DISSERTATION

PREDICTING U.S. NEWS & WORLD REPORT RANKING OF REGIONAL UNIVERSITIES IN THE SOUTH USING PUBLIC DATA

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ABSTRACT

PREDICTING U.S. NEWS & WORLD REPORT RANKING OF REGIONAL UNIVERSITIES IN THE SOUTH USING PUBLIC DATA

Using correlational analyses and multiple regressions, this study uses *U.S. News & World Report's* (*USNWR*) 2016 college rankings data and data from the National Center for Education Statistics' (NCES) Integrated Postsecondary Education Data System (IPEDS) to examine variables that explain institutional peer assessment score and rank. This study focused on the 97 institutions included in *USNWR's* 2016 Best Regional Universities (South) ranking list.

Analyses in this study addressed four major foci: 1) correlations between *USNWR* subfactor data values and selected IPEDS proxies, 2) IPEDS variables that explained variance in peer assessment score, 3) IPEDS variables that explained variance in rank, and 4) the extent to which rank could be predicted based on these results.

The results of this study indicated three main findings. First, *USNWR* subfactors with direct or indirect IPEDS proxies were highly correlated with the identified proxies. Second, more than 85% of variation in peer assessment score could be explained by five or fewer proxy variables, which differ dependent upon institution sector (private or public). Third, more than 85% of variation in institutional ranking could be explained by five proxy variables and without the inclusion of the peer assessment score subfactor. Collectively, findings suggest *USNWR* rankings are no more than a reflection of institutional outcomes and financial resources.

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CHAPTER 1: INTRODUCTION

Background

The *U.S. News & World Report* (*USNWR*) Best Colleges rankings have become a high stakes game for many institutions; one with the potential to have substantial impact on everything from admissions selectivity to alumni giving. The increasing popularity of *USNWR's* institutional rankings over the last several decades illustrates an ongoing desire in the consumer market for simplistic representations of college data (McGuire, 1995). Prospective students and parents unfamiliar with higher education jargon traditionally used in college marketing materials flock to *USNWR's* seemingly straightforward rankings (Stuart, 1995). Robert Morse, chief data strategist for *USNWR*, acknowledged that public demand for simple college information has been critical to the success of *USNWR's* rankings issue, as consumers are not interested in "academic" college representations (Morse & Gilbert, 1995). Annual rising sales of the rankings issue substantiates the growing demand for comparable user-friendly information on colleges (Morse & Gilbert, 1995). As sales of the college rankings issue continued to grow, *USNWR* became the seminal source for prospective students exploring college choices (Morse & Gilbert, 1995). By 2006, *USNWR* rankings were so entrenched they had become "the nation's *de facto* higher education accountability system" (Carey, 2006, p. 1). More than 10 million website visits were logged within the first three days of the release of the 2007 rankings (Dearden, Grewal, & Lilien, 2014). With the release of the 2014 Best Colleges rankings online, *USNWR* reported a record-breaking 2.6 million unique visitors and nearly 19 million page views in a single day (Lyons, 2013). Two years later, *USNWR* reported over 35 million unique visitors accessing *USNWR*'s Best Colleges website (Morse, Brooks, Mason, & Krivian, 2016).

The release of the 2014 Best Colleges rankings drove a record audience to *USNWR's* Education website. Most of the traffic came from within the United States, but *USNWR* saw double-digit audience gains internationally. Although consumers clamor for the annual *USNWR* "Best Colleges" issue, some college and university administrators publicly eschew the proprietary rankings system, arguing that such a system fails to represent a true portrayal of an institution's quality (Stecklow, 1995). While institutional leaders advocate that rankings do not and cannot effectively measure quality, many institutions continue to participate, aware of the impact rankings can have on applicants and donors (Ehrenberg, 2003; Stecklow, 1995).

In attempts to understand ranking methodology and data-driven means to advance in the rankings, several studies have sought to replicate *USNWR* rankings (Betsinger, 2009; Clarke, 2002a; Gnolek, Falciano, & Kuncl, 2014; Machung, 1998). Improved understanding of the constructs underlying the *USNWR* rankings would allow institutions with an eye toward attaining a higher ranking to focus on targeted measures and actions likely to results in a better ranking.

Statement of the Problem

This study examined correlations between data subfactors used by *USNWR* to calculate the 2016 Best Regional Universities (South) rankings and publicly available data from the National Center for Education Statistics' (NCES) Integrated Postsecondary Education Data System (IPEDS) to determine if IPEDS data variables were appropriate proxies for the *USNWR* factors in regards to predicting peer assessment score and rank.

Purpose of the Study

The purpose of this study was to examine associations between public IPEDS data variables and *USNWR* data factors to determine if IPEDS data could serve as potential proxies for *USNWR* data factors in the calculation of institutional ranking. Further, the study sought to

determine the extent to which such proxies might accurately predict rankings in the *USNWR* Best Regional Universities (South) list. Issues of validity within existing *USNWR* methodology were outside the scope of this study, which focused on examining and analyzing proxy variables and developing a predictive model.

Research Questions

The following research questions guided the study.

Q1: What statistically significant associations exist between *USNWR* subfactors and publicly available IPEDS variables?

Q2: To what extent does a combination of IPEDS proxies predict institutional peer assessment score in *USNWR* 2016 Best Regional Universities (South) rankings?

Q3: How well does a combination of IPEDS proxies explain variance in institutional ranking in *USNWR* 2016 Best Regional Universities (South) rankings?

Q4: To what extent can substitution of IPEDS proxies for *USNWR* values predict institutional ranking in *USNWR* 2016 Best Regional Universities (South) rankings using *USNWR's* methodology?

Operational Definitions of *USWNR* Methodology

In order to understand the specifics and context of *USNWR's* methodology and rankings, operational terms are provided below for reference.

- *Factors/subfactors* – data elements used by *USNWR* to calculate institutional ranking. 2016 factors, subfactors, and corresponding weights are shown in the Table 1
- *Ranking* – for the purposes of this analysis, this term refers to the 2016 Best Regional Universities (South) rankings, based on data collected from institutions in summer 2015 (generally on prior year 2014 data)

- *Ranking score* – calculated numeric score, on a scale of 1 to 100, based on institutional data, *USNWR* factors, and *USNWR* weights. Used to determine ranking position
- *Regional Universities* - defined by *USNWR* as institutions which "offer a broad scope of undergraduate degrees and some master's degree programs but few, if any, doctoral programs" (Morse, Brooks, & Mason, 2015, para. 8)
- *Weight* – percentage attributed to *USNWR* factors in the calculation of ranking score

Table 1

2016 USNWR Factors, Subfactors, Weights, and Operational Definitions

Factors & Weights	Subfactors & Weights	Definition
Undergraduate Academic Reputation (22.5%)	Peer assessment (100%)	The academic peer assessment survey allows top academics – presidents, provosts and deans of admissions – to account for intangibles at peer institutions. Ipsos Public Affairs collected the data in spring 2015. Of the 4,530 academics who were sent questionnaires, 40% responded.
Retention & Graduation (22.5%)	Six-year graduation rate (80%)	Average proportion of a graduating class earning a degree in six years or less; we consider first-year student classes that started from fall 2005 through fall 2008
	Retention rate (20%)	Average proportion of first-year students who entered the school in the fall of 2010 through the fall of 2013 and returned the following fall
Faculty Resources (20%)	Classes < 20 students (30%)	Proportion of classes with fewer than 20 students
	Classes > 50 students (10%)	Proportion of classes with 50 or more students
	Average full-time faculty salary (35%)	Average faculty pay, plus benefits, during the 2013-2014 and 2014-2015 academic years, adjusted for regional differences in the cost of living using indexes from the consulting firm Runzheimer International
	Faculty degree level (15%)	Proportion of professors with the highest degree in their fields
	Student-to-faculty ratio (5%)	Student-faculty ratio
	Full-time faculty (5%)	Proportion of faculty who are full-time

Factors & Weights	Subfactors & Weights	Definition
Student Selectivity (12.5%)	SAT/ACT (65%)	Factors in the admissions test scores for all enrollees who took the critical reading and math portions of the SAT and the composite ACT score. Data are for the fall 2014 entering class.
	Freshmen in top 25% of HS class (25%)	Proportion of enrolled first-year students who graduated in the top quarter of their classes. Data are for the fall 2014 entering class.
	Acceptance rate (10%)	Ratio of students admitted to applicants. Data are for the fall 2014 entering class.
Financial Resources (10%)	Average spending per student on instruction, research, etc. (100%)	Average spending per student on instruction, research, student services and related educational expenditures in the 2013 and 2014 fiscal years
Graduation Rate Performance (7.5%)	Difference between six-year graduation rate and rate predicted by *USNWR* (100%)	Shows the effect of the college's programs and policies on the graduation rate of students after controlling for spending and student characteristics, such as test scores and the proportion receiving Pell Grants. *USNWR* measures the difference between a school's six-year graduation rate for the class that entered in 2008 and the predicted rate for the class
Alumni Giving Rate (5%)	% of alumni who gave to institution within last year (100%)	Average percentage of living alumni with bachelor's degrees who gave to their school during 2012-2013 and 2013-2014

Study Limitations and Delimitations

Potential limitations to the study included: (1) missing or inaccurate IPEDS data for institutions within the population; (2) subsequent revision to the *USNWR* weightings methodology, which could hinder prediction accuracy; (3) variance in institutional data reported to *USNWR* and IPEDS; and (4) multicollinearity amongst variables.

Delimitations include that the sample for this quantitative research study included only institutions ranked in the 2016 *USNWR* Best Regional Universities (South) listing (n = 97). This represented a fraction of institutions in the southern region and did not represent all institutions classified as within the southern region by IPEDS. As the population examined contained only institutions classified as regional universities in the south per the *USNWR* definition, results are

not generalizable to all institutions, or even all institutions within the southern region. Revisions to *USNWR* methodology may render results not generalizable across time.

Study Significance

This study provided three unique contributions to the literature. First, it focused on rankings of southern regional universities. As discussed in chapter two and evidenced in Appendix A, the majority of empirical literature related to rankings have focused on institutions ranked within the national universities or liberal arts colleges listings (Bastedo & Bowman, 2010a; Clarke, 2002a; Dichev, 2001; Gnolek, Falciano, & Kuncl, 2014; Grewal, Dearden, & Llilien, 2008; Lee, Sanford, & Lee, 2014; Monks & Ehrenberg, 1999a; Webster, 2001). Second, it used public IPEDS data as inputs instead of *USNWR's* collected data. A number of prior studies have attempted to replicate rankings using *USNWR* data as a foundation; the literature regarding replicating the *USNWR* rankings relies heavily on data collected and published by *USNWR* to some extent (Betsinger, 2009; Gnolek et al., 2014; Lee, Sanford, & Lee, 2014; Webster, 2001). Third, findings from this research inform understanding of what *USNWR* rankings of regional universities in the south are actually measuring, as evidenced through correlational analysis of *USNWR* factors and IPEDS data variables. Findings from this study can be used to inform institutional discussions regarding what rankings measure and how to predict institutional rank.

Researcher's Perspective

The researcher's interest in this topic stemmed from witnessing the impact and attention devoted to *USNWR* rankings within institutions in the south and from the experience of reporting institutional survey data to *USNWR*. This perspective allowed the researcher to see the disparity between data reported and perceived quality of the rankings. Further, investigation of

the limited data *USNWR* makes available to explain their methodology prompted the researcher to wonder if the rankings could be replicated using data from other sources. As such, the researcher felt investigating this topic could provide insight into which aspects the *USNWR* factors represent and if those aspects could be used to replicate an institution's ranking.

Organization of the Study

This study is divided into five chapters, with this first section providing background and a brief overview of the study. Literature related to the *USNWR* rankings, the impact rankings have upon institutions, and prior studies of predictive models are discussed in Chapter 2. Chapter 3 focuses on data collection, analysis, and methodology procedures. Results of the analyses are examined in Chapter 4, followed by discussion of findings and implications in Chapter 5.

CHAPTER 2: LITERATURE REVIEW

Introduction

The body of research related to *USNWR* annual rankings of colleges is extensive and broad. This chapter provides context, thematic synthesis, and critique of literature related to the research questions that guide this study (noted in the prior chapter). To provide context to these questions, and why they are important, a critical review of related literature was conducted. A detailed summary of the literature is provided in Appendix A.

Literature Search and Selection

Initial search terms were limited to keywords including *U.S. News & World Report*, university rankings, predictors, and college rank. Exploration of research suggested the addition of the terms marketing, modeling, measurement techniques, predictive validity, prestige, reputation, and validity. Although much of the literature reviewed was from scholarly journals, a number of non-scholarly sources were included to demonstrate the scope of the impact of institutional rankings. While cited research is typically peer-reviewed, journalistic voices are included because it is the journalist perspective that gives power to the rankings. *USNWR* itself is a non-scholarly source; non-empirical articles drive the popularity and impact of the rankings; to exclude them would diminish the relevance of a sector that plays a critical role in the rankings context. Based on this impact, in addition to peer-reviewed research from electronic ERIC (EBSCO), JSTOR, and Proquest databases, perspectives pertaining to this research were also retrieved from sources including *The Chronicle of Higher Education*, *Inside Higher Ed*, and the *U.S. News & World Report* website. As a result, nearly half of the relevant literature was non-empirical and published outside of traditional peer-reviewed journals.

Reference lists of initial research findings were used to inform subsequent searches. Google Scholar was also used to identify potential research. Studies reviewed were limited to the timeframe of 1995 to 2016 to ensure relevance of the literature. One hundred and forty-nine items were retrieved and reviewed. A large number of these items were found to be either anecdotal in nature or repetitive, and as such were excluded from this analysis. A review of the remaining 72 items was conducted; synopses were logged in Excel and items categorized on factors including author type, thematic focus, and year of publication (Appendix A).

Several key findings emerged from the analysis. The literature showed that research focused primarily on two aspects of *USNWR* rankings: the influence rankings have on institutions and the methodology behind the rankings. Literature was nearly evenly split between the two aspects; just over half of the literature reviewed (51%) explicitly focused on concerns regarding the methodology used by *USNWR*, while 49% focused on the impact of rankings on institutional behavior. The subsequent review of literature explores why institutions participate in the rankings, how they are influenced by rankings, methodological concerns, and prior attempts to predict ranking position.

Why Do Institutions Participate in *USNWR* Rankings?

Rankings have the potential to inform students about institutional characteristics or to influence students by altering their perceptions about an institution (Dearden, Grewal, & Lilien, 2014). In this manner, rankings become a form of institutional advertising which seeks to influence prospective students (Dearden et al., 2014). Although institutions may privately scoff at the rankings methodology, this does not deter them from prominently displaying rankings data in institutional marketing and recruitment materials (Hossler, 2000). This action is prompted by the fact that employing rankings in institutional marketing has been found to impact admission acceptance rates and academic quality of incoming students in the year after the publication of

the rankings (Bowman & Bastedo, 2009). Institutions ranked in *USNWR's* top 50 were found likely to have a lower acceptance rate, a larger proportion of applicants with superior high school rank achievement, and a general increase in freshman applications in the subsequent year (Bowman & Bastedo, 2009). Ranking in the top 20 resulted in increased academic competition amongst prospective students, allowing an institution that moves up in the rankings to be more selective in enrolling high achieving students (Alter & Reback, 2014, Monks & Ehrenberg, 1999a). Conversely, a drop of one position in the rankings was found sufficient to prompt a slight increase in an institution's acceptance rate and thereby decrease selectivity in the subsequent year (Monks & Ehrenberg, 1999b). As Machung (1998) noted, institutions "most impacted by the rankings are those that have the most to lose, precisely because they benefit the most from (even rely upon) the rankings for prestige and visibility" (p. 14).

With over 35 million unique visitors accessing *USNWR*'s Best Colleges website in 2016, it is difficult to dispute the visibility of the rankings (Morse et al., 2016). Despite the vast number of individuals viewing *USNWR's* online rankings, rankings may not be a primary factor in college choice of students. Only 20% of the responding 141,189 freshman attending baccalaureate institutions reported rankings in magazines such as *USNWR* were very important in their college choice in the 2015 Cooperative Institutional Research Program (CIRP) Your Freshman Year Survey (Egan, Stolzenberg, Bates, Aragon, Suchard, & Rios-Aguilar, 2015). Students attending private universities reported higher reliance on rankings in college choice, with 29% of the 21,018 respondents indicating ranking were very important, compared to 25% of the 40,430 respondents attending public universities (Egan et al., 2015). Respondents attending public four-year colleges (n = 20,404) reported the lowest use of rankings in college choice, with just 14% finding rankings very important to their decision (Egan et al., 2015).

Impact of the rankings can be extensive, reaching beyond admissions and marketing, into faculty recruiting and alumni giving. Shin, Toutkoushian, and Teichler (2011) noted institutions that hope to improve ranking position may take into consideration for hiring purposes faculty characteristics such as research/scholarship productivity or grant attainment. Similarly, the Institute for Higher Education Policy (IHEP) (2009) observed use of faculty quality measures in rankings prompts institutions to seek faculty who are particularly well known or accomplished. Such behavior not only has the potential to influence faculty resource measures within ranking calculation, but could result in increased peer assessment score for institutions. Conversely, institutions with high rankings seeking to recruit high calibre faculty often highlight their rankings as an indicator of institutional quality and appeal.

External entities such as alumni and funding sources are also impacted by rankings. Federal grant applications from highly ranked institutions, especially those reviewed by faculty or administrators, are more likely to be funded than those from lower or non-ranked institutions (Shin et al., 2011). Although grant funding may not impact all institutions, alumni giving does; Bastedo and Bowman (2010a) found both grant funding and alumni donations to be negatively impacted by attainment of a ranking position of 20 or higher.

Pressure for institutions to participate in the rankings comes not only from perceived benefits (or loss thereof), but also from the perceived consequences of non-participation. While participation in the data collection survey is nominally voluntary, when Reed College elected not to participate in the 1995 data collection process, instead of excluding the college, *USNWR* "assigned the lowest possible value to each of Reed's missing variables" which placed the institution into the bottom rankings tier (Diver, 2005, p. 136). Reed College has refused to participate in *USNWR* ever since, voicing their "conviction that the magazine's methodology is

hopelessly flawed" (Lydgate, 2015, para. 2). Despite Reed College's lack of participation, *USWNR* continues to include them in the rankings year after year, suggesting institutions have no say over whether they are ranked by *USNWR*. In response, Reed College created a webpage devoted to clarifying reasons for non-participation and emphasizing concerns with validity of the methodology. Reed acknowledged "although we would prefer that *U.S. News* simply leave us out of their survey, the magazine persists in ranking us against other colleges, based on data that are questionable at best" (Lydgate, 2015, para. 2).

Although Reed College remains steadfast, few other institutions have dared to withdraw completely from the *USNWR* rankings given the potential marketing nightmare of being placed at the bottom of the ranks. Despite the formal agreement signed by more than 60 presidents in 2007 to decline participation (Anonymous, 2007), the percent of non-participants has changed minimally over the last decade. For the 2009 rankings, 8.6% of institutions declined to submit data; the 2015 rankings saw a slight decrease to 8.5%, and the 2016 rankings a larger decrease, with only 7.3% of institutions surveyed not submitting data (Morse et al., 2015; Morse & Flanigan, 2008, 2014).

As illustrated by this section, rankings are a high stakes game with the potential to influence a number of institutional metrics, from quality of applicants to grant funding. This pressure to perform well in rankings can create an underlying agenda at an institution, an effect Hossler (2000) referred to as "management by *U.S. News and World Report*" (p. 21).

Institutional Response to *USNWR*

Media publicity surrounding rankings has resulted in "increasing evidence that rankings are having a pernicious effect on the policies and practices of colleges and universities" (Hossler, 2000, p. 20). Accounts of institutions altering behavior to improve their rankings have become increasingly common over the last decade; Gnolek et al. (2014) suggested such behavior is so

extensive that nearly every institution makes "legitimate adjustments" to their submitted data (p. 763). Such adjustments might include managing admissions to appear more selective (Gnolek et al., 2014) or soliciting nominal donations from alumni to reflect a high overall rate of alumni giving (Farrell & Werf, 2007).

Strategic Planning for Ranking Gain

Despite the eagerness of some colleges to attempt to improve rankings through institutional changes, implementing institutional changes in efforts to gain a higher ranking is generally an impractical goal. Institutions often labor under the impression a few key changes can result in a higher ranking in the subsequent year, but many fail to realize the extent of changes required to make an actual shift in the rankings. This was evidenced by Baylor University's goal to break into the top 50 institutions by 2012; within the first five years of pursuing this goal, the university had spent over $200 million on improvements related to attaining a higher ranking (Farrell & Werf, 2007). Baylor University ranked 81st in 2007 and over ten years later it has yet to break into the top 50, ranking 75th in the 2018 National Universities rankings *(U.S. News & World Report*, 2017). Despite Baylor's failure to attain its goal with the investment of extensive expenditures, for many administrators attaining a better ranking is an articulated part of their operational campus plan (Morse, 2008). As Morphew and Swanson (2011) noted, "it is nearly impossible for any university outside the top 25 to break into this elite group, and aspirations to do so represent, in the vast majority of cases, organizational daydreaming" (p. 191).

As institutions integrate goals to attain higher ranks into strategic planning, they are essentially validating the rankings. The devotion of often-scarce resources to this goal suggests the extent to which institutions are willing to go to attain the perceived gains of higher rankings,

even though the likelihood of actually doing so is slight. Even examples such as Baylor, which evidences hefty investment towards a goal yet to be attained, seem insufficient to deter institutions from seeking ways to rise in the rankings. Institutions seem to suspect there is a magic formula that will result in a quick rise to the top, yet, the same institutions ignore the fact that the top 50 institutions change minimally (Martin, 2015). The very nature of the rankings allows a finite number of institutions to occupy the top slots, yet many institutions continue to invest resources in the aim to move up.

USNWR is not oblivious to the use of rankings to drive institutional decisions; in 2008, Morse acknowledged that rankings do influence decision-making at some institutions, but suggested resulting changes which improve academic aspects are generally beneficial for students. The subsequent year, following a particularly public revelation that Clemson University was actively attempting to gain a higher rank by bending data definitions, Morse (2009) stated "the rankings are not meant to drive the mission or any other strategic goals that a university may be trying to attain" (para. 4). With the narrow focus on rankings at some institutions, it is likely nothing said by *USNWR* would dissuade institutions from seeking to attain higher ranks.

Creative Data Reporting

As the rankings have grown in publicity, institutions seeking to gain or retain high rankings may become increasingly tempted "to respond creatively" (McGuire, 1995, p. 51). *USNWR* rankings are grounded in the assumption that a measure of institutional quality can be ascertained based on self-reported data collected from institutions. Self-reported data allow institutions to interpret definitions and data in the manner that is most beneficial to the institution and cannot be easily proven inaccurate (Diver, 2005; McGuire, 1995). One enrollment management administrator likened institutions reporting their own admissions statistics to

"asking automakers to report their own gas mileage" (Hoover, 2012a, para. 14) to illustrate the extent of the stake of the reporting entity. The fact that data collected by *USNWR* are self-reported by institutions and do not undergo rigorous validation procedures creates potential for multiple interpretations of a single question that may diminish the validity of the data.

Creative interpretations come as no surprise to *USNWR*'s chief data strategist who argued issues of varying data validity stem from institutional submissions rather than from *USNWR's* analyses of submitted data (Morse & Gilbert, 1995). In recent years, a number of institutions, including Bucknell University, Claremont McKenna College, Clemson University, Emory University, George Washington University, Lindenwood University, Rollins College, and Tulane University have admitted to submitting false data to *USNWR* (Anderson, 2013; Jaschik, 2014; Morse & Tolis, 2014). Although few higher education professionals are willing to confess to intentional misreporting, over 90% of admissions directors surveyed by *Inside Higher Ed* believed that other institutions were submitting false data to *USNWR* (Jaschik, 2014).

Most notably, Clemson's confession of efforts pursuant to attaining a more favorable ranking became public knowledge in 2009 when the institution's institutional research (IR) director presented a session at the annual institutional research conference outlining the methods the university used to rise from 38th to 22nd (Van Der Werf, 2009a). The leap in rankings stemmed from carefully implemented tuition increases, managed class sizes, admissions selectivity, and unfavorable reputational reviews of peer institutions (Lederman, 2009; Van Der Werf, 2009a). Amidst controversy, the IR director defended the presentation; stating she "was just discussing publicly what we all say privately" (Van Der Werf, 2009b, para. 11).

The majority of instances of acknowledged misreporting (Desantis, 2013; Hoover, 2012; Jaschik, 2014; Morse & Tolis, 2014; Stecklow, 1995; Supiano, 2012) focus on input measures

such as admissions selectivity and SAT/ACT score. Given Webster's (2001) finding that SAT/ACT score is the most important predictor of rank when the effects of multicollinearity were considered, it makes sense that institutions are inflating these measures. Specifically, Claremont McKenna College, Emory University, Flagler College, and Tulane University's school of business all misreported SAT/ACT test scores, along with other admissions data, some for nearly a decade (Desantis, 2013; Hoover, 2012; Jaschik, 2014; Supiano, 2012).

Penalties for submitting inaccurate data are minimal, especially in light of the perceived gains that accompany rankings increases. Institutions found to have attained a higher ranking based on misreported data are removed from the current rankings list and are required to provide evidence of quality assurance measures to *USNWR* prior to being included in subsequent year rankings (Morse, 2013a). While submitting false information to federal or financial entities could result in substantial consequences, the penalties for misreporting data to *USNWR* are likely insufficient to discourage institutions from submitting data of varying quality or interpretations.

Stecklow's (1995) finding that nearly a quarter of institutions reported differing information to rankings publications than to debt-rating agencies suggests misreporting is more widespread than the handful of cases that are discovered and publicized each year. Such discrepancies likely stemmed from the fact that institutions were more inclined to inflate figures reported to rankings publications, as there are minimal penalties for misreporting data to such entities (Stecklow, 1995). Pursuant to Stecklow's findings, *USNWR* publicly engaged in a data sharing relationship with a bonding agency to validate institutional data received by *USNWR* against that received by the bonding entity (Morse & Gilbert, 1995). To minimize institutional variance in interpretation of questions, *USNWR* revised questions that provided the most opportunity for flexible interpretation, including key admissions questions used to determine

institutional acceptance rates (Morse & Gilbert, 1995). Such validation methods were apparently inadequate, as all of the instances of misreporting data cited above occurred more than a decade after such measures were put in place by *USNWR*.

The literature shows institutions struggle to make gains in the rankings, whether through devotion of resources or beneficial interpretation of data definitions. Yet, many of these attempts have failed to examine the contributions of each of the factors used by *USNWR* to calculate the rankings. Enhanced understanding of the factors used by *USNWR* and the data values they represent allows institutions to target resource allocation in a more beneficial way.

What do *USNWR* Rankings Measure?

Although Morse (2008) asserted *USNWR* rankings "ring true" to those within higher education (p. 350), the majority of criticisms regarding *USNWR's* rankings system stem from higher education professionals who question the validity of the methodology, weighting criteria, and resulting rankings (Dichev, 2001; Ehrenberg, 2005; Farrell & Werf, 2007; Gladwell, 2011; Kuh, 2011; Lee et al., 2014; Longden, 2011; McGuire, 1995; Morse, 2015; National Opinion Research Center, 1997; Sanoff, 2007; Webster, 2001).

USNWR claims rankings "measure academic excellence" based upon "hundreds of statistical data points" (Morse, 2015). Morse (2015) acknowledged the rankings are the best representation of institutional quality, given the lack of availability of consistent and comparable learning outcome and engagement data across higher education. *USNWR's* justification that the rankings are adequately valid because there is no single "reliable and practical system of measuring outcomes" (McGuire, 1995, p. 58) across higher education does not provide validation for the rankings methodology. In lieu of consistent quality data, *USNWR* relies on seven key areas to calculate ranking: peer assessment (22.5%), retention & graduation (22.5%),

faculty resources (20%), student selectivity (12.5%), financial resources (10%), graduation rate performance (7.5%), and alumni giving rate (5%).

Existing methodology may focus more on measures designed to drive publication sales than on measures of educational quality or student learning (Graham, Thompson, Dolnick, Kipp, Koons, & Laskow, 2001; Kuh, 2011). Kuh (2011) went so far as to suggest that without the rankings issues to drive sales, *USNWR* would likely have disappeared. One indication that the methodology is driven by sales rather than student learning is *USNWR's* continued use of faculty salary as a weighted factor, which has been found to have a negative correlation to student learning (Graham et al., 2001). Lack of validity within the measures is compounded by the distillation of the numerous factors into a single number representing institutional quality and suggesting magnitudes of difference between ranks (Clarke, 2002b; Ehrenberg, 2005). *USNWR* defended the rankings structure, stressing there is no single accurate way to distill all aspects of institutional quality into a single numeric rank (Morse, 2013b a)(Morse, 2013a). Yet, this awareness does not discourage *USNWR* from publishing the rankings each year or from making continual adjustments to the methodology.

USNWR has revised its methodology nearly every year since the inception of the rankings (Machung, 1998). The methodology is no secret, as *USNWR* has been publishing detailed explanations of their methodology since 1991 to substantiate the credibility of the rankings (Sanoff, 2007). Both Sanoff (2007) and Morse (2013b), who serves as the current *USNWR* chief data strategist, have defended the frequent methodological changes as necessary modifications to address both criticism of the model and the constant changes within higher education. Morse (2013b) stressed that although modifications to *USNWR's* rankings formula are implemented frequently, such changes are necessary and not designed to increase volatility in the rankings as

some have suggested (Machung, 1998; Martin, 2015). Revisions, in part, do seem to reflect changes in higher education; the most recent weighting revisions placed more emphasis on student outcomes over admissions characteristics, which mirrors the current emphasis on higher education outcomes at the federal level. McGuire (1995) proposed that while improvements in *USNWR's* methodology were commendable, the constant variations in methodology make it difficult for consumers and institutions to understand the meaning of the fluctuations.

Despite revisions, the overarching thematic categories remain constant. The reduced weighting given to peer assessment score in 2016 rankings illustrates less emphasis on peer assessment score than prior years; in the 2016 rankings it accounted for 22.5% (down from 25% in prior years) (*U.S. News & World Report*, 2014). This lessened emphasis on peer reputation may stem from criticisms regarding the peer assessment survey, which asks institutional leaders to rate peer institutions on several aspects. Such reputational rankings are often calculated on the ratings of individuals who are not familiar with all institutions they are asked to evaluate (Kuh, 2011). As reputational rankings are based on the perception of peer schools, many institutions seek to gain higher ratings by bombarding administrators of peer institutions with publications touting the selling points of their campuses and lobbying for strategic publicity articles to increase visibility (Brennan, Brodnick, & Pinckley, 2008, p. 171).

While revisions to the methodology suggest improvement, critics argue the overall methodology lacks a firm foundation (Farrell & Werf, 2007; Machung, 1998). Findings from *USNWR's* commissioned review of its methodology by the National Opinion Research Center (NORC) suggested, "the principal weakness of the current approach is that the weights used to combine the various measures into an overall rating lack any defensible empirical or theoretical basis" (National Opinion Research Center, 1997). Shifts in the weighting scheme result in

significant changes in rankings position, as exemplified by California Institute of Technology's leap from 8th place into first place within a single year despite the lack of any significant changes from their data submitted in the prior year (Burness, 2008, para. 8). Conversely, Georgetown dropped eight rank positions within a year, due to *USNWR's* changes to a definition (Machung, 1998). As controversial changes in annual rankings result in higher sales for *USNWR*, methodological changes may be implemented for enhancing the volatility of the rankings and thereby increasing sales (Dearden et al., 2014). As institutions tend to change very little year-to-year, newsworthy changes generally do not occur independent of changes in methodology. Machung (1998) referred to this practice as creating credible instability – making methodological changes that are reasonable but attention getting enough to boost sales.

Although changes to methodology make it difficult to reproduce rankings consistently across years, the transparency afforded by *USNWR* allows researchers to examine how certain factors and subfactors contribute to the model for a single year. As rankings tend to remain relatively stable across time (Martin, 2015), understanding what contributes to ranking within a single year increases the ability to predict subsequent year rankings, barring substantial changes in methodology.

Predicting Ranking Position

Several studies have sought to replicate *USNWR* rankings in different contexts (Betsinger, 2009; Clarke, 2002a; Gnolek et al., 2014; Machung, 1998). Such attempts were often hindered by frequent changes to the *USNWR* ranking methodology. Betsinger's (2009) attempt to replicate the predicted graduation rate metric for institutions on the liberal arts college rankings was based on methodology provided by *USNWR* and used public data from IPEDS as inputs. Despite availability of the *USNWR* methodology, Betsinger was unable to replicate the predicted graduation rate metric, perhaps due to variation in the underlying data submitted to *USNWR* and

IPEDS. Similarly, Gnolek et al.'s (2014) attempt to reproduce the national universities rankings based on the same methodology and data sources replicated rankings accurately for only 20% of institutions, but were within ± 4 points for all remaining institutions (Gnolek et al., 2014). Based on analysis of a decade of *USNWR* rankings data, Gnolek et al. (2014) reproduced *USNWR's* rankings methodology and outcomes for nationally ranked institutions. Weighting values for each of the subfactors within the broad categories were determined, based on triangulation of data from *USNWR* and IPEDS and used to predict institutional rankings (Gnolek et al., 2014). This model (based on 2012 data) suggested that for an institution to improve its rank, all of the following would be required:

1) a peer reputation score similar to the top 20 institutions,

2) an acceptance rate of 25% or lower,

3) SAT scores in the 95th percentile or higher,

4) a student to faculty ratio of 8 to 1,

5) an alumni giving rate exceeding 25%, and

6) a nearly 90% graduation rate (Gnolek et al., 2014, p. 775).

To attain these metrics, an institution would likely expend nearly $90,000 in educational support per student and offer average faculty compensation of $150,000 per year (Gnolek et al., 2014). Total cost of an investment of this magnitude for a typical institution would be in excess of $100 million per year to sustain (Gnolek et al., 2014). Few institutions could afford such a substantial resource investment in order to potentially gain a rankings position. Based on the extensive resources required, Gnolek et al. (2014) suggested institutions would benefit more from "focusing their efforts and resources on what they do best, not what is being measured by *U.S. News*" (p. 778).

In their studies, both Webster (2001) and Bastedo and Bowman (2010b) noted an inherent multicollinearity amongst the variables used by *USNWR* to calculate institutional rank. Webster's (2001) examination of the accuracy of the weighting system found pervasive multicollinearity amongst variables used in computation of scores for national universities. Results from the analysis of 11 *USNWR* measures (including academic reputation, alumni giving, class size, faculty compensation, retention rates, graduation rate, and SAT/ACT scores) revealed discrepancies with *USNWR*'s order of measures based on influence upon rank (Webster, 2001). Whereas *USNWR* attributed the most weight/influence to peer reputation, it ranked fourth (11% vs. 25% per *USNWR*) when the effects of multicollinearity were considered (Webster, 2001). Average SAT score, which *USNWR* purported to be the third most heavily weighted criterion, was found to be the most important criterion in explaining an institution's rank, followed by predicted graduation rate (ranked 6th by *USNWR*) and actual graduation rate (ranked 2nd by *USNWR*) (Webster, 2001). These findings suggest the weighting scheme used by *USNWR* does not take into account the inherent multicollinearity amongst measures when calculating institutional rank and as a result may be weighting measures in a way that does not accurately reflect the true magnitude of influence.

Volkwein and Sweitzer (2006) found over 90% of variance in peer assessment scores for national research universities could be explained by eight of the *USNWR* variables used to calculate rank: total enrollment, average professor salary, student-faculty ratio, percent of full-time faculty, median SAT score, faculty productivity, alumni giving rate, and graduation rate. Brennan et al.'s (2008) subsequent research posited if peer assessment score is a reflection of quality and not of popularity, it should correlate with perceived measures of quality (i.e., SAT/ACT score, percent of small classes, graduation rate, alumni giving rate). Approximately

83% of variance in peer assessment score was explained by these variables, with graduation rate having the largest impact on peer assessment score, followed by alumni giving rate, institution sector, and median SAT/ACT score (Brennan, Brodnick, & Pinckley, 2008).

Validating the weighting system used by *USNWR* is critical for establishing validity of the rankings. However, the pervasive multicollinearity found by both Webster (2001) and Bastedo and Bowman (2010) suggest additional research is needed to determine the extent of the multicollinearity and whether all the variables used by *USNWR* are necessary to calculate peer assessment score and rank.

Support for Study

As the review of literature has shown, the majority of research focuses on rankings of institutions within the national universities or national liberal arts rankings lists. Little to no research has focused on the *USNWR* rankings for regional universities. Further, the literature regarding replicating the *USNWR* rankings relies heavily on data collected and published by *USNWR* to some extent. As the majority of predictive studies rely on *USNWR* data, this research examining the extent to which rankings of regional universities in the south can be replicated using federal IPEDS data provides a new contribution to the literature. If proxies for the *USNWR* factors can be replicated from public IPEDS data, issues stemming from misreporting (both intentional and accidental) become moot.

CHAPTER 3: METHODOLOGY

Research Design and Rationale

The purpose of this study was to examine associations between public IPEDS variables and *USNWR* factors to determine if IPEDS data can serve as potential proxies for *USNWR* factors in the calculation of institutional ranking. Further, the study sought to determine the extent to which such proxies might accurately predict rankings in the *USNWR* Best Regional Universities (South) list. The following research questions guided the study.

Q1: What statistically significant associations exist between *USNWR* subfactors and publicly available IPEDS variables?

Q2: To what extent does a combination of IPEDS proxies predict institutional peer assessment score in *USNWR* 2016 Best Regional Universities (South) rankings?

Q3: How well does a combination of IPEDS proxies explain variance in institutional ranking in *USNWR* 2016 Best Regional Universities (South) rankings?

Q4: To what extent can substitution of IPEDS proxies for *USNWR* values predict institutional ranking in *USNWR* 2016 Best Regional Universities (South) rankings using *USNWR's* methodology?

As this study tested associations between institutional characteristics in federal IPEDS datasets and ranking in *USNWR's* Best Regional Universities (South) list, a non-experimental empirical quantitative approach was used to examine relationships within existing datasets available from *USNWR* and IPEDS. This chapter examines the study population, data sources, validity and reliability, data collection processes, selection of key analysis variables, data preparation processes, and statistical analyses.

Population and Sample

The population for the study was comprised of 97 postsecondary institutions that received numeric rankings in the 2016 *U.S. News & World Report's* Best Regional Universities (South) rankings (Appendix B). The Best Regional Universities (South) category was selected as the population as it includes researcher's home institution, which allowed for increased understanding of context. Although the 2017 Best Regional Universities (South) rankings list had been published, 2016 rankings were used for two reasons: 1) to align with the time frames of institutional data available in IPEDS, and 2) to allow deeper examination of the underlying data based on the 2016 rankings data file received from *USNWR*.

Data Sources

Data for this study were drawn from three existing sources: the 2016 *USNWR* Best Regional Universities (South) rankings data, collected by *USNWR,* academic years 2013-14 and 2014-15 federal IPEDS data collected by the U.S. Department of Education, and academic years 2013-14 and 2014-15 athletic data from the Department of Education's Equity in Athletics Data Analysis system (EADA). Detailed descriptions of each of the sources used are provided below.

USNWR

USNWR relies on institutionally reported data as the foundation of the rankings. *USNWR* collects data from institutions through three survey components: a main survey, a financial aid survey, and a finance survey. For the 2016 rankings data collection, the main survey consisted of 560 questions on topics including admissions, enrollment, outcomes, alumni giving, faculty salaries, class size, academic offerings, student activities, athletics, housing, facilities, student services, and more. The financial aid survey (60+ questions) collected data on topics such as expenses, aid available, awarded aid, and indebtedness. The finance survey (15 questions)

collected data on financial aspects of the institutions such as investments, endowments, and expenditures. All elements within the finance survey are aligned with IPEDS finance survey questions; respondents are encouraged to use institutional IPEDS data as the primary source when completing the *USNWR* finance survey.

While a substantial amount of information is collected by *USNWR* during the annual survey cycle, inclusion in the Best Colleges rankings is determined based on responses to specific questions. According to Morse's presentation (Morse et al., 2016) at the 2016 AIR Forum, the "key qualifier to be ranked or unranked" is institutional response to the main survey question "does your institution make use of SAT, ACT, or SAT Subject Test scores in admission decisions for first-time, first-year, degree-seeking applicants." In order to be ranked, institutions must indicate they utilize test scores as part of the admissions decision process; a response of "no" automatically excludes institutions from being ranked. As part of the improved survey verification and submission process for the 2017 rankings, *USNWR* began indicating which specific survey questions are used to calculate rankings. Per the data collection guidance for the 2017 rankings, *USNWR* acknowledged rankings are based on approximately 30 of the questions in the main survey as well as the entirety of the finance survey (*U.S. News & World Report*, 2016). No responses from the financial aid survey were indicated as being contributors to rankings calculation (*U.S. News & World Report*, 2016).

Despite the substantial data collection required by *USNWR*, nearly 93% of institutions that received *USNWR* surveys complied and provided the requested data during the 2016 rankings collection cycle (Morse, Brooks, & Mason 2015). As a result, *USNWR* collected data from approximately 1,800 institutions; of these institutions, just under 1,400 received official rankings (Morse et al., 2015). Institutions that submit data, but do not use test scores for

admissions decisions, have enrollments of fewer than 200 students or no first-year students, or that receive insufficient peer assessment ratings are placed in the "unranked" classification (Morse & Flanigan, 2014).

Per *USNWR* methodology, missing survey data were obtained by *USNWR* from other available sources such as IPEDS and the National Collegiate Athletic Association when possible (Morse et al., 2015). It was particularly relevant to this study that *USNWR* "made extensive use of the statistical [IPEDS] data" of institutions which declined to respond to *USNWR's* surveys (Morse et al., 2015, para. 25). In instances where institutions did not provide them, IPEDS data for test scores, acceptance yields, faculty numbers, student to faculty ratios, and retention and graduation rates were used in lieu of survey data (Morse, Brooks, Mason, & Krivian, 2016).

In recent years, *USNWR* implemented processes to encourage data validity, including in-house responsibility for data collection, advanced review of the data collection instrument by select financial aid and admissions professionals, alignment to federal data definitions, and systematic internal data verification (Morse & Gilbert, 1995). *USNWR* acknowledged it may undertake discretionary "cross-checking of data" to compare received data to IPEDS data, with the caveat that "schools are ultimately responsible for the accuracy of the data that they submit" (*U.S. News & World Report*, 2016, p. 4). Logic and variance checks are now performed against all data submitted which isolate and flag any instances of substantial change or error from the prior reporting year (Morse & Gilbert, 1995).

How USNWR Calculates the Rankings. Once *USNWR* data were collected, data points were compiled and "assigned a weight that reflects our judgment about how much that measure matters" by *USNWR* (Morse et al., 2015, para. 10). (This vague explanation offered by *USNWR* serves as the foundation for much of the criticism regarding the validity of *USNWR's*

methodology.) Key steps undertaken by *USNWR* to calculate overall institutional rank score are summarized in Figure 1; a more detailed explanation of the methodology follows.

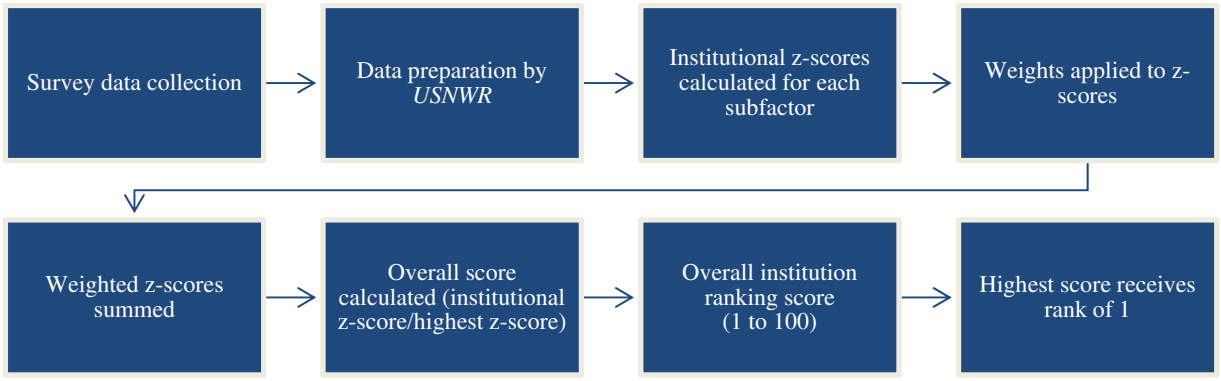

Figure 1. Process chart showing steps used by *USNWR* to calculate the 2016 Best Colleges institutional rankings.

Upon conclusion of data collection and preparation, z-scores were calculated for each of the individual subfactors shown in Table 1 (i.e., retention rate, faculty salaries, high school class standing, etc.) to standardize institutional values so resulting values could be easily compared. For *USNWR's* calculations, z-scores were determined by subtracting group average for the variable from an institution's data value for the same value and then dividing by the standard deviation of the variable. For example, to calculate the z-score of the retention subfactor for Institution X, the formula was: *z-score = (retention value of Institution X – average retention value of all institutions within the Best Regional Universities (South) group) / SD standard deviation of retention for institutions within the Best Regional Universities (South) group.*

Next, percentage weights associated with each subfactor (shown in Table 1) were applied to the z-scores. Building on the prior example, the next step of the formula applied the *USNWR* weight associated with the retention subfactor to the z-score: *weighted retention z-score = Z retention * (20%).* As weighted subfactors were grouped thematically to combine like measures into a single factor (i.e., the subfactors of retention rate and six-year graduation rate were combined into a single retention and graduation factor) the process must be repeated for

graduation: *weighted graduation z-score = Z graduation * (80%).* The resulting calculation for the weighted graduation and retention factor was *Z graduation * (80%) + Z retention * (20%).* This process was repeated for each of the subfactors, until all 15 subfactors have been rolled up into the seven larger thematic factors.

The weighted z-scores for the seven factors were then summed to create a single weighted z-score for each institution: *institution's total weighted z-score = Z academic reputation * (22.5%) + Z alumni giving * (5%) + Z financial resources * (10%) + Z student selectivity * (12.5%) + Z graduation and retention * (22.5%) + Z faculty resources * (20%) + Z graduation rate performance * (7.5%).* Overall scores for each institution were then calculated by dividing the institution's total weighted z-score by the highest weighted z-score of institutions in the same rankings category (i.e., Best Regional Universities South) and rounded to the nearest whole number (Morse et al., 2015). Institutions were sorted in descending order on overall score and ranking positions assigned, with the highest scoring institution receiving the rank of one.

Institutions that received the same score were awarded the same ranking position, with a tie score indicated. In this event, ranking positions were adjusted accordingly to reflect the tie. For example, in the 2016 rankings, both Elon University and Rollins University received ranks of one; the next institution on the rankings (The Citadel) received a rank of three. Although 97 institutions were listed in the 2016 rankings, only 42 actual ranking positions were assigned, and only 16 institutions received a ranking not in a tied position.

IPEDS

The Integrated Postsecondary Education Data System (IPEDS) serves as the collection and dissemination function of the National Center for Education Statistics (NCES). As such, data on a variety of aspects are collected from postsecondary institutions across the U.S. and beyond,

on admissions, enrollments, cost, financial aid, outcomes, libraries, and more. Each year institutions submit these data according to three mandated reporting periods corresponding to fall, winter, and spring. During the 2015-16 collection cycle, over 7,000 institutions submitted data via the IPEDS collection system (Ginder, Kelly-Reid, & Mann, 2016).

IPEDS data collection process is spread across 12 distinct survey components: Institutional Characteristics, Completions, 12-Month Enrollment, Student Financial Aid, Graduation Rates, 200 Percent Graduation Rates, Admissions, Outcome Measures, Fall Enrollment, Finance, Human Resources, and Academic Libraries (Ginder, Kelly-Reid, & Mann, 2016). This federally mandated annual data collection is required of institutions receiving federal financial aid funds. This requirement, coupled with substantial financial penalties, ensures institutions report data in a timely manner. Due to the scope, frequency, and complexity of data collection there are a number of verification processes inherent in the submission process. A number of data validity measures are utilized to ensure submission of accurate data, including limited access to the data submission system, pre-loaded prior year data values for reference, and an error check process (Ginder, Kelly-Reid, & Mann, 2016). To minimize input errors, the IPEDS data collection system employs a series of flags that indicate substantial value changes from prior years and from other IPEDS data submitted. This serves as an early alert system that helps ensure accurate data collection.

Pending review and validation by NCES, IPEDS data are made available to the public via the IPEDS website, which provides access to reported federal postsecondary education data from 1980 to present. For purposes of this analysis, data from six of the survey components were used (Admissions, Fall Enrollment, Finance, Graduation Rates, Human Resources, and Student Financial Aid) as these surveys contained elements most closely aligned with *USNWR*

subfactors. Detailed definitions for each of the IPEDS variables used, along with the survey component of the data collection and corresponding timeframes are provided in Appendix C.

EADA

As athletics financial data are not collected by IPEDS, the Department of Education's Equity in Athletics Data Analysis (EADA) website was used to obtain total athletic revenue and expenditures. These data, while not part of the *USNWR* methodology, were considered to have a potential impact on peer assessment score and were used in analysis for research question two.

Alignment and Selection of Measures

As *USNWR* and IPEDS employ different data collection methods and timeframes, it is important to acknowledge how the data from the two sources align. Data used by *USNWR* to calculate the 2016 rankings were collected from institutions in spring and summer of 2015, with resulting rankings published in September 2015. To ensure alignment of variables between the two sources, this study used IPEDS data for the corresponding time period, generally for the 2014-15 academic year (with the exception of finance and financial aid data, which were for 2013-14). Table 2 provides a summary of the alignment of variables between *USNWR* and IPEDS data collected in the 2014-15 academic year. Complete definitions and timeframes demonstrating alignment between sources are provided in Appendix C and Appendix D.

As identification of appropriate proxies for *USNWR* subfactors served as the foundation of this entire analysis, thoughtful selection of potential proxies was critical to the analysis. Definitions and timeframes used by *USNWR* during data collection were extracted from the 2015 Best Regional Universities (South) survey instrument used to collect data for the 2016 rankings. IPEDS definitions and timeframes for the potential proxies were extracted from the IPEDS data center. Comparison of the two sets of elements, summarized in Table 2, found *USNWR* and IPEDS elements grouped into three levels of alignment: direct, indirect, and no alignment.

Table 2

Alignment of 2016 USNWR Factors/Subfactors and Potential IPEDS Proxies

USNWR Factor and Weight	*USNWR* Subfactors and Weights	Potential IPEDS Proxies	*USNWR* Data Represents	IPEDS Data Represents	Alignment	Difference
Undergraduate academic reputation (22.5%)	Peer assessment (100%)	See Appendix I	Spring 2014, Spring 2015 (2-year average)	FY2014 for Endowments and Pell; all others Fall 2014	Indirect	No direct proxy
Retention & Graduation (22.5%)	Six-year graduation rate (80%)	Graduation rate - Bachelor degree within 6 years, total	Fall 2005-2008 cohorts (4-year average)	Fall 2005-2008 cohorts (4-year average)	Direct	N/A
	Retention rate (20%)	Full-time retention rate	Fall 2010-2013 cohorts (4-year average)	Fall 2010-2013 cohorts (4-year average)	Direct	N/A
Faculty resources (20.0%)	Classes < 20 students (30%)	N/A			None	No direct proxy
	Classes > 50 students (10%)	N/A			None	No direct proxy
	Average full-time faculty salary (35%)	Average salary of full-time instructional staff - all ranks	AY 2014-15	AY 2014-15	Indirect	Close, but *USNWR* adds cost of living
	Faculty degree level (15%)	Tenured instructional faculty	Fall 2014	Fall 2014	Indirect	*USNWR* uses terminal degree; proxy uses tenure status
	Student-to-faculty ratio (5%)	Student-to-faculty ratio	Fall 2014	Fall 2014	Indirect	Ratio calculations differ
	Full-time faculty (5%)	Full-time instructional faculty	Fall 2014	Fall 2014	Direct	N/A
Student selectivity (12.5%)	SAT/ACT (65%)	SAT/ACT 75th percentile scores	Fall 2014	Fall 2014	Indirect	*USNWR* collects 25th/75th percentile scores, but calculates weighted scores based on national percentile score
	Freshmen in top 25% of HS class (25%)	N/A			None	No direct proxy

USNWR Factor and Weight	*USNWR* Subfactors and Weights	Potential IPEDS Proxies	*USNWR* Data Represents	IPEDS Data Represents	Alignment	Difference
	Acceptance rate (10%)	Percent admitted - total	Fall 2014	Fall 2014	Direct	N/A
Financial resources (10.0%)	Average spending per student on instruction, research, etc. (100%)	Instruction, Research, Academic support, and Student service expenses per FTE	FY2014	FY2014	Direct	N/A
Graduation rate performance (7.5%)	Difference between six-year graduation rate and rate predicted by *USNWR* (100%)	Graduation rate - Bachelor degree within 6 years, total	Fall 2005-2008 cohorts (4-year average)	Fall 2005-2008 cohorts (4-year average)	Indirect	
Alumni giving rate (5.0%)	% of alumni who gave to institution within last year (100%)	Endowment assets (year-end) per FTE enrollment	FY2013 - FY2013 (2-year average)	FY2013 - FY2014 (2-year average)	Indirect	No direct proxy

Direct Alignment

Variables were considered directly aligned if they relied on the same definitions and timeframes in both sources. Five of the *USNWR* subfactors aligned directly across the two sources. These five subfactors (graduation rate, retention rate, full-time faculty, acceptance rate, and expenditures per FTE) accounted for 35% of the total *USNWR* institutional ranking score. For subfactors directly related to IPEDS variables, no additional proxies needed to be identified; however, these subfactors (six-year graduation rate, first-year retention rate, percent full-time faculty, acceptance rate, and average spending on instruction/research/student services) were analyzed to validate correlations between the *USNWR* subfactors and IPEDS variables.

Indirect Alignment

For seven subfactors, variables were similar but not directly aligned. The extent of difference between *USNWR* and IPEDS varied across the elements. For example, student to faculty ratio, present in both files for the same fall 2014 timeframe, stemmed from different calculations for *USNWR* and IPEDS. Resulting ratios were likely comparable, but required

validation to ensure variation stemming from the different data collection methodologies was minimal. Similarly, average full-time faculty salary appeared to rely on comparable data; however, *USNWR* incorporated a cost of living adjustment, which is not explained in detail in their methodology and not used by IPEDS.

The IPEDS variable of number of tenured faculty was determined to be the most likely proxy for faculty degree level as tenure status often requires a terminal degree as a criterion. Average faculty salary (without the *USNWR* cost of living addition) was determined to be the most likely proxy for average faculty salary, as cost of living fluctuations should be minimal as the study sample includes only institutions in the southern region of the country.

Selection of proxies for the less defined *USNWR* subfactor of peer assessment score required broad consideration of similar concepts underlying the factors. To explore IPEDS associations with the *USNWR* peer assessment reputation factor, a variety of variables associated with quality and reputation were selected as potential proxies. The broad scope of potential proxies included financial, selectivity, academic, enrollment, degrees awarded, demographic, and other elements. Table 3 summarizes the rationale for the selection of each proposed proxy.

Table 3

Rationale for Potential IPEDS Proxies for Indirect Alignments

USNWR Subfactor	Potential IPEDS Proxy	Rationale
Peer assessment	See Appendix I	The broad scope of potential proxies included financial elements (i.e., endowment assets per FTE and percent of full-time first-time undergraduates receiving Pell grants), selectivity elements (i.e., admissions yield and percent of applicants admitted), academic elements (i.e., SAT and ACT 75th percentile test scores for reading, math, and writing tests), student success elements (i.e., retention and graduation) and more.
Average full-time faculty salary	Average salary of full-time instructional staff - all ranks	*USNWR* incorporates a cost of living adjustment based on area; however, study focuses on only one region, so impact should be minimal.
Faculty degree level	Number of tenured full-time faculty	Proxy represents the number of faculty with tenure, which often requires a terminal degree as a criterion.

USNWR Subfactor	Potential IPEDS Proxy	Rationale
Student-to-faculty-ratio	Student-to-faculty-ratio	Use different calculations, but data should be similar
SAT/ACT score	SAT/ACT 75th percentile scores	*USNWR* averages scores and applies national percentile score weighting, as well as weighting based on proportion of students submitting SAT/ACT scores. As 25th and 75th percentile scores serve as the basis for *USNWR* calculations, data should be somewhat comparable.
Graduation rate performance	Graduation rate - Bachelor degree within 6 years	*USNWR* guidance indicates predicted graduation rate is based on regression analysis between six-year grad rate, SAT/ACT scores, expenditures per student, sector of institution, proportion of undergraduates receiving Pell grants, and proportion of entering students from top 25% of high school class.
Alumni giving rate (undergraduate)	Endowment assets (year-end) per FTE enrollment	Endowment per FTE should reflect overall alumni giving rate; however, for institutions with substantial graduate enrollments, graduate alumni giving may skew the data.

No Alignment

For three subfactors (proportion of classes with fewer than 20 students, proportion of classes with 50 or more students, and proportion of enrolled freshmen who graduated in the top 25% of their classes), there was no obvious IPEDS proxy to stand in for the variable that was not already identified as a proxy for another subfactor. Proxies already identified with another subfactor were not used a second time to avoid creating issues of multicollinearity which would need to be addressed later on in the analysis. As such, these three subfactors were excluded from the proxy analysis and the *USNWR* assigned weights for the overall factor containing them were adjusted proportionally. For example, the proportion of enrolled freshmen who graduated in the top 25% of their classes contributed 25% of the weight of the total student selectivity factor. As no unique proxy could be identified to represent freshmen from the top 25% of their graduating class, the weights associated with the other two elements within the factor (test scores (65%) and acceptance rate (10%)) were proportionally rescaled. This was accomplished by dividing the weight of each of the remaining subfactors by the total weight of the factor after excluding the

weight of the top 25% class variable. For example, the two remaining subfactors accounted for 75% of the total weight; so test score weight (65%) divided by the new factor total (75%) resulted in a new proportional test score weight of 87%. Likewise, the new proportional weight for the acceptance rate subfactor rose to 13%.

Data Collection

Collection of *USNWR* Data

USNWR 2016 rankings data were acquired via a request to Bob Morse, *USNWR*'s chief data strategist. During his presentation at the 2016 Association of Institutional Research conference, Morse offered to provide rankings data files to institutional researchers. Data files were received from *USNWR* in July 2016; the "Regional Universities -- South 2016 edition as of 9.9.2015" Excel document provides the basis for this analysis. As shown in Appendix E, this data file, containing a row for each ranked institution, included raw data for the following variables: school, rank, public/private, overall score, peer assessment score, average retention rate, predicted graduation rate, actual graduation rate, percent of classes under 20, percent of classes of 50 or more students, student/faculty ratio, SAT/ACT 25th and 75th percentiles, freshmen in top 25% of high school class, acceptance rate, and average alumni giving rate.

The presence of peer assessment score for each of the institutions in the file was beneficial to the analysis, as it provided insight into an otherwise elusive data point. Each institution within the file received a peer assessment score on a scale of one to four; scores ranged from 4.0 (the highest ranked institution) to 2.6. As undergraduate academic reputation relies entirely on this metric for the full 22.5% weight of the factor, this data point is extremely important. Knowing the *USNWR* peer score for each institution allowed for correlational examination of IPEDS variables to determine which were best suited to serve as proxies.

Collection of IPEDS Data

To obtain IPEDS data for the *USNWR* institutions, a list of all U.S. degree-granting institutions, with name and unique unit ID, was exported from NCES's public IPEDS data site and matched into the 2016 Best Regional Universities (South) rankings data file received from *USNWR* on institution name to return the unique federal unit ID for each of the 97 institutions. The resulting list of unit IDs was copied into the online IPEDS interface to generate a comparison group containing only the 2016 *USNWR* Best Regional Universities (South). Once finalized, the institutional comparison group list was extracted from the IPEDS site and saved for subsequent use. With the addition of unit IDs to the rankings list base file, data extracted from IPEDS could easily be merged into the base data file for each of the ranked institutions.

Upon identification of potential IPEDS proxies (as discussed in the prior section), the institution comparison group was uploaded into the IPEDS site and the variables shown in Table 2 and Appendix I were selected within the interface. As institutions report financial data based on institutional sector (public, private not-for-profit, private for-profit), sector variable was also extracted to aid in the later integration of financial data. A .csv data file containing data for each of the 97 institutions in the sample was exported from the IPEDS site and saved as an Excel file. Data from the exported IPEDS file were copied into a new worksheet within the *USNWR* base data file. Both datasets were then formatted as tables within Excel to allow for easier merging of data. Ablebits Excel add-in software was used to merge data; within Ablebits, the *USNWR* base table was identified as the table to be updated and the IPEDS data table as the lookup table. Institution name and unit ID were selected as matching columns within both datasets. All of the columns in the IPEDS table were selected as columns to add to the base data table. The option to include a status column was employed to verify accurate matching. Seventy-seven of the 97 institutions matched on the first pass, with the 20 non-matching records due to variations of

naming conventions between the two files. The matching process was conducted a second time in Ablebits, using only unit ID as the matching key with 100% success. The merged data file was saved and then imported into SPSS Statistics 24. Variables names were read from the first row of data to eliminate the need to label each variable within SPSS. Decimal places were set to two for consistency of numeric values.

Collection of EADA Data

Total athletic revenue and expenditures were obtained from the Department of Education's Equity in Athletics Data Analysis (EADA) website. Available SPSS data files for academic years 2013-14 and 2014-15 were downloaded and matched into the SPSS master file using the federal unit ID number for institution present in both files.

Data Preparation

Missing Data

Once the IPEDS data were merged into the base file, initial review of the data began. As many of the IPEDS data points were commonly reported metrics, missing data were expected to be minimal. SPSS case summaries were conducted on all IPEDS variables to determine the prevalence of missing values. Table 4 shows the occurrence of missing data for each of the key proxies in the analysis. Sixty-five percent of proxies (20) contained at least one instance of missing data; of those, 30% (6) were found to be missing data for more than 10% of cases.

Table 4

Occurrence of Missing Data by Variable

Variable	n Missing	Percent Missing
ACT Writing 75th percentile score	88	90.7%
SAT Writing 75th percentile score	54	55.7%
ACT English 75th percentile score	19	19.6%
ACT Math 75th percentile score	19	19.6%
SAT Critical Reading 75th percentile score	12	12.4%
SAT Math 75th percentile score	11	11.3%
ACT Composite 75th percentile score	8	8.2%
All ranks	8	8.2%
Graduation rate - bachelor's degree within 4 years total (DRVGR2011)	4	4.1%

Variable	n Missing	Percent Missing
Graduation rate - bachelor's degree within 6 years total (DRVGR2011)	4	4.1%
Graduation rate - bachelor's degree within 4 years total (DRVGR2012)	3	3.1%
Graduation rate - bachelor's degree within 6 years total (DRVGR2012)	3	3.1%
Full-time retention rate 2011 (EF2011D)	2	2.1%
Full-time retention rate 2012 (EF2012D)	2	2.1%
Admissions yield - total	1	1.0%
Graduation rate - Bachelor degree within 4 years total (DRVGR2013)	1	1.0%
Graduation rate - Bachelor degree within 4 years total (DRVGR2014)	1	1.0%
Graduation rate - Bachelor degree within 6 years total (DRVGR2013)	1	1.0%
Graduation rate - Bachelor degree within 6 years total (DRVGR2014)	1	1.0%
Percent admitted - total	1	1.0%
Academic support expenses per FTE	0	0.0%
Faculty - All ranks	0	0.0%
Average salary equated to 9 months (DRVHR2014)	0	0.0%
Endowment assets (year-end) per FTE enrollment	0	0.0%
Full-time retention rate 2013 (EF2013D)	0	0.0%
Full-time retention rate 2014 (EF2014D)	0	0.0%
Instruction expenses per FTE	0	0.0%
Percent of full-time first-time undergraduates awarded Pell grants	0	0.0%
Research expenses per FTE	0	0.0%
Student service expenses per FTE	0	0.0%
Student-to-faculty ratio (EF2014D)	0	0.0%
EADA Revenue	0	0.0%
EADA Expenses	0	0.0%
2016 USN Rank	0	0.0%

All six of the variables missing data for more than 10% of institutions were related to entrance test scores. ACT Writing 75th percentile score had the highest percentage of missing values. This is not surprising for two reasons: 1) writing test scores are not used by institutions as extensively as English/Reading and Math test scores, and 2) SAT is used more commonly in the southern states within the population. Three of the four of the variables missing 20% of values were related to ACT test scores and were removed from the analysis on the basis that SAT test score data represent the same construct, with far fewer missing cases across the institutions. In addition, ACT Composite score remained, allowing for analysis of the association of overall ACT score to rankings. The other variable with a high percentage of missing values was SAT Writing 75th percentile score, which was also removed from the analysis, based on the same rationale for exclusion. The number of tenured faculty variable initially resulted in eight missing values; all eight institutions do not have tenure systems, making missing values acceptable.

Since the sample contained only 97 institutions, 20 of which contained a missing value, list-wise deletion was determined not to be an appropriate choice for handling missing data as it would reduce the sample size from 97 to 77 by deleting institutions that have at least one missing value. To maintain the sample size, missing data were addressed using imputation whenever possible, specifically, prior year IPEDS data were used to replace missing values. Appendix F provides detailed listing of values that were imputed and their sources. With imputations in place and exclusion of variables with 20% or more of values missing, the number of the missing values was reduced to two valid instances: Loyola University-New Orleans missing 2011 cohort four-year and six-year graduation rates, which were not reported due to Hurricane Katrina. These two missing values were coded as 999, with 999 coded as discrete missing values in SPSS for the two variables. This excluded these two validly missing values from analysis.

Variable Normalization

Variables were combined for ease of analysis where necessary; for example, endowment values of public and private institutions were collected separately and combined into a single variable. Financial variables such as spending per FTE, average faculty salary, and endowment were rescaled (divided by 1000) to ensure comparable beta coefficients. To match *USNWR's* methodology, multiple year averages were calculated and used for retention and graduation rates (4 years of data), year-end endowment per FTE (2 years of data), and expenditures per FTE student (2 years of data). Expenditures per student were summed into one variable containing instructional, student services, academic support, and research expenses.

Data Analysis

Table 5 provides a summary of dependent and independent variables and analyses used for each research question. An in depth discussion of analyses used for each question follows.

Table 5

Variables per Research Question

Research Question	Dependent Variable	Independent Variables	Analysis Method
1. What statistically significant associations exist between *USNWR* subfactors and publicly available IPEDS variables?	*USNWR* subfactor data used to calculate 2016 Best Regional Universities (South) rankings (Table 2)	Potential IPEDS proxies for 2016 Best Regional Universities (South) *USNWR* subfactors aligned to IPEDS (Table 2)	Correlational analyses
2. To what extent does a combination of IPEDS proxies predict institutional peer assessment score in *USNWR* 2016 Best Regional Universities (South) rankings?	*USNWR* 2016 institutional peer assessment score	Potential IPEDS proxies for *USNWR* peer assessment score (Appendix I)	Multiple regression analyses
3. How well does a combination of IPEDS proxies explain variance in institutional ranking in *USNWR* 2016 Best Regional Universities (South) rankings?	*USNWR* 2016 institutional ranking position	IPEDS proxies for the *USNWR* subfactors resulting from research Q1	Multiple regression analyses
4. To what extent can substitution of IPEDS proxies for *USNWR* values predict institutional ranking in *USNWR* 2016 Best Regional Universities (South) rankings using *USNWR's* methodology?	*USNWR* 2016 institutional ranking position	IPEDS proxies for the *USNWR* subfactors resulting from research Q1 and predicted peer assessment score from research Q2	Weighted z-score analysis

Correlational Analysis

In order to estimate the extent to which proxy variables were related to *USNWR* subfactors (research Q1), statistical correlations were conducted in SPSS 24. Correlation coefficient analyses were performed to examine relationships between the dependent variables (*USNWR* subfactor values) and the independent variables (potential IPEDS subfactor proxies). Onwuegbuzie and Daniel (1999) found Pearson's correlation coefficients to be appropriate in circumstances where "both variables represent either interval or ratio scales of measurement" (p. 6), as were *USNWR* and proxy variables used within this analysis. Use of proxy variables in place of unobservable or unattainable data is supported by the literature (Mahnken, Chen, Brown, Vidoni, Billinger, & Gajewski, 2014). Mahnken (2014) specifically noted, "it is often of interest to scientific investigators to develop a new measure to serve as a proxy for another in the setting where the original is observable" (p. 25). This supports the use of IPEDS variables as proxies for existing *USNWR* variables in this study.

This analysis examined whether a new proxy metric was an appropriate substitute for the original metric. For each direct or indirect potential proxy variable shown in Table 2 with a corresponding value in the file received from *USNWR*, appropriateness was tested using simple linear regression of the original *USNWR* subfactor metric onto the proposed IPEDS proxy metric to examine the relationship of the proxy to the original variable.

Multiple Regression Analysis

To address research questions which sought to predict peer assessment score (research Q2) and overall rank (research Q3), multiple regression analyses were conducted using SPSS. Simultaneous multiple linear regression was selected as it examines the effect of a group of predictor variables on a continuous dependent variable at the same time (Yan & Su, 2009). As regression analysis is often used for examining relationships between dependent and independent variables and for generating predictions (Chatterjee & Simonoff, 2013), multiple regression was considered to be an appropriate method of analysis. Scatterplots, partial plots, analyses of variance (ANOVA), R^2 values, coefficients, correlations, and collinearity statistics were generated as part of the regression analyses. Once the list of influential variables was narrowed from the results of the simultaneous regression, stepwise regressions were conducted to examine the contribution of each variable to the model.

Weighted z-scores

Research question four sought to replicate the *USNWR* methodology for calculating rank that relied on calculation of weighted z-scores for each subfactor. *USNWR* methodology was followed for the analysis, with z-scores calculated for subfactors, weighted per *USNWR* proportion assigned to subfactor, and summed to create a total score value for each institution.

The next chapter provides detailed discussion of the analyses and results.

CHAPTER 4: RESULTS

This chapter presents the results of the study, which examined how institutional characteristics of may be associated with ranking position. Descriptive statistics are provided, with detailed results of analyses for each question following.

Descriptive Statistics

Descriptive statistics for key variables were conducted in SPSS Statistics 24 to examine distribution of *USNWR* subfactors and potential proxies. For each of the *USNWR* provided data points and potential direct or indirect IPEDS proxies, the number of institutions, minimum and maximum values for each variable, mean, standard error, and standard deviation are shown in Table 6.

Table 6

Descriptive Statistics

Variable	N	Min.	Max.	Mean	Std. Error	Std. Deviation
USNWR 2016 Rank	97	1.00	93.00	47.94	2.80	27.60
USNWR Peer Assessment Score	97	2.10	4.00	2.89	0.04	0.41
USNWR Average freshman retention rate	97	0.55	0.92	0.74	0.01	0.07
USNWR Predicted graduation rate	97	0.27	0.80	0.52	0.01	0.11
USNWR Actual graduation rate	97	0.32	0.82	0.51	0.01	0.12
USNWR Student/faculty ratio	95	9.00	24.00	15.17	0.34	3.28
USNWR SAT 75th percentile	50	23.00	1320.00	1117.88	25.66	181.43
USNWR ACT 75th percentile	45	20.00	29.00	25.58	0.31	2.08
USNWR Acceptance rate	95	0.20	0.99	0.68	0.02	0.16
USNWR Average alumni giving rate	95	0.01	0.26	0.09	0.01	0.05
IPEDS Percent admitted	97	22.00	99.00	68.59	1.65	16.25
IPEDS SAT Crit Reading 75th percentile score	97	460.00	690.00	573.29	4.70	46.29
IPEDS SAT Math 75th percentile score	97	460.00	680.00	573.88	4.56	44.94
IPEDS ACT Composite 75th percentile score	97	19.00	29.00	25.00	0.24	2.36
Average 6-yr grad rate of 2005-2008 cohorts	97	28.00	82.00	50.01	1.18	11.67
Average retention rate of 2010-2013 cohorts	97	54.00	92.00	73.45	0.73	7.23
IPEDS Student-to-faculty ratio	97	9.00	22.00	15.05	0.31	3.09
IPEDS Average FT faculty salary	97	36459.00	90252.00	63045.93	1005.13	9899.36
IPEDS Number tenured faculty	97	0.00	507.00	133.53	11.17	110.05
Avg Expenses per FTE Instruction, Research, Student Services, Academic Support	97	4685.00	33565.00	12416.22	421.82	4154.49
Avg Endowment assets (year-end) per FTE	97	36.00	112507.00	13668.39	1779.07	17521.81

The remainder of this chapter is organized around the research questions that guided this study. Detailed results for each of the research questions, along with a summary of key results are provided. A comprehensive summary of results is provided at the end of the chapter.

Research Question 1: What statistically significant associations exist between *USNWR* factors and publicly available IPEDS variables?

To examine if variables used by *USNWR* to calculate rankings measure what they purport to measure, correlations were conducted on the *USNWR* values provided by *USNWR* that aligned to IPEDS variables, directly or indirectly: acceptance rate, average retention rate, average six-year graduation rate, predicted graduation rate, student to faculty ratio, SAT/ACT score, and alumni giving rate. As *USNWR* did not make available data for all of the subfactors used to calculate rank, correlations were conducted only on the values provided by *USNWR* which aligned directly or indirectly to potential IPEDS proxies (as outlined in Table 2). As a result, correlations were not tested for faculty salary, degree level, or average spending per FTE, as *USNWR* did not provide these values in their file. Nor were correlations tested for percentage of classes with fewer than 20 or greater than 50 students, percent of freshmen in the top 25% of their high school class due to the absence of an appropriate IPEDS proxy. Peer reputation score was not included, as it is addressed in depth in research question two.

In example, this analysis examined the correlation of the *USNWR* collected average six-year graduation rate for Rollins College against the average IPEDS reported six-year graduation rate for Rollins College to determine if the IPEDS measure was an appropriate proxy for the *USNWR* measure. As Mahnken (2014) noted, in order for a proxy to validly represent the original variable, the linear relationship between the two variables should be approximately *Y (original measure) = X (proxy measure)*.

Assumptions and conditions of Pearson correlations, chiefly linear relationships between variables, normal distribution, and minimal presence of outliers, were checked. To test for linear relationships between the *USNWR* variables and potential proxies, scatterplots for each independent variable (IPEDS proxy) and dependent variable (*USNWR* value) were created and examined for evidence of non-linearity (Appendix G).

As shown in Appendix H, and in response to research question 1, two-tailed Pearson correlations (and Spearman rho correlations for alumni giving and endowment per FTE) found statistically significant positive associations between each of the nine tested pairs of *USNWR* and IPEDS proxies, all with much larger than typical effect sizes:

- *USNWR* acceptance rate and IPEDS percent admitted: $r(93) = .949$, $p < .001$
- Test scores:
    - *USNWR* 75th percentile ACT Composite score and IPEDS ACT 75th percentile score: $r(44) = .982$, $p < .001$
    - *USNWR* 75th percentile SAT score and IPEDS SAT Math 75th percentile score: $r(47) = .978$, $p < .001$
    - *USNWR* 75th percentile SAT score and IPEDS SAT Critical Reading 75th percentile score: $r(47) = .876$, $p < .001$
- *USNWR* average retention rate and IPEDS average retention rate: $r(95) = .974$, $p < .001$
- *USNWR* average six-year graduation rate and IPEDS average six-year graduation rate: $r(95) = .973$, $p < .001$
- *USNWR* student to faculty ratio and IPEDS student to faculty ratio: $r(93) = .974$, $p < .001$
- *USNWR* predicted six-year graduation rate and IPEDS average six-year graduation rate: $r(95) = .834$, $p < .001$

- As the IPEDS variable endowment per FTE student was found to be skewed (*skewness* = 2.80), a separate Spearman rho correlation was conducted to examine its correlation with *USNWR* undergraduate alumni giving. *USNWR* undergraduate alumni giving rate and IPEDS endowment per FTE student: $r(93) = .453$, $p < .001$

These results indicated that the selected IPEDS proxies were highly positively correlated with the values used by *USNWR* to calculate rankings. Based on the weights attributed to factors in the *USNWR* 2016 rankings, a third of the total ranking score can be attributed to these pairs of variables which correlated at levels greater than .94; addition of predicted graduation rate ($r(95) = .834$) increases the percent to 40.

Summary of Results

In summary, all nine of the pairs of *USNWR* subfactors with direct or indirect IPEDS variables were strongly correlated.

Research Question 2: To what extent does a combination of IPEDS proxies predict institutional peer assessment score in *USNWR* 2016 Best Regional Universities (South) rankings?

Research question two examined the extent to which variance in peer assessment score could be explained using IPEDS variables. As peer assessment score is considered a black box, a wide variety of input variables were included in the analysis to examine potential influence on the peer score. Forty-five independent variables extracted from IPEDS were examined in relation to peer assessment score; tested variables included those related to admission selectivity, graduation rates, entrance test scores, faculty salaries, tenure status, endowments and gifts, enrollment demographics, tuition, expenditures per full-time equivalent student (FTE), degrees awarded, financial aid awards, and athletic revenue. The complete list of variables tested for the

peer assessment prediction model is provided in Appendix I. Two models were developed to examine contribution of variables to peer assessment score. The first model, the overall model, examined all institutions collectively, while the second model, the sector-based model, examined institutions separately by sector (private or public).

Both models utilized the same regression analysis methods; all independent variables were entered simultaneously (enter method). This method was used because it was not known which independent variables would be most impactful in the model. To check assumptions, linear regression was conducted with peer assessment score as the dependent variable and the variables listed in Appendix I as independent variables. Scatterplots for each independent variable against peer assessment score were examined for linearity (shown in Appendix J). To reduce the number of variables being tested, variables that did not exhibit a linear relationship with an R^2 of .12 or greater with peer assessment score were removed from the model, leaving 21 variables of the original 45 variables for examination.

Linear regression was conducted; descriptives, coefficients, part and partial correlations, collinearity diagnostics, Durbin-Watson residuals, casewise diagnostics, unstandardized predicted values, studentized and studentized deleted residuals (SDR), leverage values, and Cook's values were generated. Correlations were examined to determine collinearity amongst variables; variance inflation factors (VIF) were examined to check for high levels of collinearity. Variables exhibiting high levels of collinearity were removed from the model. Additional scatterplots were created upon exclusion of collinear variables, with the unstandardized predicted value as the dependent variable and the studentized residual as the independent, to determine if a linear relationship was present between the dependent variable and the collective group of independent variables. Casewise diagnostics and predicted

studentized deleted residuals generated by the regression model were used to determine potential outliers within the dataset. Generated leverage values were used to determine if any institutions were exerting undue influence upon the model. P-plots of the standardized residuals were examined to determine if residuals were approximately normally distributed.

Once all assumptions were confirmed and outliers were excluded from the model, means, standard deviations, intercorrelations, and coefficients were calculated and examined. Variables found to have low standardized beta coefficients were removed from the model. Regression analysis was conducted on remaining variables and cases. Significance values from the analysis of variance (ANOVA) were used to determine if the combination of proxies significantly predicted peer assessment score. Beta coefficients were examined to determine which proxies significantly contributed to the model. Unstandardized predicted values for peer assessment score were generated for each institution remaining within the model. As *USNWR* peer assessment scores are rounded to one decimal, predicted values were rounded accordingly. A variable was computed in SPSS to subtract the (rounded) predicted institution peer score value from the actual peer score value. Differences between the predicted and actual values were grouped into ranges of .10 for ease of comparison.

The sector-based model utilized the same methodology, differing only in how the dataset was used. Rather than applying a single model to all institutions, the data were filtered on the institution sector variable and private institutions and public institutions were analyzed separately. The same processes outlined above for the overall model were applied to both the private and public datasets. Once predicted peer assessment scores were generated for both sectors, the values were merged into a single variable to allow comparison of predicted score to actual score. Scores were compared and differences grouped as in the overall model.

Overall Model

As discussed above, the overall model applied a single common model to all institutions collectively. The scatterplots shown in Appendix J revealed eleven variables had linear relationships with peer assessment score and an R^2 of greater than .21:

- average six-year graduation rate,
- average retention rate,
- percent of first-time students receiving Pell grants,
- average full-time faculty salary,
- ACT Composite 75th percentile score,
- SAT Math 75th percentile score,
- SAT Critical Reading 75th percentile score,
- percent of enrollment between ages 18 and 24,
- number of tenured faculty,
- average instructional/support/research expenses per FTE student, and
- library expenditures per FTE.

Linear regression was conducted again on only these variables to examine collinearity amongst the remaining variables. High correlations were found between the three test score variables (SAT Math, SAT Critical Reading, and ACT Composite). To reduce collinearity, SAT Critical Reading and ACT Composite variables were removed from the model, leaving SAT Math score as it yielded the highest correlation with peer score. Retention and graduation rates were also highly correlated; as graduation rate correlated higher with peer score, retention rate was removed from the model. Percent of students receiving Pell grants was found to be highly negatively correlated with six-year graduation rate and was removed from the model.

Upon removal of highly correlated variables, another scatterplot was created, with unstandardized predicted value as the dependent variable and the studentized residual as the independent, to determine if a linear relationship was present between the dependent variable and the collective group of independent variables. The relationship was found to be linear. The scatterplot also confirmed homoscedasticity of the residuals. Casewise diagnostics confirmed no cases with standardized residuals greater than ±3 were present in the model. Predicted studentized deleted residuals were sorted in descending order to determine if any residuals greater than ±3 were present. Only one institution (The Citadel) had an SDR greater than ±3 (3.05). The Citadel was excluded from the analysis population and the regression conducted again. The Durbin-Watson statistic increased to 1.98, a gain of .13 from the prior model, suggesting improvement in independence of observations upon removal of the outlier.

Institutions were sorted on predicted leverage value, revealing one institution, Georgia Regents' University, with a leverage value of .48, far exceeding the suggested leverage cutoff value of 2.0. This was likely due to institution's consolidation with another institution during the analysis timeframe, resulting in increased expenses for the time period. The institution was excluded from the analysis and the regression was conducted again.

Collinearity statistics confirmed removal of the highly correlated variables resulted in variance inflation factors that did not suggest the presence of excessive multicollinearity between remaining variables. Examination of the p-plot of regression standardized residuals confirmed residuals were approximately normally distributed. Means, standard deviations, intercorrelations, and coefficients for the variables were calculated and examined. Two variables did not have statistically significant sig. values, suggesting they were not contributing to the model substantially and were removed (total library expenditures, $p = .66$

and percent of undergraduate enrollment between ages 18 and 24, p =.79). Means, standard deviations, and correlations of the remaining variables can be found in Table 7. The combination of variables was found to significantly predict the dependent variable $F(5,89)$ = 77.11, $p < .001$, with a much larger than typical effect size according to Cohen (1988). The adjusted R^2 of the model was .80 suggesting the model, based on five variables, explains approximately 80% of variation in peer assessment score. Table 8 shows the beta coefficients.

Table 7

Means, Standard Deviations, and Intercorrelations for USNWR Peer Assessment Score and Predictor Variables (N=95)

Variable	M	SD	1	2	3	4	5	6
1. *USNWR* peer score	2.88	0.40	--	0.62**	0.71**	0.62**	0.50**	0.56**
2. SAT Math 75th percentile	573.64	45.34		--	0.54**	0.29**	0.21	0.27**
3. 6-year grad rate	50.04	11.40			--	0.37**	0.20	0.45**
4. Avg. FT faculty salary	62.87	9.91				--	0.29**	0.58**
5. n tenured Faculty	132.91	110.95					--	0.01
6. Avg spending per FTE	12.17	3.57						--

*$p < .05$; **$p < .01$.

Table 8

Coefficients and Collinearity Statistics for USNWR Peer Assessment Score and Key Predictor Variables (N=95)

Variable	Unstd. Coefficients		Std. Coefficients			95% Confidence			
	B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Tolerance	VIF
1. *USNWR* peer score	0.01	0.25		0.03	0.98	-0.50	0.51		
2. SAT Math 75th percentile	0.00	0.00	0.25	4.60	0.00	0.00	0.00	0.69	1.45
3. 6-year grad rate	0.01	0.00	0.34	5.63	0.00	0.01	0.02	0.59	1.69
4. Avg. FT faculty salary	0.01	0.00	0.20	3.36	0.00	0.00	0.01	0.58	1.74
5. n tenured Faculty	0.00	0.00	0.32	6.39	0.00	0.00	0.00	0.84	1.19
6. Avg spending per FTE	0.03	0.01	0.22	3.66	0.00	0.01	0.04	0.56	1.77

Once variables known to explain variance in peer assessment score were narrowed down to those indicated above, stepwise regression was conducted to examine the extent to which each variable contributed to the model. Six-year graduation rate was found to have the largest impact,

explaining 51% of the variation. Addition of average faculty salary raised the adjusted R^2 to .654, addition of number of tenured faculty to .732, addition of SAT Math 75th percentile score to .775 and, lastly, addition of average expenses per FTE student resulted in an adjusted R^2 of .802, which according to Cohen (1988) is a much larger than typical effect size.

The unstandardized predicted values for peer assessment scores for each institution were compared to actual peer assessment scores of institutions to determine difference between predicted and actual scores. As *USNWR* peer assessment scores are rounded to one decimal, predicted values were rounded accordingly, resulting in 18 exact matches (18.9%) out of 95 institutions. Predicted and actual peer assessment scores are shown in Appendix M. Differences between the two values were grouped according to distance from the actual score. As shown in Table 9, just over 50% of predicted peer assessment scores were .10 or less different from actual scores. Nearly 90% of predicted scores were within .20 of actual scores. The remaining 10% of institutions had predicted score values that differed by more than .21 from their actual scores, of those, only 3% differed by greater than .31.

Table 9

Difference between Predicted and Actual Peer Assessment Scores: Overall model (N=95)

Difference Range	Frequency	Percent	Valid Percent	Cumulative Percent
No difference	18	18.99	18.9	18.9
.01 to .10 score difference	32	33.7	33.7	52.6
.11 to .20 score difference	35	36.8	36.8	89.5
.21 to .30 score difference	7	7.4	7.4	96.8
.31 or more score difference	3	3.2	3.2	100.0
Total	95	100.0	100.0	

Sector-based Model

To examine if accuracy of the model could be improved by analyzing institutions by sector (public or private), the data file was split on sector and analyses were conducted again.

Private Institutions. Beginning with the variables in Appendix I found to have a linear relationship with peer assessment score, regression modeling was run on the dataset containing only private not-for-profit institutions (n = 48). Scatterplots revealed 14 variables had strong linear relationships with peer assessment score and an R^2 of greater than .24 for private institutions (Appendix K):

- number of tenured faculty,
- average six-year graduation rate,
- average instructional/support/research expenses per FTE student,
- average full-time faculty salary,
- average retention rate,
- management salary outlays,
- SAT Math 75th percentile score,
- percent of first-time students receiving Pell grants,
- ACT Composite 75th percentile score,
- in-state tuition,
- library expenditures per FTE,
- SAT Critical Reading 75th percentile score,
- endowment per FTE, and
- percent of enrollment between ages 18 and 24.

Linear regression was conducted again on only these variables to examine collinearity amongst the remaining variables. High positive correlations were found between the three test score variables (SAT Math, SAT Critical Reading, and ACT Composite). To reduce collinearity, SAT Critical Reading and ACT Composite variables were removed from the

model, leaving SAT Math score as it yielded the highest correlation with peer score. Retention and graduation rates were also highly correlated; as graduation rate correlated higher with peer score, retention rate was removed from the model. SAT Math 75th percentile score (r = .753) and percent of first time students receiving Pell grants (r = -.723) were found to be highly correlated with six-year graduation rate for private institutions and removed.

Upon removal of the highly correlated variables, another scatterplot was created, with the unstandardized predicted value as the dependent variable and the studentized residual as the independent, to determine if a linear relationship was present between the dependent variable and the collective group of independent variables. The relationship was found to be linear. The scatterplot also confirmed homoscedasticity of the residuals. Collinearity statistics confirmed removal of the highly correlated variables resulted in variance inflation factors that did not suggest the presence of excessive multicollinearity between remaining variables. Examination of the p-plot of regression standardized residuals confirmed residuals were approximately normally distributed.

Means, standard deviations, intercorrelations, and coefficients for these variables were calculated and examined. Several variables did not have statistically significant sig. values, suggesting they were not contributing to the model substantially (in-state tuition, p = .53, percent of undergraduate enrollment between ages 18 and 24, p = .88, and average expenses per FTE, p = .31). These variables were removed from the model and the regression conducted again; removal of average expenses per FTE student, despite not being significant, diminished the accuracy of the model. As such, it was allowed to remain in the model. Casewise diagnostics were conducted and no cases with standardized residuals greater than ±3 were present in the model. Predicted studentized deleted residuals were sorted in descending order

to determine if any residuals greater than ±3 were present. No private institutions were found to have a studentized deleted residual greater than ±3. Cook's Distance values were examined to check for influence and no institutions were found to exhibit values greater than one. The Durbin-Watson statistic (2.05) confirmed independence of observations.

The final combination of variables was found to significantly predict the dependent variable $F(6,41) = 57.03$, $p < .001$, with a much larger than typical effect size according to Cohen (1988). The adjusted R^2 of the model was .877 (a much larger than typical effect size) suggesting that this model, based on six variables, explains approximately 88% of variation in peer assessment score for private institutions. Means, standard deviations, and correlations are shown in Table 10, beta coefficients are shown in Table 11.

Table 10

Means, Standard Deviations, and Intercorrelations for USNWR Peer Assessment Score and Predictor Variables for Private, Not-for-Profit Institutions (N=47)

Variable	M	SD	1	2	3	4	5	6	7
1. *USNWR* Peer Score	2.89	0.46	-	0.77**	0.81**	0.74**	0.73**	0.75**	0.52**
2. 6-year grad rate	53.17	10.10		-	0.62**	0.45**	0.50**	0.55**	0.46**
3. Avg. FT faculty salary	62.48	12.20			-	0.62**	0.63**	0.60**	0.38**
4. n tenured Faculty	64.52	58.54				-	0.54**	0.66**	0.34**
5. Management salary outlay	5432.68	4260.77					-	0.55**	0.16
6. Avg. expenses per FTE	13.31	4.32						-	0.59**
7. Avg. endow. Per FTE	21.34	20.64							-

*$p < .05$; **$p < .01$.

Table 11

Coefficients and Collinearity Statistics for USNWR Peer Assessment Score and Predictor Variables for Private, Not-for-Profit Institutions *(N=47)*

Variable	Unstd. Coefficients		Std. Coefficients			95% Confidence			
	B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Tolerance	VIF
1. *USNWR* Peer Score	1.17	0.19		6.04	0.00	0.78	1.57		
2. 6-year grad rate	0.01	0.00	0.30	4.20	0.00	0.01	0.02	0.53	1.90
3. Avg. FT faculty salary	0.01	0.00	0.23	2.86	0.01	0.00	0.02	0.40	2.47
4. n tenured Faculty	0.00	0.00	0.24	3.23	0.00	0.00	0.00	0.48	2.09

Variable	Unstd. Coefficients		Std. Coefficients			95% Confidence			
	B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Tolerance	VIF
5. Management salary outlay	2.54	0.00	0.24	3.18	0.00	0.00	0.00	0.47	2.11
6. Avg. expenses per FTE	0.01	0.01	0.09	1.03	0.31	-0.01	0.03	0.35	2.86
7. Avg. endow. Per FTE	0.00	0.00	0.13	1.82	0.08	0.00	0.01	0.55	1.82

Because the scale used for peer assessment score is small (one to four), beta coefficients, with the exception of management salary outlay, were incredibly small. Once variables known to explain variance in peer assessment score were narrowed down to those indicated above, stepwise regression was conducted to examine the extent to which each variable contributed to the model. Number of tenured faculty was found to have the largest impact, explaining 65% of the variation for private institutions. Addition of average six-year graduation rate increased adjusted R^2 to .762; addition of average faculty salary an adjusted R^2 of .835, and addition of management salary outlays produced an adjusted R^2 of .860. Addition of average endowment per FTE student resulted in slight improvement with an adjusted R^2 of .877 (a much larger than typical effect size). Average expenses per FTE student, while significant in the model, added no improvement to the adjusted R^2 of the overall model. As it has no contribution, it can be removed from the model to make it dependent upon only five variables.

Public Institutions. Public institutions (n = 49) were selected within the data file and the process was repeated. Scatterplots revealed sixteen variables had strong linear relationships with peer assessment score and an R^2 of greater than .21for public institutions (Appendix L):

- SAT Critical Reading 75th percentile score,
- SAT Math 75th percentile score,
- ACT Composite 75th percentile score,
- percent of first-year students receiving Pell grants,

- percent of undergraduates receiving federal loans,
- percent of undergraduates receiving grant aid,
- four-year graduation rate,
- six-year graduation rate,
- retention rate,
- number of tenured faculty,
- number of Bachelor's degrees awarded,
- percent of enrollment between 18 to 24,
- percent of students not enrolled in any distance education courses,
- tuition and fees as a percent of core revenues,
- total athletic revenue, and
- total athletic expenses.

Again, the three test score variables were found to be highly correlated (r = .746, r = .848, r = .772); SAT Critical Reading and Math were removed, as ACT Composite had the highest correlation with peer assessment score for public institutions. Percent of students receiving federal loans was found to be highly correlated with percent of first-year students receiving Pell grants (r = .712) and was removed from the model. Pell grant was further found to correlate highly to four-year graduation rate (r = -.717) and was also removed. Six-year graduation rate was found to be highly correlated with four-year graduation rate (r = .958) and retention rate (r = .843). As four-year graduation rate had the highest correlation with peer assessment score, the other two variables were removed. Athletics revenues and expenses (r = .999) and Bachelor's degrees awarded and number of tenured faculty (r = .819) were highly correlated; athletics expenses and Bachelor's degrees awarded were removed.

Several variables did not have statistically significant sig. values, suggesting they were not contributing to the model substantially and were removed (percent of students not taking any distance education courses, $p = .76$, tuition and fees as percent of core revenue, $p = .80$, athletic revenue, $p = .86$, and percent of students receiving grant aid, $p = .85$). These variables were removed from the model and the regression conducted again; removal of percent of student receiving grant aid, despite not being significant, diminished the accuracy of the model. As such, it was retained in the model.

Casewise diagnostics were conducted and The Citadel was again the only institution found to exhibit standardized residuals greater than ±3 (3.09). Examination of studentized deleted residuals identified one institution with a high SDR value: Mississippi University for Women (3.76). Four institutions were found to have leverage values exceeding the suggested cutoff of 2.0; three were marginally outside the suggested cutoff value. Only the University of Mary Washington had a leverage value (3.70) that suggested it be excluded from the analysis to avoid influencing the model. The Citadel, Mississippi University for Women, and the University of Mary Washington were subsequently excluded from the analysis and the regression run again.

A scatterplot was examined and the model relationship was found to be linear with homoscedasticity of the residuals. Collinearity statistics confirmed removal of the highly correlated variables resulted in variance inflation factors that did not suggest the presence of excessive multicollinearity between the remaining variables. The p-plot of regression standardized residuals confirmed residuals were approximately normally distributed. Means, standard deviations, and correlations of the variables in the final model can be found in Table 12. The combination of variables was found to significantly predict the dependent variable

$F(5,40) = 56.08$, $p < .001$, with a much larger than typical effect size according to Cohen (1988). The adjusted R^2 of the model was .860 suggesting that this model, based on five variables, explains approximately 86% of variation in peer assessment score for public institutions. Beta coefficients for the final model are shown in Table 13.

Table 12

Means, Standard Deviations, and Intercorrelations for USNWR Peer Assessment Score and Predictor Variables for Public Institutions (N=45)

Variable	M	SD	1	2	3	4	5	6
1. *USNWR* Peer Score	2.87	0.34	-	0.69**	-0.53**	0.74**	0.71**	0.57**
2. ACT Composite 75th	24.37	2.21			-0.31	0.38**	0.42**	0.22**
3. Percent of undergrad rec grant aid	69.35	12.16				-0.62**	-0.41**	-0.33*
4. 4-year grad rate	23.81	12.71					0.44**	0.64**
5. n tenured faculty	207.02	107.24						0.18
6. Percent enroll 18-24	78.20	11.42						-

*$p < .05$; **$p < .01$.

Table 13

Coefficients and Collinearity Statistics for USNWR Peer Assessment Score and Predictor Variables for Public Institutions (N=45)

Variable	Unstd. Coefficients		Std. Coefficients			95% Confidence			
	B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Tolerance	VIF
1. *USNWR* Peer Score	0.50	0.31		1.58	0.12	-0.14	1.13		
2. ACT Composite 75th	0.06	0.01	0.37	5.91	0.00	0.04	0.08	0.78	1.29
3. Percent of undergrad rec grant aid	0.00	0.00	-0.01	-0.20	0.85	0.00	0.00	0.59	1.70
4. 4-year grad rate	0.01	0.00	0.27	2.88	0.01	0.00	0.01	0.37	2.74
5. n tenured faculty	0.00	0.00	0.38	5.74	0.00	0.00	0.00	0.70	1.43
6. Percent enroll 18-24	0.01	0.00	0.24	3.33	0.00	0.00	0.01	0.58	1.73

Once variables known to explain variance in peer assessment score for public institutions were narrowed down to those indicated above, stepwise regression was conducted to examine the extent to which each variable contributed to the model. Four-year graduation rate was found to have the largest impact, explaining 54% of the variation for public institutions. Addition of ACT

Composite 75th percentile score increased adjusted R^2 to .737; addition of number of tenured faculty resulted in an adjusted R^2 of .829, and addition of proportion of undergraduate enrollment ages 18 to 24 produced an adjusted R^2 of .863. As this was higher than the adjusted R^2 of .860 produced by the simultaneous regression model, percent of undergraduates receiving grant aid was determined to have been detracting from the model. Removal of this variable created a model that explains 86% of variance in peer assessment score with only four variables.

Peer Assessment Predictions. Predicted peer assessment scores generated by the separate private and public models were combined into a single predicted peer score variable and a variable was computed in SPSS to subtract the predicted value from the actual peer score value. Of the 94 institutions, the model resulted in 24 exact matches (25.5%). Predicted and actual peer assessment scores for the sector-based model are shown in Appendix M. As in the overall model, differences between the two values were grouped according to distance from the actual peer assessment score. Shown in Table 14, nearly 70% of predicted peer assessment scores were .10 or less different from actual scores. Nearly all predicted scores were within .20 of actual scores; only two institutions (Lynchburg College and Mary Baldwin College) differed by more than .21 from actual scores.

Table 14

Difference between Predicted and Actual Peer Assessment Scores: Sector-based Model (N=94)

Difference Range	Frequency	Percent	Valid Percent	Cumulative Percent
No difference	24	24.7	25.5	25.5
.01 to .10 score difference	41	42.3	43.6	69.1
.11 to .20 score difference	27	27.8	28.7	97.9
.21 to .30 score difference	1	1.0	1.1	98.9
.31 or more score difference	1	1.0	1.1	100.0
Total	94	96.9	100.0	

Summary of Results

In summary, the two models yielded substantially different results in terms of accuracy match to actual peer assessment score. The overall model, which applied a single model to all institutions explained 80% of variance in peer assessment score for 95 institutions ($F(5,89) = 77.11$, $p < .001$, $R^2 = .80$). This model relied on five variables, all of which were statistically significant. In order of importance, the five variables found to explain variance in peer assessment score in the overall model were: six-year graduation rate, average full-time faculty salary, number of tenured faculty, SAT Math 75th percentile score, and average spending per FTE on instruction/student services/academic support/research. Comparison of predicted scores to actual scores found 53% of predicted values to differ from actual values by less than .11.

The sector-based model, which applied a different models to private not-for-profit ($n = 48$) and public institutions ($n = 49$), explained 88% of variance in peer assessment score for private institutions ($F(6,41) = 57.03$, $p < .001$, $R^2 = .88$) and 86% of variance in score for public institutions $F(5,40) = 56.08$, $p < .001$, $R^2 = .86$). The private institution model relied on six variables, all of which were statistically significant, except for endowment per FTE. As stepwise regression revealed average spending per FTE on instruction/student services/academic support/research did not contribute to the model, it was removed reducing the model to five variables. In order of importance, the five variables found to explain variance in peer assessment score for private institutions were number of tenured faculty, six-year graduation rate, average faculty salary, management salary outlays, and average endowment per FTE student.

The public institution model also relied on five variables: ACT Composite 75th percentile score, percent of undergraduate students receiving grant aid, four-year graduation rate, number of tenured faculty, and percent of undergraduate students between the ages of 18 and 24. As stepwise regression revealed percent of undergraduates receiving grant aid actually hindered the

model, it was removed reducing the model to four variables. In order of importance, the four variables found to explain variance in peer assessment score for public institutions were four-year graduation rate, ACT Composite 75th percentile score, number of tenured faculty, and proportion of undergraduate enrollment ages 18 to 24. Comparison of predicted peer assessment scores to actual found 69% of predicted values to differ from actual values by less than .11.

Research Question 3: How well does a combination of IPEDS proxies explain variance in institutional ranking in *USNWR* 2016 Best Regional Universities (South) rankings?

Question three examined the extent to which proxy inputs explain variance in rank. As rank is calculated based on known factors used by *USNWR*, independent variables included in the model were limited to those that aligned to *USNWR* factors/subfactors (Appendix D). Assumptions of linearity and distribution were checked with a series of scatterplots and histograms for each variable against *UNSWR* rank. Adjusted r-squared values resulting from multiple regression were used to determine the extent of variance in rank that could be attributed to the collective proxies. Significance values from resulting ANOVA were used to determine if the combination of proxies significantly predicted ranking position. Beta coefficients indicated which proxies significantly contributed to the equation.

Unstandardized predicted values for rank were generated for each institution; institutions that were excluded from prior analyses for being outliers were not assigned rank order values. For example, The Citadel, which received a *USNWR* rank of three, but was found to be an outlier in the regression model, was excluded, and the rank order of three assigned to the next ranked institution, Samford University. This adjusted rank order was then compared to predicted rank order (excluding outliers) to determine difference between actual and predicted values.

Because *USNWR* assigns the same rank position to multiple institutions, comparison of predicted and actual rank could not be accomplished by simply subtracting predicted rank order from the actual order. For example, *USNWR* assigned the rank of 37 to four institutions, with the next institution on the list receiving a rank of 41. Although the four institutions are all ranked 37, they represent rank order values of 37 to 40. *USNWR* sorts these four institutions alphabetically, rendering them equal for rankings purposes. For comparison of predicted and actual values for institutions with tie rankings, benefit was given to the predicted value if it matched any of the order positions encompassed within the ranking. Continuing the example above, for the four institutions ranked 37, if predicted rank order fell within the range of represented by the rank position (37 to 40) it was considered a match. For predicted rank orders not falling within the range, predicted values that were below the actual rank were subtracted from lowest rank possible within range; predicted values above actual rank were subtracted from the highest rank possible within range. Table 15 provides an example of this methodology. Radford University, ranked 37 by *USWNR*, had a predicted rank of 36, one position higher than the lowest possible rank represented by the range, resulting in a difference of one. Columbia College had a predicted rank of 47, seven positions lower than the highest possible rank represented by the range, resulting in a difference of seven.

Table 15

Example Rank Difference Calculation

Rank	Possible Rank Range	Institution	Predicted Rank Order	Difference
37	37-40	Radford University	36	1.00
37	37-40	Wingate University	42	2.00
37	37-40	University of Montevallo	44	4.00
37	37-40	Columbia College	47	7.00

Scatterplots revealed ten of the thirteen variables tested had linear relationships with rank (Appendix N):

- average six-year graduation rate,
- average retention rate,
- ACT Composite 75th percentile score,
- SAT Critical Reading 75th percentile score,
- SAT Math 75th percentile score,
- average full-time faculty salary,
- average endowment per FTE student,
- average instructional/support/research expenses per FTE student,
- student to faculty ratio, and
- predicted peer assessment score.

Correlations indicated high levels of collinearity between six-year graduation rate and retention rate (r = .788) and the three test score variables (SAT Critical Reading 75th percentile score and SAT Math 75th percentile score, r = .749, SAT Critical Reading 75th percentile score and ACT Composite 75th percentile score, r = .788, SAT Math 75th percentile score and ACT Composite 75th percentile score, r =.802). Retention rate and the SAT scores were removed; six-year graduation rate and ACT Composite 75th percentile score remained in the model as they had higher correlations with rank. Peer assessment score correlated highly with six-year graduation (r = -.801) which was to be expected since graduation rate was found to be highly influential in peer assessment score. Although predicted peer score demonstrated high correlation with graduation rate, it was kept in the model. After exclusion of the highly correlated variables, regression was conducted on the remaining six variables. A scatterplot of the unstandardized

predicted value as the dependent variable and the studentized residual as the independent confirmed a linear relationship was present between the dependent variable and the collective group of independent variables and homoscedasticity of the residuals. Collinearity statistics indicated predicted peer assessment score had a VIF of 6.2 and six-year graduation rate a value of 3.3, suggesting a high presence of multicollinearity between the variables.

Casewise diagnostics were conducted and no cases with standardized residuals greater than ±3 were present in the model. Predicted studentized deleted residuals were sorted in descending order. Elon University, which received the highest predicted and actual peer assessment score, was found to have a high SDR of 3.3, but was not excluded from the model. Leverage values were also examined; Georgia Regents University (.497) and Rollins College (.418) exhibited leverage values exceeding the suggested leverage cutoff value. Rollins College was retained in the analysis as it was ranked number one in the analysis year and its leverage value was substantially lower than that of Georgia Regents University. Georgia Regents University was removed from the analysis and the regression conducted again.

The Durbin-Watson statistic (1.97) confirmed independence of observations remained after removal of the institution. Examination of the p-plot of regression standardized residuals confirmed residuals were approximately normally distributed. Means, standard deviations, intercorrelations, and coefficients were calculated and examined. Endowment per FTE (p = .46) and predicted peer assessment score (p = .54) did not have statistically significant sig. values suggesting they were not contributing to the model substantially. Upon removal of endowment per FTE, predicted peer assessment score still did not have a statistically significant sig. value (p = .60). The adjusted R^2 for the model at this point was .863, suggesting 86% of variability in rank can be attributed to the variables in the model. Removal

of peer assessment score from the model found the combination of the five remaining variables significantly predicted *USNWR* rank $F(5,91) = 116.76$, $p < .001$. The adjusted R^2 was .859, suggesting minimal change in variance from the removal of the predicted peer score.

Table 16

Means, Standard Deviations, and Intercorrelations for USNWR Rank and Predictor Variables (N=96)

Variable	M	SD	1	2	3	4	5	6
1. *USNWR* Rank	47.70	27.65	-	-.88**	-.53**	-.65**	-.61**	.40*
2. Avg 6-year Grad Rate	50.24	11.51		-	.38**	.58**	.45**	-.32**
3. Avg FT faculty Salary	63.00	9.94			-	.30	.58*	-.012
4. ACT Composite 75%	25.00	2.37					.29	-.10
5. Avg spending per FTE	12.20	3.56						-.53*
6. Student to fac ratio	15.07	3.10						-

*$p < .05$; **$p < .01$.

To examine the importance of each variable to the model, stepwise regression was conducted on the variables found to contribute to explanation of variance in rank. The base model, containing only the average of six-year graduation rate, produced an adjusted R^2 of .765, suggesting over three quarters of variability in rank could be explained with the single variable. Addition of average instructional/support/research expenses per FTE increased adjusted R^2 to .823; addition of ACT Composite 75th percentile score produced an adjusted R^2 of .848, and addition of average faculty salary an adjusted R^2 of .855. Addition of student to faculty ratio to the model resulted in slight improvement (adjusted R^2 of .859).

Table 17

Coefficients and Collinearity Statistics for USNWR Rank and Predictor Variables (N=96)

Variable	Unstd. Coefficients		Std. Coefficients			95% Confidence			
	B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Tolerance	VIF
1. *USNWR* Rank	205.25	13.89		14.78	0.00	177.67	232.84		
2. Avg 6-year Grad Rate	-1.47	0.12	-0.61	-11.76	0.00	-1.72	-1.22	0.55	1.82
3. Avg FT faculty Salary	-0.40	0.14	-0.14	-2.82	0.01	-0.67	-0.12	0.58	1.71

Variable	Unstd. Coefficients		Std. Coefficients			95% Confidence			
	B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Tolerance	VIF
4. ACT Composite 75%	-2.31	0.56	-0.20	-4.14	0.00	-3.42	-1.20	0.65	1.54
5. Avg spending per FTE	-1.14	0.46	-0.15	-2.50	0.01	-2.04	-2.33	0.43	2.32
6. Student to fac ratio	0.84	0.43	0.09	1.95	0.05	-0.01	1.70	0.64	1.57

Based on these results, the model to predict rank can be expressed as follows: *USNWR* rank = constant + (-.1.47*6-year graduation rate) + (-.40*average FT faculty salary) + (-2.31*average ACT Composite 75th percentile score) + (-1.14*average spending per FTE) + (.84*student to faculty ratio).

As *USNWR* rank uses an inverse scale (i.e., one is the highest), results indicated that to attain an improvement in rank, on average, an institution would need to increase 6-year graduation rates by 1.5 points, increase average faculty salary by $400, increase average ACT Composite 75th percentile score of incoming students by over two points, increase spending per FTE student by over $1100 and decrease student to faculty ratio by nearly a full point.

As shown in Table 18, this model, based on just five proxy variables predicted 46% of institutional rankings within two positions of actual rank order. Nearly 63% of predicted scores were within five positions of actual rank order.

Table 18

Difference between Predicted and Actual Rank Order (N=96)

Difference Range	Frequency	Percent	Valid Percent	Cumulative Percent
No difference	20	20.83	20.83	20.83
1 to 2 difference	24	25.00	25.00	45.83
3 to 5 difference	16	16.67	16.67	62.50
6 to 9 difference	20	20.83	20.83	83.33
10 or more difference	16	16.67	16.67	100.00
Total	96	100.00	100.00	

Summary of Results

In summary, the analysis, which applied a single model to all institutions (n = 97), explained 86% of variance in ranking for 96 institutions ($F(5,91) = 116.76$, $p < .001$, $R^2 = .86$). This model relied on five variables, all of which were statistically significant: six-year graduation rate, average full-time faculty salary, ACT Composite 75th percentile score, average spending per FTE on instruction/student services/academic support/research, and student to faculty ratio. Peer assessment score was found to be highly collinear with other values and was not statistically significant to the model. Comparison of predicted rank to actual found 46% of predicted rank order to differ from actual rank order by fewer than three positions, without the inclusion of peer assessment score in the model.

Research Question 4*:* To what extent can substitution of IPEDS proxies for *USNWR* values predict institutional ranking in *USNWR* 2016 Best Regional Universities (South) rankings using *USNWR's* methodology?

Question four sought to replicate the *USNWR* weighted z-score methodology for calculating rank. Peer assessment scores predicted in the analysis of question two and IPEDS data found to be appropriate proxies for *USNWR* subfactors in question one were used in lieu of *USNWR* collected data. Based on the factors/subfactors used by *USNWR* (shown in Table 1), means and standard deviations were generated for each institution on the following variables: peer assessment score, retention rate, six-year graduation rate, student to faculty ratio, SAT/ACT score percentile, percent of applicants admitted, average full-time faculty salary, number of faculty with tenure, number of full-time faculty, and average spending per FTE student on instruction/support/research. Table 19 shows proxies used for each of the *USNWR* subfactors.

Table 19

2016 USNWR Factors, Subfactors, and Identified Proxies

Factor	Subfactor	Proxy
Undergraduate Academic Reputation	Peer assessment	Peer assessment score predicted in Q2
Retention & Graduation	Six-year graduation rate	Average six-year graduation rate (IPEDS)
	Retention rate	Average retention rate (IPEDS)
Faculty Resources	Classes < 20 students	N/A
	Classes > 50 students	N/A
	Average FT faculty salary	Average faculty salary equated to 9 months-all ranks (IPEDS)
	Faculty degree level	Number of instructional faculty with tenure (IPEDS)
	Student-to-faculty ratio	Number of instructional faculty who are full-time (IPEDS)
	Full-time faculty	
Student Selectivity	SAT/ACT	ACT Composite 75th percentile score (IPEDS)
	Freshmen in top 25% of HS class	N/A
	Acceptance rate	Percent of applicants admitted (IPEDS)
Financial Resources	Average spending per student on instruction, research, etc.	Average spending per FTE student on instruction, student services, academic support, and research (IPEDS)
Graduation Rate Performance	Difference between six-year grad rate and rate predicted by *USNWR*	N/A
Alumni Giving Rate	% of alumni who gave to institution within last year	N/A

The analysis followed *USNWR's* methodology of calculating z-scores for each of the subfactors for each institution. Using calculated means and standard deviations, z-scores were calculated for each subfactor variables with a direct or indirect proxy (shown in Table 2). Z-scores were calculated within Excel by subtracting group average of the variable from an institution's value for the same variable, divided by the standard deviation of the variable. For acceptance rate and student to faculty ratio, z-scores were calculated inversely so lower values, perceived by *USNWR* to be more beneficial, received higher scores. *USNWR* applies specific weighting proportions to each subfactor z-score. Since not all subfactors used by *USNWR* to calculate rank were determined to have appropriate proxies, those subfactors were excluded and weights were adjusted accordingly (Table 20).

Table 20

2016 USNWR Factors, Subfactors, Weights, and Rescaled Weights

Factor	Subfactor	Original Weight	Rescaled Weight
Undergraduate Academic Reputation	Peer assessment	22.5%	25.7%
Retention & Graduation	Six-year graduation rate	18.0%	20.6%
	Retention rate	4.5%	5.1%
Faculty Resources	Classes < 20 students	6.0%	--
	Classes > 50 students	2.0%	--
	Average FT faculty salary	7.0%	13.3%
	Faculty degree level	3.0%	5.7%
	Student-to-faculty ratio	1.0%	1.9%
	Full-time faculty	1.0%	1.9%
Student Selectivity	SAT/ACT	8.1%	12.4%
	Freshmen in top 25% of HS class	3.1%	--
	Acceptance rate	1.3%	1.9%
Financial Resources	Average spending per student on instruction, research, etc.	10.0%	11.4%
Graduation Rate Performance	Difference between six-year grad rate and rate predicted by *USNWR*	7.5%	--
Alumni Giving Rate	% of alumni who gave to institution within last year	5.0%	--

Rescaled percentage weights associated with each subfactor (shown in Table 20) were applied to the z-scores. The weighted z-scores for the ten proxies were summed into a total weighted z-score for each institution; ranking scores were calculated by dividing the institution's total weighted z-score by the highest weighted z-score of all institutions. Institutions were sorted in descending order on predicted rank score. Excel's RANK function was used to calculate predicted rank order based on position of an institution's predicted score within the group; the institution with the highest total score received a rank order of one.

Actual rank values were sorted lowest to highest and assigned rank orders. Institutions that were excluded from prior analyses for being outliers (The Citadel, Georgia Regents

University, University of Mary Washington, and Mississippi University for Women) were not assigned rank order values. Order of actual ranks were adjusted accordingly, for example, The Citadel, which received a *USNWR* rank of three, but was found to be an outlier, was excluded, and the rank order of three assigned to the next ranked institution, Samford University. This rank order was then compared to predicted rank order (excluding outliers) to determine difference between actual and predicted values.

Institutions with tie rankings were handled as discussed earlier, with benefit given the predicted value if it matched any of the order positions encompassed within the ranking. For predicted rank orders not within the range, predicted values below actual rank were subtracted from lowest rank possible within the range; predicted values above actual rank were subtracted from highest rank possible within the range. Differences between predicted and actual rank were calculated and categorized into ranges for comparison purposes. As shown in Table 21, 13% of institutions were predicted exactly, and 31% of institutions were predicted within two rank positions. Comparison of predicted and actual *USNWR* rank are provided in Appendix O.

Table 21

Difference between Predicted and Actual Rank Scores (N=93)

Difference Range	Frequency	Percent	Valid Percent	Cumulative Percent
No difference	12	12.90	12.90	12.90
1 to 2 rank difference	17	18.28	18.28	31.18
3 to 5 rank difference	19	20.43	20.43	51.61
6 to 9 rank difference	15	16.13	16.13	67.74
10 or greater rank difference	30	32.26	32.26	100.00
Total	93	100.0	100.0	100.00

Figure 2 shows the percentage of institutions correctly and incorrectly classified into the decile rank group of their actual ranking position. As shown in the figure, all institutions that

received an actual rank between 1 and 10 received a predicted rank within the same range. Of institutions that received ranks between 11 and 20, 78% of them received predicted ranks within the same range. A steep decline in the percentage of institutions classified correctly occurs after this point; with none of the subsequent actual rank ranges correctly predicted ranks for more than 40% of institutions within range.

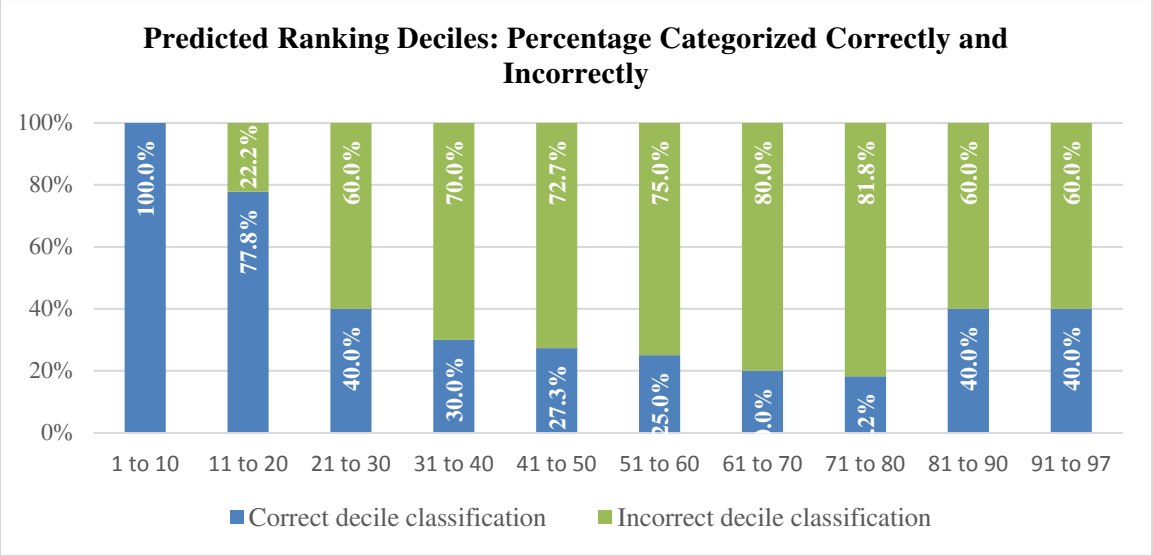

Figure 2. Percentage of predicted ranks classified into same decile as actual ranking.

Summary of Results

This model, which combined predicted peer assessment values from research question two with data from IPEDS proxies determined in research question one, predicted 31% of ranks within two positions of actual rank. Just over 50% of predicted ranks were within five positions of actual rank. For ease of comparison of results generated by the models in question three and question four, a comparison table is provided in Appendix O.

CHAPTER 5: DISCUSSION

The purpose of the study was to examine potential predictors of *USNWR* institutional rankings for regional universities in the south. Key findings from the results of the analyses are summarized below.

Summary of Major Findings

***USNWR* subfactors with direct or indirect proxies were highly correlated with identified IPEDS proxies.** Results of research question one found all nine of the pairs of *USNWR* subfactors with direct or indirect IPEDS variables to be strongly correlated.

More than 85% of variation in peer assessment score can be explained by five or fewer proxy variables, which differ dependent upon institution sector (private or public).

Analyses for research question two found the private institution model explained 88% of score variation with five variables. In order of importance, the variables were number of tenured faculty, six-year graduation rate, average full-time faculty salary, management salary outlay, and average year-end endowment per FTE. The adjusted R^2 of the public institution model was slightly lower, explaining 86% of variation with four variables. In order of importance, the variables were four-year graduation rate, ACT Composite 75th percentile score, number of tenured faculty, and percent of undergraduate students between the ages of 18 and 24. The overall model which grouped private and public institutions together, was found to be less accurate than the sector-based model (overall model = 53% of predicted values differ from actual by less than .11, sector-based model = 69% of predicted differ from actual by less than .11).

The most important variables in explaining variation in peer assessment score are number of tenured faculty members (private institutions) and average four-year graduation rate (public institutions).

Number of tenured faculty was found to have the largest impact for private institutions, explaining 65% of the variation. Addition of average six-year graduation rate (adjusted R^2 = .762), faculty salary (adjusted R^2 = .835), management salary outlays (adjusted R^2 = .860), and average endowment per FTE student resulted in an adjusted R^2 of .877. Four-year graduation rate was found to have the largest impact for public institutions, explaining 54% of the variation in peer score. Addition of ACT Composite 75th percentile score (adjusted R^2 =.737), number of tenured faculty (adjusted R^2 of .829), and proportion of undergraduate enrollment aged 18 to 24 produced an adjusted R^2 of .863.

More than 85% of variation in institutional ranking can be explained by five proxy variables and peer assessment score is not one of them.

Results of analyses conducted for research question three explained 86% of variance in ranking for 96 institutions with five variables, all of which were statistically significant: six-year graduation rate, average full-time faculty salary, ACT Composite 75th percentile score, average spending per FTE on instruction/student services/academic support/research, and student to faculty ratio. Peer assessment score was tested in the model and found to have no impact on the accuracy of the model when the five factors listed above were included. Comparison of predicted rank to actual found 46% of predicted rank orders to differ from actual rank order by fewer than three positions, without the inclusion of peer assessment score in the model.

Just over 50% of institutional rankings can be predicted within five positions using predicted values generated by proxy values and *USNWR's* methodology.

The model used to address research question four combined predicted peer assessment values from research question two with data from IPEDS proxies determined in research question one. This model predicted 31% of ranks within two positions of actual rank and just

over 50% of predicted ranks within five positions of actual rank. Results generated by the models in question three and question four are shown side by side in Appendix O.

Relevance to Literature

Volkwein and Sweitzer's (2006) research, which examined how *USNWR* subfactors related to variance in peer assessment score of national research universities, attributed over 90% of variance to eight *USNWR* collected subfactors. The eight variables found to explain variance were total enrollment, average professor salary, student-faculty ratio, percent of full-time faculty, median SAT score, faculty productivity, alumni giving rate, and graduation rate. Although the study examined a different population (national research universities) and relied on *USNWR* data rather than proxies, the findings are similar. Whereas Volkwein and Sweitzer's model accounted for 90% of variance using the *USNWR* values listed above, the sector-based model employed in research question two of this study explained 88% of variance in peer assessment score for private institutions and 86% of variance in score for public institutions using proxies. Several of the variables found to contribute to variance in Volkwein and Sweitzer's study were found to contribute to variance of peer assessment score in private institutions (graduation rate, average faculty salary) as well as public institutions (graduation rate, entrance test score). Although several of the variables found to explain variance in this study differed somewhat from those in Volkwein and Sweitzer's study, this could potentially be due to the inherent difference in populations between national research universities and regional southern universities.

Brennan et al.'s (2008) study, which used national universities as a population, found graduation rate to have the largest impact on peer assessment score with approximately 83% of variance explained by graduation rate, alumni giving rate, sector of institution, and entrance test score (Brennan et al., 2008). This study confirmed Brennan et al.'s findings regarding graduation rate, as it was found to have the largest impact on peer score variance for two of the three models

(overall and public) used in research question two of this study, and was second in the third model (private). Further, Brennan et al.'s findings, which indicate sector of institution is important in explaining variation in peer assessment score, support the use of the sector-based model developed in research question two of this study. With the development of the sector-based model, this study took Brennan et al.'s findings a step further and examined *how* factors differ between institution types.

Gnolek et al. (2014) attempted to replicate rankings for institutions within the national universities rankings by using *USNWR* data when available, supplemented with IPEDS data for values not provided by *USNWR* (entrance test scores, faculty salary, and financial resources per student). The model developed in their study used the same methodology as research question four in this study, namely application of *USNWR* subfactor weights and calculation of z-scores to predict a score for each institution. Based on their model, Gnolek et al. predicted exact rank of 21% of institutions within their population correctly. The model used to address research question four within this study, which used similar methodology, predicted just 13% of ranks correctly. This difference in accuracy could be attributed to the difference in populations (national universities vs. regional southern universities) or input source, as Gnolek et al. (2014) used *USNWR* collected values for 12 of the 15 subfactors used to predict rank. It could also be attributed to the inclusion of predicted subfactors which did not have identifiable proxies in Gnolek et al.'s model that were excluded from the models used in this study.

The analyses conducted for this study also supported Bastedo and Bowman's (2010b) finding of inherent multicollinearity amongst *USNWR* subfactor variables and Webster's (2001) finding that although *USNWR* gives peer assessment score the largest weighting value, it was not found to be the most influential factor when the effects of multicollinearity were taken into

account. Although Webster's (2001) study focused on national universities, the findings that the most influential subfactors on prediction of rank were average SAT score, predicted graduation rate, and actual graduation rate are similar to the results of this study, which found six-year graduation rate, average expenses per FTE student, and ACT 75th percentile score to be most influential for predicting rank for regional universities in the south. Differences may be due to the substantial variation that exists between national universities and regional universities or the fact that this study did not include predicted graduation rate in the model, due to multicollinearity with six-year graduation rate.

Interpretation of Findings

Although *USNWR* publishes the methodology and weighting scheme used for their ranking calculations each year, this information alone is insufficient to inform precise replication of the rankings. Even with data provided by *USNWR,* exact replication cannot be attained, as the dataset provided did not contain all variables used to calculate the rankings. Publishing methodology and providing limited datasets allow *USNWR* to make claims of transparency without substantiation. Lacking the full dataset used by *USNWR*, it is difficult to determine the true impact of all variables used by *USNWR* on peer assessment score or rank.

Proxy Correlations

As noted earlier, the data file received from *USNWR* did not provide faculty salary, proportion of professors with highest degree in field, proportion of full-time faculty or average spending per student on instruction, research, student services and related educational expenditures. Had values been provided for these subfactors, correlational analyses could have been conducted to determine the extent to which they are related to their respective similar IPEDS variables (average faculty salary, percent of faculty with tenure, percent of full-time faculty, and instructional/research/ student services expenses per FTE). Of the six subfactors

within the faculty resources factor used by *USNWR* (which accounts for 20% of ranking weight), only data for student class size and student to faculty ratio were provided by *USNWR*.

Without *USNWR* data, the extent of the correlation between the *USNWR* and proxy variables could not be determined for these variables. For purposes of this study, identified proxies were used in analyses in order to include the concepts of faculty resources and institutional spending, despite being unable to validate the relationships with original *USNWR* data. To exclude the proxies for the faculty resources subfactors not provided would have excluded 11% of the 20% of the weight attributed to the faculty resources factor. This percent would have been further reduced by the lack of appropriate IPEDS proxies for the two class size subfactors, leaving only student to faculty ratio to account for the entire weight of faculty resources. Considering student to faculty ratio accounted for only 1% of the 20% attributed to the faculty resources factor, use of uncorrelated proxies was deemed more suitable for the analyses than exclusion of the subfactors.

Of the subfactors provided by *USNWR* with potential proxies (retention rate, six-year graduation rate, student to faculty ratio, acceptance rate, 75th percentile entrance test score, and alumni giving rate), all were found to correlate highly with identified proxies. The proxy of year-end endowment per FTE was found to have a moderate correlation $r(93) = .453$, $p < .001$, whereas the other five pair of proxies had correlations greater than .876. As Brennan et al. (2008) found alumni giving rate to be influential for predicting ranking of national universities, it is possible that lack of a strongly correlated proxy hinders the models used in this study.

Peer Assessment Score

In addition to the proxies found to be highly correlated with *USNWR* values, over 30 other IPEDS variables were included in the model used in research question two to examine

elements that influence peer assessment score (shown in Appendix I). As discussed in the prior chapter, the prediction of peer assessment score was improved with the development of separate models for private and public institutions. Whereas the overall model resulted in 18 exact matches (18.9%) out of 95 institutions and 53% of predicted peer assessment scores within .10 of actual scores, the sector-based model resulted in 23 exact matches (24.5%) out of 94 institutions, and nearly 70% (69.1%) within .10 of actual scores.

Private Institutions. Three of the five variables found to be influential on peer score for private institutions were related to financial aspects (average full-time faculty salary, average management salary outlay, and average endowment per FTE); with the other two related to student success and faculty resources (six-year graduation rate and number of tenured faculty). Given the breadth of variables tested in the model (shown in Appendix I), the finding that financial variables are responsible for a large amount of variance in predicting peer score for private institutions may be due to private institutions having (and publicizing) more resources than public institutions. Awareness of institutional resources and salary structures appear to influence peer assessment score for private institutions more than selectivity or student demographics. This might be attributed to resources being an area of differentiation within private institutions in a sector that typically recruits high-achieving students.

Mean entrance test scores were higher at private institutions, most notably in mean SAT Critical Reading 75th percentile scores, which were 21 points higher (584) than those of public institutions (563). SAT Math 75th percentile score means were closer in comparison (private = 577, public = 570), but the score range for private institutions was narrower (a range of 167 points) than that of public institutions (195 score range). Variation between maximum test scores were more striking; maximum SAT Critical Reading 75th percentile score for private institutions

was 690, compared to 640 for public institutions. SAT Math 75th percentile (680, 655) and ACT Composite 75th percentile (29,27) yielded similar results.

This suggests that although selectivity does not play an influential role in predicting peer assessment score for private institutions, it may be due to the notion that private institutions tend to enroll high-achieving students. In other words, individuals completing peer assessment surveys consider high test scores and selectivity a given aspect of private institutions. With these factors aside, financial elements such as endowment and salaries become key considerations.

Results of the stepwise regression which revealed number of tenured faculty to be the most important variable in the private institution model (adjusted R^2 = .649) were somewhat surprising given that graduation rate was the biggest contributor in other models. The importance attributed to number of tenured faculty suggests individuals rating private institutions on peer score are influenced by perception of a large body of qualified faculty more than student success. Although not inherently financial in nature, number of tenured faculty employed does reflect institutional allocation of financial resources. This investment in quality faculty may be perceived as a reflection of institutional quality by individuals responding to the peer assessment survey. As respondents, generally academic administrators, tend to rate institutions they are somewhat familiar with, it stands to reason that they possess some awareness of the general size of the tenured body at institutions they are ranking. Coupled with a general knowledge of student success in the form of graduation rate, these two factors explain 76% of variance in peer assessment score for private institutions.

Public Institutions. Conversely, variables found to be influential for public institutions related more to student success and demographics (ACT Composite 75th percentile score, percent of undergraduate students receiving grant aid, four-year graduation rate, and percent of

undergraduate students between the ages of 18 and 24), with only number of tenured faculty related to faculty resources. Of these, only number of tenured faculty was found to be influential for private institutions.

Four-year graduation rate was found to be more highly correlated (r = .743) with peer assessment score than six-year graduation rate (r = .729) for public institutions. As such, it is not surprising that stepwise regression found four-year graduation rate to be the largest contributor to the model, accounting for 54% of variation. In combination with ACT Composite 75th percentile test score, the second largest contributor, 74% of variance in peer assessment score for public institutions could be explained. These findings suggest individuals rating public institutions are influenced by factors that reflect the traditional college structure, i.e., a large proportion of students aged 18 and 24, receiving grant aid, who graduate within four years. Whereas selectivity variables were not found to explain variance in private institutions, ACT Composite 75th percentile score made a substantial contribution to explaining variance for public institutions, suggesting higher entrance test scores may be perceived as a representation of quality public institutions. Interestingly, in this model nearly three-quarters of variance was explained entirely with two student success variables and without inclusion of a single financial variable.

In summary, individuals completing the peer assessment survey appear to rate institutions on different criteria, based on their sector. Private institutions are judged heavily on financial resources and allocation, with six-year graduation rate the only student success measure contributing to the model. Conversely, public institutions are judged on student success and demographics, with number of tenured faculty the only resource measure.

Rank Regression Model

The rank regression prediction model, which relied on five variables (six-year graduation rate, average full-time faculty salary, ACT Composite 75th percentile score, average spending per FTE on instruction/student services/ academic support/research, and student to faculty ratio), explained 86% of variance in ranking for 96 institutions, predicting 21% of institution ranks accurately and 46% within two positions.

Despite the ability to explain peer assessment score based on the variables discussed in the prior section, the purpose of including the peer assessment component as a substantial weight in *USNWR's* methodology is not clear. Research question three, which examined the ability to predict rank with the identified proxy variables, found peer assessment score contributed to the accuracy of the model minimally (R^2 = .863 with peer score, R^2 = .859 without).

The finding that peer assessment score yielded negligible improvement suggests peer assessment score has little impact on the majority of institution rankings due to the collinearity of variables that predict peer assessment score and institutional rank. As a number of the same variables were found to explain variance in both peer assessment score and rank, high multicollinearity is to be expected if peer assessment score is included in the model. This multicollinearity may explain why *USWNR* does not use a regression model to calculate rank, instead using the weighted z-score methodology that allows for inclusion of peer score and collinear variables. Based on these findings, it is unclear what the peer assessment score adds to the overall rank calculation. Perhaps it is a mechanism to inflate weights of collinear measures; for example, an increase in graduation rate is reflected in an increase in peer assessment score to result in a magnified rankings boost.

Rank *USNWR* Methodology Model

The final model, developed to address research question four, combined predicted peer assessment values from the sector-based model of research question two with data from highly correlated IPEDS proxies determined in research question one. Relying on the weighted z-score methodology used by *USNWR*, this model predicted 31% of ranks within two positions of actual rank, with just over 50% of predicted ranks within five positions of actual rank.

As shown in Table 22, the model used in research question three, which relied on multiple regression rather than the application of weighted z-scores used in research question four, yielded predictions that were more accurate. In the Q3 model, 46% of ranks were predicted within two positions, compared to 31% in the Q4 model. In both models, institutions were predicted to have ranks which differed by greater than ten positions from actual rank; however, the Q3 model yielded 16 institutions in this range, while the Q4 model resulted in 30.

Table 22

Comparison of Difference between Predicted and Actual Rank Order by Model (N=96/93)

	Q3 Model			Q4 Model		
Difference Range	Frequency	Valid Percent	Cumulative Percent	Frequency	Valid Percent	Cumulative Percent
No difference	20	20.83	20.83	12	12.90	12.90
1 to 2 difference	24	25.00	45.83	17	18.28	31.18
3 to 5 difference	16	16.67	62.50	19	20.43	51.61
6 to 9 difference	20	20.83	83.33	15	16.13	67.74
10 or more difference	16	16.67	100.00	30	32.26	100.00
Total	96	100.00		93	100.00	

As shown by Table 22, the Q4 weighted z-score model, based on proxies for ten of the 15 subfactors used by *USNWR*, displayed less accuracy than the Q3 regression model based on five variables. Despite the adjustment to the weights applied to the subfactors, accuracy of the Q4 model may have been hindered by the exclusion of variables for which appropriate proxies could

not be identified (classes with fewer than 20 students, classes with more than 50 students, freshmen in the top 25% of high school class, difference between six-year graduation rate and rate predicted by *USNWR*, and alumni giving rate).

Limitations of Findings

This study relied on institutional enrollment and financial data for the years 2013 through 2014, during which the nation was experiencing a recovery from an economic recession and a changing political environment. As such, it should be noted that findings for this study may be impacted by these factors which have the capacity to greatly affect state appropriations, institutional resource allocations, financial aid awards, and enrollment patterns. Changing economic and political environs may render findings non-generalizable across time.

Implications and Recommendations for Application

As the variables found to be most influential in predicting rank (Table 23, column Rank Q3) do not include peer assessment score and differ from the weighting order used by *USNWR* to calculate rank, these findings suggest *USNWR's* methodology does not accurately reflect the levels of influence for subfactors for regional universities in the south. Graduation rate was present in every model, indicating it explained variance in peer assessment score (for private and public institutions), as well as institutional rank. Average faculty salary was relevant in all of the models except for peer assessment score for public institutions. In essence, these findings suggest rankings are a reflection of outcomes and investments rather than quality. While *USNWR* purports the rankings are a sound representation of institutional quality (Morse, 2015), findings from this study suggest rankings represent strategic investment of resources and support for student success. Whether these elements correlate with institutional quality cannot be assessed.

Regardless of what the rankings represent, the regression models used to explain peer assessment score and rank were able to explain approximately 86% of variance with six or fewer

variables. The implication from this finding is that the other variables used by *USNWR* to calculate rank are noise to make the model seem more complex. Influential variables for each model are shown in Table 23.

Table 23

Variables found to be Influential by Model in Order of Importance

Peer Assessment Score			Rank
Q2 Overall	Q2 Private	Q2 Public	Q3
6-year grad rate	n tenured Faculty	4-year grad rate	6-year grad rate
Avg. FT faculty salary	6-year grad rate	ACT Composite 75th score	Avg. spending per FTE
n tenured Faculty	Avg. FT faculty salary	n tenured faculty	ACT Composite 75th score
SAT Math 75th score	Management salary outlay	Percent enroll 18-24	Avg. FT faculty salary
Avg. spending per FTE	Avg. endow. Per FTE		Student to faculty ratio

Implications for Practice

As the regression model used in Q3 was found to be the most accurate in terms of predicting institutional rank, institutions seeking to advance in the rankings should dedicate resources to the variables associated with Q3. If only one area can receive substantial resources, the best investment is to improving graduation rates, as average six-year graduation rate alone was found to result in an adjusted R^2 of .765. These findings were supported by Brennan et al.'s (2008) study which suggested institutions "if […] bound to fight the ratings, should concentrate on boosting graduation rates" (p. 187). Beyond improving graduation rates, the best investment of university resources would be to increasing instructional, support, and research expenditures per FTE student (increased R^2 of model by .058) and enrolling freshmen with higher ACT Composite scores (increased R^2 of model by .025). Collectively, these three variables explained 85% (adjusted R^2 = .848) of variance in rank.

To provide context of the extent of improvement required to gain a rank within the top ten regional universities in the south, Table 24 provides a profile of the top ten ranked

institutions for the variables found to explain variance in rank, as well as the predicted rank based on the Q3 model. As shown in Table 24, excluding Embry-Riddle Aeronautical University, which offers a unique curriculum, the lowest average six-year graduation rate within the group was 61% and the lowest average retention rate was 78%. Excluding The Citadel, which was found to be an outlier, the top ranked institutions have ACT 75th percentile scores of 27 or higher and average full-time faculty salaries of approximately $70,000 or greater. This profile illustrates the general values needed for an institution to attain a rank within the top ten positions of the Best Regional Universities (South) ranking category.

Table 24

2016 Profile of Top 10 Ranked Institutions (n = 10)

Rank	Institution	Six-year Graduation Rate	Avg. FT Faculty Salary	Act Composite 75th	Avg. Expenses Per FTE	Student to Faculty Ratio	Q3 Predicted Rank
1	Elon University	82.00	80,424	29	21,108	12	1
1	Rollins College	70.00	76,311	29	22,524	10	2
3	The Citadel	69.00	75,231	25	14,805	13	10
4	Samford University	69.00	75,303	29	21,202	12	3
5	Belmont University	68.00	78,264	29	15,330	13	5
5	Stetson University	63.00	90,252	28	19,620	12	6
7	James Madison U.	81.00	71,937	27	11,929	16	4
8	Mercer University	61.00	71,505	29	19,658	13	8
9	Embry-Riddle Aeronautical	55.00	80,415	27	24,640	14	13
10	Appalachian State U.	68.00	69,030	27	10,622	16	18

Although influential aspects affecting ranking have been identified in this study and provide guidance on allocation of resources in areas most likely to increase ranking position, it must be emphasized that such gains do not come quickly or cheaply. This was evidenced by Baylor's example, which has yet to break into the top 50 national universities, despite an investment of over $200 million towards the goal (Farrell & Werf, 2007, *U.S. News & World Report*, 2015). Further, as Martin (2015) noted regarding national universities, the top 50

institutions change minimally, despite institutional efforts to gain in position. The findings of this study provide guidance on resource allocation that may result in ranking gains; however, such gains will not be quickly realized.

Potential Future Research

Findings discussed in this study have built upon prior research on modeling *USWNR* rank and peer assessment score. There are a number of avenues for further research in relation to this study. First, the models used in this study should be extended to other rankings categories beyond the southern regional universities, such as national universities or liberal arts colleges to see if results are consistent across institution types. Second, although this study examined how many institutions were classified correctly by rank, additional analyses could be conducted to examine how many institutions were predicted higher than actual rank compared to how many were predicted lower. Third, the models within this study could be augmented with alumni giving data from the Voluntary Support of Education report that can be purchased from the Council for Aid to Education (CAE) to provide a potential proxy for alumni giving rates. Lastly, as this study examined only a single year of rankings, replication of the analyses would be beneficial to determine the extent to which proxies influencing peer assessment score and rank remain stable over time.

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APPENDIX A: LITERATURE REVIEW LOG

Author	Title	Year	Published in	Author Occupation	Primary topic	Subtopics	Empirical	Brief Abstract	Rankings List Used in Study
Anderson, N.	Five colleges misreported data to U.S. News, raising concerns about rankings, reputation.	2013	*The Washington Post.*	Journalist	influence on institutions	data misreporting	No	Tulane University, Bucknell University, Claremont McKenna, Emory University, & George Washington University submitted false data to *USNWR*	
Anonymous.	Sixty-One College Presidents Withdraw from the College-Rankings System.	2007	*The Hispanic Outlook in Higher Education.*	Journalist	influence on institutions	not participating in US News	No		
Avery, C., Glickman, M., Hoxby, C., & Metrick, A.	A revealed preference ranking of U.S. colleges and universities.	2004	*National Bureau of Economic Research*	Faculty	methodology	alternate methodology	Yes	Constructs a ranking of U.S. undergraduate programs based on students' revealed preferences, based on models used for ranking players in tournaments, such as chess or tennis.	
Bastedo, M. N., & Bowman, N. A.	U.S. News & World Report college rankings: Modeling institutional effects on organizational reputation.	2010	*American Journal of Education*	Faculty	methodology	modeling, multicollinearity	Yes	Explores the institutional effects of the *USNWR* rankings on the reputational assessments made by senior administrators at peer universities and liberal arts colleges.	Liberal Arts Colleges and National Universities
Betsinger, A.	Modeling U.S. News & World Report's predicted graduation rate and explaining differences between actual and predicted rates.	2009	*N/A*	University Administration	methodology	reliability	Yes	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.	
Bougnol, M.-L., & Dulá, J. H.	Technical pitfalls in university rankings.	2014	*Higher Education*	Faculty	methodology	reliability	Yes		
Brennan, J., Brodnick, R., & Pinckley, D.	De-Mystifying the U.S. News rankings: How to understand what matters, what doesn't and what you can actually do about it.	2008	*Journal of Marketing for Higher Education*	University Administration	methodology	modeling	Yes	Developed a model to predict the peer assessment score and examine underlying factors within the data	
Carey, K.	College rankings reformed. The case for a new order in higher education.	2006	*N/A - report by Education Sector*	Independent Researcher	methodology	alternate methodology	No	Suggests new ranking system based on data from NSSE, CLA, accreditation, outcomes, etc.	
Clarke, M.	News or Noise? An Analysis of U.S. News and World Report's Ranking Scores.	2002	*Educational Measurement: Issues and Practice*	Faculty	methodology	alternate methodology	Yes	Rankings are "falsely precise" creating a vertical column where a group might more properly exist. Uses jackknife method and linear regression model to illustrate uncertainty around the overall scores used to rank schools.	Liberal Arts Colleges and National Universities

Author	Title	Year	Published in	Author Occupation	Primary topic	Subtopics	Empirical	Brief Abstract	Rankings List Used in Study
Clarke, M.	Quantifying quality: What can the U.S. News and World Report rankings tell us about the quality of higher education?	2002	*Education Policy Analysis Archives*	Faculty	methodology	reliability	Yes	Examines changes in ranking formula over years and precision of overall ranking score.	
Crabbe, N.	University of Florida President Bernie Machen, in a recent assessment of national universities, gave his school the highest-possible ranking.	2009	*Gainesville Sun*	Journalist	influence on institutions	data misreporting	No		
Desantis, N.	U.S. News moves Tulane U. business school to "unranked" over inflated data	2013		Journalist	influence on institutions	data misreporting	No		
Desantis, N.	U.S. News says 2 colleges misreported rankings data.	2014	*Chronicle of Higher Education*	Journalist	influence on institutions	data misreporting	No		
Dichev, I.	News or Noise?	2001	*Research in Higher Education*	Faculty	methodology	validity	Yes	Investigates the quality of the *USNWR* rankings of national universities and liberal arts colleges. Findings estimate 70 to 80 percent of variation in rankings changes is transitory and reversible.	Liberal Arts Colleges and National Universities
Diver, C.	Is there life after rankings?	2005	*The Atlantic Monthly*	University Administration	influence on institutions	not participating in US News	No	Reed College refused to participate in *USNWR* data collection as there is no way to ensure either the accuracy of the information or the reliability of the resulting rankings.	
Egan, K., Stolzenberg, E. B., Bates, A., Aragon, M., Suchard, M. R., & Rios-Aguilar, C.	The American freshman: National norms fall 2015. Los Angeles: Higher Education Research Institute, UCLA.	2015	*Retrieved from http://www.heri.ucla.edu/monographs/TheAmericanFreshman2015.pdf*	Independent Researcher	influence on institutions	institutional behavior	Yes		
Ehrenberg, R.	Method or madness? Inside the U.S. News & World Report college rankings.	2005	*Journal of College Admission*	Faculty	methodology	validity	No	The problem with the *USNWR* rankings lies not in individual data elements, but in its effort to aggregate these elements into a single index.	
Ehrenberg, R. G.	Reaching for the brass ring: The U.S. News & World Report rankings and competition.	2003	*The Review of Higher Education*	Faculty	influence on institutions	institutional behavior	No	Explores how rankings exacerbate the competitiveness among American higher education institutions.	
Farrell, E. F., & Werf, M. V. D.	Playing the rankings game.	2007	*The Chronicle of Higher Education*	Journalist	methodology	validity	No	*USNWR* rankings overwhelmingly favor private institutions.	

Author	Title	Year	Published in	Author Occupation	Primary topic	Subtopics	Empirical	Brief Abstract	Rankings List Used in Study
Gladwell, M.	The Order of Things.	2011	*The New Yorker*	Journalist	methodology	validity	No	U.S. News algorithm relies on proxies for quality—and the proxies for educational quality turn out to be flimsy at best.	
Gnolek, S. L., Falciano, V. T., & Kuncl, R. W.	Modeling change and variation in U.S. News & World Report college rankings: What would it really take to be in the top 20?	2014	*Research in Higher Education*	University Administration	methodology	reliability	Yes	Produces a ranking model that recreates U.S. News outcomes and quantifies the inherent ‘‘noise’’ in the rankings. Results show that for a university ranked in the mid-30s it would take a significant amount of additional resources, directed in a very focused way, to become a top-ranked national university, and that rank changes of up to ± 4 points should be considered ‘‘noise’’.	National Universities
Graham, A., Thompson, N., Dolnick, B., Kipp, S., Koons, J., & Laskow, R.	Broken Ranks.	2001	*Washington Monthly*	US News Employee	methodology		No		
Grewal, R., Dearden, J. A., & Llilien, G. L.	The university rankings game.	2008	*The American Statistician*	Faculty	methodology	alternate methodology	Yes	Developed model which provides (lagged) rank-specific elasticities of ranks with respect to changes in university characteristics, thereby offering insight about the effect of a university’s strategy on its rank.	National Universities
Hoover, E.	Inflated SAT scores reveal “elasticity of admissions data.”	2012	*Chronicle of Higher Education*	Journalist	influence on institutions	data misreporting	No		
Hoover, E.	Differing “admission priorities” prompted VP to falsify data.	2012	*Chronicle of Higher Education*	Journalist	influence on institutions	data misreporting	No		
Hossler, D.	The problem with college rankings.	2000	*About Campus*	University Administration	influence on institutions	institutional behavior	No	There is a growing sense that institutions are changing policies and procedures, including the way they report information, in order to move up in the rankings.	
Jaschik, S.	Should U.S. News make presidents rich?	2007	*Inside Higher Ed*	Journalist	influence on institutions	motivation to improve rank	No	Arizona Board of Regents approved contract changes for president of Arizona State University, that link $60,000 in bonus pay to an improved rating from *USNWR*.	
Jaschik, S.	Flagler College admits that vice president changed admissions statistics.	2014	*Inside Higher Ed*	Journalist	influence on institutions	data misreporting	No	Flagler College, announced that one of its senior officials altered admissions statistics for freshmen who were admitted from the fall of 2010 through the fall of 2013.	

Author	Title	Year	Published in	Author Occupation	Primary topic	Subtopics	Empirical	Brief Abstract	Rankings List Used in Study
Jaschik, S.	Fibbing for rankings.	2015	*Inside Higher Ed*	Journalist	influence on institutions	data misreporting	No		
Kuh, G. D.	Rehabbing the rankings: Fool's errand or the lord's work?	2011	*College and University*	Faculty	methodology	validity	No	Reviews the history of rankings, analyzes what they represent, and evaluates the extent to which rankings serve their espoused purposes	National Universities
Lederman, D.	Manipulating, er, influencing U.S. News.	2009	*Inside Higher Ed*	Journalist	influence on institutions	data misreporting	No	Clemson University moved up from 38th to 22nd in rankings of public research universities through targeted actions and manipulated data reporting.	
Lee, G., Sanford, T., & Lee, J.	Variables that explain changes in institutional rank in U.S. News & World Report rankings.	2014	*KEDI Journal of Educational Policy,*	University Administration	methodology	validity	Yes	Examines variables that are most important in explaining changes in ranking from 2006-2008 and how the variables that are most important in explaining change in institutional rank vary by public and private institutions.	National Universities
Lee, S.	Reputation without rigor.	2009	*Inside Higher Ed*	Journalist	methodology	modeling	No		
Levin, D.	The uses and abuses of the "U.S. News" rankings.	2002	*Priorities*	University Administration	influence on institutions	data misreporting	No		
Longden, B.	Ranking indicators and weights.	2011	*In J. C. Shin, R. K. Toutkoushian, & U. Teichler (Eds.), University Rankings*	Faculty	methodology	validity	Yes	*USNWR* remains confident that it is unlikely that serious criticism will come from an analysis of the content of the rankings because of the 'challenging mathematical and statistical complexity' that inevitably would ensue.	
Machung, A.	Playing the ranking game.	1998	*Change: The Magazine of Higher Learning*	Independent Researcher	methodology	reliability	No	*USNWR* changes rankings methodology each year to ensure volatility.	
Martin, J. P.	Moving Up in the U.S. News and World Report Rankings.	2015	*Change: The Magazine of Higher Learning*	University Administration	methodology	modeling	Yes	Examines likelihood of an institution attaining a higher ranking.	
McDonough, P. M., Lising, A., Walpole, A. M., & Perez, L. X.	College rankings: Democratized college knowledge for whom?	1998	*Research in Higher Education*	Faculty	influence on institutions	admissions	Yes	Explores the use of *USNWR* rankings by student types to examine what types of freshmen find rankings useful in college choice.	
McGuire, M. D.	Validity issues for reputational studies.	1995	*New Directions for Institutional Research*	University Administration	methodology	validity	Yes		

Author	Title	Year	Published in	Author Occupation	Primary topic	Subtopics	Empirical	Brief Abstract	Rankings List Used in Study
Meredith, M.	Why do universities compete in the ratings game? An empirical analysis of the effects of the U.S. News and World Report college rankings.	2004	*Research in Higher Education*	Student	influence on institutions	admissions	Yes	An institution's ranking impacts admission outcomes and pricing decisions - many schools' admission outcomes are responsive to movements in the rankings; however, changes in rank are more significant at certain locations in the rankings and affect public and private schools differently	National Universities
Monks, J., & Ehrenberg, R. G.	U.S. News & World Report's college rankings: Why they do matter.	1999	*Change: The Magazine of Higher Learning*	Faculty	influence on institutions	admissions	Yes	Examines the effects of changes in rankings on the admissions outcomes and pricing policies of a set of institutions that are at the very top of the undergraduate rankings	Liberal Arts Colleges and National Universities
Monks, J., & Ehrenberg, R. G.	The impact of U.S. News & World Report college rankings on admissions outcomes and pricing policies at selective private institutions.	1999	*National Bureau of Economic Research*	Faculty	influence on institutions	admissions	Yes	Examines impact of rankings on applications, admissions, and enrollment decisions, as well as on institutions' pricing policies.	
Morphew, C. C., & Swanson, C.	On the efficacy of raising your university's rankings.	2011	*In J. C. Shin, R. K. Toutkoushian, & U. Teichler (Eds.), University Rankings.*	Faculty	influence on institutions	institutional behavior	No	Provides an analysis of how universities are controlled by higher education rankings; how universities react to rankings; the importance of reputation; and efficacy of pursuing a change in rankings.	
Morse, R.	The real and perceived influence of the US News ranking.	2008	*Higher Education in Europe*	US News Employee	influence on institutions	institutional behavior	No	Discusses the growing influence of *USNWR* rankings since inception in 1983.	
Morse, R.	Debunking myths about the U.S. News Best Colleges rankings.	2015	*U.S. News*	US News Employee	methodology	validity	No	*USNWR* responds to criticisms of rankings published in the New York Times.	
Morse, R.	Clemson and the college rankings.	2009	*U.S. News*	US News Employee	influence on institutions	data misreporting	No		
Morse, R.	FAQs on recent data misreporting by colleges.	2013	*U.S. News*	US News Employee	influence on institutions	data misreporting	No		
Morse, R.	U.S. News Best Colleges rankings turn 30 years old.	2013	*U.S. News*	US News Employee	methodology	reliability	No		
Morse, R., & Gilbert, J.	Publishers' perspectives: Magazines.	1995	*New Directions for Institutional Research*	US News Employee	methodology	validity, reliability	No	Discusses *USNWR* purpose and methodology - primarily for parents and prospective students; defense of methodology and changes as a means to annual improvement.	

Author	Title	Year	Published in	Author Occupation	Primary topic	Subtopics	Empirical	Brief Abstract	Rankings List Used in Study
Morse, R., & Tolis, D.	Updates to 2 schools' 2015 Best Colleges rankings data.	2014	*U.S. News*	US News Employee	influence on institutions	data misreporting	No		
Morse, R., Brooks, E., & Mason, M.	How U.S. News calculated the 2016 Best Colleges rankings.	2015	*U.S. News*	US News Employee	influence on institutions	institutional behavior	No		
National Opinion Research Center.	A review of the methodology for the U.S. News & World Report's rankings of undergraduate colleges and universities.	1997	*N/A - report by National Opinion Research Center*	Independent Researcher	methodology	validity	No	Critically reviews the methodology used by the *USNWR* to rank colleges and universities and suggests ways in which it can be improved.	
Ridley, D. R., Cuevas, N. M., & Matveev, A. G.	Transitions between Tiers in U.S. News and World Report Rankings of Colleges and Universities.	2001	*N/A - Conference paper*	University Administration	methodology	modeling	Yes	Investigated whether changes occur frequently in college rankings to provide an accurate picture of how much movement, whether rising or falling, has occurred historically	Liberal Arts Colleges and Southern Regional Universities
Sanoff, A. P.	The US News college rankings: a view from the inside.	2007	*N/A - report by Institute for Higher Education Policy*	US News Employee	methodology	reliability	No	Overview of history of the *USNWR* rankings and methodologies by former managing editor of the *USNWR* rankings.	
Sponsler, B. A.	The role and relevance of rankings in higher education policymaking.	2009	*N/A - report by Institute for Higher Education Policy.*	Independent Researcher	influence on institutions	institutional behavior	No	Examines the role college rankings might play in policymaking for postsecondary education.	
Stecklow, S.	Cheat sheets: Colleges inflate SATs and graduation rates in popular guidebooks.	1995	*Wall Street Journal, Eastern Edition,*	Journalist	influence on institutions	data misreporting	No	Compared data submitted to *USNWR* to data submitted to debt rating agencies. Findings showed more than two dozen discrepancies in SAT scores, acceptance rates and other enrollment data. In nearly every case, the Moody's and S&P numbers were less favorable to the colleges than the guidebook figures.	
Supiano, B.	Emory U. intentionally misreported admissions data, investigation finds.	2012	*Chronicle of Higher Education*	Journalist	influence on institutions	data misreporting	No		
Thompson, N.	Playing with numbers.	2000	*The Washington Monthly*	Journalist	methodology	alternate methodology	No	Examines changes in *USNWR* methodology, including proposed methodologies that the publishers rejected because they resulted in a top 10 beyond the expected.	
U.S. News & World Report.	How U.S. News calculated the 2015 Best Colleges rankings.	2014	*U.S. News*	US News Employee	methodology		No		

Author	Title	Year	Published in	Author Occupation	Primary topic	Subtopics	Empirical	Brief Abstract	Rankings List Used in Study
U.S. News & World Report.	U.S. News Best Colleges National Universities 2016.	2015	*U.S. News*	US News Employee	methodology		No		
Van Der Werf, M.	Researcher offers unusually candid description of university's effort to rise in rankings.	2009	*Chronicle of Higher Education*	Journalist	influence on institutions	data misreporting	No		
Van Der Werf, M.	Clemson assails allegations that it manipulates U.S. News rankings.	2009	*Chronicle of Higher Education*	Journalist	influence on institutions	data misreporting	No		
Volkwein, J. F., & Sweitzer, K. V.	Institutional prestige and reputation among research universities and liberal arts colleges.	2006	*Research in Higher Education*	University Administration	methodology	reliability	Yes		
Webster, T. J.	A principal component analysis of the U.S. News & World Report tier rankings of colleges and universities.	2001	*Economics of Education Review*	Faculty	methodology	validity, multicollinearity	Yes	Analyzes the accuracy of the *USNWR* criteria weighting scheme and discusses implications of the findings - that actual contributions of the 11 ranking criteria examined differ substantially from the explicit *USNWR* weighting scheme because of severe and pervasive multicollinearity among the ranking criteria.	

APPENDIX B: INSTITUTIONS IN THE ANALYSIS

Ninety-seven institutions were initially included in this study. Criteria used to select the sample are described in Chapter 3. Institutions in the sample are listed below.

Institutions Included in the Analysis

Institution	State	2016 *USNWR* Rank
Albany State University	GA	93
Alcorn State University	MS	68
Appalachian State University	NC	10
Arkansas State University	AR	53
Arkansas Tech University	AR	87
Austin Peay State University	TN	68
Belhaven University	MS	58
Bellarmine University	KY	13
Belmont University	TN	5
Brenau University	GA	61
Campbell University	NC	24
Campbellsville University	KY	84
Charleston Southern University	SC	93
Christian Brothers University	TN	27
Christopher Newport Univ.	VA	14
Coastal Carolina University	SC	63
College of Charleston	SC	11
Columbia College	SC	37
Columbia International Univ.	SC	35
Converse College	SC	25
Eastern Kentucky University	KY	76
Elon University	NC	1
Embry-Riddle Aeronautical U.	FL	9
Fayetteville State University	NC	84
Florida Gulf Coast University	FL	80
Francis Marion University	SC	76
Freed-Hardeman University	TN	46
Gardner-Webb University	NC	41
Georgia College & State Univ.	GA	28
Georgia Regents University	GA	71
Hampton University	VA	18
Harding University	AR	22
Henderson State University	AR	87
Jacksonville University	FL	65
James Madison University	VA	7
Kennesaw State University	GA	71
King University	TN	71
Lee University	TN	46
Liberty University	VA	80
Lincoln Memorial University	TN	50
Lipscomb University	TN	18
Longwood University	VA	28
Loyola University New Orleans	LA	11
Lynchburg College	VA	32

Institution	State	2016 *USNWR* Rank
Marshall University	WV	45
Mary Baldwin College	VA	41
Marymount University	VA	53
McNeese State University	LA	87
Mercer University	GA	8
Mississippi College	MS	32
Mississippi Univ. for Women	MS	46
Montreat College	NC	93
Morehead State University	KY	61
Murray State University	KY	28
Nicholls State University	LA	87
North Carolina Central Univ.	NC	65
Northern Kentucky University	KY	80
Palm Beach Atlantic University	FL	46
Pfeiffer University	NC	76
Piedmont College	GA	53
Queens University of Charlotte	NC	20
Radford University	VA	37
Rollins College	FL	1
Saint Leo University	FL	71
Samford University	AL	4
Shenandoah University	VA	41
Spring Hill College	AL	21
St. Thomas University	FL	63
Stetson University	FL	5
Tennessee Technological Univ.	TN	35
The Citadel	SC	3
Thomas More College	KY	53
Troy University	AL	65
U. of North Carolina--Pembroke	NC	93
U. of South Florida--St. Petersburg	FL	58
Union College	KY	83
Union University	TN	14
Univ. of Mary Washington	VA	16
Univ. of North Carolina--Wilmington	NC	16
Univ. of Tennessee--Chattanooga	TN	58
University of Central Arkansas	AR	68
University of Louisiana--Monroe	LA	93
University of Montevallo	AL	37
University of North Alabama	AL	71
University of North Florida	FL	50
University of North Georgia	GA	53
University of Tampa	FL	22
University of Tennessee--Martin	TN	50
University of the Cumberlands	KY	87
University of West Georgia	GA	87
Valdosta State University	GA	76
Western Carolina University	NC	32
Western Kentucky University	KY	31
William Carey University	MS	41
Wingate University	NC	37
Winston-Salem State Univ.	NC	84
Winthrop University	SC	26

APPENDIX C: DEFINITIONS OF IPEDS POTENTIAL PROXIES

Definitions of IPEDS Independent Variables to be Tested as Proxies for USNWR Subfactors

Variable	IPEDS Survey	Data Type	Collected In	Definition
Admissions yield - total	Admissions	Numeric	Winter 2014-15	Admissions yield = number enrolled divided by the number admitted.
Percent admitted - total	Admissions	Numeric	Winter 2014-15	Percent admitted total = number of admissions-total divided by the total applicants.
Full-time retention rate, 2014	Fall Enrollment	Numeric	Spring 2015	Percent of the fall full-time cohort from the prior year (minus exclusions) that re-enrolled at the institution as either full- or part-time in the current year.
SAT Critical Reading 75th percentile score	Admissions	Numeric	Winter 2014-15	75th percentile scores of students submitting SAT Critical Reading scores.
SAT Math 75th percentile score	Admissions	Numeric	Winter 2014-15	75th percentile scores of students submitting SAT Math scores.
SAT Writing 75th percentile score	Admissions	Numeric	Winter 2014-15	75th percentile scores of students submitting SAT Writing scores.
ACT Composite 75th percentile score	Admissions	Numeric	Winter 2014-15	75th percentile scores of students submitting ACT Composite scores.
ACT Math 75th percentile score	Admissions	Numeric	Winter 2014-15	75th percentile scores of students submitting ACT Math scores.
ACT English 75th percentile score	Admissions	Numeric	Winter 2014-15	75th percentile scores of students submitting ACT English scores.
Percent of full-time first-time undergraduates awarded Pell grants	Student Financial Aid	Numeric	Winter 2014-15	Percentage of full-time, first-time degree/ certificate-seeking undergraduate students awarded Pell grants.
Endowment assets (year-end) per FTE enrollment	Finance	Numeric	Spring 2015	Endowment assets (year-end) divided by 12-month FTE enrollment.
Graduation rate - Bachelor degree within 4 years, total*	Graduation Rates	Numeric	Winter 2014-15	Four-year graduation rate of full-time, first-time students seeking a bachelor's or equivalent degree - 2007 Bachelors subcohort (4-year institutions)
Graduation rate - Bachelor degree within 6 years, total*	Graduation Rates	Numeric	Winter 2014-15	Six-year graduation rate of full-time, first-time students seeking a bachelor's or equivalent degree - 2007 Bachelors subcohort (4-year institutions)
Student-to-faculty ratio	Fall Enrollment	Numeric	Spring 2015	Total FTE (full-time equivalent) undergraduate students divided by total FTE undergraduate instructional staff
Average salary of full-time instructional staff - all ranks	Human Resources	Numeric	Spring 2015	Average salary equated to 9 months of full-time non-medical instructional staff - all ranks
Average salary of full-time instructional staff - assistant professors	Human Resources	Numeric	Spring 2015	Average salary equated to 9 months of full-time non-medical instructional staff - assistant professors

Variable	IPEDS Survey	Data Type	Collected In	Definition
Tenured, men + Tenured, women	Human Resources	Numeric	Spring 2015	The number of male + female full-time instructional faculty who are tenured.
On tenure track, men + On tenure track, women	Human Resources	Numeric	Spring 2015	The number of male + female full-time instructional faculty who are on tenure track.
Full-time instructional faculty	Human Resources	Numeric	Spring 2015	Total number of full-time instructional staff on the institution's payroll as of November 1 of the reporting year.
Instruction expenses as a percent of total core expenses	Finance	Numeric	Spring 2015	Instruction expenses divided by total core expenses.

* Three years of data for graduation (cohorts 2005-2008) and retention (cohorts 2010-2013) variables are used in *USNWR* calculations

APPENDIX D: ALIGNMENT OF DATA SOURCE DEFINITIONS

USNWR Factor and Weight	*USNWR* Subfactors and Weights	*USNWR* Definition	Potential IPEDS Proxies	IPEDS Definition	*USNWR* Data	IPEDS Data	Align.	Difference
Undergraduate academic reputation (22.5%)	Peer assessment (100%)	Academic peer assessment score in this year's rankings is based on the results from surveys in spring 2014 and spring 2015	See Appendix I		Spring 2014, Spring 2015 (2-year average)	FY2014 for Endow and Pell; all others Fall 2014	Indirect	No direct proxy
Retention & Graduation (22.5%)	Six-year graduation rate (80%)	Six-year graduation rate for the cohort of full-time, first-time, bachelor's (or equivalent) degree-seeking undergraduate students who entered your institution in the Fall 2008. *Note: USNWR calculations are based on the average proportion of a graduating class earning a degree in six years or less; we consider first-year student classes that started from fall 2005 through fall 2008.*	Graduation rate - Bachelor degree within 6 years, total	Six-year graduation rate of full-time, first-time students seeking a bachelor's or equivalent degree - 2005-2008 Bachelors subcohorts (4-year institutions)	Fall 2005-2008 cohorts (4-year average)	Fall 2005-2008 cohorts (4-year average)	Direct	N/A
	Retention rate (20%)	For the cohort of all first-time, full-time, bachelor's degree-seeking undergraduate students who entered your institution in fall 2013 (or the preceding summer term), what percentage was enrolled at your institution in fall 2014? *Note: USNWR calculations are based on the average proportion of first-year students who entered the school in the fall of 2010 through the fall of 2013 and returned the following fall.*	Full-time retention rate	Percent of the fall full-time cohort from the prior year (minus exclusions) that re-enrolled at the institution as either full- or part-time in the current year.	Fall 2010-2013 cohorts (4-year average)	Fall 2010-2013 cohorts (4-year average)	Direct	N/A

USNWR Factor and Weight	*USNWR* Subfactors and Weights	*USNWR* Definition	Potential IPEDS Proxies	IPEDS Definition	*USNWR* Data	IPEDS Data	Align.	Difference
Faculty resources (20.0%)	Classes < 20 students (30%)	Size of class sections offered in the Fall 2014 term. A class section is an organized course offered for credit, identified by discipline and number, meeting at a stated time or times in a classroom or similar setting, and not a subsection such as a laboratory or discussion session. Exclude distance learning classes and noncredit classes and individual instruction such as dissertation or thesis research, music instruction, or one-to-one readings. Exclude students in independent study, co-operative programs, internships, foreign language taped tutor sessions, practicums, and all students in one-on-one classes. Each class section should be counted only once and should not be duplicated because of course catalog cross-listings.	N/A		Fall 2014		None	No direct proxy
	Classes > 50 students (10%)		N/A		Fall 2014		None	No direct proxy
	Average FT faculty salary (35%)	Average salaries of full-time instructional faculty, defined as full time faculty whose regular assignment is instruction. Include those on paid leave. Exclude administrative officers with titles such as dean, librarian, and registrar, even if they devote time to instruction. Exclude nonprofessorial rank faculty with title of instructor, lecturer or no-rank. Exclude faculty on unpaid leave, but include visitors who are temporarily replacing them. Full-time salaries other than 9- or 12-month should be converted to an academic year.	Average salary of full-time instructional staff - all ranks	Average salary equated to 9 months of full-time non-medical instructional staff - all ranks	AY 2014-15	AY 2014-15	Indirect	Close, but *USNWR* adds cost of living

USNWR Factor and Weight	*USNWR* Subfactors and Weights	*USNWR* Definition	Potential IPEDS Proxies	IPEDS Definition	*USNWR* Data	IPEDS Data	Align.	Difference
	Faculty degree level (15%)	Number of instructional faculty members in each category for Fall 2014. Include faculty who are on your institution's payroll on the census date your institution uses for IPEDS/AAUP. Total number with doctorate or other terminal degree Total number whose highest degree is a master's but not a terminal master's Total number whose highest degree is a bachelor's Total number whose highest degree is unknown or other	Tenured instructional faculty	Total number of tenured instructional faculty	Fall 2014	Fall 2014	Indirect	*USNWR* uses terminal degree; IPEDS proxy uses tenure status
	Student-to-faculty ratio (5%)	Fall 2014 ratio of full-time equivalent students (full-time plus 1/3 part time) to full-time equivalent instructional faculty (full time plus 1/3 part time). In the ratio calculations, exclude both faculty and students in stand-alone graduate or professional programs such as medicine, law, veterinary, dentistry, social work, business, or public health in which faculty teach virtually only graduate level students. Do not count undergraduate or graduate student teaching assistants as faculty.	Student-to-faculty ratio	Total FTE (full-time equivalent) undergraduate students divided by total FTE undergraduate instructional staff	Fall 2014	Fall 2014	Indirect	Ratio calculations differ
	Full-time faculty (5%)	Number of full-time instructional faculty employed on a full-time basis for instruction (including those with released time for research).	Full-time instructional faculty	Total number of full-time instructional staff on the institution's payroll as of November 1 of the reporting year	Fall 2014	Fall 2014	Direct	N/A

USNWR Factor and Weight	*USNWR* Subfactors and Weights	*USNWR* Definition	Potential IPEDS Proxies	IPEDS Definition	*USNWR* Data	IPEDS Data	Align.	Difference
Student selectivity (12.5%)	SAT/ACT (65%)	*Percent and number of first-time, first-year students enrolled in fall 2014 who submitted national standardized (SAT/ACT) test scores. Include information for ALL enrolled, first-time, first-year (freshman) degree-seeking students, *75th and 25th percentile test scores, *average test scores, and *percent of students by score range	SAT/ACT 75th percentile score	75th percentile scores of students submitting SAT scores (Reading, Math, Writing) or ACT scores (English, Math, Composite)	Fall 2014	Fall 2014	Indirect	IPEDS does not collect average test score or % by score range
	Freshmen in top 25% of HS class (25%)	Percent of all degree-seeking, first-time, first-year (freshman) students who had high school class rank within each of the ranges. "Freshman" includes all full- and part-time, first-time, first-year students who enrolled in fall of 2014	N/A		Fall 2014		None	No direct proxy
	Acceptance rate (10%)	Number of students who applied, were admitted, and enrolled as degree-seeking students in fall 2014.	Percent admitted - total	Percent admitted total = number of admissions-total divided by the total applicants	Fall 2014	Fall 2014	Direct	N/A
Financial resources (10.0%)	Average spending per student on instruction, research, etc. (100%)	Finance data as reported on the IPEDS Finance Survey using the provided U.S. News to IPEDS key.	Instruction, Research, Academic support, and Student service expenses per FTE	Instruction (research/academic support/student services) expenses divided by 12-month FTE enrollment	FY2014	FY2014	Direct	N/A

USNWR Factor and Weight	*USNWR* Subfactors and Weights	*USNWR* Definition	Potential IPEDS Proxies	IPEDS Definition	*USNWR* Data	IPEDS Data	Align.	Difference
Graduation rate performance (7.5%)	Difference between six-year graduation rate and rate predicted by *USNWR* (100%)	A school's predicted graduation rate is calculated by determining the statistical relationship (a regression analysis) between a school's six-year graduation rate and its average SAT and ACT test scores, expenditures per student, proportion of the entering class in the top 25 percent of their high school class, whether the university is public or private, and the proportion of the undergraduate student body that receives Pell grants (federal aid given to students from low-income families).	Graduation rate - Bachelor degree within 6 years		Fall 2005-2008 cohorts	Fall 2005-2008 cohorts	Indirect	
Alumni giving rate (5.0%)	% of alumni who gave to institution within last year (100%)	Number of undergraduate alumni of record at your institution and number of undergraduate alumni donors for your institution. Alumni of record are former full- or part-time students with an undergraduate degree from your institution and for whom you believe you have a valid address or other way to make contact (telephone, email, etc.) Alumni donors are alumni with undergraduate degrees from your institution who made one or more tax-deductible gifts from either themselves or their legal spouse/partner for either current operations or capital expenses during the specified fiscal year.) Exclude all soft-credit only contributions – only report on IRS reportable gifts. *Note: USNWR calculation based on average percentage of living alumni with bachelor's degrees who gave to their school during 2012-2013 and 2013-2014*	Endowment assets (year-end) per FTE enrollment		2012-2013 and 2013-2014 (2-year average)	FY2013 - FY2014 (2-year average)	Indirect	No direct proxy

APPENDIX E: SCREENSHOT OF DATA FILE RECEIVED FROM *USNWR*

	A	B	D	E	F	G	I	J	L	N	P	R	T	V	X
1	Rank	School	Public/Priva	Overall Score	Peer Assessme nt Scor	Average freshman retention rate	Predicted graduatio n rate	Actual graduatio n rate	Percent of classes under 2	Percent of classes of 50 or more student	Student/f aculty ratio	SAT/ACT 25th-75th percent	Freshmen in top 25% of high school class	Acceptance rate	Average alumni giving rate
2	1	Elon University (NC)	2	100	4.0	90%	80%	81%	49%	0%	12/1	1130-1320	62%	54%	21%
3	1	Rollins College (FL)	2	100	3.9	83%	72%	71%	73%	0.20%	10/1	1100-1280	64%	57%	14%
4	3	The Citadel (SC)	1	90	3.9	84%	61%	69%	39%	2%	13/1	990-1190	33%	76%	26%
5	4	Samford University (AL)	2	87	3.8	87%	72%	66%	63%	1%	13/1	23-29	56%	82%	10%
6	5	Belmont University (TN)	2	86	3.8	81%	73%	70%	41%	0.30%	13/1	23-29	60%	83%	22%
7	5	Stetson University (FL)	2	86	3.6	78%	68%	61%	61%	0.20%	12/1	1070-1275	58%	61%	11%
8	7	James Madison University (VA)	1	84	3.9	88%	71%	82%	34%	11%	16/1	1050-1230	43%	66%	7%
9	8	Mercer University (GA)	2	83	3.7	82%	69%	63%	62%	3%	13/1	1090-1290	70%	67%	10%
10	9	Embry-Riddle Aeronautical U. (FL)	2	79	3.6	77%	54%	52%	24%	2%	14/1	980-1240	49%	73%	2%
11	10	Appalachian State University (NC)	1	78	3.6	88%	64%	70%	36%	8%	16/1	1060-1240	56%	63%	8%
12	11	College of Charleston (SC)	1	77	3.7	82%	69%	67%	36%	4%	15/1	1030-1230	55%	78%	8%
13	11	Loyola University New Orleans	2	77	3.5	78%	71%	62%	50%	1%	11/1	22-28	39%	90%	8%
14	13	Bellarmine University (KY)	2	76	3.3	80%	65%	67%	55%	1%	12/1	22-27	53%	83%	17%
15	14	Christopher Newport Univ. (VA)	1	74	3.2	85%	68%	68%	57%	3%	15/1	1060-1250	54%	56%	14%
16	14	Union University (TN)	2	74	3.1	92%	65%	66%	72%	0.30%	10/1	22-29	57%	69%	8%
17	16	Univ. of Mary Washington (VA)	1	72	3.3	82%	70%	70%	57%	3%	15/1	1020-1200	45%	77%	14%
18	16	Univ. of North Carolina--Wilmington	1	72	3.3	86%	65%	70%	30%	9%	17/1	1110-1270	69%	59%	6%
19	18	Hampton University (VA)	2	70	3.0	77%	58%	67%	62%	3%	9/1	910-1100	52%	29%	13%
20	18	Lipscomb University (TN)	2	70	3.0	76%	64%	62%	55%	6%	12/1	23-29	51%	56%	13%
21	20	Queens University of Charlotte (NC)	2	69	3.0	71%	60%	62%	68%	0%	10/1	920-1160	46%	78%	25%
22	21	Spring Hill College (AL)	2	66	2.9	75%	63%	58%	57%	0%	13/1	22-27	55%	52%	17%
23	22	Harding University (AR)	2	65	3.0	82%	63%	63%	54%	7%	16/1	22-28	55%	99%	11%
24	22	University of Tampa (FL)	2	65	3.1	74%	60%	62%	39%	3%	17/1	990-1160	48%	52%	19%

APPENDIX F: IMPUTED DATA AND SOURCES

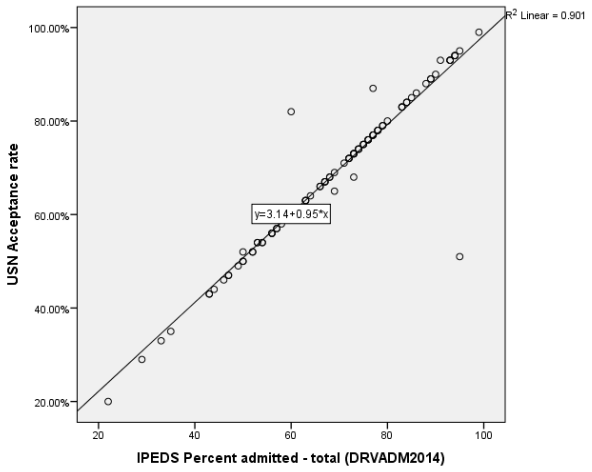
As described in Chapter 3, imputation was used to address missing IPEDS data values in a number of cases. The table below shows instances of imputation as well as sources of the imputed data.

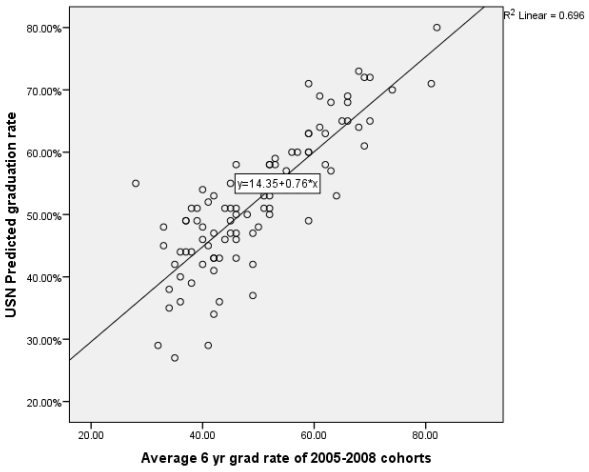
Imputed Data Values and Sources of Imputed Data

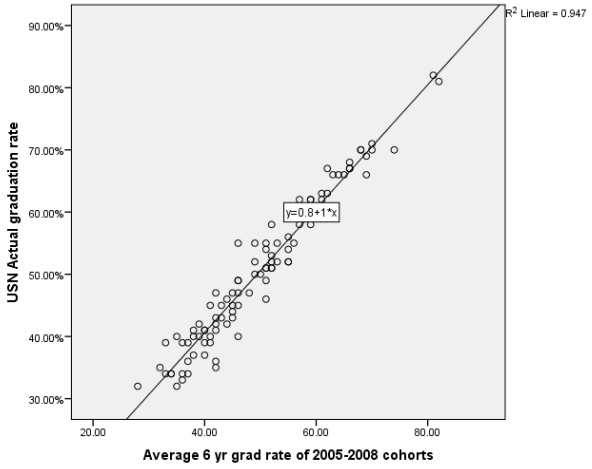
Variable	Institution	Source of Imputed Data	Year of Imputed Data
SAT Critical Reading 75th percentile score (ADM2014)	Belhaven University	IPEDS	2013
	Christian Brothers University	concordance based on ACT score	2014
	Embry-Riddle Aeronautical U.	IPEDS	2013
	Jacksonville University	IPEDS	2013
	Rollins College	IPEDS	2013
	Saint Leo University	https://www.princetonreview.com/schools/1022707/college/saint-leo-university	2015?
	Stetson University	IPEDS	2013
	Troy University	concordance based on ACT score	2014
	Union College		2013
	University of Louisiana--Monroe		2012
	University of Tennessee--Martin	concordance based on ACT score	2014
SAT Math 75th percentile score (ADM2014)	Belhaven University	IPEDS	2013
	Christian Brothers University	concordance based on ACT score	2014
	Embry-Riddle Aeronautical U.	IPEDS	2013
	Jacksonville University	IPEDS	2013
	Rollins College	IPEDS	2013
	Saint Leo University	https://www.princetonreview.com/schools/1022707/college/saint-leo-university	2015?
	Stetson University	IPEDS	2013
	Troy University	concordance based on ACT score	2014
	Union College	IPEDS	
	University of Tennessee--Martin	concordance based on ACT score	2014
ACT Composite 75th percentile score (ADM2014)	Belhaven University	IPEDS	2013
	Brenau University	IPEDS	2013
	Embry-Riddle Aeronautical U.	IPEDS	2013
	Jacksonville University	IPEDS	2013
	Rollins College	IPEDS	2013
	Saint Leo University	IPEDS	2011
	Stetson University	IPEDS	2013

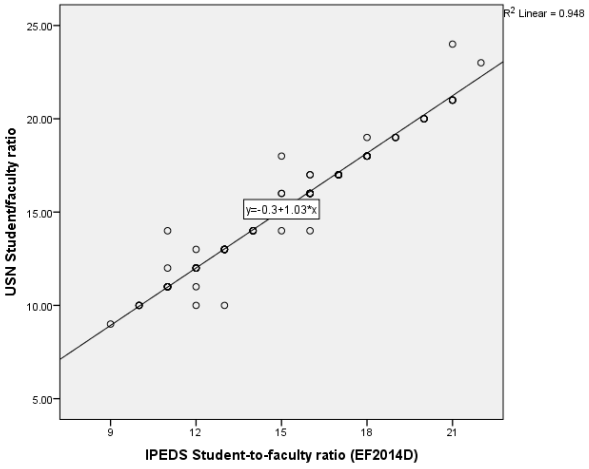
Variable	Institution	Source of Imputed Data	Year of Imputed Data
Graduation rate - bachelor's degree within 6 years total (DRVGR2012)	Georgia Regents University	University System of Georgia Graduation Rate report, http://www.info.usg.edu/, accessed 1/12/17	2012
	University of North Georgia	University System of Georgia Graduation Rate report, http://www.info.usg.edu/, accessed 1/12/17	2012
Graduation rate - bachelor's degree within 4 years total (DRVGR2012)	Georgia Regents University	University System of Georgia Graduation Rate report, http://www.info.usg.edu/, accessed 1/12/17	2012
	University of North Georgia	University System of Georgia Graduation Rate report, http://www.info.usg.edu/, accessed 1/12/17	2012
Graduation rate - bachelor's degree within 6 years total (DRVGR2011)	Georgia Regents University	University System of Georgia Graduation Rate report, http://www.info.usg.edu/, accessed 1/12/17	2011
	University of North Georgia	University System of Georgia Graduation Rate report, http://www.info.usg.edu/, accessed 1/12/17	2011
Graduation rate - bachelor's degree within 4 years total (DRVGR2011)	Georgia Regents University	University System of Georgia Graduation Rate report, http://www.info.usg.edu/, accessed 1/12/17	2011
	University of North Georgia	University System of Georgia Graduation Rate report, http://www.info.usg.edu/, accessed 1/12/17	2011
Full-time retention rate 2012 (EF2012D)	Georgia Regents University	University System of Georgia Retention Rate report, http://www.info.usg.edu/, accessed 1/12/17	2012
	University of North Georgia	University System of Georgia Retention Rate report, http://www.info.usg.edu/, accessed 1/12/17	2012
Full-time retention rate 2011 (EF2011D)	Georgia Regents University	University System of Georgia Retention Rate report, http://www.info.usg.edu/, accessed 1/12/17	2011
	University of North Georgia	University System of Georgia Retention Rate report, http://www.info.usg.edu/, accessed 1/12/17	2011

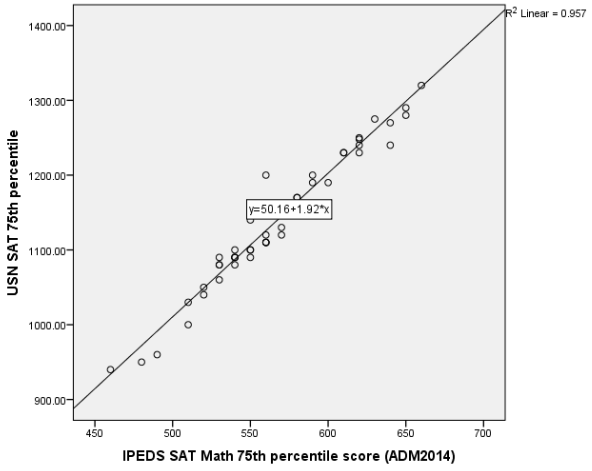
APPENDIX G: CORRELATION SCATTERPLOTS

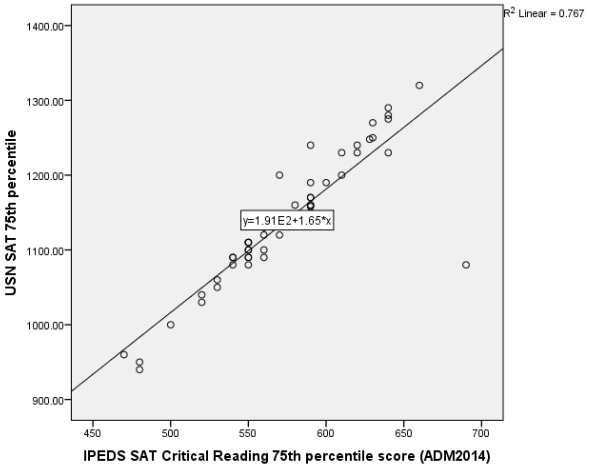


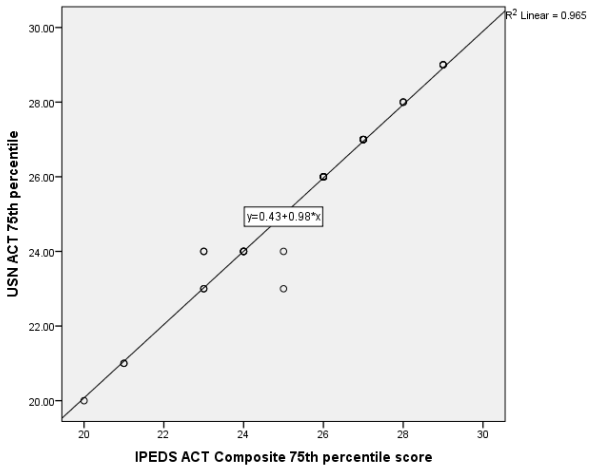


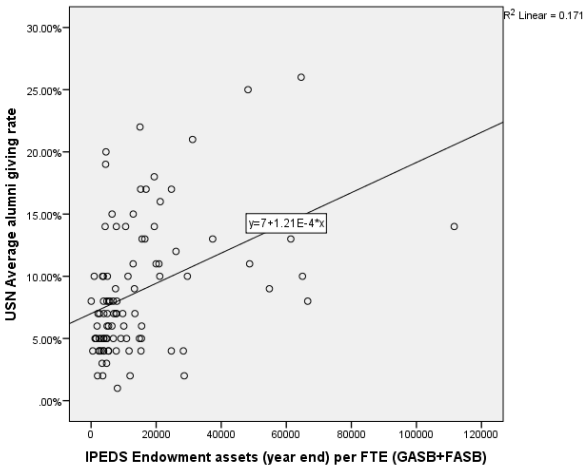









R² Linear = 0.965
y=0.43+0.98*x
USN ACT 75th percentile
IPEDS ACT Composite 75th percentile score
30.00
28.00
26.00
24.00
22.00
20.00
20
22
24
26
28
30


R² Linear = 0.171
y=7+1.21E-4*x
USN Average alumni giving rate
IPEDS Endowment assets (year end) per FTE (GASB+FASB)
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
.00%
0
20000
40000
60000
80000
100000
120000

APPENDIX H: CORRELATIONS OF *USNWR* SUBFACTORS AND IPEDS PROXIES

Pearson Correlations of 2016 USNWR Subfactors and Potential IPEDS Proxies (N=97)

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. USNWR Acceptance rate	-	0.058	0.043	-0.034	-0.036	0.161	0.059	.949**	0.127	-0.063	0.150	0.016	-0.024	0.076
2. USNWR SAT 75th		-	-	.645**	.656**	.825**	-0.096	0.028	.978**	.876**	.918**	.633**	.707**	-0.064
3. USNWR ACT 75th			-	.642**	.717**	.769**	-0.232	-0.009	.507**	.686**	.982**	.641**	.724**	-0.243
4. USNWR Avg freshman retention rate				-	.817**	.687**	-0.059	-0.106	.556**	.472**	.489**	.974**	.800**	-0.065
5. USNWR Avg 6-year graduation rate					-	.820**	-.315**	-0.075	.512**	.560**	.543**	.801**	.973**	-.292**
6. USNWR Predicted 6-year graduation rate						-	-.312**	0.126	.686**	.703**	.741**	.686**	.834**	-.288**
7. USNWR Student/faculty ratio							-	0.028	-0.046	-0.186	-0.128	-0.039	-.329**	.974**
8. IPEDS Percent admitted								-	0.094	-0.072	0.118	-0.035	-0.065	0.046
9. IPEDS SAT Math 75th percentile score									-	.723**	.767**	.565**	.537**	0.008
10. IPEDS SAT Critical Reading 75th percentile score										-	.790**	.453**	.565**	-0.157
11. IPEDS ACT Composite 75th percentile score											-	.496**	.567**	-0.097
12. IPEDS Avg retention rate												-	.792**	-0.052
13. IPEDS Avg 6-year Graduation rate													-	-.298**
14. IPEDS Student-to-faculty ratio														-

*$p < .05$; **$p < .01$.

APPENDIX I: PEER ASSESSMENT MODEL: VARIABLES TESTED

Admissions/Selectivity

- Admissions yield
- Percent of applicants admitted
- Number of applicants-total
- Number of applicants-men
- Number of applicants-women
- SAT Critical Reading 75th percentile score
- SAT Math 75th percentile score
- ACT Composite 75th percentile score

- **Financial**
- In-state tuition
- Percent of undergraduates receiving Pell
- Percent of undergraduates receiving loans
- Total amount of loans awarded
- Percent of undergraduates receiving grant aid
- Total amount of grant aid awarded
- Average year-end endowment per FTE
- Average FTE expenses for Instruction, Academics, Student Services, Research
- Average full-time instructional faculty salary
- Total salary outlay - Management
- Total salary outlay – full-time non-instructional personnel
- Total library expenditures
- Total core revenues
- Tuition as a percent of revenue
- Gifts as a percent of revenue
- Gift revenue per FTE student
- Total athletic revenue
- Total athletic expenses

Student Success

- Average four-year graduation rate
- Average six-year graduation rate
- Average retention rate
- Number of Doctorate degrees awarded
- Number of Master's degrees awarded
- Number of Bachelor's degrees awarded
- Number of Associate's degrees awarded

Faculty Resources

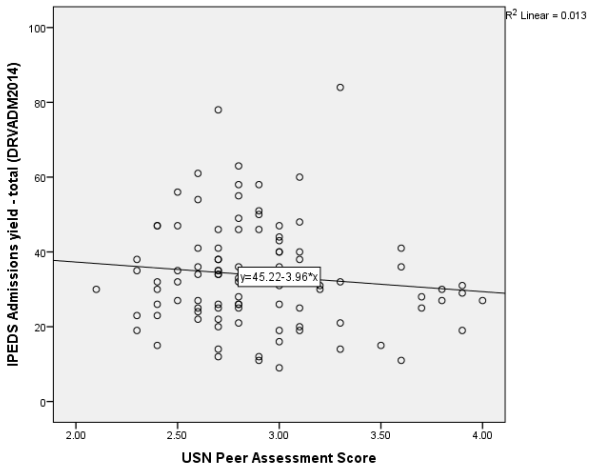
- Student to faculty ratio
- Number of full-time instructional faculty
- Number of tenured faculty
- Percent of faculty tenured

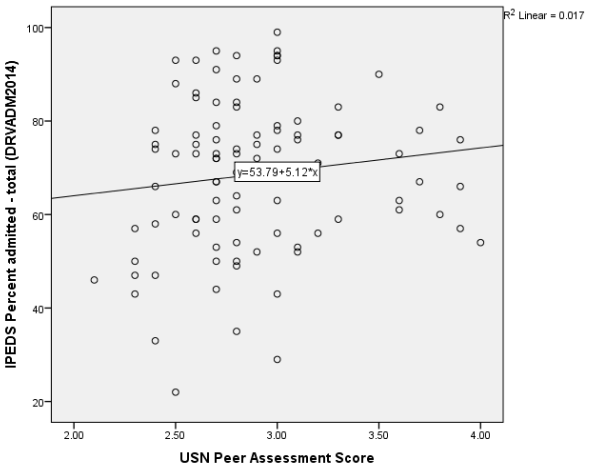
Student Demographics

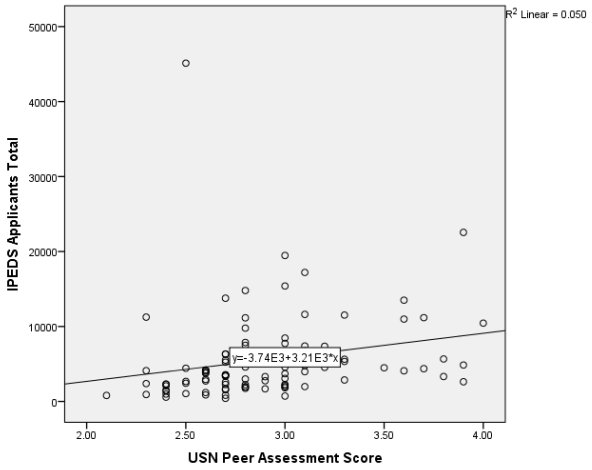
- Percent of undergraduate enrollment who is White
- Percent of undergraduate enrollment under 18
- Percent of undergraduate enrollment 18-24
- Percent of undergraduate enrollment 25-64
- Percent of undergraduate enrollment 65+
- Percent of students taking courses exclusively online
- Percent of students taking some courses online
- Percent of students taking no courses online

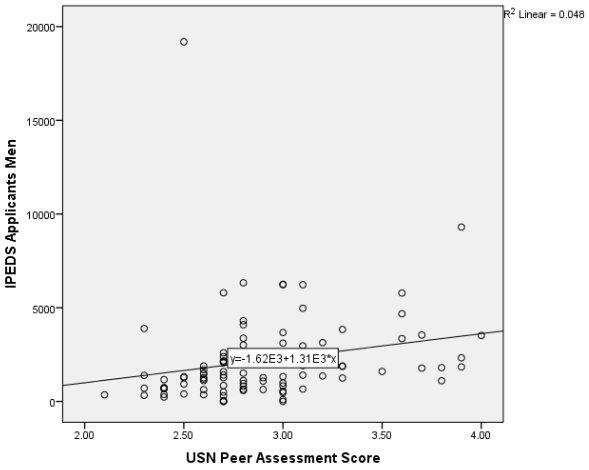
APPENDIX J: PEER ASSESSMENT SCORE: SCATTERPLOTS OF ALL VARIABLES

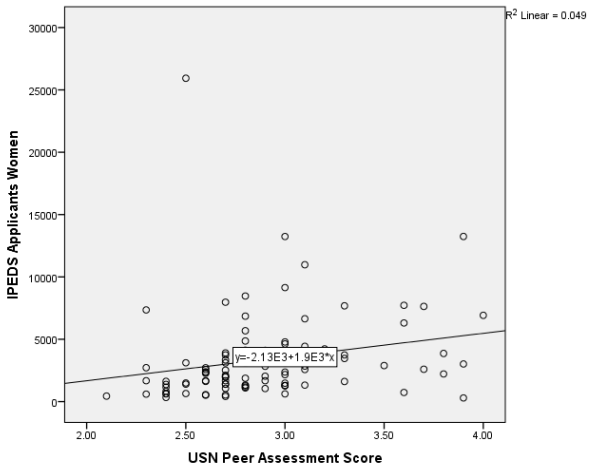
Scatterplots shown in blue indicate a linear relationship with peer score and an R^2 of .12 or greater.

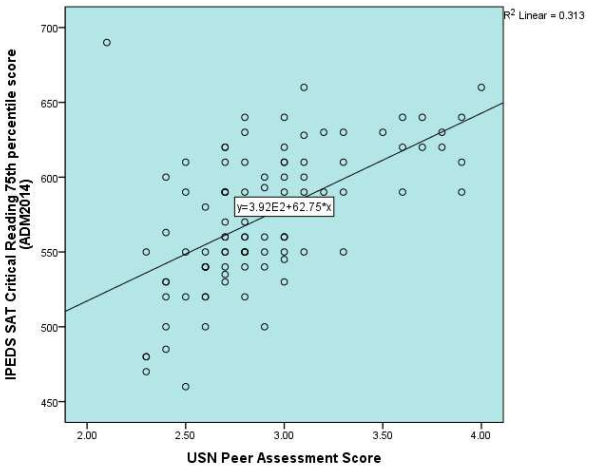




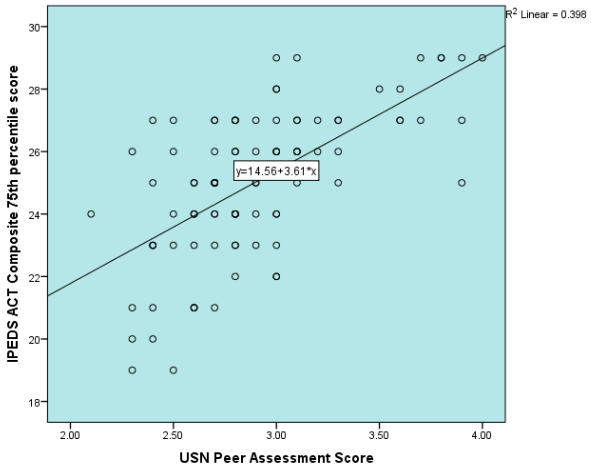


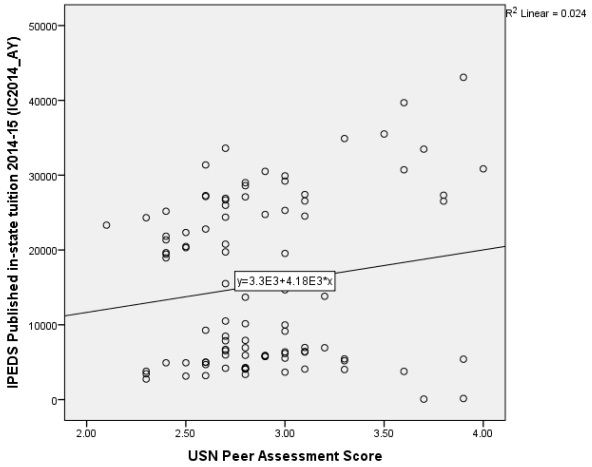


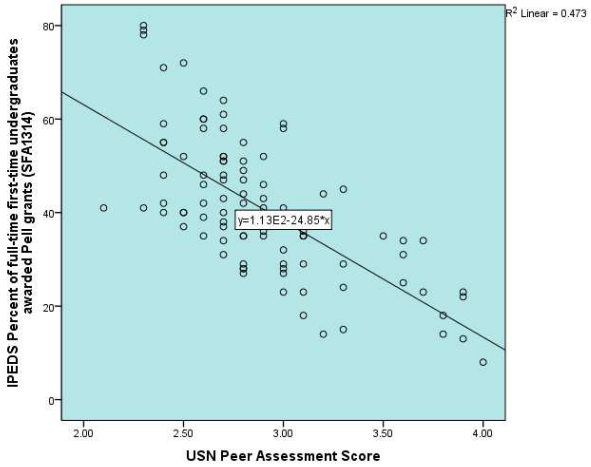


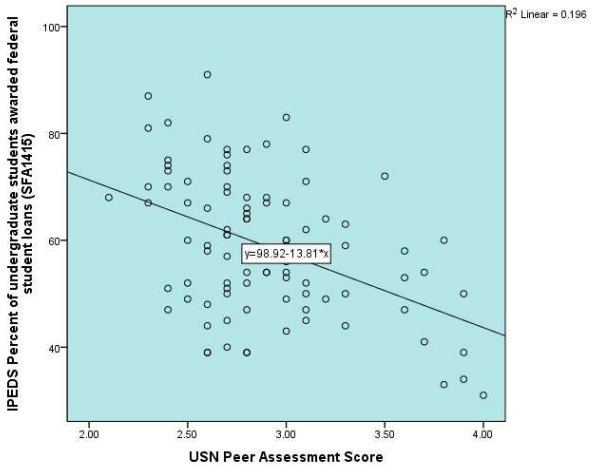


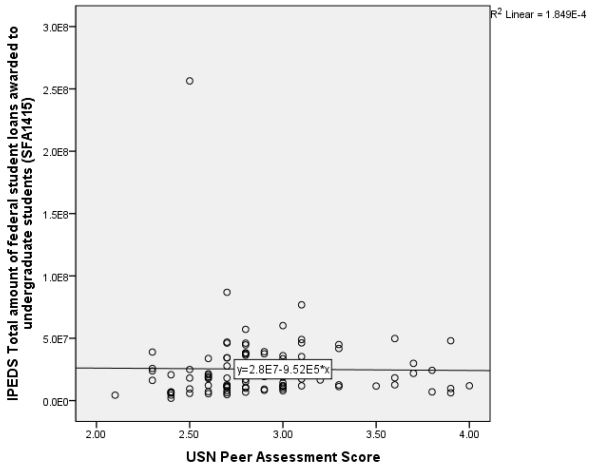

IPEDS SAT Math 75th percentile score (ADM2014)
USN Peer Assessment Score
R² Linear = 0.382
y=3.79E2+67.33*x

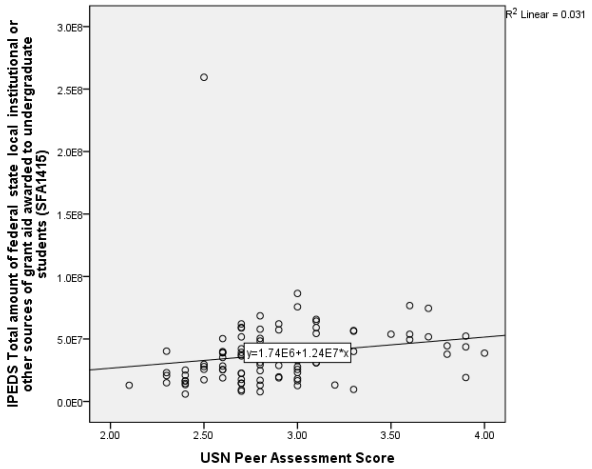

IPEDS ACT Composite 75th percentile score
USN Peer Assessment Score
R² Linear = 0.398
y=14.56+3.61*x

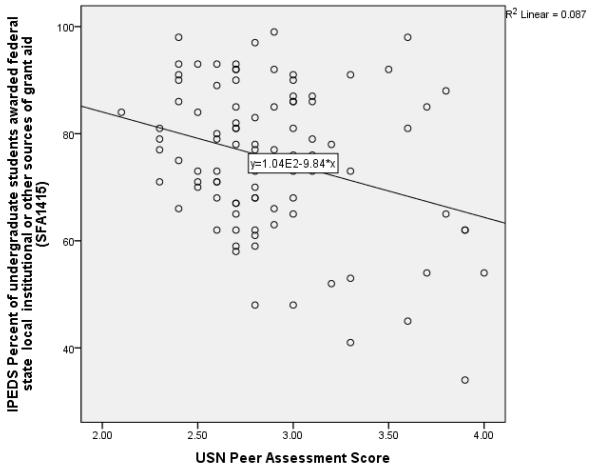

IPEDS Published in-state tuition 2014-15 (IC2014_AY)
USN Peer Assessment Score
R² Linear = 0.024
y=3.3E3+4.18E3*x

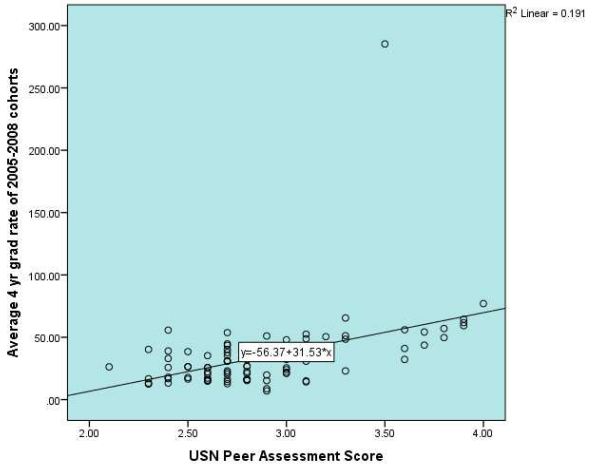

IPEDS Percent of full-time first-time undergraduates awarded Pell grants (SFA1314)
USN Peer Assessment Score
R² Linear = 0.473
y=1.13E2-24.85*x

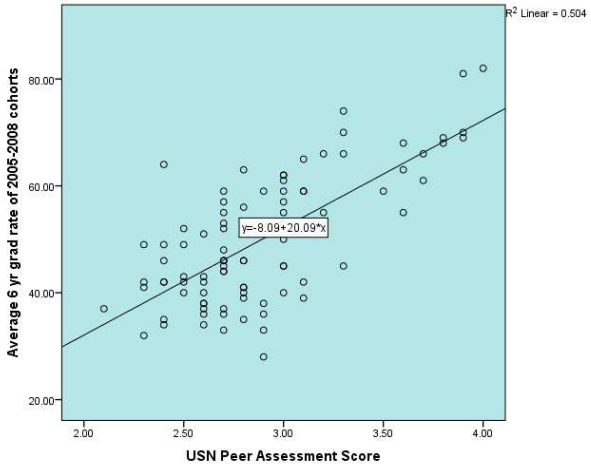

IPEDS Percent of undergraduate students awarded federal student loans (SFA1415)
USN Peer Assessment Score
R² Linear = 0.196
y=98.92-13.81*x

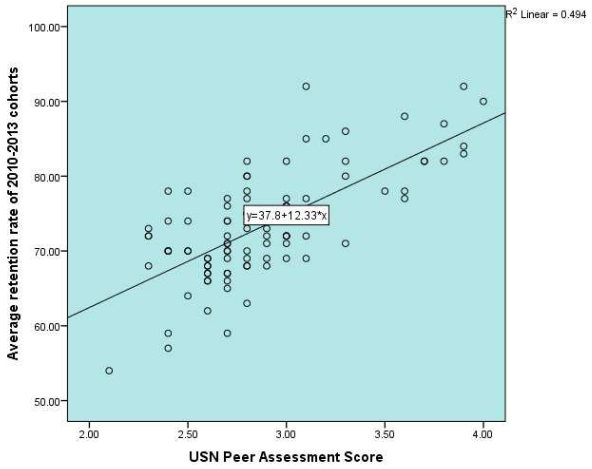

IPEDS Total amount of federal student loans awarded to undergraduate students (SFA1415)
USN Peer Assessment Score
R² Linear = 1.849E-4
y=2.8E7-9.52E5*x

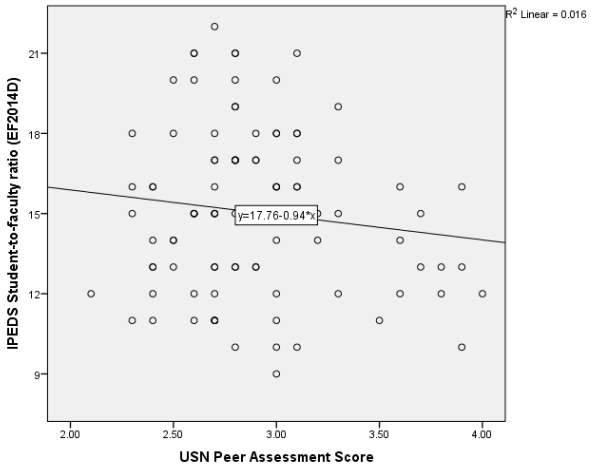

IPEDS Total amount of federal state local institutional or other sources of grant aid awarded to undergraduate students (SFA1415)
USN Peer Assessment Score
R² Linear = 0.031
y=1.74E6+1.24E7*x

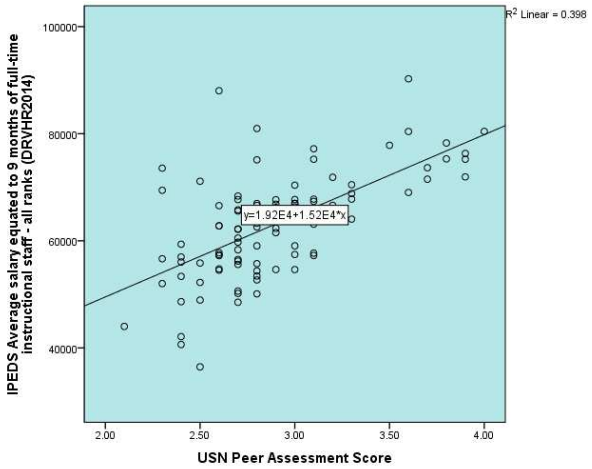

IPEDS Percent of undergraduate students awarded federal state local institutional or other sources of grant aid (SFA1415)
USN Peer Assessment Score
R² Linear = 0.087
y=1.04E2-9.84*x

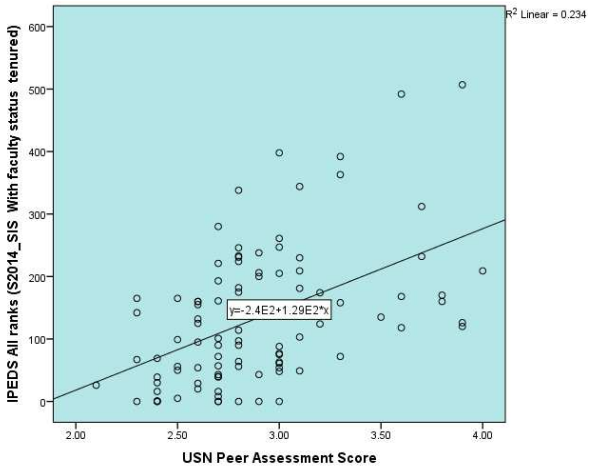

Average 4 yr grad rate of 2005-2008 cohorts
USN Peer Assessment Score
R² Linear = 0.191
y=-56.37+31.53*x

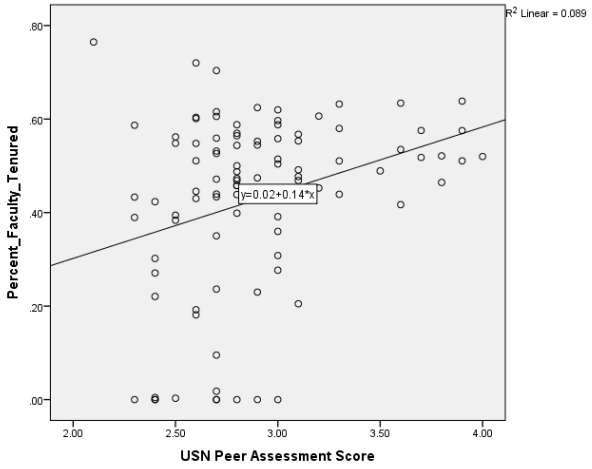

Average 6 yr grad rate of 2005-2008 cohorts
USN Peer Assessment Score
R² Linear = 0.504
y=-8.09+20.09*x

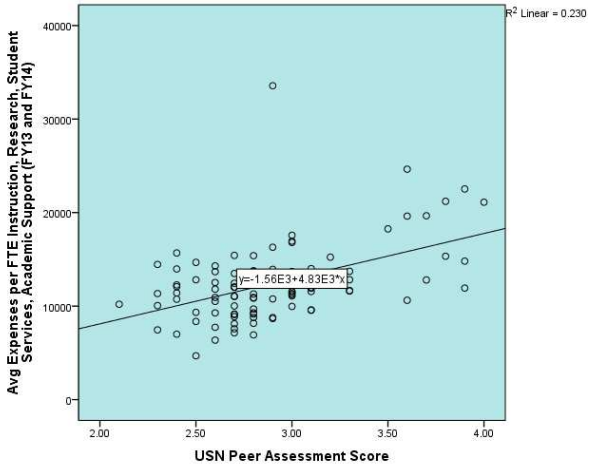

Average retention rate of 2010-2013 cohorts
USN Peer Assessment Score
R² Linear = 0.494
y=37.8+12.33*x

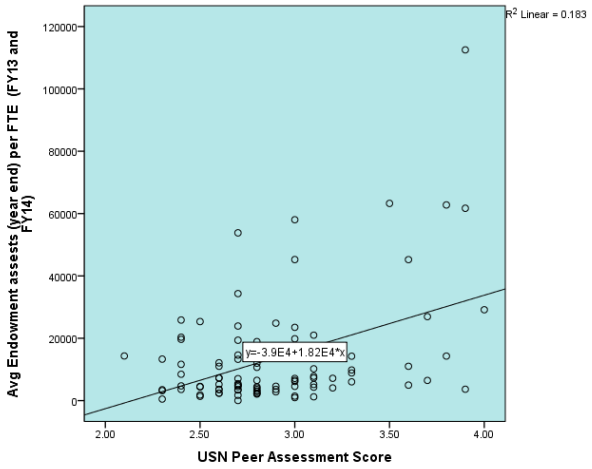

IPEDS Student-to-faculty ratio (EF2014D)
USN Peer Assessment Score
R² Linear = 0.016
y=17.76-0.94*x

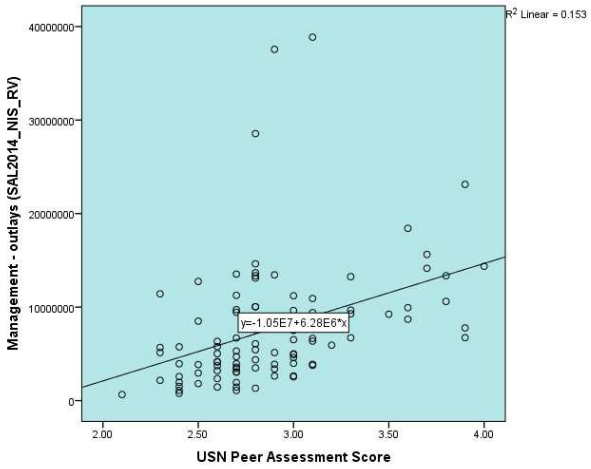

IPEDS Average salary equated to 9 months of full-time instructional staff - all ranks (DRVHR2014)
USN Peer Assessment Score
R² Linear = 0.398
y=1.92E4+1.52E4*x

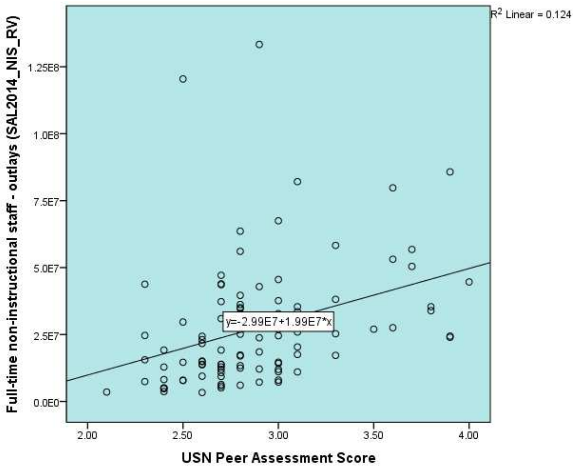

IPEDS All ranks (S2014_SIS With faculty status tenured)
USN Peer Assessment Score
R² Linear = 0.234
y=-2.4E2+1.29E2*x

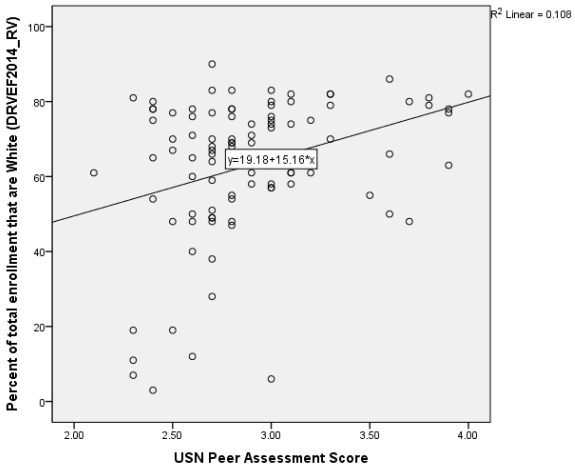

Percent_Faculty_Tenured
USN Peer Assessment Score
R² Linear = 0.089
y=0.02+0.14*x

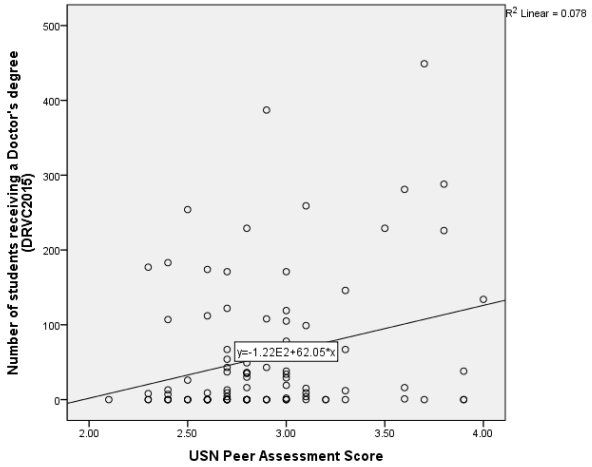

Avg Expenses per FTE Instruction, Research, Student Services, Academic Support (FY13 and FY14)
USN Peer Assessment Score
R² Linear = 0.230
y=-1.56E3+4.83E3*x

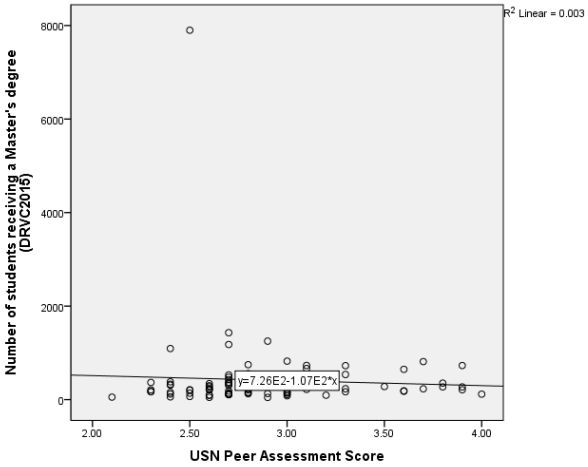

Avg Endowment assests (year end) per FTE (FY13 and FY14)
USN Peer Assessment Score
R² Linear = 0.183
y=-3.9E4+1.82E4*x

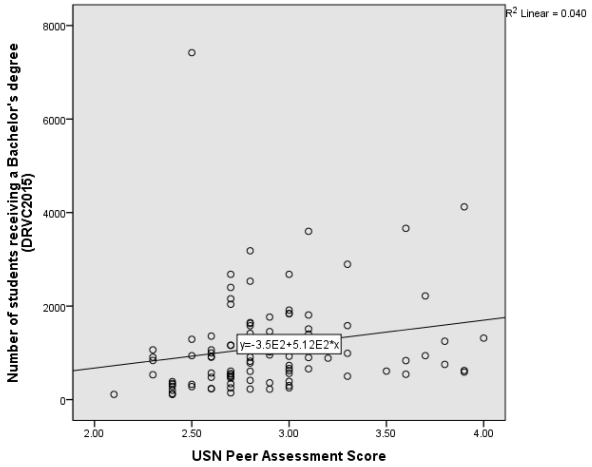

Management - outlays (SAL2014_NIS_RV)
USN Peer Assessment Score
R² Linear = 0.153
y=-1.05E7+6.28E6*x

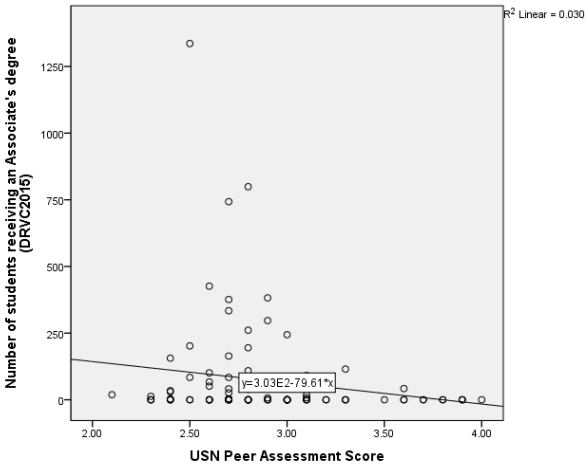

Full-time non-instructional staff - outlays (SAL2014_NIS_RV)
USN Peer Assessment Score
R² Linear = 0.124
y=-2.99E7+1.99E7*x

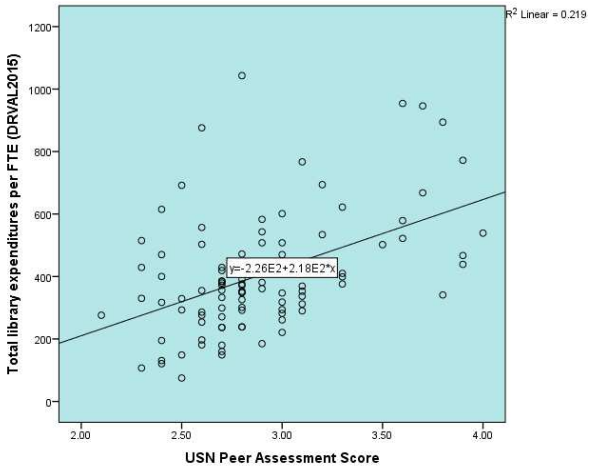

Percent of total enrollment that are White (DRVEF2014_RV)
USN Peer Assessment Score
R² Linear = 0.108
y=19.18+15.16*x

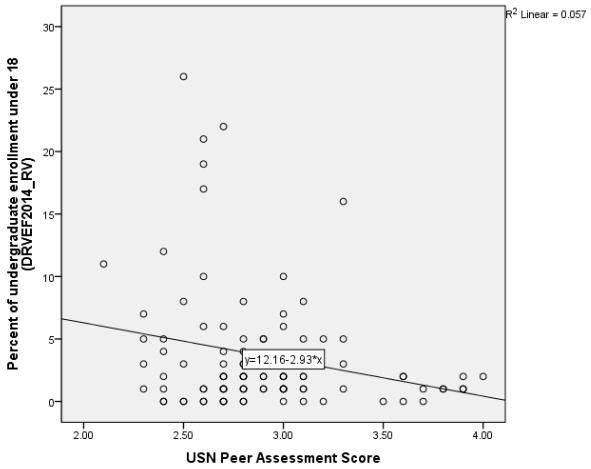

Number of students receiving a Doctor's degree (DRVC2015)
USN Peer Assessment Score
R² Linear = 0.078
y=-1.22E2+62.05*x

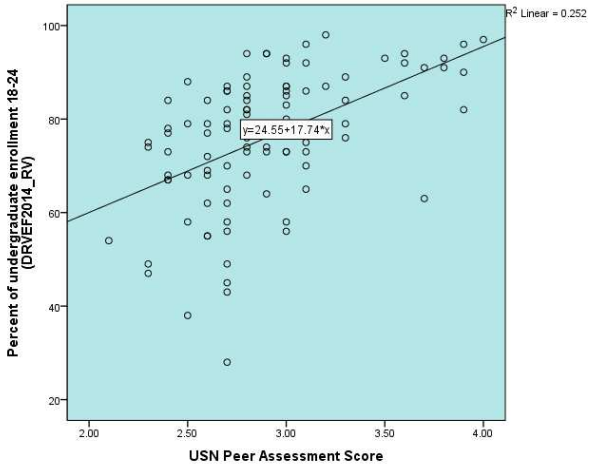

Number of students receiving a Master's degree (DRVC2015)
USN Peer Assessment Score
R² Linear = 0.003
y=7.26E2-1.07E2*x

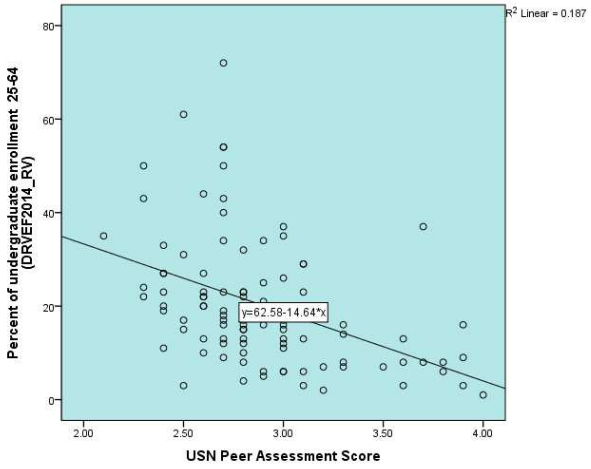

Number of students receiving a Bachelor's degree (DRVC2015)
USN Peer Assessment Score
R² Linear = 0.040
y=-3.5E2+5.12E2*x

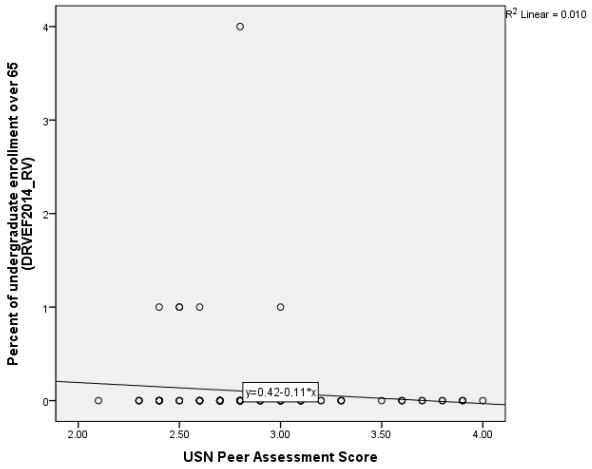

Number of students receiving an Associate's degree (DRVC2015)
USN Peer Assessment Score
R² Linear = 0.030
y=3.03E2-79.61*x

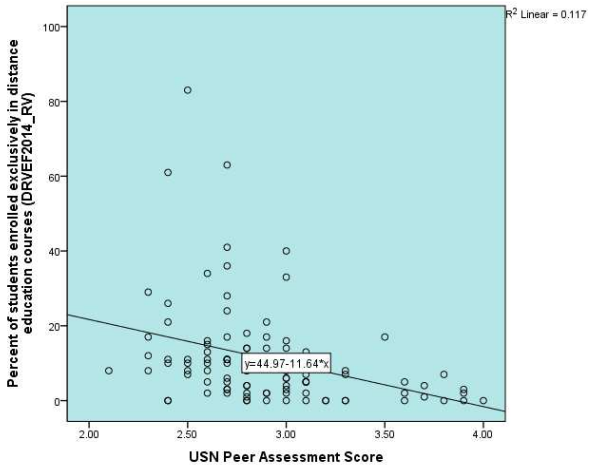

Total library expenditures per FTE (DRVAL2015)
USN Peer Assessment Score
R² Linear = 0.219
y=-2.26E2+2.18E2*x

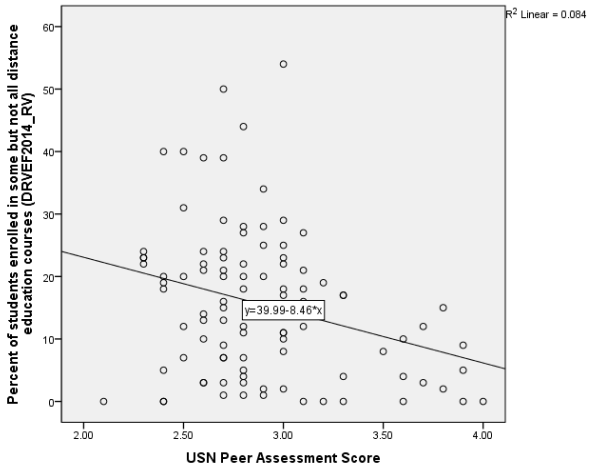

Percent of undergraduate enrollment under 18 (DRVEF2014_RV)
USN Peer Assessment Score
R² Linear = 0.057
y=12.16-2.93*x

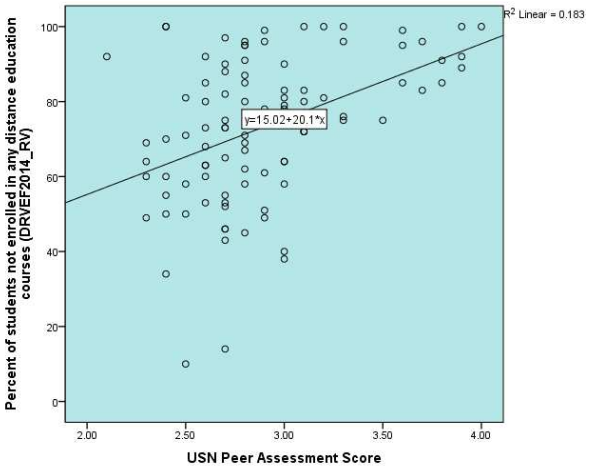

Percent of undergraduate enrollment 18-24 (DRVEF2014_RV)
USN Peer Assessment Score
R² Linear = 0.252
y=24.55+17.74*x

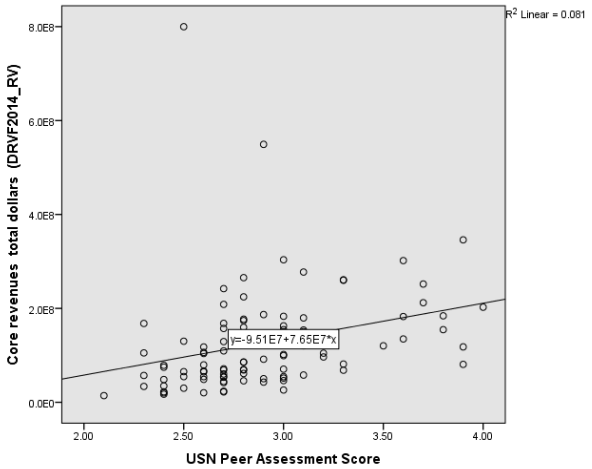

Percent of undergraduate enrollment 25-64 (DRVEF2014_RV)
USN Peer Assessment Score
R² Linear = 0.187
y=62.58-14.64*x

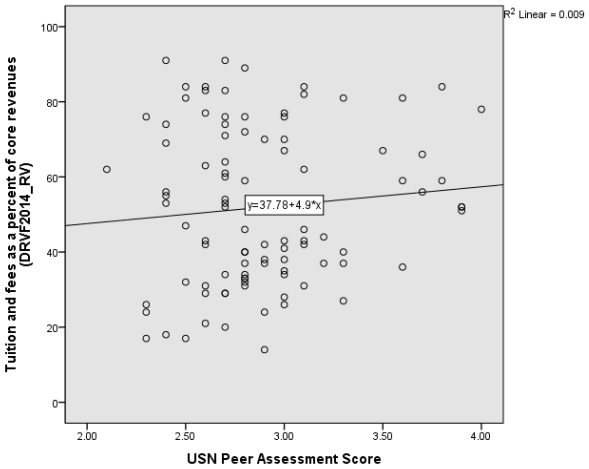

Percent of undergraduate enrollment over 65 (DRVEF2014_RV)
USN Peer Assessment Score
R² Linear = 0.010
y=0.42-0.11*x

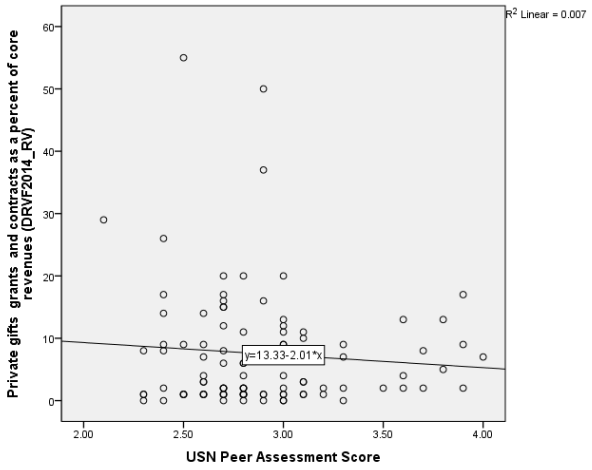

Percent of students enrolled exclusively in distance education courses (DRVEF2014_RV)
USN Peer Assessment Score
R² Linear = 0.117
y=44.97-11.64*x

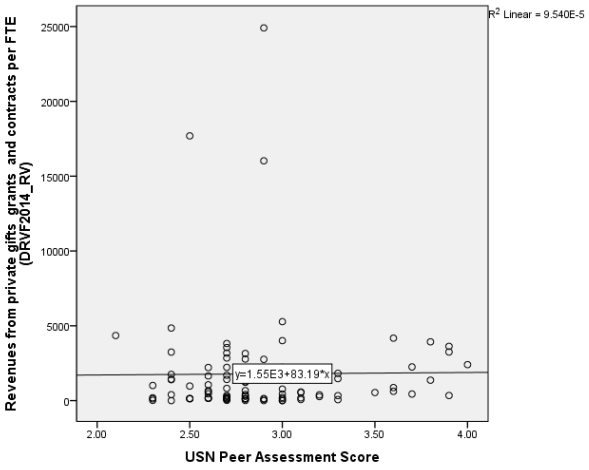

Percent of students enrolled in some but not all distance education courses (DRVEF2014_RV)
R² Linear = 0.084
y=39.99-8.46*x
USN Peer Assessment Score

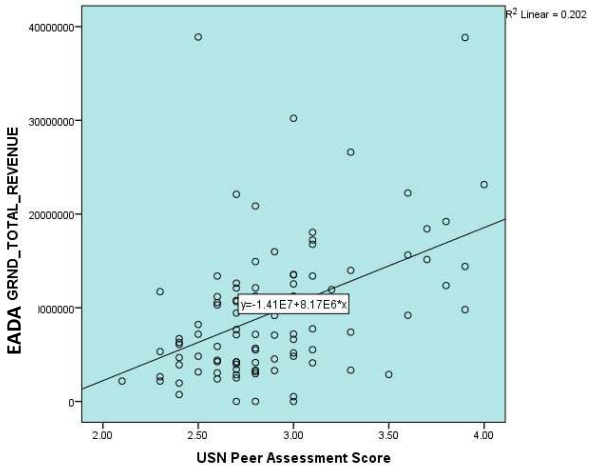

Percent of students not enrolled in any distance education courses (DRVEF2014_RV)
R² Linear = 0.183
y=15.02+20.1*x
USN Peer Assessment Score

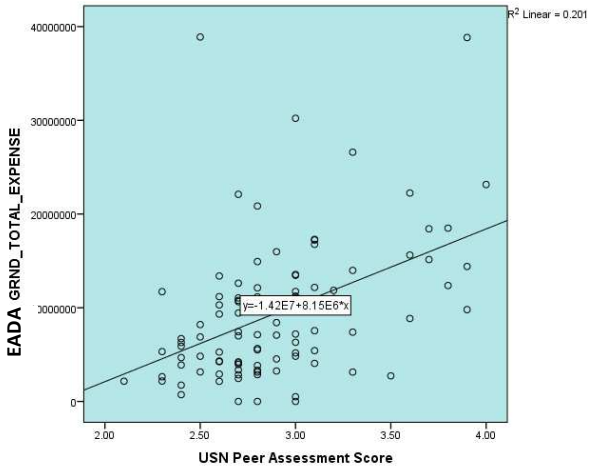

Core revenues total dollars (DRVF2014_RV)
R² Linear = 0.081
y=-9.51E7+7.65E7*x
USN Peer Assessment Score


Tuition and fees as a percent of core revenues (DRVF2014_RV)
R² Linear = 0.009
y=37.78+4.9*x
USN Peer Assessment Score

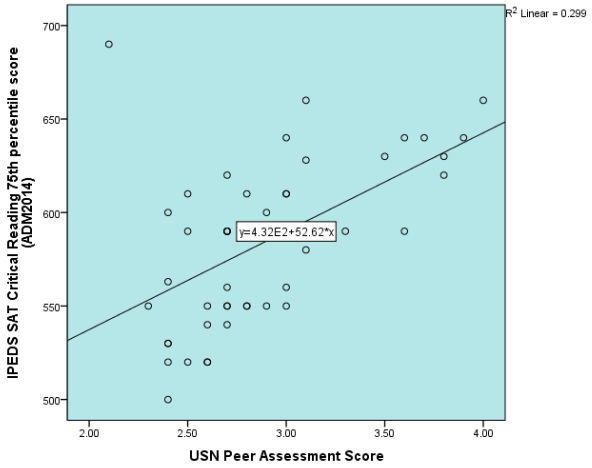

Private gifts grants and contracts as a percent of core revenues (DRVF2014_RV)
R² Linear = 0.007
y=13.33-2.01*x
USN Peer Assessment Score

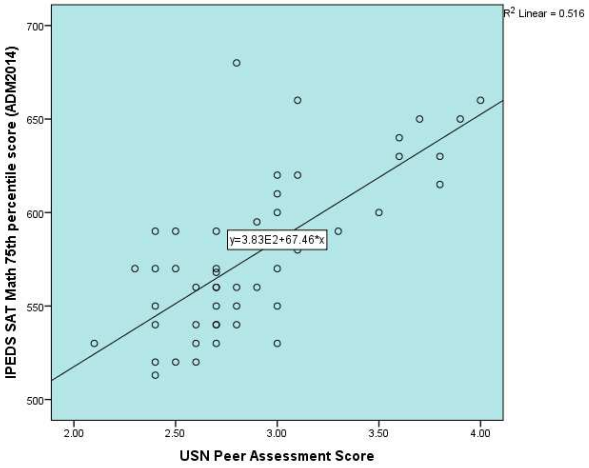

Revenues from private gifts grants and contracts per FTE (DRVF2014_RV)
R² Linear = 9.540E-5
y=1.55E3+83.19*x
USN Peer Assessment Score

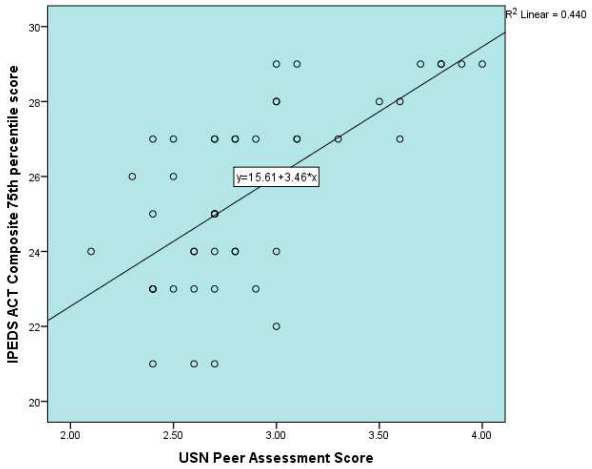

EADA GRND_TOTAL_REVENUE
USN Peer Assessment Score
R2 Linear = 0.202
y=-1.41E7+8.17E6*x
40000000
30000000
20000000
0
2.00
2.50
3.00
3.50
4.00

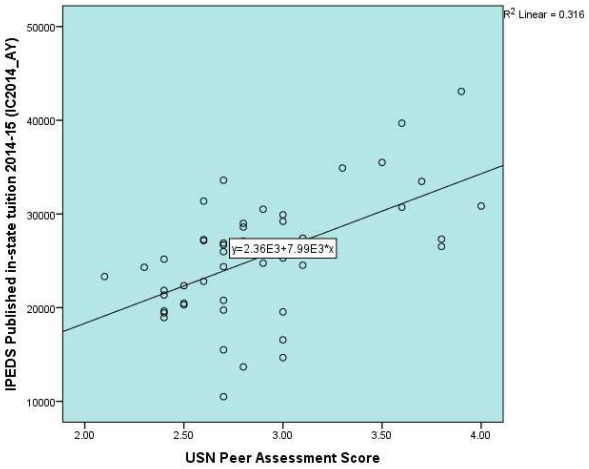

EADA GRND_TOTAL_EXPENSE
USN Peer Assessment Score
R2 Linear = 0.201
y=-1.42E7+8.15E6*x
40000000
30000000
20000000
0
2.00
2.50
3.00
3.50
4.00

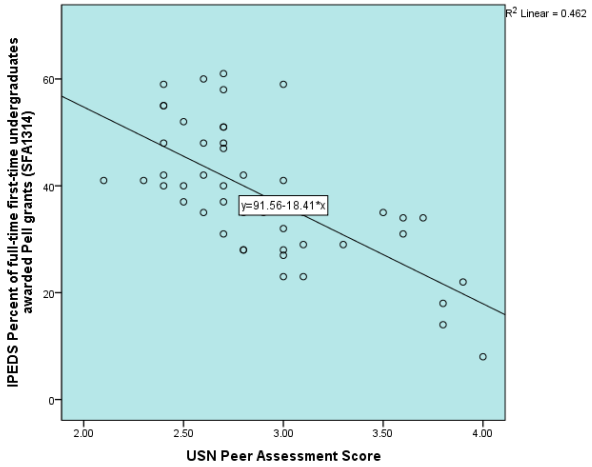
APPENDIX K: PEER ASSESSMENT SCORE: SCATTERPLOTS OF VARIABLES USED IN PRIVATE INSTITUTIONS MODEL

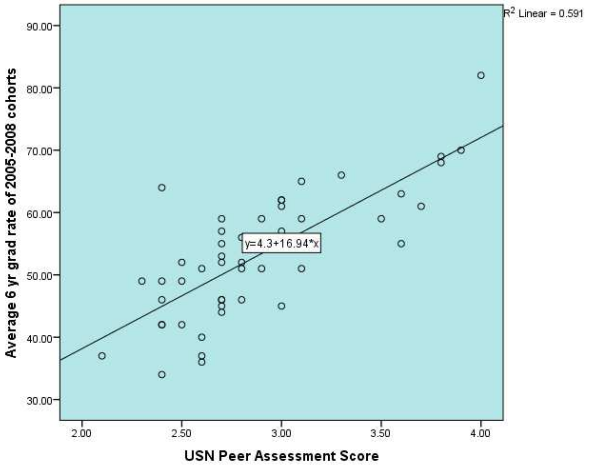


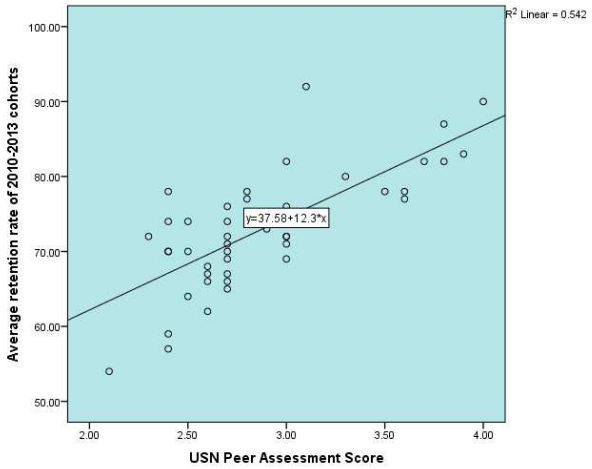


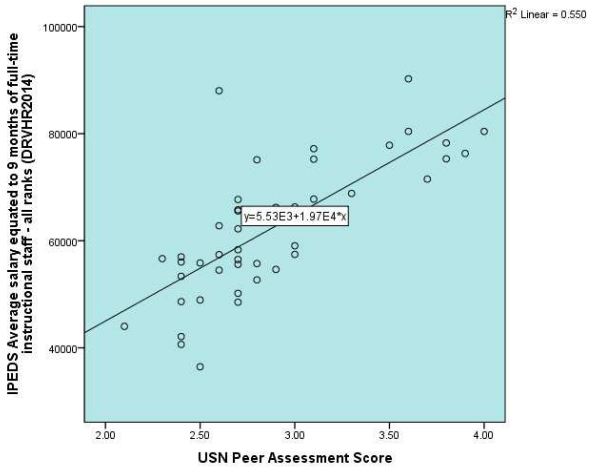


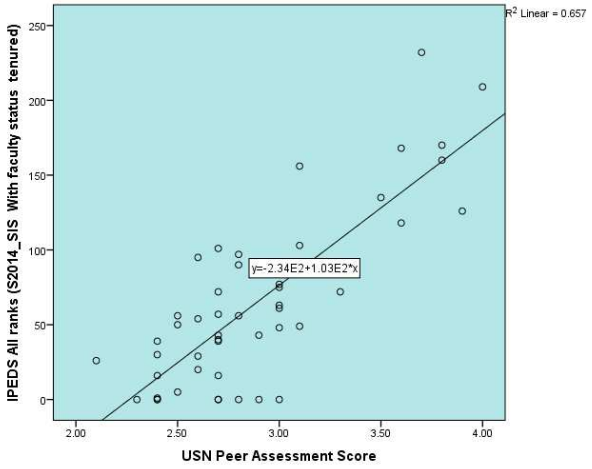


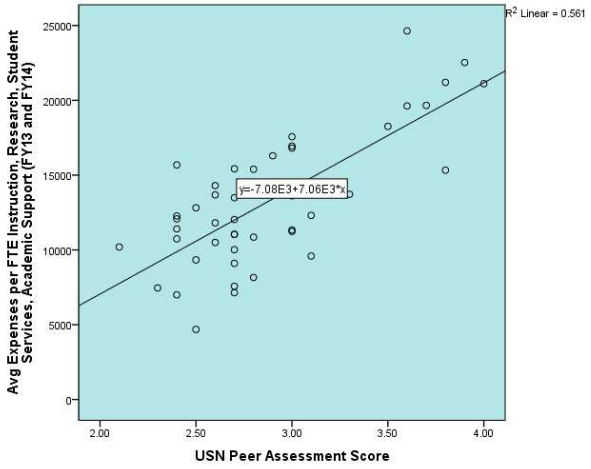


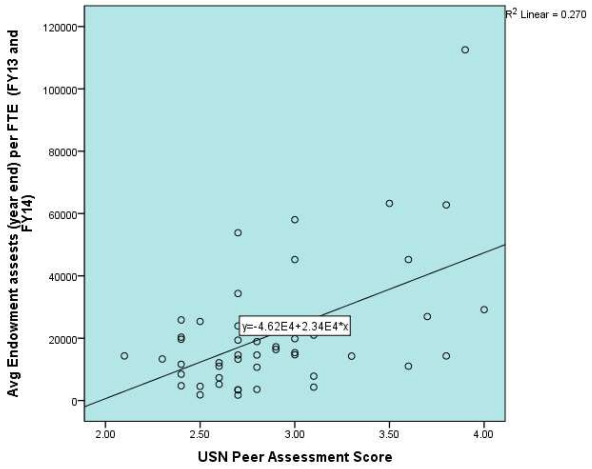


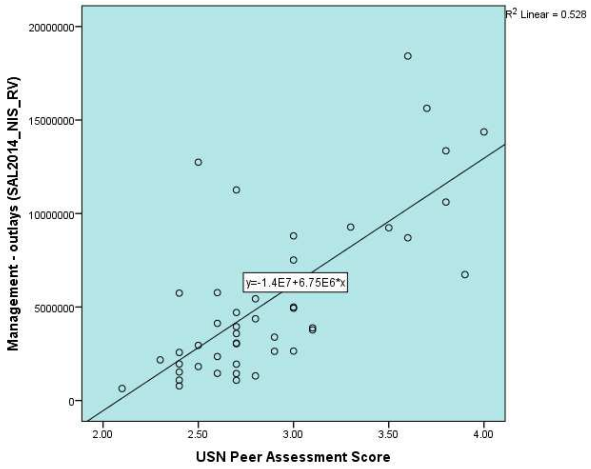

Average retention rate of 2010-2013 cohorts
USN Peer Assessment Score
R² Linear = 0.542
y=37.58+12.3*x

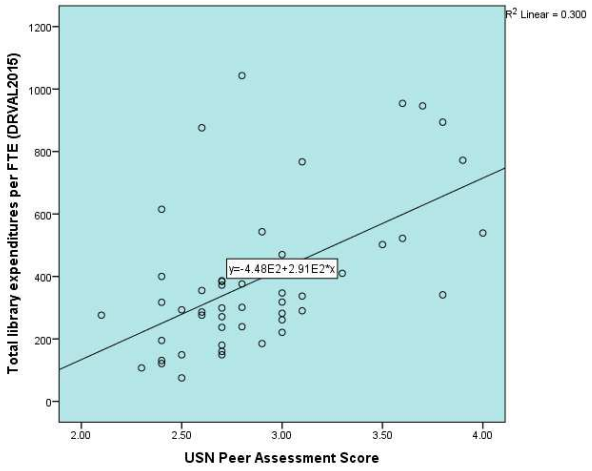

IPEDS Average salary equated to 9 months of full-time instructional staff - all ranks (DRVHR2014)
USN Peer Assessment Score
R² Linear = 0.550
y=5.53E3+1.97E4*x

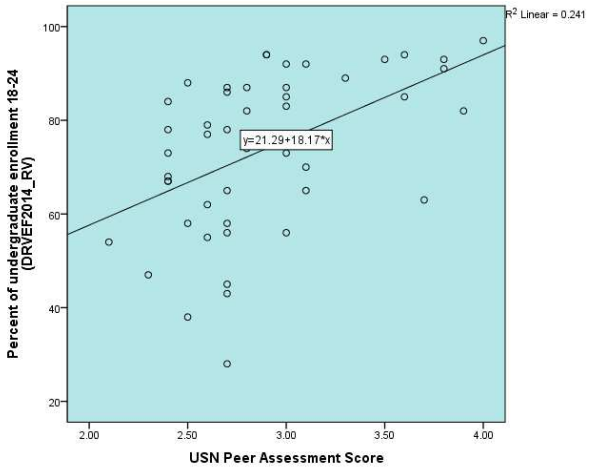

IPEDS All ranks (S2014_SIS With faculty status tenured)
USN Peer Assessment Score
R² Linear = 0.657
y=-2.34E2+1.03E2*x


Avg Expenses per FTE Instruction, Research, Student Services, Academic Support (FY13 and FY14)
USN Peer Assessment Score
R² Linear = 0.561
y=-7.08E3+7.06E3*x

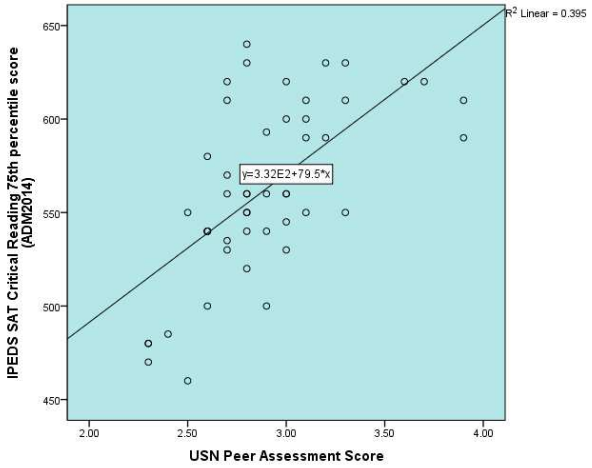

Avg Endowment assests (year end) per FTE (FY13 and FY14)
USN Peer Assessment Score
R² Linear = 0.270
y=-4.62E4+2.34E4*x

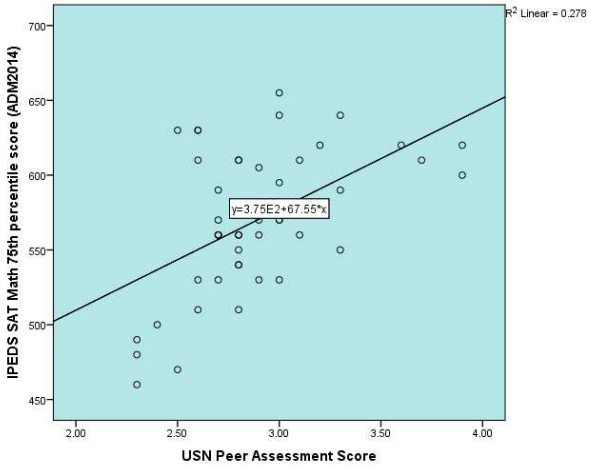

Management - outlays (SAL2014_NIS_RV)
USN Peer Assessment Score
R² Linear = 0.528
y=-1.4E7+6.75E6*x

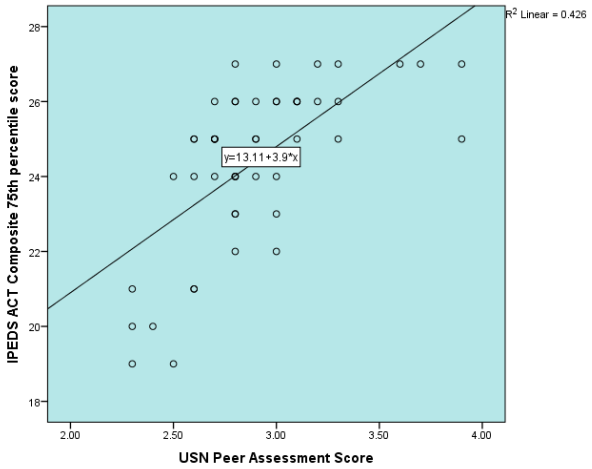

Total library expenditures per FTE (DRVAL2015)
USN Peer Assessment Score
y=-4.48E2+2.91E2*x
R² Linear = 0.300
0
200
400
600
800
1000
1200
2.00
2.50
3.00
3.50
4.00

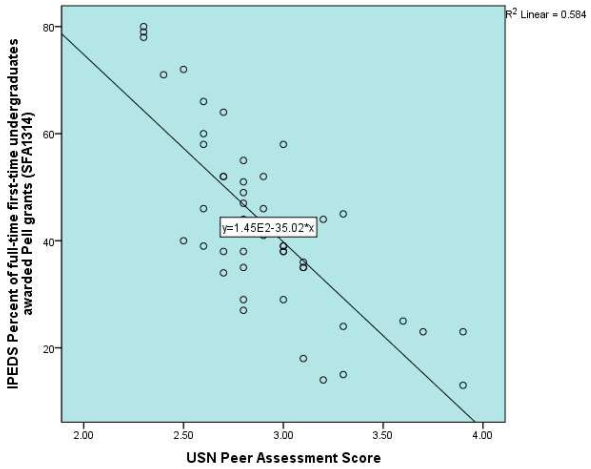

Percent of undergraduate enrollment 18-24 (DRVEF2014_RV)
USN Peer Assessment Score
y=21.29+18.17*x
R² Linear = 0.241
20
40
60
80
100
2.00
2.50
3.00
3.50
4.00

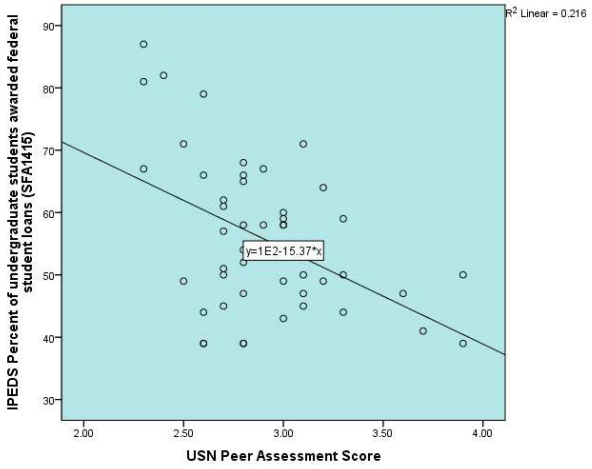
APPENDIX L: PEER ASSESSMENT SCORE: SCATTERPLOTS OF VARIABLES USED IN PUBLIC INSTITUTIONS MODEL

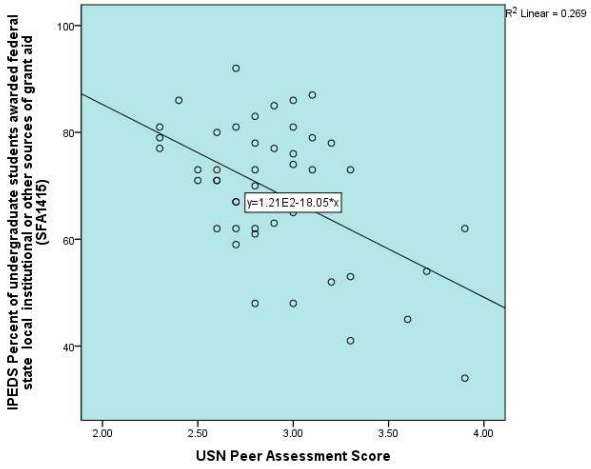


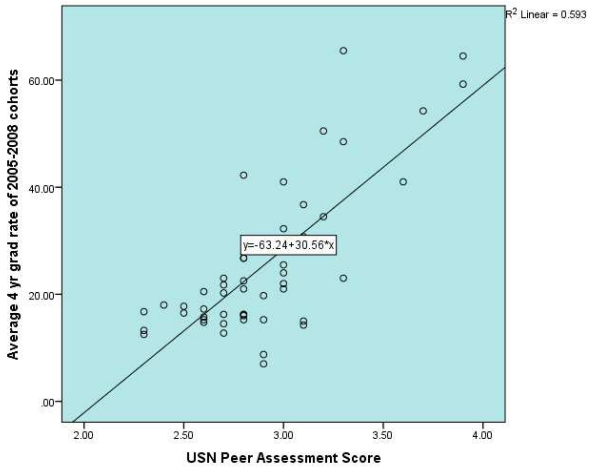


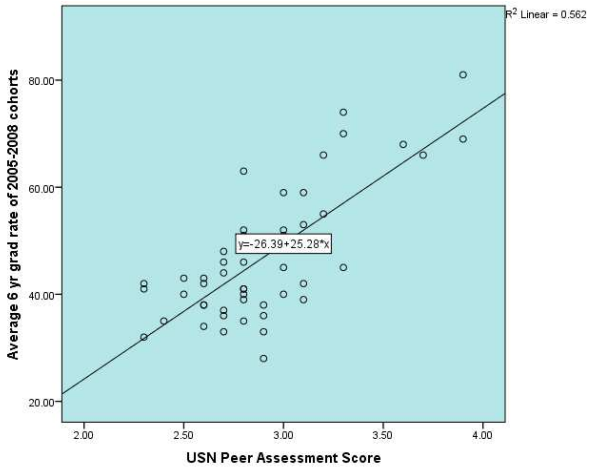


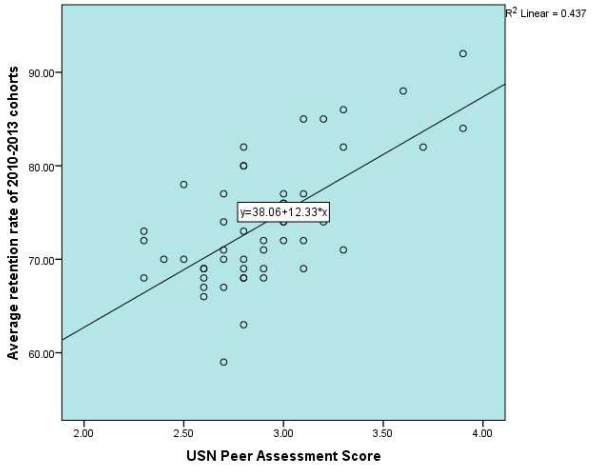


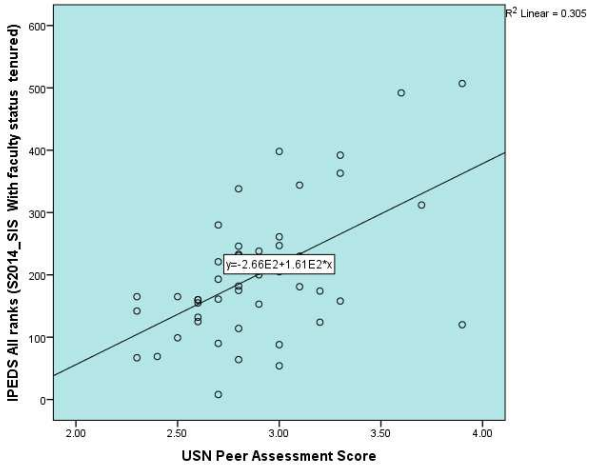


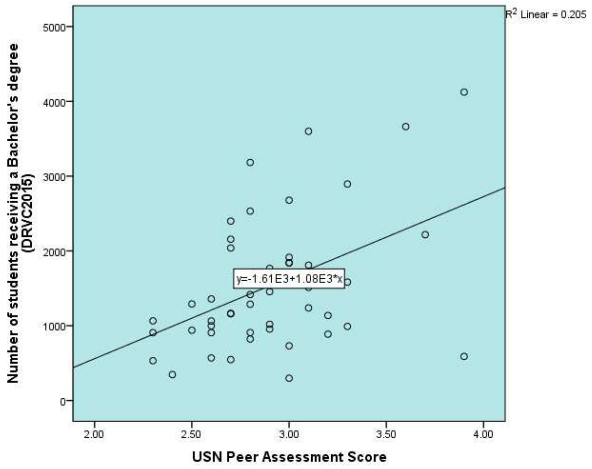


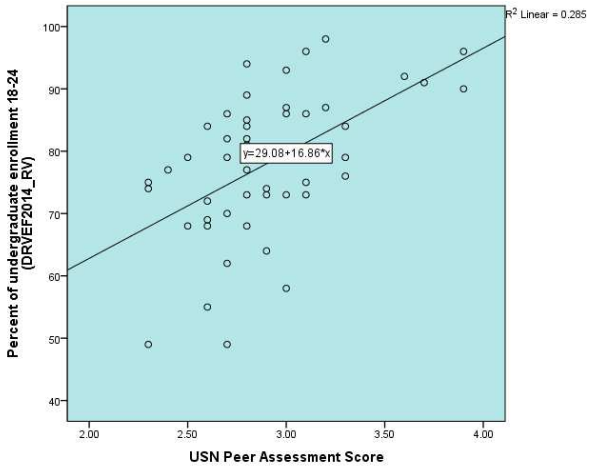

R² Linear = 0.593
Average 4 yr grad rate of 2005-2008 cohorts
y=-63.24+30.56*x
USN Peer Assessment Score

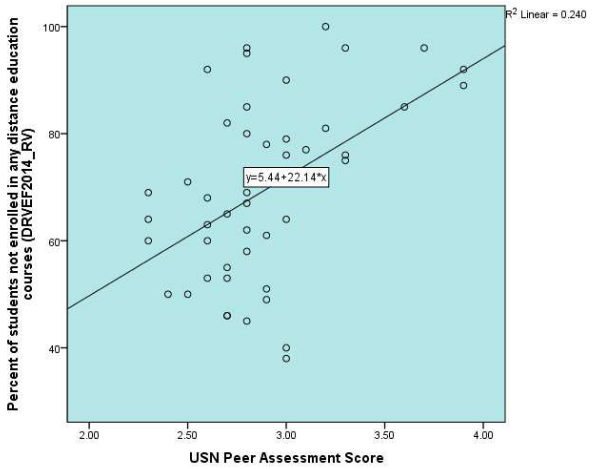

R² Linear = 0.562
Average 6 yr grad rate of 2005-2008 cohorts
y=-26.39+25.28*x
USN Peer Assessment Score

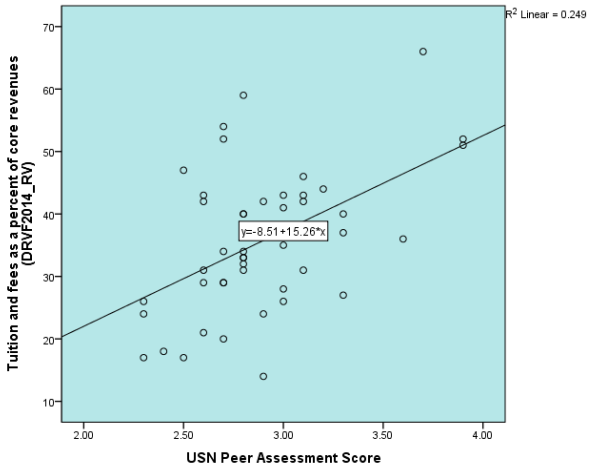

R² Linear = 0.437
Average retention rate of 2010-2013 cohorts
y=38.06+12.33*x
USN Peer Assessment Score

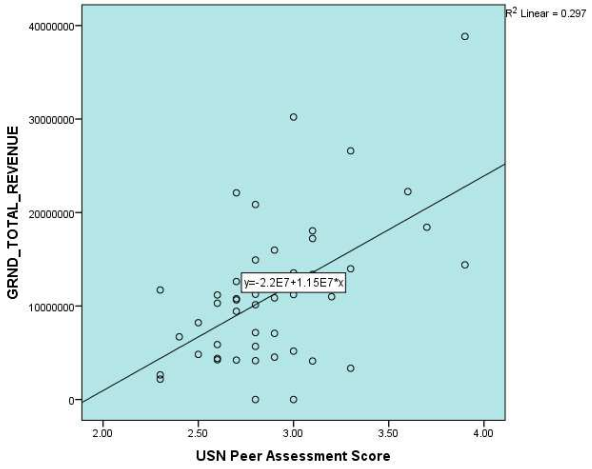

R² Linear = 0.305
IPEDS All ranks (S2014_SIS With faculty status tenured)
y=-2.66E2+1.61E2*x
USN Peer Assessment Score

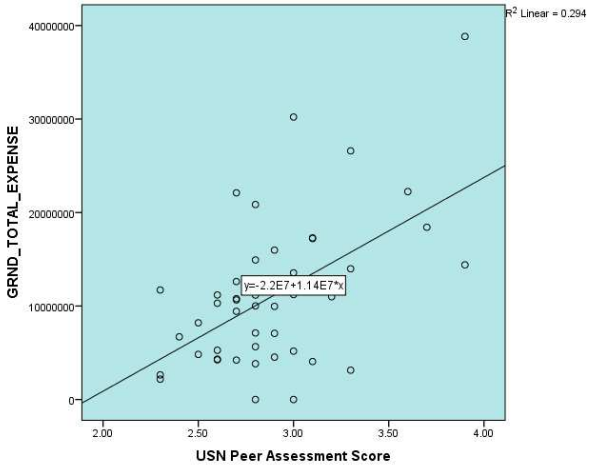

R² Linear = 0.205
Number of students receiving a Bachelor's degree (DRVC2015)
y=-1.61E3+1.08E3*x
USN Peer Assessment Score


R² Linear = 0.285
Percent of undergraduate enrollment 18-24 (DRVEF2014_RV)
y=29.08+16.86*x
USN Peer Assessment Score


Percent of students not enrolled in any distance education courses (DRVEF2014_RV)
USN Peer Assessment Score
y=5.44+22.14*x
R² Linear = 0.240


Tuition and fees as a percent of core revenues (DRVF2014_RV)
USN Peer Assessment Score
y=-8.51+15.26*x
R² Linear = 0.249


GRND_TOTAL_REVENUE
USN Peer Assessment Score
y=-2.2E7+1.15E7*x
R² Linear = 0.297


GRND_TOTAL_EXPENSE
USN Peer Assessment Score
y=-2.2E7+1.14E7*x
R² Linear = 0.294

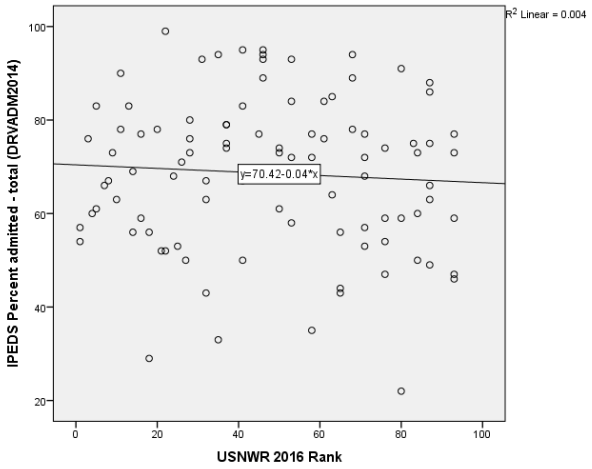
APPENDIX M: PEER ASSESSMENT SCORES: COMPARISON OF OVERALL AND SECTOR-BASED MODELS

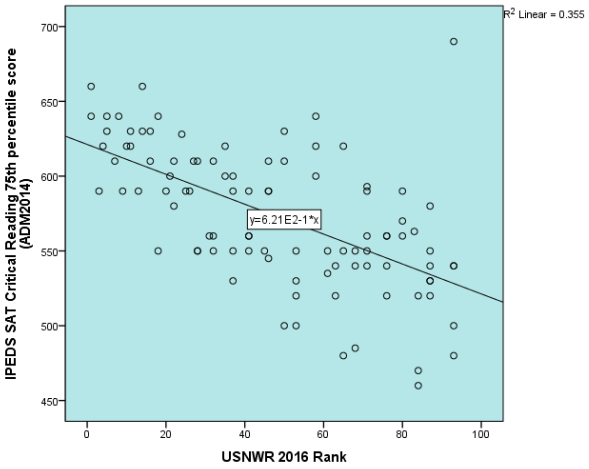
Rank	Institution		Overall Model		Sector-Based Model	
		Actual	Predicted	Difference	Predicted	Difference
1	Elon University	4.00	3.90	-0.10	4.00	0.00
1	Rollins College	3.90	3.70	-0.20	3.70	-0.20
3	The Citadel	3.90	n/a	n/a	n/a	n/a
4	Samford University	3.80	3.60	-0.20	3.70	-0.10
5	Belmont University	3.80	3.50	-0.30	3.60	-0.20
5	Stetson University	3.60	3.60	0.00	3.70	0.10
7	James Madison University	3.90	3.90	0.00	3.80	-0.10
8	Mercer University	3.70	3.60	-0.10	3.70	0.00
9	Embry-Riddle Aeronautical U.	3.60	3.50	-0.10	3.60	0.00
10	Appalachian State University	3.60	3.60	0.00	3.60	0.00
11	College of Charleston	3.70	3.50	-0.20	3.50	-0.20
11	Loyola University New Orleans	3.50	3.30	-0.20	3.50	0.00
13	Bellarmine University	3.30	3.10	-0.20	3.20	-0.10
14	Christopher Newport Univ.	3.20	3.30	0.10	3.30	0.10
14	Union University	3.10	3.30	0.20	3.10	0.00
16	Univ. of Mary Washington	3.30	3.30	0.00	n/a	n/a
16	Univ. of North Carolina--Wilmington	3.30	3.60	0.30	3.40	0.10
18	Hampton University	3.00	3.00	0.00	3.20	0.20
18	Lipscomb University	3.00	3.20	0.20	3.10	0.10
20	Queens University of Charlotte	3.00	3.00	0.00	3.00	0.00
21	Spring Hill College	2.90	3.00	0.10	2.80	-0.10
22	Harding University	3.00	3.00	0.00	2.90	-0.10
22	University of Tampa	3.10	3.10	0.00	3.20	0.10
24	Campbell University	3.10	3.00	-0.10	2.90	-0.20
25	Converse College	2.70	2.80	0.10	2.90	0.20
26	Winthrop University	3.20	3.10	-0.10	3.10	-0.10
27	Christian Brothers University	2.80	3.00	0.20	2.70	-0.10
28	Georgia College & State Univ.	3.10	3.10	0.00	3.10	0.00
28	Longwood University	2.80	2.90	0.10	2.90	0.10
28	Murray State University	3.10	3.00	-0.10	3.00	-0.10
31	Western Kentucky University	3.00	3.20	0.20	3.20	0.20
32	Lynchburg College	2.70	2.90	0.20	3.00	0.30
32	Mississippi College	3.00	2.90	-0.10	2.90	-0.10
32	Western Carolina University	3.00	3.00	0.00	2.90	-0.10
35	Columbia International Univ.	2.40	2.70	0.30	2.60	0.20
35	Tennessee Technological Univ.	3.00	3.20	0.20	3.10	0.10

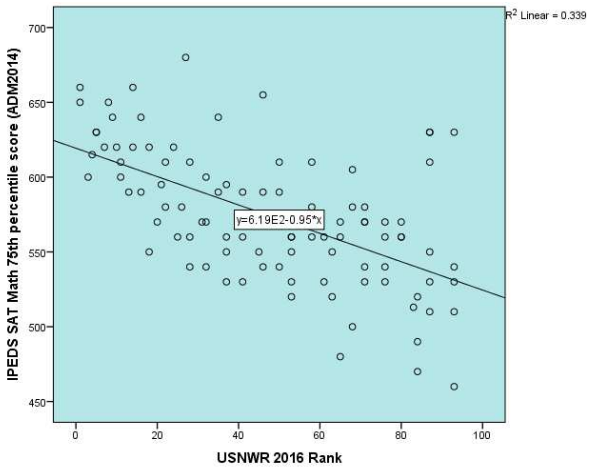
Rank	Institution		Overall Model		Sector-Based Model	
		Actual	Predicted	Difference	Predicted	Difference
37	Columbia College	2.70	2.60	-0.10	2.60	-0.10
37	Radford University	3.00	3.00	0.00	3.00	0.00
37	University of Montevallo	3.00	2.90	-0.10	2.90	-0.10
37	Wingate University	2.90	2.80	-0.10	2.70	-0.20
41	Gardner-Webb University	2.70	2.70	0.00	2.70	0.00
41	Mary Baldwin College	3.00	2.60	-0.40	2.60	-0.40
41	Shenandoah University	2.80	2.70	-0.10	2.70	-0.10
41	William Carey University	2.70	2.60	-0.10	2.50	-0.20
45	Marshall University	3.30	3.10	-0.20	3.10	-0.20
46	Freed-Hardeman University	2.50	2.80	0.30	2.70	0.20
46	Lee University	2.80	2.60	-0.20	2.70	-0.10
46	Mississippi Univ. for Women	3.00	2.80	-0.20	n/a	n/a
46	Palm Beach Atlantic University	2.70	2.80	0.10	2.80	0.10
50	Lincoln Memorial University	2.40	2.60	0.20	2.60	0.20
50	University of North Florida	2.80	3.00	0.20	3.00	0.20
50	University of Tennessee--Martin	2.70	2.90	0.20	2.80	0.10
53	Arkansas State University	2.90	2.70	-0.20	2.90	0.00
53	Marymount University	2.80	3.00	0.20	3.00	0.20
53	Piedmont College	2.40	2.50	0.10	2.60	0.20
53	Thomas More College	2.60	2.60	0.00	2.60	0.00
53	University of North Georgia	2.80	2.80	0.00	2.90	0.10
58	Belhaven University	2.70	2.50	-0.20	2.50	-0.20
58	U. of South Florida--St. Petersburg	2.80	2.80	0.00	2.70	-0.10
58	Univ. of Tennessee--Chattanooga	3.10	2.90	-0.20	3.00	-0.10
61	Brenau University	2.70	2.50	-0.20	2.60	-0.10
61	Morehead State University	2.70	2.90	0.20	2.80	0.10
63	Coastal Carolina University	2.80	2.90	0.10	2.90	0.10
63	St. Thomas University	2.60	2.70	0.10	2.70	0.10
65	Jacksonville University	2.60	2.70	0.10	2.80	0.20
65	North Carolina Central Univ.	2.30	2.70	0.40	2.50	0.20
65	Troy University	2.70	2.60	-0.10	2.70	0.00
68	Alcorn State University	2.40	2.50	0.10	2.40	0.00
68	Austin Peay State University	2.90	2.80	-0.10	2.70	-0.20
68	University of Central Arkansas	2.80	2.80	0.00	3.00	0.20
71	Kennesaw State University	3.10	2.90	-0.20	3.00	-0.10
71	King University	2.30	2.50	0.20	2.50	0.20
71	Saint Leo University	2.70	2.50	-0.20	2.80	0.10
71	University of North Alabama	2.90	2.60	-0.30	2.70	-0.20
76	Eastern Kentucky University	2.80	3.00	0.20	2.90	0.10
76	Francis Marion University	2.60	2.70	0.10	2.60	0.00
76	Pfeiffer University	2.40	2.50	0.10	2.40	0.00

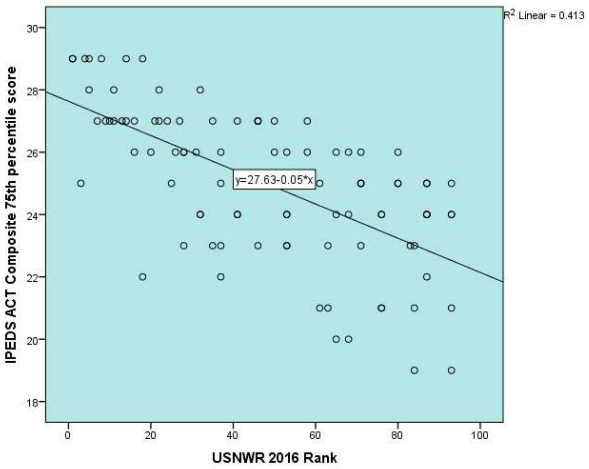
Rank	Institution		Overall Model		Sector-Based Model	
		Actual	Predicted	Difference	Predicted	Difference
76	Valdosta State University	2.80	2.70	-0.10	2.80	0.00
80	Florida Gulf Coast University	2.70	2.60	-0.10	2.70	0.00
80	Liberty University	2.50	2.30	-0.20	2.50	0.00
80	Northern Kentucky University	2.70	2.90	0.20	2.80	0.10
83	Union College	2.40	2.20	-0.20	2.20	-0.20
84	Campbellsville University	2.50	2.40	-0.10	2.40	-0.10
84	Fayetteville State University	2.30	2.60	0.30	2.30	0.00
84	Winston-Salem State Univ.	2.50	2.70	0.20	2.40	-0.10
87	Arkansas Tech University	2.60	2.70	0.10	2.60	0.00
87	Henderson State University	2.70	2.30	-0.40	2.70	0.00
87	McNeese State University	2.60	2.70	0.10	2.70	0.10
87	Nicholls State University	2.50	2.70	0.20	2.70	0.20
87	University of the Cumberlands	2.40	2.40	0.00	2.40	0.00
87	University of West Georgia	2.80	2.50	-0.30	2.70	-0.10
93	Albany State University	2.30	2.30	0.00	2.30	0.00
93	Charleston Southern University	2.60	2.40	-0.20	2.40	-0.20
93	Montreat College	2.10	2.30	0.20	2.30	0.20
93	U. of North Carolina--Pembroke	2.60	2.50	-0.10	2.50	-0.10

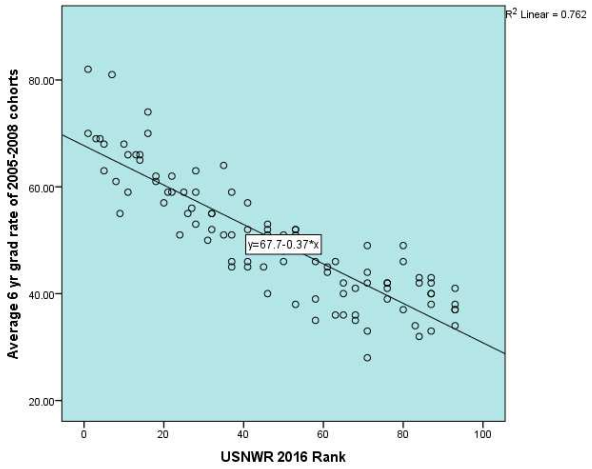
APPENDIX N: RANK SCATTERPLOTS

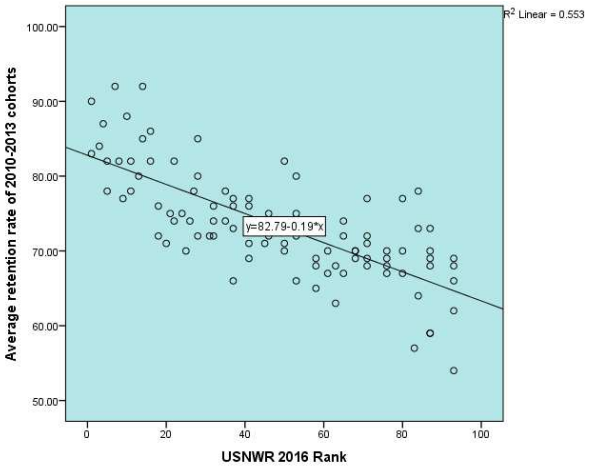


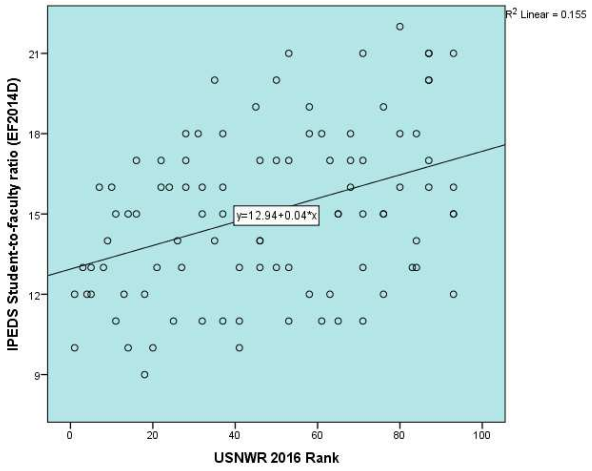


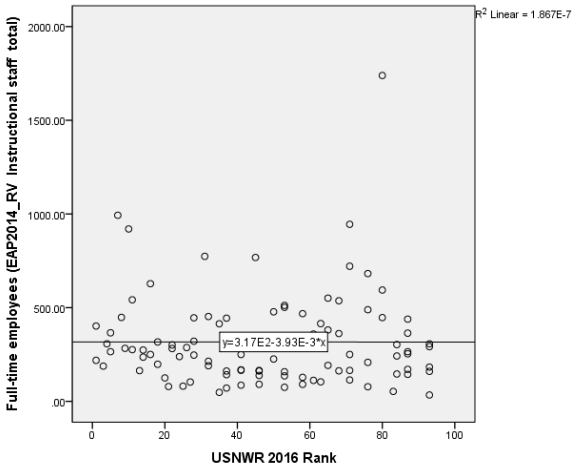


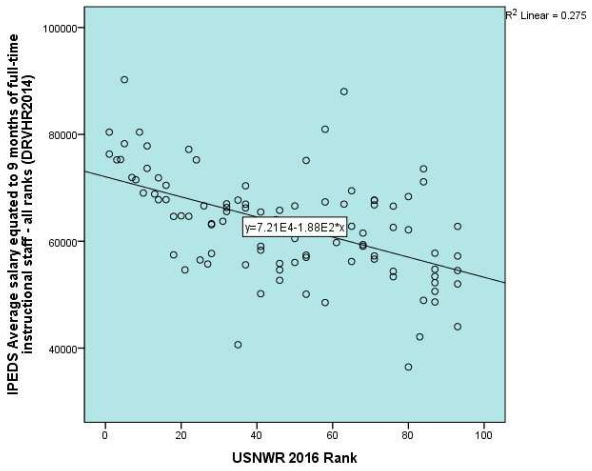


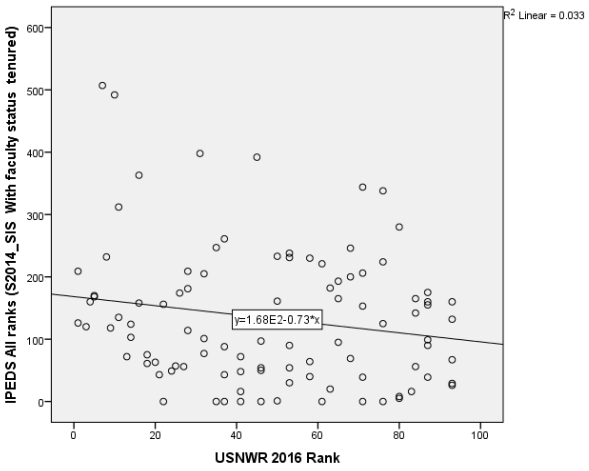


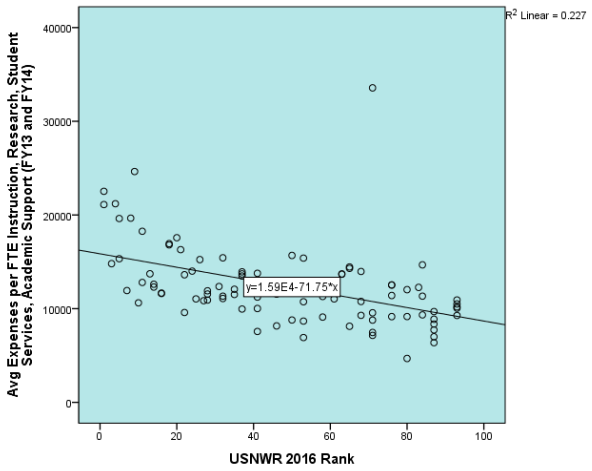


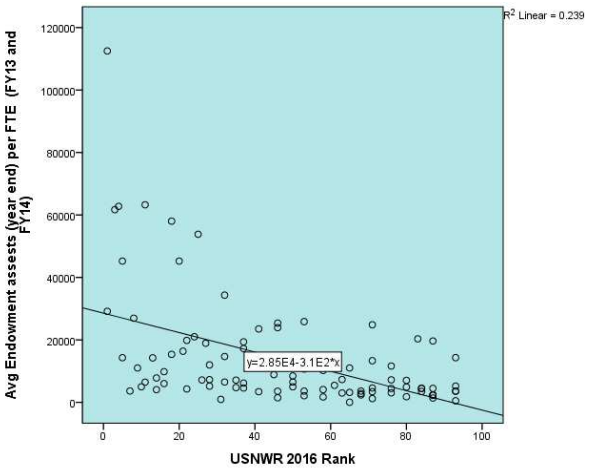

IPEDS Student-to-faculty ratio (EF2014D)
USNWR 2016 Rank
R² Linear = 0.155
y=12.94+0.04*x

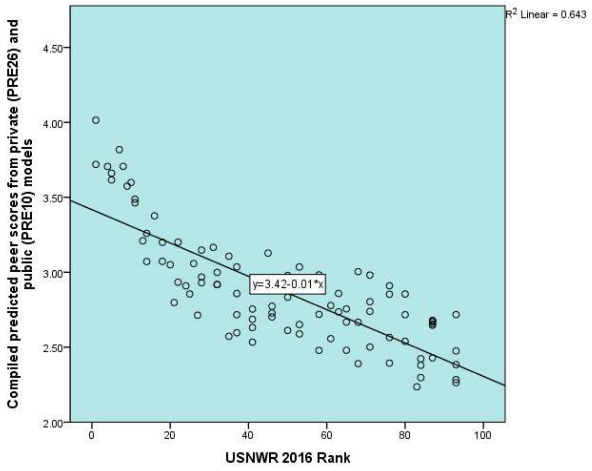

Full-time employees (EAP2014_RV Instructional staff total)
USNWR 2016 Rank
R² Linear = 1.867E-7
y=3.17E2-3.93E-3*x


IPEDS Average salary equated to 9 months of full-time instructional staff - all ranks (DRVHR2014)
USNWR 2016 Rank
R² Linear = 0.275
y=7.21E4-1.88E2*x


IPEDS All ranks (S2014_SIS With faculty status tenured)
USNWR 2016 Rank
R² Linear = 0.033
y=1.68E2-0.73*x


Avg Expenses per FTE Instruction, Research, Student Services, Academic Support (FY13 and FY14)
USNWR 2016 Rank
R² Linear = 0.227
y=1.59E4-71.75*x


Avg Endowment assests (year end) per FTE (FY13 and FY14)
USNWR 2016 Rank
R² Linear = 0.239
y=2.85E4-3.1E2*x


R² Linear = 0.643
Compiled predicted peer scores from private (PRE26) and public (PRE10) models
4.50
4.00
3.50
3.00
2.50
2.00
y=3.42-0.01*x
0
20
40
60
80
100
USNWR 2016 Rank

APPENDIX O: COMPARISON OF RESULTS OF MODELS USED IN RESEARCH QUESTIONS 3 AND 4

Note: values with negative symbols received a lower predicted rank value than actual

Rank	Institution	Research Q3		Research Q4	
		Predicted	Difference	Predicted	Difference
1	Elon University	1	0.0	1	0.0
1	Rollins College	2	0.0	4	-2
3	The Citadel	10	-7.0	n/a	n/a
4	Samford University	3	1.0	3	1.0
5	Stetson University	5	0.0	5	0.0
5	Belmont University	6	0.0	7	-1
7	James Madison University	4	3.0	2	5.0
8	Mercer University	8	0.0	6	2.0
9	Embry-Riddle Aeronautical U.	13	-4.0	8	1.0
10	Appalachian State University	18	-8.0	9	1.0
11	Loyola University New Orleans	11	0.0	10	1.0
11	College of Charleston	15	-1	11	0.0
13	Bellarmine University	12	1.0	15	-2
14	Union University	9	5.0	14	0.0
14	Christopher Newport Univ.	17	0.0	13	1.0
16	Univ. of Mary Washington	7	9.0	n/a	n/a
16	Univ. of North Carolina--Wilmington	16	0.0	12	4.0
18	Lipscomb University	14	4.0	16	2.0
18	Hampton University	22	-1	18	0.0
20	Queens University of Charlotte	20	0.0	28	-8.0
21	Spring Hill College	21	0.0	30	-9.0
22	Harding University	19	3.0	20	2.0
22	University of Tampa	23	-1.0	17	5.0
24	Campbell University	28	-4.0	25	-1.0
25	Converse College	27	-2.0	38	-13.0
26	Winthrop University	24	2.0	19	7.0
27	Christian Brothers University	32	-5.0	40	-13.0
28	Longwood University	30	-2.0	34	-4
28	Georgia College & State Univ.	33	-1	22	6.0
28	Murray State University	36	-4	29	-1.0
31	Western Kentucky University	42	-11.0	21	10.0
32	Mississippi College	25	7.0	27	5.0
32	Lynchburg College	26	6.0	26	6.0
32	Western Carolina University	43	-7	35	-1
35	Columbia International Univ.	34	1.0	60	-24

Rank	Institution	Research Q3		Research Q4	
		Predicted	Difference	Predicted	Difference
35	Tennessee Technological Univ.	39	-1	23	12.0
37	Radford University	38	-1.0	33	4.0
37	Wingate University	44	-2	49	-9
37	University of Montevallo	46	-4	37	0.0
37	Columbia College	49	-7	64	-24
41	William Carey University	37	4.0	61	-17
41	Gardner-Webb University	41	0.0	54	-10
41	Shenandoah University	45	0.0	46	-5
41	Mary Baldwin College	55	-9	72	-28
45	Marshall University	56	-11.0	32	13.0
46	Palm Beach Atlantic University	29	17.0	36	10.0
46	Freed-Hardeman University	35	11.0	43	3.0
46	Lee University	50	0.0	58	-9
46	Mississippi Univ. for Women	76	-30.0	n/a	n/a
50	Lincoln Memorial University	40	10.0	57	-5
50	University of North Florida	47	3.0	31	19.0
50	University of Tennessee--Martin	52	-2.0	45	5.0
53	Marymount University	31	22.0	24	29.0
53	Thomas More College	51	2.0	66	-9
53	Piedmont College	53	0.0	67	-10
53	University of North Georgia	64	-11.0	55	-2.0
53	Arkansas State University	74	-15	51	2.0
58	Belhaven University	59	-1.0	82	-22
58	U. of South Florida--St. Petersburg	61	0.0	48	10.0
58	Univ. of Tennessee--Chattanooga	63	-1	39	19.0
61	Morehead State University	58	3.0	50	11.0
61	Brenau University	62	-1.0	78	-16
63	Coastal Carolina University	54	9.0	42	21.0
63	St. Thomas University	65	-2.0	59	4.0
65	Jacksonville University	57	8.0	53	12.0
65	North Carolina Central Univ.	69	0.0	69	-2
65	Troy University	81	-11	62	3.0
68	University of Central Arkansas	68	0.0	47	21.0
68	Austin Peay State University	85	-12	71	-3
68	Alcorn State University	91	-18	89	-19
71	King University	48	23.0	75	-4.0
71	Saint Leo University	67	4.0	65	6.0
71	Kennesaw State University	75	0.0	41	30.0
71	University of North Alabama	87	-9	70	1.0
71	Georgia Regents University	n/a	n/a	n/a	n/a
76	Eastern Kentucky University	70	6.0	44	32.0

Rank	Institution	Research Q3		Research Q4	
		Predicted	Difference	Predicted	Difference
76	Francis Marion University	71	5.0	74	2.0
76	Pfeiffer University	77	-1.0	84	-5
76	Valdosta State University	82	0.0	63	13.0
80	Florida Gulf Coast University	60	20.0	56	24.0
80	Northern Kentucky University	72	8.0	52	28.0
80	Liberty University	73	7.0	81	-1.0
83	Union College	92	-9.0	93	-10.0
84	Winston-Salem State Univ.	66	18.0	73	11.0
84	Campbellsville University	78	6.0	88	-2
84	Fayetteville State University	94	-5	83	1.0
87	University of the Cumberlands	79	8.0	90	-3.0
87	Arkansas Tech University	80	7.0	79	8.0
87	Nicholls State University	88	-1.0	80	7.0
87	McNeese State University	89	-2.0	76	11.0
87	University of West Georgia	90	-3.0	77	10.0
87	Henderson State University	96	-1	86	1.0
93	University of Louisiana--Monroe	83	10.0	68	25.0
93	Charleston Southern University	84	9.0	85	8.0
93	Montreat College	86	7.0	91	2.0
93	Albany State University	93	0.0	92	1.0
93	U. of North Carolina--Pembroke	95	-2.0	87	6.0