The Cost of Rankings? The Influence of College Rankings on Institutional Management

by

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A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
(Higher Education)
in The University of Michigan
2015

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Acknowledgement

The enormous support and opportunities that I received through my journey to complete this dissertation can be only explained as the work of God through the people of great and kind minds. Most of all, I have been very fortunate to have four mentors at the University of Michigan. It is impossible to put into words how much they have done to mentor, support, and prepare me to complete this dissertation as well as for my future as a scholar and teacher.

First, I thank Mike Bastedo for being a great mentor and dissertation chair. I am grateful to Mike for reading my countless drafts and pushing me to make my arguments more rigorous and holistic. Mike supported my interests in the relationship between the external systems and institutional behaviors, including the topic of college rankings. He always encouraged me to expand my view of the topic with various organizational theories. His comments were not only helpful for the dissertation but also valuable for my future research. I also appreciate the opportunities to work with him as they allowed me to specify my interests in the stratification of higher education. I look forward to pursuing these lines of research and continued learning from Mike. I am indebted to him for his support and great advice as I prepared for an academic job. It was impossible without his help.

I am likewise so grateful to Steve DesJardins, for his support and encouragement with regard to my dissertation as well as my development as a scholar and teacher. Steve

created opportunities for me to conduct rigorous research that push the theoretical and methodological boundaries. He taught me how to write in order to communicate the results with different audiences. I remember his support and advice for engaging in the academic community and expanding my scholastic network. I deeply appreciate Steve for cheering me on when I felt overwhelmed. I will "do my best," in whatever I do, and "not worry about" things.

I was so very lucky to have Jan Lawrence as my academic advisor. Jan helped me develop the arguments for the research questions and significance of this study. Whenever I was stuck with the dissertation, she was willing to sit down with me and pushed me to expand and clear my thoughts. I will not forget her consistent care for my academic progress, for every important milestone that I had to accomplish. Her hosting me for several Christmases allowed me to feel at home in Ann Arbor, and I will be thinking about the white elephant gift exchange when the season comes.

I also thank Kevin Stange for his enthusiastic support for this project. His insightful suggestions and solutions were very helpful whenever I felt stuck by methodological problems during the dissertation process. I learned a lot from his thoughtful answers to my inquiries and examples from his works that he shared with me. I also thank Kevin for allowing me to work with him on an exciting project and to present and publish the work as co-author. The project expanded my approach to data and analytic strategies in studying higher education policy as a quantitative researcher.

I also owe great teachers who directed me to pursue PhD in higher education: Professor Hayakawa Misao at Nagoya University, Hyun-seok Shin at Korea University, and Brian Martin at the Moray House School of Education at the University of

Edinburgh. I am also grateful for the Korea Foundation for Advanced Studies for supporting my study. I hope I can support other people's academic interests and course of life as they did me through my teaching, mentoring, research, and service.

The long journey to complete my PhD was only possible with the support of great people from the Center for Study of Higher and Postsecondary Education. I thank for Brian McCall and Peter Bahr, who provided me opportunities to grow as a teacher. I appreciate all administrative assistance I received from Melinda Richardson and Linda Rayle during my time at the Center. I am grateful to my cohort and the colleagues who helped me throughout the important steps to dissertation and career: Sergio Celis, Joanna Frye, Woo-jeong Shim, Heesun Kim, Katie Madden, Lara Badke, Kim Reyes, Jiyun Kim, Brett Alpert, Molly Ott, Ozan Jaquette, Julie Posselt, Brian Burt, Noe Ortega, Angela Vidal-Rodriguez, James Ellis, Alfredo Sosa, Rob Bielby, Mark Widerspan, Allyson Flaster, and Ben Alcott. I also thank my friends who always wished me the best: Ju-hyun Song, Inyoung Cho, Patricia Hackney, Yay-hyung Cho, Yujeong Yang, Jaehun Jung, Jung-kuk Kim, Andy Madden, Minha Park, and the Nagatani family. I deeply thank Davina Potts, who has been my best colleague, friend, and big sister for this long journey to be a PhD. This dissertation could not be done without her help and encouragement.

I faced small and big challenges and could survive them with prayers from my parents who always supported me in whatever I pursued. Through their own life, they taught me to do my best in what I do, be the best for other people, and be honest. I am also thankful for my sister Jungsun and brother Yohan who have been the greatest supporters and best friends to me. I look forward to the years that we grow more and accomplish our dreams together.

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Abstract

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Increasing college costs and financial consequences for students and families have created a need to collect and disseminate information about institutions to better inform students and parents as they make an important and expensive education decision. To fill this need, several media outlets, including the *U.S. News and World Report* started to publish college rankings for commercial purposes. Rankings (otherwise referred to as ratings systems) have proven popular and influential as evidenced by growing sales and attention to their numerical ranking by publishers, educational observers, and higher education administrators and faculty. Until recently, ranking systems were viewed as tools for increasing information leverage and accountability of higher education institutions. Yet, there have been growing concerns about the unintended consequences of rankings. Specifically, rankings intensify institutional competition for prestige, making institutions increase their expenditures. The cost escalation might have

unintended consequences on access and equity as well as teaching and learning on campus.

These concerns about rankings/ratings systems are linked with the nature of rankings. Rankings evaluate colleges based on criteria chosen by the producers of the rankings, and the evaluated results are organized numerically or by arbitrary classification of universities. Also, ranking is a volatile system because an institution's position can fluctuate from year-to-year. However, only limited empirical research exists on how these attributes of ranking systems affect the resource allocation behavior of universities. Given the growing interest in employing ranking systems and the potential impact of rankings on the management of higher education institutions, this study examines the causal link between rankings and resource allocations of colleges and universities, addressing the unique features of rankings.

Utilizing the *U.S. News and World Report*'s Best Colleges Rankings (USNWR) 1987-2009, this study examines changes in institutional expenditures, particularly in the three areas that are heavily weighted in rankings: (1) student selectivity, (2) financial (educational) resources, and (3) faculty resources. Employing a differences-in-differences and differences-in-differences-in-differences approach based on the unexpected changes in the methodology of USNWR, this study demonstrates that the numerical ordering of universities encourages institutions comply with what rankings measure by increasing expenditures in all three areas. The event-study specification results indicate that expenses that are related to student selectivity are the ones that schools respond to immediately, while the effect lasts over time for financial resources and faculty resources. The areas of expenditures that experience significant changes

differ between National Universities and National Liberal Arts Colleges. Furthermore, the arbitrary grouping of rankings serves as an important mechanism that drives institutional responses to rankings. Schools ranked near at the cut-off of the ranking groups (Top 1, 25, 50, and 120) take on a bigger increase in the expenditures in the areas that rankings directly measure. Year-to-year changes in the ranking positions encourage universities to move resources from a routinized, universal expenditure (e.g., instruction) to categories that are perceived to provide more leverage to improve rankings (e.g., institutional fellowships, proportion of full-time faculty, student-faculty ratio). The study's findings have important implications for the use of rankings/ratings systems in higher education as well as future research on the pursuit of prestige and institutional behaviors.

Chapter 1

INTRODUCTION

The rapid increase in the cost of higher education over the last decades has raised concerns about quality and affordability (Archibald & Feldman, 2012). Since the 1980s, expenses of colleges and universities have increased, exceeding the overall inflation rate. As cost has been growing at such a fast pace and colleges do not have revenue to cover costs, the financial sustainability of many higher education institutions has become weaker (Denneen & Dretler, 2013). The cost burden has been passed down to students via tuition (Bowen, 2012): over 30 years from 1984-85 to 2014-15, the average published tuition and fees rose by 146% at private four-year colleges, and by 225% at public institutions (Baum & Ma, 2014). Student debt has also been a serious issue: as of December 2014, student loan debt stands at $1.16 trillion nationally, which is the largest form of consumer debt outside of mortgages; it rose by 81.3% ($520 billion) between the fourth quarter of 2008 and the fourth quarter of 2014 (Federal Reserve Bank of New York, 2015). On the other hand, students now value institutional quality in college choices, consider resources offered by schools (Brewer, Eide, & Ehrenberg, 1999; Hoxby & Long, 1999; Long, 2004) and reputation (Eagan, Lozano, Hurtado, & Case, 2013; Marklein, 2006) as a proxy for eventual returns. These trends in college cost and financial consequences on students and families have created a need to collect and

disseminate information about institutions to better inform students and parents as they make an important and expensive decision (Clarke, 2007; Hossler & Foley, 1995).

To fill this need, several media, including the *U.S. News and World Report* started to publish college rankings for commercial purposes (Dill & Soo, 2005; McDonough, Antonio, Walpole, & Perez, 1998; Sanoff, Usher, Savino, & Clarke, 2007). Ranking providers have argued that rankings offer information that should be relevant to the choices students make about where to study (Kehm & Stensaker, 2009), as their rankings compare at a glance the relative quality of university teaching and research (Brown, 2006). Rankings have proven popular and influential as evidenced by growing sales (Dichev, 2001; Jin & Whalley, 2007; McDonough et al., 1998) and attention to their numerical ranking by publishers, educational observers, and higher administrators and faculty (Hossler, 1998). The success of USNWR spawned many imitators both within the United States and Internationally (Espeland & Sauder, 2009).

Even though rankings have grown in popularity, some researchers and practitioners in higher education have expressed concerns that rankings intensify the aspiration for prestige (Hossler, 2000), and fuel the higher education expenditure race (Ehrenberg, 2003). Researchers have demonstrated that the cost increase in higher education institutions is due to the growing tuition discount rate, costs of research, faculty salaries, regulatory burdens (e.g., reporting requirements), informational technology or new facilities, expenditure on alumni affairs and development activities that seek to expand the flow of external gifts, especially when universities face a long-run decline in per full-time equivalent student state appropriations (Archibald & Feldman, 2008; Ehrenberg, 2012; Harvey, Williams, Kirshstein, O'Malley, & Wellman, 1998). As these

expenditures are items that tend to be the focus of ranking surveys, schools might allocate even more resources to student selectivity, facilities, and faculty, and in turn, the cost will escalate (Shin & Toutkoushian, 2011).

As institutions try to attract selective students and faculty to improve rankings, schools change admission processes and financial aid practices, increase faculty salaries and benefits, emphasize research activities rather than teaching (O'Meara, 2007), spend more on amenities and facilities (Capraro, Patrick, & Wilson, 2004; Hartley & Morphew, 2008; Jacob, McCall, & Stange, 2013; Toma, Dubrow, & Hartley, 2005), and increase administrative expenditures (Morphew & Baker, 2004). These changes may have significant consequences for policy goals, such as equity and diversity (Meredith, 2004; Shaw & LeChasseur, 2005), as well as institutional effectiveness and efficiency (Frank, 1999; Hossler, 2000; Winston, 2000).

Despite these concerns, rankings are penetrating into the policy arena. First, media rankings are used as an accountability device. In the U.S. context, states fold rankings and ratings into their policies (Morphew & Swanson, 2011). For example, Minnesota, Indiana, and Texas included the domestic and international ranking of public institutions in their state assessments and accountability policies (Sponsler, 2009). In other countries, rankings are used as tools for international benchmarking and quality assurance (Hazelkorn, 2011) and are linked with resource allocation (Maassen & Stensaker, 2011). Furthermore, government or non-profit entities have employed ratings/rankings systems for monitoring institutional practices and increasing transparency. The U.S. Secretary of Education's Commission on the Future of Higher Education (Spellings Commission) (2006) noted the need for comparable information on

student achievement in higher education to inform students and families. Although the commission's work did not lead to a solid measurement system, different sectors of the higher education community have designed distinct approaches for disseminating information to stakeholders of postsecondary education, while avoiding ranking colleges (Sponsler, 2009). The Voluntary System of Accountability program, *Measuring up*-National Report Card on Higher Education, and College Scorecard provide examples of this movement. Recently, the Obama administration has proposed the Postsecondary Institution Ratings System (aiming for delivery in the academic year of 2015-16) that would rate colleges and universities and tie the results to institutional eligibility for federal student financial aid programs. Although the administration has tried to quell the controversy (Stratford, 2014), the premises of ratings have generated concerns. Many in the higher education community still believe that the ratings scheme will become a *de facto* ranking (Espinosa, Crandall, & Tukibayeva, 2014). Furthermore, there has been a fear about the ratings system driving institutional behavior, especially when the result is tied to federal funding (Bastedo, 2014). The possible unintended consequences on student composition (e.g., reduced access for low-income and other underrepresented students in exchange for higher rankings), as well as teaching and learning at institutions (e.g., lowering academic quality, graduate unqualified students), have been the major concerns (Hillman, 2014).

The concerns about rankings/ratings systems stem from the nature of rankings or ratings. Rankings evaluate colleges based on criteria chosen by the producers, and the evaluated results are organized numerically. In addition, rankings provide arbitrary classification of universities based on the numerical order. For example, USNWR

designates the number one or best National University or National Liberal Arts Colleges. Also, institutions are grouped into the top 1-25, 26-50, and 51-120 (Ehrenberg, 2002; Lynch, 2014; Webster, 2001). Whether an institution belongs to a specific ranking group (e.g., top 25) rather than another group (e.g., top 26-50) has significant consequences for schools (Alter & Reback, 2014; Bastedo & Bowman, 2011; Luca & Smith, 2013; Meredith, 2004). Thus, being located at the upper or lower margin of the cut-offs (i.e. Top 1, 25, 50, and 120) might be a factor that colleges attend to when they comprehend rankings. Also, ranking is a volatile system because an institution's position can fluctuate from year-to-year (Ehrenberg, 2002; Longden, 2011; Wedlin, 2006). Therefore, when examining the effect of rankings on institutional behavior, these unique features of rankings should be addressed.

However, only limited empirical research exists on how these attributes of ranking systems affect the resource allocation behavior of universities. Previous research on rankings has focused on two major areas. First, researchers have been interested in understanding the effects that rankings have on higher education stakeholders. In particular, studies have focused on how rankings affect admissions outcomes, revenue, and institutional reputation. Findings from these studies suggest that changes in ranking positions are associated with the number of applicants, acceptance rates, matriculation rates, and the quality of incoming students (e.g., through standardized test scores) at both the undergraduate and graduate levels (Griffith & Rask, 2007; Luca & Smith, 2011; Monks & Ehrenberg, 1999; Sauder & Lancaster, 2006). These results were most pronounced among public institutions rather than private; no significant effect has been found for liberal arts colleges (Bowman & Bastedo, 2009; Meredith, 2004).

Demonstrating the influence of rankings on resource attainment from different sources, Bastedo and Bowman (2011) indicated that the impact of rankings might not be significant for resource providers who are on the periphery of the organization field and can buffer them from rankings, such as foundations and industry. Ranking is more influential for those who are vulnerable to the status hierarchy of higher education, particularly college administrators, faculty, alumni, and out-of-state students. Rankings (the *U.S. News & World Report* and National Research Council) had a strong correlation with research and development funding from the federal government and industry, and alumni donations; rankings did not have an effect on funding from foundations (Grunig, 1997), or on the amount of private gifts, grants, and contracts a university received (Meredith, 2004). The proximal effect of rankings on financial resource attainment was weaker for shorter periods (i.e., within two to four years) than over longer periods (i.e., eight or more years) (Bastedo & Bowman, 2011). However, it is difficult to conclude whether rankings bring more resources to institutions, since there are factors that affect both financial resources and rankings (e.g., student selectivity, faculty quality). Employing the differences-in-differences approach, Jin and Whalley (2007) argued that appearing in rankings, regardless of the institutions' position, increased state appropriations but decreased private gifts; but rankings did not have a significant effect on tuition and fees, government contracts, and endowments. Finally, several studies found that rankings affect future peer assessments of reputation (Bastedo & Bowman, 2010; 2011; Espeland & Sauder, 2007) and perceptions by employers about institutions' academic programs (Boyd, Bergh, & Ketchen, 2010; Rindova, Williamson, Petkova, & Sever, 2005).

Meanwhile, a relatively smaller body of research has been conducted on how institutions strategically respond to rankings. Findings from studies in this area suggest that top managers of higher education institutions actively respond to rankings, despite their skepticism about the process (Corley & Gioia, 2000). Organizational changes seem to occur in a way that corresponds with ranking criteria.[1] For example, Conlin, Dickert-Conlin, & Chapman (2013) found campuses change admission requirements and financial aid policies (e.g., no change in sticker price, but greater price discount) to boost admission selectivity results (Monks & Ehrenberg, 1999). Espeland and Sauder's (2007) study showed that rankings matter for the resource allocation of law schools. Particularly, schools expanding spending on marketing and merit scholarships to attract students with high entrance exam scores. Based on a survey of top administrators around the world, Hazelkorn (2006) found that top administrators consider ranking formulas to be an explicit part of target agreements between rectors and faculty members, and therefore, use them as budgetary tools.

Some studies suggest that the effect of rankings on higher education institutions might be segmented by the arbitrary groupings that rankings classify. The influence of rankings on admission outcomes, resource attainment, and reputation is different for the institutions at different positions, such as the top 25 versus top 26-50 groups (Alter & Reback, 2014; Bowman & Bastedo, 2009; Bastedo & Bowman, 2010). Furthermore, a retrospective analysis of USNWR data for eight years indicated that ranking positions are sticky, and do not move at a high rate. Also, different criteria create competitive

[1] For example, the *U.S. News & World Report* rankings produce ranking scores based on academic reputation, retention, faculty resources, student selectivity, financial resources, graduation rate, and alumni giving rate.

advantage for the institutions ranked in the top 10 and top 40 (Grewal, Dearden, & Lilien, 2008). It is also notable that ranking positions have a strong tendency to revert in the following years (Dichev, 2001), and the movement happens within a small interval (+/-4 points), mostly due to statistical noise (Gnolek, Falcino, & Kuncl, 2014; Grewal et al., 2008).

To summarize, previous research has suggested that rankings have significant consequences for colleges and universities, particularly with regard to admissions outcomes, resource attainment, and future reputation. Furthermore, a small number of empirical inquiries indicate that top managers of academic departments and institutions may engage in strategic behaviors to improve their rankings, regardless of their skepticism about rankings. These efforts appear to involve changing institutional practices in ways that boost performance on rankings criteria. However, the impact of rankings might be dependent on the characteristics of the system. Specifically, the arbitrary groupings of colleges based on their rankings as well as the volatility of the ranking positions might result in a different level of motivation and the strategic behavior of institutions.

Purpose of the Study

Our understanding of the extent to which rankings influence college and university resource allocation is limited in several ways. In particular, we do not know what areas of expenditure rankings impact, and to what degree. Second, studies have not explained the mechanisms through which rankings influence institutional behavior given the unique characteristics of rankings—numerical order, arbitrary grouping, and volatility. With few exceptions, most studies assume that the competition intensity is the

same at all ranked levels and treat all institutions as if their motivation to change organizational behavior is identical. Finally, existing studies only capture cross-sectional changes, and miss the temporal dimensions in the relationship between rankings and organizational changes. Previous inquiries are often limited in the extent to which they account for the issue of endogeneity and omitted variable bias. Without parsing out confounding factors that influence institutions' rankings as well as resource allocation behaviors, we cannot infer the casual effect of rankings.

While ranking systems have attracted the interest of higher education stakeholders, there has been increased criticism of rankings that claims rankings engender *the cost escalation* among colleges and universities. Yet, previous studies are limited in theory and methodology to fully explain whether and how rankings impact institutional management. This dissertation aims to fill the void in the research by exploring the effects that college rankings have on college and university resource allocations.

Employing four data sets–The Higher Education General Information Survey (HEGIS), the Integrated Postsecondary Education Data System (IPEDS), National Postsecondary Student Aid Survey (NPSAS), and the *U.S. News and World Report*'s Best Colleges Rankings (USNWR), this dissertation considers how the motivation to perform well on rankings affects the strategies universities use and the consequences of the rankings phenomenon from a longitudinal perspective. This study contributes to the research on prestige maximizing behavior of higher education institutions by identifying behavioral patterns of striving institutions. The study also seeks to understand if competition among higher education institutions generated by ranking activities increases homogeneity of the U.S. higher education system, while reducing its diversity.

Moreover, from a methodological standpoint, the study will benefit the research and discussion about rankings and university practice by isolating the *causal impact* of rankings. The findings will help us consider if rankings promote an expensive competition by encouraging higher education institutions to comply with rankings.

Research Questions

This dissertation investigated the strategic behaviors that higher education institutions employ to improve their ranking positions. The following overarching question guided the study: *How do college rankings impact resource allocations by higher education institutions?* In order to explore this question, three sub-questions were addressed in relation to the features of ranking systems—numerical order, arbitrary grouping, and volatility:

1) How do rankings affect institutional expenditures in the areas that rankings emphasize, particularly student selectivity, financial resources,[2] and faculty resources over time?

2) How does arbitrary grouping of rankings affect institutions' expenditure behaviors?

3) How do year-to-year changes in ranking positions lead to changes in expenditure behaviors?

Definitions of Key Terms

To estimate the effect of rankings on institutional expenditures, this study employed the *U.S. News and World Report's* the America's Best Colleges rankings (USNWR). While USNWR consists of multiple rankings that compare different types of

[2] *Financial resources* refer to the criteria that USNWR measures. It includes expenditures on instruction, research, student services, and related educational activities.

universities, this study focuses on the National Universities and National Liberal Arts Colleges.

National Universities are institutions that offer a full range of undergraduate majors, plus master's and doctoral programs, and emphasize faculty research. *National Liberal Arts Colleges* focus most exclusively on undergraduate education and award at least 50 percent of degrees in Arts and Sciences.

This dissertation focuses on how the ranking system affects institutional expenditures, using the three distinctive characteristics of rankings. First, only limited numbers of National Universities and National Liberal Arts Colleges are ranked at a specific position that is defined as a number. Hypothesizing that this feature of the ranking system serves as an important mechanism for institutional behaviors, I define the ranking *status* of an institution as *ranked* for schools having specific numerical orders in the top 25, 50, and 120, and *tiered* for National Universities or National Liberal Arts Colleges that are aggregated into a category with other similar schools, but not in a particular hierarchical order.

Due to the expansion of numerical rankings, there are variations among the *ranked* schools in terms of timing, meaning the year they were first numerically ranked. One of the significant expansions occurred in 2003, as the numerical ranking changed from the top 50 to top 120. Thus, I further distinguish the *ranked* schools into schools that were ranked before the expansion in 2003 and schools that were ranked for the first time in 2003 and thereafter.

Another important characteristic of the rankings is arbitrary grouping/classification of institutions, which produces results in which the overall

ranking of schools is subdivided into intervals. The term *ranking group* will refer to the arbitrary classification of institutions based on numerical rankings into the best college (top 1), top 1-25, 26-50, and 51-120 schools. I define the ranking group *cut-offs* as top 1, 25, 50, and 120 and indicate whether an institution is located at the upper or lower *margins* of each cut-off. As changes in the rankings often occur at +/- 4 points from the cut-offs (Dichev, 2001) and movements within 0-4 intervals from the cut-off points are due to statistical noise (Gnolek et al., 2014; Grewal et al., 2008), I specify the *upper margin* as 0 to 4 points above the cut-off points, and the *lower margin* as -1 to -4 points away from the cut-offs. I also examine the movement in the rankings around different ranking group cut-off points to verify these findings.

The last dimension of rankings addressed in this study is the volatility of rankings, defined as year-to-year changes in an institution's ranking. Assuming the year-to-year changes in an institution's position drive institutional behavior, I define *Drop* as a negative change in an institution's ranking compared to the previous year's ranking, and *Improving* or *Maintaining* as a positive change or no change from the previous ranking, respectively.

Significance of the Study

This study has important implications for research and practice. First, the study will contribute to the understanding of mechanisms through which college rankings affect the management of colleges and universities. In particular, I consider the three distinctive characteristics of rankings system—numerical order, arbitrary grouping, and volatility—in estimating the effect of rankings on institutional expenditures. In estimating the causal impact of rankings, this study also attempts to investigate how

quickly institutions respond to rankings by changing their resource allocation. From the findings of this study, I will be able to identify colleges that strive the most according to rankings, which will significantly contribute to the conceptualization of pursuit of prestige and strategic behaviors. Also, the study will foster our understanding of how rankings, as institutional forces, encourage universities to spend more on the areas that are valued by rankings and increase the homogenization of higher education over time.

In a context where college costs and cost containment are among the top policy issues in higher education, this study will help policymakers understand the consequences of competition for rankings and prestige on institutional spending. Prior to using college rankings in the construction of public policy, policymakers need to consider the effects rankings can have on institutional behavior and policy goals, such as equity and diversity, as well as financial efficiency and effectiveness. Furthermore, the findings will provide a meaningful perspective to top administrators with limited resources who are considering how to balance the pressure for competition with the needs of students and faculty. Finally, ranking providers can find ways to improve current methodology, which has been criticized as driving an expensive *arms race* (Machung, 1998; Michael, 2005). They can consider the pros and cons of the current methodology and ways to improve the practice in relation to various ways of presenting college information. If rankings are here to stay, the questions of how we could improve the ranking practice and how stakeholders could make better use of rankings are critical. I believe this study has potential to guide these discussions.

Organization of the Dissertation

In the second chapter of this dissertation, I will provide a brief history and overview of the practices of the USNWR in order to contextualize the inquiry. The existing literature on college rankings will be reviewed. Since little empirical research exists on the effects of rankings on institutional management, research on organizational prestige seeking behavior informed the current study. A detailed discussion of the theoretical framework for the study will then be proposed. The third chapter describes the research methodology including a description of data, sample, variables, and identification strategy. Chapters 4 and 5 present the study results, addressing the descriptive statistics and each sub-research question. In the final chapter, a discussion of the key findings as well as implications for future research and policy will be provided.

Chapter 2

LITERATURE REVIEW

A Brief History of Rankings by the *U.S. News and World Report*

The emergence of college rankings

Rankings originally began with a sole interest in academic reputation. In the early 1900s, a number of researchers including Cattell (1910), Visher (1928), Kunkel (1930), and Prentice (1951) published rankings of American colleges based on the number of eminent undergraduate alumni. Similarly, Raymond Hughes (1925) and Hayward Kiniston (1959) compared graduate schools and comprehensive research universities based on faculty's reputational ratings of the programs. Due to institutions' opposition to the pecking order, the results were presented in alphabetical order with each institution's score. Rankings done by news media (e.g., *Chicago Sunday Tribune*, 1957) also started to appear. In the 1960s and 1970s, reputation rankings, mostly of graduate programs or professional schools (e.g., Cartter, 1966; Roose & Anderson, 1970; Blau & Margulies, 1973), were produced. The *Gourman Report* (1967) rankings of undergraduate programs were initiated during this time period as were the United States National Research Council's (NRC) rankings (1982) of research-doctorate programs. The latter were based on a reputation survey as well as other quantitative measures about institutions.

Intensified attention to reputational rankings began with the publication of rankings by the media (Walleri & Moss, 1995). The *U.S. News & World Report*

(*USNWR*) published their first ranking in 1983.[3] The success of the first two editions of college rankings based on a reputational survey encouraged USNWR to produce their publication annually, beginning in 1987. Despite opposition from higher education institutions, the popularity and impact of the rankings have grown over time (Freedman, 2007; Jin & Whalley, 2007). While there have been other types of college classifications—College Guide Books (e.g., Fiske's guide to colleges, Peterson's Four-year colleges, Barron's Profiles of American Colleges) and the Carnegie classification—dating back to as early as 1870, the USNWR has arguably influenced the format of most college rankings and how the information about colleges is communicated (Hossler, 1998; Lynch, 2014). Following the USNWR, other media rankings of U.S. undergraduate and graduate programs such as those in *Money, Forbes, Business Week, The Wall Street Journal,* and *Washington Monthly* were published. Subsequently, magazines in different regions started to produce global and regional rankings. For example, in 2003 *Times Higher Education* (THE) and Quacquarelli Symonds (QS) started ranking the top 200 global schools, and the first publication of the Academic Ranking of World Universities (ARWU) by Shanghai Jiao Tong University attracted attention from universities, governments, and public media worldwide. Beginning in 2008, USNWR joined with QS and published the World's Best Colleges and Universities rankings.

Most of the rankings, including USNWR evaluate institutions based on a number of criteria weighted differently and placed institutions in a numerical order, along with arbitrary grouping of schools. This design of rankings inspired debates over rankings in

[3] The year that appears on the issue is different from the year of publication. For example, the Best Colleges 2004 (i.e. 2004 edition) was published in 2003. In this study, rankings are based on the year of publication, not the years appear on the issue (edition).

three main ways. First, rankings have been criticized for threatening the diversity of higher education institutions. By choosing a particular set of indicators and using them as proxies for institutional quality, rankings set a *one-size-fits-all* approach in judging institutional performance (Dill & Soo, 2004; Usher & Savino, 2006; 2007). Furthermore, some stakeholders in higher education argue that what rankings measure are not necessarily good proxies for educational quality. Conforming to rankings methodology creates incentives for higher education institutions to focus disproportionate resources on data elements that can change rankings without necessarily changing the quality of the institution (Machung, 1998). Second, the aggregation of multiple aspects and ordinal presentation of institutions exaggerate insignificant differences between institutions that, in turn, cause misperceptions about institutional quality. Finally, the source of data matters because institutions can manipulate or distort the data to perform better in the rankings (Ehrenberg, 2005).

In response to these critics, ranking providers have made efforts to gain legitimacy as valid sources of information about institutional quality. Ranking providers insist that they have frequent dialogue with institutions, college officials and stakeholders to improve their measures and transparency (Sanoff et al., 2007). In addition, the major ranking providers such as *USNWR* and *THE*, in association with United Nations Educational, Scientific, and Cultural Organization (UNESCO) and Institute for Higher Education Policy (IHEP), launched the International Rankings Expert Group (IREG) in 2004. They announced the Berlin Principles in rankings of higher education institutions, emphasizing ethical practice in the collection of data, ranking analysis, and dissemination of information (Sponsler, 2009).

Criticism of rankings led to recent efforts to develop alternatives. For example, Avery, Glickman, Hoxby, and Metrick (2005) created revealed preference rankings based on students' preference for one school relative to other schools to which they had been admitted. The authors concluded that using revealed preference as an additional component in rankings would be beneficial for students trying to find schools that attract the best students. Moreover, in response to concerns that rankings' measurement criteria do not reflect the quality of education that students actually receive, some researchers suggest using the National Survey of Student Engagement (Pike, 2004), or the Collegiate Learning Assessment (CLA) to judge institutional quality. Recently, the Organization for Economic Co-operation and Development (OECD) launched the Assessment of Higher Education Learning Outcomes (AHELO) (OECD, 2009), and the European Commission started the U-Multirank project to measure and compare student learning across countries. While AHELO aims to measure what individual students in higher education know and can do upon graduation through generic and discipline specific skills, U-Multirank focuses on the five dimensions of institutional practices: teaching and learning, research, knowledge transfer, international orientation, and regional engagement.

Changes in the USNWR methodology

The first two publications of USWNR published the top ten schools in the five institutional categories (National Universities, Liberal Arts Colleges, Regional Liberal Arts Colleges, (Regional) Comprehensive Institutions, and Smaller Comprehensive Institutions) based solely on institutional reputations. College presidents were asked to name the single top (in 1983) or top five (in 1985) undergraduate schools from a provided list of institutions similar to their own.

Since 1987, the America's Best Colleges has been published every year, listing a limited number of *top* colleges for the institutions in four categories—National Universities, National Liberal Arts Colleges, Regional universities and Regional Liberal Arts colleges—defined by the Carnegie classification.[4] Over time, the rankings methodology has been modified. In particular, the measurement criteria and weights have been revised, and the scope of the numerical order has been expanded. All changes in the methodology are summarized in Table 2.1.

Since the annual publication started in 1987, an institution's ranking has been determined based on reputation (25% of the overall score; 22.5% in 2010) and objective measures of input and output (75% of the overall score). Data are self-reported. If colleges do not provide data, USNWR uses supplemental data from other sources such as the American Association of University Professors, the College Board, the National Collegiate Athletic Association, the Council for Aid to Education, and the U.S. Department of Education.[5] In that year's rankings, all data are standardized in the calculation of the rankings. The top school in each institutional category receives a score of 100, and the relative score is calculated for the rest of the schools based on the rankings. Although USNWR argued that this allows the ranking results to reflect the size of differences between schools on each component of the rankings, this practice became

[4] Prior to 1989, schools were categorized as National Universities, Liberal Arts Colleges, Regional Liberal Arts Colleges, (Regional) Comprehensive Institutions, and Smaller Comprehensive Institutions. The modification of the Carnegie Classification also changed the institutional categories in USNWR and evaluated schools within each category.

[5] When schools do not meet certain conditions, USNWR marks the institutions as *Unranked* and does not publish the ranking scores. The conditions include: no use of SAT/ACT scores, few responses in the peer assessment survey, enrollment size less than 200, and a high proportion of non-traditional students. Also, institutions without first-year students and institutions that focus on special areas (e.g., technical universities) are also unranked. When an institution's ranking is calculated but editorial reasons prevent publication of the data, the school is categorized as *Not Published*. In this study, rankings of those schools were treated as missing for the respective year.

controversial as universities assume it exaggerates minor differences between the universities (Sauder & Espeland, 2006).

The objective measures of input and output are composed of broad evaluation criteria that are measured through multiple statistics. The broad evaluation criteria include student selectivity, faculty resources, retention and graduation, and educational resources with a varying degree of emphasis.[6] Student selectivity (12.5% of overall score) is measured through acceptance rate (10%), the proportion of freshmen who were in the top 10% of high school (25%) as well as average SAT/ACT score (65%). Yield rate was removed from the selectivity measure in 2003. Financial resources (10% of overall score) are measured by average spending per student on instruction, research, student services, and related educational expenditures (other/general expenditure per student was removed in 1999). As a last category, faculty resources (20% of overall score) include class size (proportion of classes with fewer than 20 students (30%) and with 50 or more students (10%)), faculty salary (35%), proportion of professors with the highest degree in their field (15%), the student-faculty ratio (5%), and the proportion of faculty who are full time (5%). Over time, USNWR reduced weights on student selectivity (25% to 15%), financial resources (20% to 10%), and faculty resources (25% to 20%). Retention and graduation rates (5% to 25%) carried more importance, and the graduation rate performance[7] (5% since 1996, 7.5% in 2010) and alumni giving (5% since 1993) were added to the measurements.

[6] Measurements and criteria reported here are based on the 2015 methodology.
[7] USNWR calculates the predicted six-year graduation rate for each school, based on student characteristics (e.g., test scores and the proportion receiving Pell Grants) and spending. Then the difference between a school's actual six-year graduation rate and the predicted rate is measured.

Along with measurement changes, the number of institutions ranked among the *top* colleges and universities expanded over time. For the first annual ranking in 1987, only the top 25 institutions were selected, with no other institutions listed in the publication. In 1990, USNWR created a *tier* system: schools that were not included in the top 25 National Universities and National Liberal Arts Colleges were divided into four quartiles (tiers) and within each tier institutions were presented alphabetically without numerical order. In 1995, USNWR expanded the numerical list of rankings to the top 50. This placed the first quartile schools in specific numerical order and the rest of the schools into tiers (Top 50 plus Tier 2, 3, and 4). In 2003, the magazine started to assign numerical rankings to the top 50 percent of colleges and universities in both National University and Liberal Arts College rankings. Universities that were previously called Tier 2 now received specific numbers. The rest of the schools were grouped in two tiers and listed alphabetically (Tier 3 and 4). This resulted in about 125 and 110 universities and colleges being ranked in the National University and Liberal Arts College categories, respectively. USNWR once again expanded the scope of numerical rankings in 2010. In observance of this change, the top 75% of institutions received a specific numerical order (i.e. Top 200), and the remaining 25% (that were formerly categorized as Tier 4) were categorized as Tier 2.

Some argue that these methodological changes reflect a marketing ploy by ranking producers to maintain the popularity by making changes in the rankings in forthcoming editions (Federkeil, 2008; Stella & Woodhouse, 2006). Dichev (2011) found that USNWR's annual rankings have a strong tendency to revert to earlier rankings

Table 2.1 Changes in methodology, 1987-2010

Year	Reputation	Student Selectivity	Faculty Resource	Retention and Graduation	Financial Resource	Alumni Giving	Graduation Rate Performance	Numerical Orders
1987	**25**	**25**	**25**	**5**	**20**	**0**	**0**	**Top 25**
1989	25	25	25	5	20	0	0	
1990	25	25	25	5	20	0	0	**Top 25 + Tier 1, 2, 3, 4**
1992	25	25	25	**7**	**18**	0	0	
1993	25	25	**20**	**10**	**15**	**5**	0	
1994	25	25	20	**15**	**10**	5	0	
1995	25	**15**	20	**25**	10	5	0	**Top 50 + Tier 2, 3, 4**
1996	25	15	20	**20**	10	5	**5**	
1997	25	15	20	**25**	10	5	5	
1999	25	15	20	25	10[i]	5	5	
2003	25	**15**[ii]	20	25	10	5	5	**Top 120 + Tier 3, 4**
2010	**22.5**[iii]	15	20	25	10	5	**7.5**	**Top 200 + Tier 4**

Notes. i) Prior to 1999, expenditure was measured by educational expenditure per student (80%) and other and general expenditure per student (20%). Since 1999, only educational expenditure was included in the expenditure.

ii) Since 2003, yield rates was dropped from the indicators; weights on the remaining indicators were changed: acceptance rate (from 15% to 10%), % freshmen who were 10% of high school (additional 5%), average SAT/ACT (additional10%).

iii) Since 2010, reputation score is based on the peer survey (66.7%) and high school counselor's rating (33.3%).

in the following two years. About 70 to 80 percent of the variation in the rankings change was due to transitory and reversible noise, and as little as 10 percent of the variation in annual rankings change was due to real changes in school fundamentals. Year-to-year changes in the positions mostly happened only within a small window of ranking points (Grewal et al., 2008).

The influence of college rankings on higher education institutions

Discussions of rankings in publications have increased over time, following the emergence of USNWR and global rankings (Stergiou & Tsikliras, 2014). However, empirical inquiries into the impact of rankings on colleges and universities are limited and tend to focus on the benefits that accrue from higher ranking positions (Kehm & Stensaker, 2009). Few empirical studies examine the responses of higher education institutions to rankings, such as whether resources are reallocated to achieve that can enhance institutional standing (Hazelkorn, 2011). It is not clear how the unique characteristics of the system of ranking/ratings—numeric order, arbitrary grouping, and volatility of positions—constitute mechanisms that motivate institutions' resource allocation behaviors.

The benefits of higher rankings

From an economic perspective, rankings serve as a signal of a campus' underlying quality since students cannot directly evaluate its quality before their enrollment and experience. Gormley and Weimer (1999) conceptualize rankings to a) provide consumer information on academic quality, utilizing measures that closely approximate or are linked to valued outcomes (Fombrum, 1996), b) inform and influence

student choice of university (Hossler & Foley, 1995), and c) encourage universities to act in anticipation of the potential effects of published rankings and/or respond to student choices by genuinely improving the educational benefits universities provide.

Results from empirical studies have indicated that rankings have a significant effect on admission outcomes, including numbers of applications (Luca & Smith, 2011), acceptance rates, matriculation rates, and academic achievement levels of incoming classes (Monks & Ehrenberg, 1999). Out-of-state and international applicants (Griffith & Rask, 2007) and students from high-income families who are high achieving and have higher educational motivation (McDonough et al., 1998) are particularly sensitive to rankings. The effect of rankings on admissions varies across schools with different price flexibility and missions: the effect is bigger at public institutions compared to private universities (Meredith, 2004). Rankings are only influential for admission outcomes of National Universities in USNWR, but not for those of National Liberal Arts Colleges (Bowman & Bastedo, 2009).

Signaling theory also posits that rankings provide information for stakeholders as they decide on resource allocations. From a rational choice perspective, resource providers would be expected to gravitate toward high-status institutions as the best chances for return on their investment (Brewer et al, 2002). Studies have documented administrators' perceptions that rankings affect outside constituencies such as government, university trustees, research foundations, and employers. Higher rank positions (USNWR and NRC) significantly increase research and development funding from federal government and industry (Grunig, 1997), while it does not affect funding from foundations. In contrast, Meredith (2004) and Jin and Whalley (2007) found no

evidence that changes in the rankings were associated with changes in the amount of private gifts, grants, and contracts.

A line of research has applied sociological perspectives in explaining the consequences of rankings on higher education institutions. These perspectives emphasize that rankings shape the social recognition, rather than function as a sheer source of information. Applying the theory of spectacle (Debord, 1967), Chang and Osborn (2005) explained that rankings convert images of colleges and universities into discrete numbers. As rankings gain legitimacy, the discrete numbers replace an institution's excellence and value. Along the same line, Wedlin (2007) explained that the numerical image is meaningful as it functions as social recognition. Rankings serve as *templates* that define groups by specifying measures that determine belongingness to a group. The numerical order signifies how successful an organization is in meeting what is considered desirable and proper in relation to the comparison organizations. Social recognition, in turn improves material resource flows, creating a kind of virtuous circle of accumulative advantage (Bastedo & Bowman, 2011).

Rindova et al., (2005) describes the mechanism through which media rankings affect employers' perception of MBA graduates of different programs. From an analysis of 107 U.S. business schools that are included in the *Business Week* rankings, the authors found that the rankings indirectly increased the average starting salaries for MBA graduates by shaping recruiters' assumptions about programs' reputations. Better performance, higher starting salaries in this case, enabled institutions to charge higher levels of tuition, which in turn could be used to underwrite initiatives to further boost program reputation (Boyd, Bergh & Ketchen, 2010).

Rankings also influence peer assessments of reputation. Bastedo and Bowman (2010) found that overall rankings, tier level, and changes in tier level of previous rankings significantly change the following year's reputation ratings (Bastedo & Bowman, 2010). Furthermore, the *anchoring effect* of rankings—adjusting final judgment for an ambiguous subject based on a particular value that is available—is strong when there is limited information about reputation, as is the case for international higher education institutions. In this case, even higher education experts refer to rankings to judge institutions (Bastedo & Bowman, 2011).

Yet, the influence of rankings depends on constituencies' positions in the higher education field. Bastedo and Bowman (2011) analyzed 225 U.S. research universities and found that being ranked in the top tier (i.e. tier 1, top 25) of *USNWR* rankings significantly increased research and development funding from federal government and industry, proportion of alumni donation, and out-of-state tuition and fees while it did not have an effect on funding from foundations. The authors explained these findings as different stakeholders' capability to buffer themselves from rankings' influence. In addition, rankings' effect on constituencies and their behavior may not be immediate, and may change over time. Measuring the effects at different time periods, this study also found that the effect of rankings on financial resource attainment was weaker over a shorter period of time (2 to 4 years later) than over a longer period (8 years later).

Finally, a number of studies suggested that the unique method of presentation of the USNWR that places the *top* schools (e.g., top 50) in numerical order and the rest of the institutions into tiers (e.g., tiers 2-4) might result in a different impact of rankings on schools. Studies found that movement between the top tier and the second tier had a

stronger impact than movement within the top tier. While being ranked in the top 50 leads to a substantial improvement in admissions indicators in the following year, one rank increase within the top group only has a limited effect (Meredith, 2004). Also, rankings' effect on admissions is more substantial for the competition among the top 25, compared to the movement between the 26th and 50th positions (Bowman & Bastedo, 2009). Furthermore, the drop from the top tier has a stronger negative impact on reputation than a drop among lower tiers (Bastedo & Bowman, 2010).

Alter and Reback (2014) attempted to estimate the effect of USNWR on application outcomes by different groups of institutions: a) all National Universities listed in the USNWR, b) the 25 schools ranked in earlier editions, and c) schools included to the top 10 vs. top 11-25. The study found ranking position affected admission outcomes. Academic competitiveness and the fraction of out-of-state freshmen increased when schools were ranked and were higher in the numerical order. When colleges were one of the top 25 schools in the first two editions, the number of applications increased by about 6%. Among the top 11-25 schools, peer institutions' ranking status affected an institution's admission outcomes (number of applications and academic competitiveness).

Luca and Smith (2013) framed this as the effect of *salience of information.* The authors assumed that salience, the simplicity of information, would be higher when USNWR published ordinal rankings. The more salient the rankings, the more significant the impact of rankings on students' application decision. Taking into account the changes in ranking methodology, which converted alphabetically listed schools to ordinal rank of the top 26-50, the study found no effect on application decisions when colleges were listed alphabetically; but a one place improvement in ordinal rankings led to a one-

percent point increase in the number of applications. Thus, an investigation into the responses to the rankings needs to consider the way USNWR organize the information—both numeric order and arbitrary groupings of colleges.

Institutional responses to college rankings

The constant and vigilant interest in rankings and institutional efforts to increase position in rankings are explained by higher education institutions' dependency upon external resources. As increases in rankings yield increases in important resources, universities develop a set of cognitive and strategic responses to the rankings. How institutions respond to rankings as a threat in the environment are explained by resource dependence theory and institutional theory (Bastedo & Bowman, 2011).

Based on the resource dependence theory, Bastedo and Bowman (2011) suggest tactics that institutions might employ to manage rankings. Such options include cooptation (e.g., providing alternative sources of institutional information), influence tactics (e.g., manipulating data, and other tactics for influencing reputation surveys), collective actions (e.g., associations and alliances among institutions), and executive contracts (e.g., tying rankings and incentives for presidents). Sauder and Fine (2008) described how business school administrators synthesize, simplify, and select information in ways that best represent their institutions to public and ranking agencies. Analyzing business school data, Fee, Hadlock, and Pierce (2005) showed that controlling for deans' personal characteristics and performance measures (e.g., financial management), a poor ranking increased the probability of the dean's departure in one or two years. However, changes in leadership did not have a significant effect on enhancing upcoming years' rankings.

While resource dependence theory provides useful perspectives on how schools respond to rankings in order to control the impact of rankings on resources, this perspective is limited in its ability to fully explain institutional responses. First, the theory does not explain how universities comply with the ranking measurements by changing practices and how the compliance persists. In the context of higher education rankings, there is an inconsistency between the top managers' ambivalent perception of rankings and their actual managerial behavior. While they are skeptical about the soundness of rankings as a measure for the quality of institutions, they appear to conform to what rankings measure, by allocating more resources to relevant areas (Corley & Gioia, 2000) without guarantees that more resources would enhance prestige and quality of educational activities (Oliver, 1991). Furthermore, tactics that resource dependence theory predicts such as associations and alliance may have limited influence on environment (e.g., failure of boycotting USNWR (e.g., Jaschik, 2007)). The managerial anxiety about rankings and competition with other universities might lead universities to fail to resist rankings, and succumb to the allure to game the rankings system (Sauder & Lancaster, 2006).

In addition, resource dependence theory focuses on the internal organizational shift of power that results from environmental factors. As the environment (e.g., rankings) imposes uncertainties, constraints, and contingencies, those subunits (e.g., academic or administrative departments) that are able to bring the most critical resources to aid in the survival of the organizations come to hold more power. The new power dynamics modify organizational actions and structures (Pfeffer & Salancik, 1978). Thus, empirically examining the effect of rankings requires data and analysis within

universities, not a simple demonstration of field-level changes (Bastedo & Bowman, 2011; Davis & Cobb, 2010).

Meanwhile, some studies explained institutional responses to rankings from an institutional theory perspective. Rankings, as a third-party system forms a significant part of the normative environment of universities (Rao, 1994; Sauder, 2006). Higher education administrators estimate their relative position to other institutions and judge the institutions' performance based on what rankings measure. In some organizations, discrepancy between the expected ranking position and actual position causes an identity threat to institutions (Elsbach & Sauder, 1996; Martins, 2005), which encourages institutional actions that accommodate the ranking criteria. Sauder and Espeland (2009) argued that universities cannot decouple themselves from rankings. The managerial anxiety about rankings and competition with other universities leads top administrators to fail to resist rankings and encourages them to game the rankings system.

According to institutional theory, organizational changes happen through isomorphism and conformity to ranking criteria (Martins, 2005). Studies on universities and professional schools have documented that rankings significantly change institutions' resource allocations, admissions processes, and definitions of work in some departments. Being *reactive*, institutions expand spending on marketing, put greater emphasis on entrance exam scores and offer generous grant aid to students with high test scores (Espeland & Sauder, 2007; Monks & Ehrenberg, 1999). Collecting and reporting data becomes a major task for administrators. Administrators experience dilemmas between improving educational activities versus obtaining better positions in rankings by manipulating data, but they perceive that boosting rankings is still doing *what's best for*

the school (Espeland & Sauder, 2007). Administrators at universities across countries reported that global rankings influence academic activities. More emphasis is placed on the research productivity of faculty, as well as improving the structure of teaching and output (e.g., the number of degrees conferred) (Hazelkorn, 2008). Based on a historical analysis of 30 years in the context of U.K. business schools, Wilkins and Huisman (2011) found that the structure of academic programs becomes isomorphic as institutions start to offer programs that turn out to be successful in rankings measures.

Gnolek et al. (2014) projected that pursuit of a higher ranking will involve a higher level of costs. The authors simulated changes in each ranking criterion required to move an institution from mid-30s to the top 20 in National Universities rankings. Improving only financial resources per student and average faculty compensation would require a sustained increase of over $ 112,000,000 per year, in addition to the expenses for decreasing class sizes, increasing graduation rates, or attracting greater numbers of highly qualified students. Furthermore, moving to the top 20 is impossible without a corresponding change (0.8 points) in undergraduate reputation, which has a less than a 0.01% of probability of occurring. The study also noted that the changing rank of +/- 4 points is due to statistical noise. While this study sheds light on how expensive the ranking games might be, it is still unknown whether universities are actually employing these strategies and spending at the levels the authors forecast.

The costs of competition may vary across the ranking positions. Analyzing eight years (1999-2006) of USNWR data for the top 50 National Universities, Grewal et al. (2008) captured the localized nature of rankings competition. First, ranking positions are sticky and do not change rapidly. The study found that the probability of a university

being ranked within four points of its current rank is about 90%. Second, when analyzing how sub-ranks on each ranking criteria are associated with the overall ranking, different criteria matter for institutions with different ranks. For an institution ranked in the top 10, financial resources and graduation and retention rate were most important, while alumni giving and selectivity appeared to be the least important. For the top 40 institutions, academic reputation, as well as graduation and retention were most important, while financial resources was least important. Thus, the authors concluded that highly ranked universities get more leverage from growing financial resources while lower ranked universities get more leverage from improvements in academic reputation.

The different nature of competition between the higher and lower-ranked institutions might be due to the fact that low-ranked institutions are limited in their ability to take strategic actions to improve their rankings by a lack of resources. Gardner (2010) showed that a low-tiered school perceives that it was disadvantaged in attracting high quality students and invested a significant amount of budget in hiring faculty to enhance its rankings. Yet, since the study is drawn from the case of one school, it is difficult to generalize that all low-ranked institutions have the same issues.

In summary, rankings inspire higher education institutions to improve their rankings because they have a significant influence on admissions, financial resources, and reputation, and on self-perceived legitimacy. Prior research suggests colleges incorporate changes in organizational practice and structure in order to secure a better ranking. Yet, limited research exists in terms of changes in the resource allocations over time that are consistent with the structure of ranking systems. The strategic responses of

universities to rankings might be informed by the literature on prestige and striving behaviors.

Pursuit of prestige and striving behavior of universities

The strategic behavior of institutions toward ranking is not a new concept. Prestige maximization has been one of the most critical goals of higher education institutions (Ehrenberg, 2000; James, 1990; Melguizo & Strober, 2007). Yet, the definition of academic prestige remains unclear. Studies suggest that selectivity of students and faculty research as well as resources to attract and support students and faculty are indicators of prestige. Brooks (2005) explained that in U.S. higher education, the academic prestige of an institution or educational program has often been assessed by reputation, faculty research, and student characteristics such as students' academic achievement and educational outcomes. Volkwein and Grunig (2004) summarized three models that have been used to explain prestige. Resource-reputation models (Astin, 1985) highlight the importance of faculty and financial resources, external funding, and student selectivity. Strategic investment models emphasize return on investment, particularly graduation rates or time-to-degree, in relation to expenditures per student (Burke & Minassians, 2002). Client-centered models (Seymour, 1992) consider prestige to be determined by how well an institution responds to students as customers, measured through student services, faculty availability, and the level of tuition and financial aid. The emergence of systems such as the Carnegie classification and ratings, particularly USNWR, made prestige in American higher education more visible, more institutionalized, and more quantifiable (Geiger, 2000). These systems increased the awareness of an institution's reputation and prestige as major assets (Zemsky, Wegner, &

Massy, 2005). The ratings now construct the prestige goals that colleges and universities pursue (O'Meara, 2007).

While there is little agreement on what prestige is, studies have documented prestige-seeking behaviors of campuses. The strategic behavior of universities to improve prestige is defined as *striving* behavior. The desire to become prestigious can lead to institutional choices that may be viewed as irrational (Clotfelter, 1996; Melguizo & Strober, 2007; Rothschild & White, 1995; Winston, 1999). For example, the pursuit of prestige is driving up costs (Gross & Grambsch, 1973) and causing net losses (Veblen, 1918; 1993) as institutions attempt to *keep up with the Joneses*. Bowen (1980) also explained that the dominant goals of institutions are educational excellence, prestige, and influence, and there is virtually no limit to the amount of money an institution could spend for seemingly fruitful educational ends. Each institution raises all the money it can and spends all it raises which leads to ever increasing expenditures.

Striving behaviors involve changes in institutional structures, practices, and resource allocations on campuses. Aspiring to increase the selectivity of students and faculty as well as resource allocation to the level of prestigious institutions, striving institutions would change the admission process, reward structures, and resource allocation decisions on campus. Recruiting both quality faculty and students is important for institutions to increase the quality of instruction, research, and scholarship, and therefore prestige (Blau, 1994). Furthermore, increased prestige yields increased selectivity of students and the quality of faculty, and the feedback loop perpetuates (Geiger, 2004; Szelest, 2004).

As a part of striving behaviors, institutions change their admission related process to enhance student selectivity. Admitting academically best-prepared students, often characterized by their SAT/ACT scores or high school rank percentile, will lead to better outcomes, such as graduation rates and time-to-degree (Goenner & Snaith, 2003). The most fundamental element of this strategy is to provide a significant price discount to some of the best students through grants and generous financial aid packages (Leeds & DesJardins, 2014; McPherson & Schapiro, 1991; 1997; Winston, 1997). Other admission policies such as the early admission process (Chaker, 2004) or the offering of an Honors College are often used to attract students with high admissions credentials.

In addition to student selectivity, institutions adjust admissions policies to increase applications and matriculation. Some institutions relax admission standards by dropping SAT/ACT requirements (Kirp, 2003), potentially to attract students who are willing and able to pay the full-price (Brewer et al., 2002; Stecklow, 1995). Avery et al., (2005) insisted that institutions reject some of the top applicants, knowing that they will likely be accepted to other institutions that will be more attractive to the applicant, and the applicant will decide to go to the higher prestige institution. Institutions have increased their spending on consumption amenities (Newman, Couturier, & Scurry, 2004; Kirp, 2005) particularly to respond to wealthy students who are willing to pay more (Jacob, McCall, & Stange, 2013).

Institutions perceive that prominent faculty can boost their prestige (Grunig, 1997; Massy & Zemsky, 1994; Melguizo & Strober, 2007). Thus, schools make efforts to recruit and retain faculty. A big part of this effort involves increasing faculty salaries, especially to recruit, or *steal* star faculty from other prestigious institutions (Clotfelter,

1996; O'Meara, 2007). Using the case of a small liberal art college with lower prestige in the Middle Atlantic States, where their strategic document called for raising faculty salary, Ehrenberg (2003) showed that competition for faculty incentivized universities to increase salary outside of market conditions in spite of any internal desire to do so. Attracting faculty is also associated with other costs, such as costs for laboratories and facilities or indirect research expenses (Brewer et al., 2002).

Seeking prestige, institutions emphasize research and publication (Massy & Zemsky, 1994) and move faculty away from undergraduates (Bennett, 1986) and teaching (Sowell, 1993). Clotfelter (1996) compared the arrangement of faculty work at four elite institutions from 1976 to 1992, and found a teaching-research trade-off over the fifteen years. He pointed out that this phenomenon occurred at the same time that schools were under pressure to be comprehensive by offering *full-service*—offering degrees, conducting research in all or virtually all of the recognized academic fields, and performing many other services. This *academic ratchet* makes institutions hire more part-time or adjunct faculty to both teach courses (Callan, 1997; Massy & Zemsky, 1994) and reduce the faculty-student ratio (Volkwein & Sweitzer, 2006).

These striving behaviors have resulted in reduction of faculty teaching loads and the transfer of some traditional academic duties, such as advising, to administrative positions. This formation of an *administrative lattice* (Massy & Wilger, 1992) further increases expenditure on non-instructional administrative support (Leslie & Rhoades, 1995; Zemsky & Massy, 1990). The size and sophistication of administration has increased (Collis, 2004) as administrators need to support non-instructional activities, such as fundraising and communications with external agencies (Ehrenberg, 2000).

Comparing the rising Research I universities and Research II universities in the Carnegie classification, Morphew and Baker (2004) explained that rising to the next level incurs higher administrative costs, as schools make efforts to mimic the spending behavior of other comprehensive, prestigious universities, and to increase the amount of federal funding received.

Several frameworks presented explanations for why institutions are compelled to engage in striving behaviors (O'Meara, 2007). For the most part, the theories explain that universities pursue prestige because it leads to both material (e.g., financial resources, selective students and faculty) and virtual resources (e.g., legitimacy), which in turn lead to increases in prestige, and the cycle continues (Toma, 2012).

From an economic perspective, striving behaviors emerge as the market structure of higher education changes. In particular, the expansion of higher education through telecommunications, travel costs, use of standardized admissions tests, and tuition reciprocity agreements has promoted vertical differentiation among the institutions and students (Hoxby, 1997). Once enrollment thresholds are met, schools try to increase in student quality in consideration of peer effects on learning, positive outcomes such as retaining students, career placement, student satisfaction, and alumni giving (Winston, 2000). Yet, there are only limited numbers of high ability students (e.g., high GPA, SAT/ACT scores) and access to these students is dependent on an institution's relative position compared to other schools (Winston, 2000). Therefore, schools engage in striving behaviors by increasing subsidies to students whose input quality is high (Hoxby, 1997). In addition, competition over faculty with outstanding qualifications as well as disciplines with an undersupply of prospective faculty contributes to striving through

amenities and research support to attract these faculty (Clotfelter, 1996; O'Meara, 2007). The economic theory explains striving behavior as a way of leveraging input quality and resources. Yet, this perspective cannot explain why schools engage in irrational behaviors that entail significant costs when prestige is not tangible and the relationship between prestige and access to student, faculty, and other resources is unclear.

Meanwhile, the ecological and sociological perspectives explain striving behavior as a process of institutions becoming more homogeneous. The population ecology theory posits that environments *choose* organizations most suitable for survival (Kast & Rosenzweig, 1973). From this perspective, higher education institutions at a particular period would strive for survival by competing over similar scarce resources, similar supply and demand of faculty and students, and similar government regulation (Birnbaum, 1983). Yet, how institutions perceive prestige and develop strategic behaviors remains unexplained.

On the other hand, institutional theory explains that universities pursue prestige in order to enhance the organization's perceived legitimacy. As universities lack clear goals and technologies that suggest a more distinctive path (Morphew & Huisman 2002) for success, prestigious institutions provide a model of legitimate institutional practice. Prestige shapes an isomorphic pressure, and institutions are susceptible to prestige regardless traditional measures of environmental change such as revenue streams (Morphew, 2009). The detailed process of striving was explained by mimicking behavior, modeling the most prestigious organizations. Using the concept of *academic procession,* Riesman (1956) explained that most prestigious institutions in the hierarchy are at the head, followed by a middle group, and then less prestigious schools at the tail

of *the snake*. Institutions in the middle group mimic the practice of prestigious universities, and the less prestigious schools follow the middle group.

More recent studies recognize that the same theory is useful in explaining how universities balance the demands of institutional pressures and institutional core. From this perspective, schools take tactical responses to institutional processes, and striving behaviors include both rational and institutional components (Oliver, 1991). Some studies argue that schools with different characteristics may use different prestige-seeking behaviors, as they face different contingencies. Decisions on campus are inextricably linked to a specific history, market, competitors, institutional identity, and leadership at a given time. While financially solvent universities are at the higher end of the academic hierarchy (Winston, 1997), it is smaller colleges (Schultz & Stickler, 1965), public schools with flagship (Morphew & Huisman, 2002) and land-grant status (Finnegan, 1993; Wolf-Wendel & Ward, 2005), and research universities (Geiger, 2004; Massy & Zemsky, 1994; Sweitzer & Volkwein, 2005) that are more likely to engage in striving behaviors.

Yet, the institutional theory explanation of striving behavior is limited, as it does not explain how institutions of different prestige might engage in striving behavior differently. Schools primarily compete with schools in their band or region of the hierarchy (Zemsky, Shaman, & Iannozzi, 1997). Distinguishing between reputation and prestige, Brewer et al., (2002) argued that reputation-seeking, prestige-seeking, and hybrid institutions display distinct practices. In their study, reputation refers to how well an institution meets the needs of its clientele. Institutions concerned about reputation focus more attention on student services, graduate placement, and curriculum offerings to

meet the needs of changing markets, whereas prestige-seeking institutions focus on expenditures on student quality, research, and sports. Hybrid institutions tend to employ different resource allocation strategies for different segments of institutions (e.g., undergraduate vs. graduate programs). While the distinction of different levels of prestige is arbitrary, what defines the status hierarchy should be explored in relation to the definition of prestige.

The overview of research on rankings and prestige seeking behaviors suggests that institutions have been engaging in a *positional arms race* (Frank, 2001; Mause, 2008), and the practice of rankings might have intensified the striving behavior of institutions. Yet, previous research leaves some important questions unanswered. Although existing research suggests changes in institutional practices around rankings, there has been limited empirical research that explains specific areas of resource change in relation to the attributes of ranking systems. While rankings place a numerical order on institutions, they create an arbitrary grouping of universities based on the ranking positions as well as changes in each institution's position every year (volatility). The arbitrary grouping of universities and volatility may create a mechanism that differentiates institutional responses to rankings. If being ranked at or within the top 1, 25, 50, or 120 is associated with critical benefits, institutions that are at the margins of those ranking groups might be most intensively engaged in strategic behaviors either to maintain their membership within their current group or to move into the next most prestigious group. Also, we do not know how year-to-year changes in the numerical order induce colleges to change their resource allocations.

It is worth mentioning, finally, some methodological concerns with the previous research. The cross-sectional design of previous studies does not capture the temporal dimension of the influence of rankings on institutional behavior. Therefore, we are limited in understanding whether and how the influence of rankings on higher education has changed over time. When institutions learn the consequences of rankings over time and incorporate changes in their practice, universities may increase expenditures to improve their standing over time. Although some quantitative studies imply that rankings affect higher education institutions, these studies did not account for other external factors that influence institutions' rankings as well as resource management. Only a few studies attempted to remedy this issue by employing a quasi-experimental approach (e.g., Jin & Whalley, 2007; Luca & Smith, 2011). Therefore, drawing causal conclusions about the influence of rankings on spending behaviors requires caution. Filling these gaps in the literature is the purpose of this dissertation.

I employ the institutional theory, as this theory has provided useful perspectives in explaining the motivation of institutions engaging in strategic behaviors in response to the vague concept of prestige or rankings as institutional forces. While previous research focused on homogenization and isomorphism, I emphasize the specific link between institutional behaviors and the unique characteristics of rankings—a numeric order, arbitrary grouping of universities, and volatility in the positions generated based on a set of evaluation criteria determined by the ranking producers. How schools with different contingencies employ different behaviors is also considered. Furthermore, I expand the framework provided by the institutional theory by adding the status-based model. The status-based model explains how an important but less explored nature of rankings—

arbitrary grouping of universities—creates bands or regions of hierarchy and develops different behaviors of schools in relation to their respective rankings. In the next section, I provide the underlying assumptions of the theories and their implications for explaining institutional behaviors in relation to the college rankings.

Theoretical Framework

Taken together, institutional theory and the status-based model can help us better conceptualize why and how institutions are inspired to change resource allocations in response to rankings, by increasing expenses that are evaluated by USNWR. In particular, how the unique characteristics of the rankings system—numeric order, arbitrary grouping of schools, and volatility (year-to-year changes in the position)—may lead to different strategies of institutions will be explained.

Institutional theory

Institutional theory, drawn from sociology, emphasizes the tendency for organizations to succeed and persist as a result of conformity to institutionalized rules and procedures as opposed to technical efficiency (Meyer & Rowan, 1977; DiMaggio & Powell, 1983). The *old* institutionalism proposed by Selznick and others (Clark, 1956; Perrow, 1961; Selznick, 1948, 1949, 1957) posited that organizations are social systems that are embedded in environments and change over time. The goals, structures, and processes of organizations are developed in response to the interplay of interests among the internal and external constituents of organizations and the changing social environments in which organizations are located. Parsons (1960) highlighted the importance of *legitimacy* and organizational conformity to institutions that exist at a

societal level. Organizations gain legitimacy and resources by conforming to norms, values, and technology that are institutionalized in society. Thus, administrators align organizations' aims and missions with society's norms and values. Yet, as social values conflict with actions directed toward goal attainment, organizations develop separate subsystems to secure legitimacy and to enhance efficiency.

More specific elaboration about the nature and variety of institutional processes and the range of influences that these processes exert on structural characteristics of organizations started in the late 1970s, as a number of works (e.g., Meyer & Rowan, 1977; Zucker, 1977; DiMaggio & Powell, 1983; Scott & Meyer, 1983) provided the initial formulation of *new* institutional theory (DiMaggio & Powell, 1991). Meyer and Rowan (1977) argued that the formal structure of an organization is the outcome of conformity to institutionalized *myths*. Innovative structures that improve technical efficiency in early adopting organizations become legitimized in the environment, and reach a level of legitimization where failure to adopt them is seen as irrational and negligent or the structures become legal mandates. In a highly institutionalized context, new and existing organizations will adopt products, services, techniques, policies, and programs that function as powerful myths, even if the form does not improve efficiency (Tolbert & Zucker, 1983). The myths originate from complex relational networks (i.e. interconnections among organizations that facilitate the spread of ideas and understandings), collective organization of the environment (i.e. the rise of powerful states that can pass and enforce mandates that affect organizations), and the leadership of local organizations (i.e. non-governmental organizations that have power and/or legitimacy to promote prescribed organizational arrangements).

Organizations conform to institutions by incorporating elements that are legitimated externally rather than in terms of efficiency and employing external or ceremonial assessment criteria to define the value of structural elements. Dependence on externally fixed institutions reduces turbulence and maintains stability. This dependence increases the commitment of internal participants and external constituents (Jepperson, 1991) and ensures organizational success and survival.

Yet, organizations must also attend to practical activity. Meyer and Rowan assumed that technical activities and demands for efficiency may conflict and be inconsistent with organizations' efforts to conform to the ceremonial rules. They conceptualized that organizations find a stable solution by maintaining a loosely coupled state. Organizations *decouple* their technical core from these legitimizing structures and maintain displays of confidence, satisfaction and *good faith* internally and externally, and minimize and ceremonialize inspection and evaluation (Meyer, 1983, Meyer & Rowan, 1978; Rowan, 1981, 1982).

Isomorphic adaptation by organizations to their institutional environments results in an increased homogeneity of organizational structures over time. DiMaggio and Powell (1983) distinguished that such isomorphism is driven by both responding to technical demands of markets (i.e. *competitive isomorphism*) and competition for legitimacy (i.e. *institutional isomorphism*). Especially, in a weak technical environment where means-ends uncertainty is high and clear economic fitness measures are absent, organizations are more likely to compete for *social* fitness.

DiMaggio and Powell further specified three mechanisms of institutional isomorphism: *coercive, mimetic*, and *normative.* In coercive isomorphism, organizations

follow the formal rules and regulations laid by the state and its agencies and thereby end up with similar structures and procedures (Rowan & Miskel, 1999). Rules about appropriate goals, operating procedures, and output measures require organizations to follow standard operating procedures of powerful exchange partners. If organizations fail to comply with these rules, they lose social and financial sanctions.

Normative isomorphism is the process by which professions commonly impose order on organizations. Normative expectations and moral obligations generated by a society of professional communities reinforce certain structures and practices. Certifications in the professional occupations and accreditations for organizations that are mainly led by field professions are good examples of normative isomorphism. Finally, mimetic isomorphism is similar to the notion of conformity to rationalized myths (Meyer & Rowan, 1977). Facing uncertainty, organizations mimic goals, structures and practices of successful or prestigious organizations. By diffusing information, common personnel, and taken-for-granted scripts, less successful organizations seek to gain prestige and to assure the public that they are acting in modern and rational ways. In the end, this increases homogeneity of organizations in the same institutional sector as they adopt similar structures.

A more recent development in institutional theory has pointed out that organizations are not unitary entities, and their responses to institutional processes may be divergent (Lawrence & Suddaby, 2006), less homogeneous, and less automatic than originally envisaged (Hinings & Greenwood, 1988). From these *neo-institutional* perspectives, researchers claimed that some organizations persist or change templates for organizing, given the institutionalized organizational field. Organizations employ

strategic behaviors in direct response to the institutional processes that affect them. Oliver (1991) specified various types of strategic behaviors by integrating insights from institutional and resource dependence perspectives. He hypothesized that some organizations *acquiesce* by habituating, imitating, and complying with institutions; others take *compromising* behaviors such as balancing, pacifying, and bargaining with different constituencies' expectations; moreover, some organizations *avoid* institutional influence by concealing, buffering, and escaping from the norms or *defy* by dismissing, challenging, and attacking the institutional structures, and even *manipulate* them by incorporating behaviors such as co-opting, influencing, and controlling. In addition, he suggested that whether institutional pressure comes from efficiency or legitimacy, whether an organization has multiple or single constituencies, what content and means of control the institutions have, and the level of uncertainty and interconnectedness of the organizations predict different patterns of strategic behaviors that organizations take toward institutional pressures that are exerted on organizations.

From the institutional theory perspective, rankings become a powerful institutional force in the field of higher education as they decide a) the scope of institutions to be evaluated and ranked, b) measurement criteria and their weights, and c) the hierarchical numeric order of colleges (Sauder & Fine, 2008; Wedlin, 2010). Numerical rankings provide an external assessment of organizational reputation and worth, generate influential images of the positional status of schools to field experts (e.g., admins, faculty, regulating organizations) and external audiences (e.g., students, governments, employers, funding providers, and alumni), which leads to an institution's virtual and material resource attainment (Bastedo & Bowman, 2011).

Then, rankings, an institution's numeric order becomes important for universities to gain legitimacy and access to resources (Meyer & Rowan, 1977). Thus, compliance to a ranking system occurs and persists, even in the absence of any ostensible indication that these behaviors serve the organization's own interests or contribute to organizational efficiency or control (Oliver, 1991; Tolbert, 1985; Tolbert & Zucker, 1983; Zucker, 1983). Being *reactive*, colleges monitor and interpret rankings and adjust their actions accordingly. Top managers at universities monitor their respective institutions' ranking positions in each year (relative to competing peers) and year-to-year changes in the positions. Furthermore, they attend to what rankings measure and quantitative data in institutional management. Thus, when universities are included in the rankings, schools would adjust institutional policies and practices in ways that conform to visible criteria of performance evaluated by the rankings (Rao, 1994; Zimmerman, 2001). As measurements of USNWR are composed of inputs of resources (Brooks, 2005; Dill & Soo, 2005) including student selectivity, financial resources, and faculty resources, institutions will consider increasing resources in these areas in order to organize strategic practices for improving quality of inputs in those areas or simply to report a higher data values. Pursuing higher ranking positions, schools might raise revenue as much as possible, spend all the money they raise, and continue the spending over time as there is no clear standard of achievement (Bowen, 1980; Leslie, Slaughter, Taylor, & Zhang, 2011).

Schools might be able to strategically act to *decouple* their technical core from organizational forces (Rowan, 1981, 1982; Meyer, 1983, Meyer & Rowan, 1978). If teaching and research are the technical core of universities, changes in the resources that

have immediate impact on these areas (e.g., composition of faculty, expenses on instruction, research expenditure) would happen slower than changes in the areas loosely related with the core (e.g., non-educational services, student support). However, Sauder and Espeland (2009) argued that universities cannot decouple themselves from rankings. Universities internalize rankings due to managerial anxiety about rankings and competition with other universities. Thus, the *discipline* of rankings makes universities fail to resist and game the rankings system even for their technical core. We would expect to see changes in all expenses areas.

The timing of expenditure changes might coincide with the budgeting process. Most ongoing and incremental expenses for day-to-day activities, which are directly related to academic activities and student enrollment, receive priority in budget adjustment according to the institutional needs (Lasher & Greene, 2001). On the other hand, budgets that are related to faculty composition or quality might be hard to change in the short term because of the tenure system but can be accomplished over time through not filling permanent positions when senior faculty retire and using non-regular faculty to handle additional teaching load (Toutkoushian, 1999). Increases in spending for non-educational services such as constructing new buildings might require a long-term change as these facilities are expected to pay their own way without support from the tuition or appropriation revenues that support the core operating budget (Lasher & Greene, 2001; Meisinger & Dubeck, 1984). It is possible that flexibility of budgeting might be affected by rankings over time, but it is beyond the scope of this study.

The isomorphic perspective of institutional theory is limited in explaining the heterogeneous effect of rankings on colleges and different ways that universities respond

to the environment, as the basic idea of institutional theory prioritizes similarities over differences in practice (Beckert, 2010; Mohr, 1982; Rowan & Miskel, 1999). Recent studies in institutional theory acknowledged that not all organizations act in the same way. Researchers posited that whether organizations can be more or less receptive to institutional forces is mediated by contingency factors, such as size and technology (Beck & Walgenbach, 2005), and by organizational identity (Elsbach & Kramer, 1996; Labianca, Fairbank, Thomas, Gioia, & Umphress, 2001). In particular, Liberal Arts Colleges might develop different tactical responses than National Universities as they try to balance between external pressures from the rankings and their mission (Oliver, 1991). For example, Liberal Arts Colleges might increase expenses for student support rather than research, even though ranking measures include research expenses. Moreover, if the initial ranking set a bar for the level that the university ought to be, dropping from the previous year's position might lead to a higher level of response to the rankings.

Yet, this perspective is limited in explaining the unique characteristics of rankings as an institutional pressure: rankings place colleges in a hierarchy using a numerical order and arbitrary grouping of institutions. Thus the position determined by rankings may have different consequences for universities and constrain their action to varying degrees. For example, the impact of rankings on a school's legitimacy may differ across schools, depending on their ranking: in the case of schools at the borders of ranking group cut-off points (e.g., top 1, 25, 50, or 120), moving up (or dropping) a few positions can be a significant gain (or threat) to their legitimacy and identity, compared to the schools that are stable in the middle of the ranking groups (Espeland & Sauder, 2007). The different

pressure perceived by institutions in different ranking positions may cause different motivation and behaviors of universities in their reactions to college rankings.

The status-based model

The status-based model provides a useful perspective in explaining why schools with different ranking positions, determined by an arbitrary grouping of USNWR, might have different responses to college rankings. Based on the structural perspective, sociologists have theorized and empirically investigated the significance of networks in determining the probability that an actor would come into contact with some opportunity, resource, or information (Granovetter, 1985). Extending the notion of network, the status-based model posits that the network ties translate to an actor's status (Podolny, 1993).

Podolny and his colleagues defined status as *accumulated acts of deference* that take various forms such as conferral of awards, ordering or rankings of organizations, and imitation of practices by other organizations. In this model, status has two characteristics. First, status functions as a signal that potential exchange partners use to make inferences about quality. When quality of an organization is not directly observable, constituencies will look to status to reduce their uncertainty. Thus, status generates privileges or discrimination, independent of their and others' performance (Washington & Zajac, 2005).

Second, status derives from the status of an actor's exchange partners, and is contingent on its cooperative and competing affiliations (Washington & Zajac, 2005). When organizations affiliate with well-known, high-status organizations, they enjoy a significant advantage in contests for the recognition and acceptance of their products and

processes (Podolny & Stuart, 1995; Rao, 1994; Stuart, Hoang, & Hybels, 1999) and gain legitimacy from constituencies (Baum & Oliver, 1991; 1992; Rao, Davis, & Ward, 2000; Zuckerman, 1999; 2000). Linkages among peers of equal status do not cause either actor to gain or lose in status, and linkages between actors of unequal status benefit the lower-status actor but damage the high-status actor (*status contagion*) (Stuart et al., 1999). Thus, to maintain and enhance status, organizations try to manage their relationships. As a result, *status homophily* (Gould, 2001) or *status segregation* (Podolny, 1994) occurs: high-status organizations partner disproportionately with other high-status organizations, while low-status organizations are more likely to associate with low-status firms.

The notion of homophilious affiliation is useful to explain variations in isomorphic changes depending on status hierarchy. Status overrides organizations' actions as a basis for establishing identity and practice. Status confers security to top status organizations, the prospect of mobility to middle status organizations, and renders the lowest status organizations observable to outsiders. Therefore, at the middle tier, organizations are motivated to conform to institutional norms or imitate others' practice. On the other hand, top tier institutions strive to differentiate their organizations from others, whereas low tier organizations are not concerned as they lack resources or are indifferent about the influence of institutional pressure (Han, 1994; Philips & Zuckerman, 2001).[8]

From the status-based model perspective, rankings define an institution's *status* by numerical order, and also by the categories or groups of the institutions labeled as the

[8] The Strategic balance model (Deephouse, 1999) provides similar explanation. The model explains that organizations try to conform to the institution and differentiate their practice from others. This strategic behavior is mostly available for organizations with high status, while their counterparts with lower status are more likely to conform to the norms.

top 1, 25, 50, and 120 for each college type. From Podolny's notion of status, institutions placed in the same ranking group consist of competing networks, and belonging to a group indicates affiliations of institutions that compete at similar levels of quality. (Wedlin, 2007; 2011). Thus, mere inclusion in the high status group benefits colleges in terms of the quality of students, quality of junior faculty, job placement of graduates, and financial resource attainment such as research funding or patents (Burris, 2004; D'Aveni, 1996; Rindova et al., 2005; Sine et al., 2003). Also, an institution's previous performance and accumulated status in rankings, taken together, affect the institution's future status (Washington & Zajac, 2005). This *Matthew Effect* (Merton, 1968) intensifies stratification as schools in high status gain greater resources and influence over time.

Based on the concept of status homophily, it is arguable that schools try to move up to the next ranking group or at least maintain positions in the current ranking group. Thus, the proximity of an institution to the arbitrary cut of each ranking group might determine the level of motivation and responses of colleges to conform to institutional norms set by USNWR. In particular, schools that aspire to upward movement or fear a downward movement across the ranking groups are most likely to conform to what rankings measure and what well performing institutions do. Nonetheless, institutions far from the cut-offs may tend to show a lower level of conformity and fewer strategic behaviors as they lack resources or are indifferent to the influence of rankings (Gardener, 2010; Han, 1994; Phillips & Zuckerman, 2001).

The two theories suggest that higher education institutions are reactive to rankings, attending to the ranking attributes. Once ranked, institutions monitor numeric

position and year-to-year changes in the position, as well as criteria that rankings evaluate. Complying with rankings' evaluation criteria, institutions would increase expenditures that are related with student selectivity, financial resources, and faculty resources. The effect of rankings on institutional management would be more significant over time, as rankings are fully institutionalized. Schools might increase responses when the institutions observe a negative change in their rankings. Yet, the behavior will vary between National Universities and National Liberal Arts Colleges. Furthermore, the arbitrary grouping of schools translates into an institution's legitimacy, schools near at the margin of each ranking group (Top 1, 25, 50, and 120) would have a higher motivation and active engagement in complying to rankings, from their expectation for moving up to the next level or fear for slipping from the current group. In the next chapter, I will explain the research method to test these hypotheses.

Chapter 3

RESEARCH METHODOLOGY

In this section, I introduce the empirical approach employed in this study in order to examine the influence of rankings on institutional behavior. I first explain the sources of the data, sample and time periods included in the analyses as well as variables that were used in this study. Then, I turn to the analytic strategies to examine the causal effect of rankings, accounting for factors other than rankings that influence resource allocation.

Data

To test the hypotheses proposed in the previous section, this study requires information about institutional characters and practices as well as rankings over time. I first constructed a panel dataset using the Higher Education General Information Survey (HEGIS) for the years 1980 to 1986, prior to its replacement the Integrated Postsecondary Education Data System (IPEDS) for the years 1987 to 2011.

The National Center for Education Statistics (NCES) supervised the two surveys. The HEGIS survey was conducted between 1966 and 1986, for institutions that are accredited at the college level. In 1985, IPEDS phased in and replaced HEGIS since 1987,[9] collecting information from every postsecondary institution in the United States

[9] The replacement was completed in 1988, but this was only for the library survey. All other institutional survey components were migrated to IPEDS by 1987.

that participates in the federal aid programs (Title IV institutions).[10] The two surveys have been the primary data source for describing and analyzing trends in postsecondary education in the U.S. The HEGIS survey included 7 components: Finance, Fall Enrollment, Institutional Characteristics, Completions, State Migration, Libraries, and Faculty/Staff. Along with these components, other components have been added to the survey over time. The current IPEDS includes 9 components: Institutional characteristics, completions, 12-Month enrollment, student financial aid, graduation rates, 200% graduation rates, Fall Enrollment, finance, and Human Resources.

The major source of the data for this study was from the Finance component, as it includes expenses by function (e.g., scholarships and fellowships, auxiliary enterprises, student services, instruction, academic and student support, and research). The Student Financial Aid survey also provides data regarding undergraduate students, in terms of number of students receiving different types of financial assistance as well as the average amount received for each type of financial aid. Finally, I used Human Resources data for the number of faculty by primary activity, tenure status, academic rank, as well as salaries and benefits for full-time instructional staff. Other information about the institution was drawn from Institutional Characteristics (control, affiliations), Fall enrollment (total number of enrollment) as well as Finance (total revenue, endowment asset).[11]

Creating a panel data with HEGIS and IPEDS involves a number of issues. First, each survey component is administered in different cycles and covers different time

[10] For the last year of the HEGIS survey (1986), 3,714 institutions (2,029 four-year) were included, where as 12,052 institutions (2,652 four-year) were included in the first IPEDS survey (1987). Institutions included in HEGIS are included in IPEDS (Fuller, 2011).
[11] Endowment asset (market value) was not available in 1987-1990 and 1997-2002 financial year.

spans. Therefore, merging the separate parts for one academic year requires caution. Specifically, Institutional Characteristics survey is collected in fall (early September to mid-October), whereas Finance, Fall Enrollment, and Human Resources are collected in spring (early December to mid-April), and Student Financial Aid is collected in winter (early December to mid-February). Furthermore, the Finance and Student Financial Aid survey focuses on the data one year before the particular academic year. For example, in order to create data for the academic year of 2011, I used data released in 2012 for Finance and Student Financial Aid, and 2011 data for the rest of the survey components.

As some survey components have been changed, data harmonization—assuring consistency of definitions for variables—is also an important dimension of the panel data. The changes in the Finance survey raise the issue of keeping consistency in the variables. Due to the changes in accounting standards adopted by the Financial Accounting Standards Board in the fiscal year 1997 and the Governmental Accounting Standards Board in 2004, public and private institutions begin to use different formats (GASB and FASB) for reporting their financial information. This amendment changed the expense reporting for private institutions. The operation and maintenance of plants and interest are included in expenses to each function, but these are not included in the old format or GASB. Therefore, I adjusted expense related variables by subtracting those amounts for the comparability.

Finally, the parent-child reporting is particularly problematic for finance related variables. Institutions that have multiple affiliated campuses have different reporting choices. Some universities report financial information only under the name of their main campus or the systems office, while others maintain individual reporting. This

issue is more complex as the reporting choice of an institution is not consistent across different years. To account for this issue, I employed the *collapsing solution* (Jaquette & Parra, 2014). If institutions reported financial information along with other campuses or at the system level for any year, I aggregated those schools and assigned the value to the main campus. Yet, the number of schools that are affected by this was very small in the sample: 36 universities among the 199 National Universities sample, 3 universities among the 134 National Liberal Arts Colleges sample. Also, the schools evaluated by the USNWR were mostly main campuses, and only one case included both main and another campus in the same ranking category: Rutgers-New Brunswick and Newark. As I aggregated variables for all Rutgers campuses to New Brunswick campus, I dropped the Newark campus from the sample.

Although IPEDS provides useful information about the organization and management of universities, detailed information is limited on some dimensions. Financial aid practice is a good example. Although IPEDS started to include the financial aid component from the academic year of 1998-99, the survey does not distinguish the number of students and average amount per recipient for detailed financial aid types. To better understand institutional aid behavior, I employed the National Postsecondary Student Aid Survey (NPSAS) 92-93, 95-96, 99-00, and 07-08. NPSAS compiles a dataset based on student-level records and on financial aid provided by multiple agencies, including a student's respective postsecondary institution. Detailed information about student financial aid programs—amount, types of aid—were extracted from institutional records. Based on the nationally representative sample of institutions and students for multiple cohorts, NPSAS has been the primary source of information

used by the federal government, researchers, and higher education associations to analyze student financial aid (National Center for Educational Statistics, n.d.).

Because IPEDS forms the institutional sampling frame for NPSAS, I aggregated observations for undergraduate students at the institutional level, using the IPEDS ID (UNITID) associated with each university. The data was then added to the IPEDS panel for the subsequent years in order to examine how institutions allocate institutional aid for different cohorts of students (e.g., need-based and merit-based aid) in relation to the changes in their rankings status.

Finally, the America's Best Colleges rankings published by the *U.S. News and World Report* was added to the IPEDS panel data for the years 1987 to 2009. The data includes an institution's Carnegie classification (in 1987, 1994, 2000, and 2005), which determines whether the institution is one of the National Universities or National Liberal Arts Colleges. For each year, the data lists all National Universities and Liberal Arts Colleges evaluated by USNWR. If the institution is numerically ranked, a specific number is provided; for tiered institutions, their respective tier group information is recorded. Using this information, I identified the year an institution is numerically ranked for the first time. Also, the institution's ranking position in its respective ranking group and year-to-year changes in the rankings were retrieved from the data.

Sample and Analysis Period

Employing IPEDS, I first created data that includes Title IV colleges and universities that offer at least a BA degree and have not experienced merger or closure during the analytic periods (1980-2011). Schools that offer only graduate degrees in specialized majors (e.g., law, business) were excluded. I then limited samples based on

the USNWR categories. USNWR ranks about 1,800 colleges and universities in the United States. Based on the Carnegie classification, USNWR divides institutions mainly into four categories: National Universities, National Liberal Arts Colleges, Regional Universities, and Regional Colleges.[12] This study focuses on the colleges and universities that belong to the National Universities and National Liberal Arts Colleges categories because institutions ranked at the top of these rankings receive a disproportionate share of public attention (Monks & Ehrenberg, 1999).

The number of schools that are ranked has changed over time, due to the changes in the Carnegie classification in 1994, 2000, and 2005. These changes resulted in the inclusion of new schools to the ranking for the first time, and exclusion of some schools that used to be included in National Universities or National Liberal Arts Colleges. Disregarding the changes in the Carnegie classification, there were 264 National Universities and 548 National Liberal Arts Colleges that are part of National Universities or National Liberal Arts Colleges rankings in any years during the analytic periods. To avoid possible exogenous impact from the change in the classification, I restricted the initial sample to the schools that were consistently categorized as National Universities or National Liberal Arts Colleges throughout the analytic period. This resulted in the sample of 199 schools in National Universities and 134 schools in National Liberal Arts Colleges rankings.

Finally, the study examined the influence of rankings on universities over time. In order to consider trends in the outcomes, the data covered observations in 1980 through 2011. Since 1987, USNWR compared schools in each category using criteria,

[12] Also includes unranked specialty schools for colleges that offer most or all of their degrees in fine arts, performing arts, business, or engineering.

consisting of sixteen indicators, all weighted differently. The colleges and universities in each category are ranked against their peers, based on their composite weighted score. Then, a group of schools are placed in numerical order; the rest of the institutions are grouped into quartiles, and placed in alphabetical order. The number of schools that are numerically ranked has changed over time. Prior to 1995, only 25 universities were numerically ranked; since 1995, the top 25% institutions (the top 50) received the numerical rankings, and the rest of the 75% were categorized into Tiers 2, 3, and 4. In 2003, USNWR expanded the scope of numerical rankings. The top 50% institutions (the top 120) were given numerical rankings (*top schools*), and the remaining 50% were categorized as Tier 3 and 4. Also, I limited data to the 2009 rankings as there was another methodological change,[13] and the current data do not provide sufficient data points for the post-change periods.

Research variables

Dependent variables

The dependent variables for this study are institutional expenditures that are related to the three areas that USNWR highly emphasizes—student selectivity, financial resources, and faculty resources.

Expenditures related to student selectivity. In USNWR, student selectivity is measured using admission test scores for all enrollees who took the SAT/ACT, the proportion of freshmen who graduated in the top 10% of their high school class, and acceptance rate. Possible efforts to improve rankings include attracting more

[13] USNWR expanded the numerical rankings from the top 50% (top 121) to top 75% (top 199) in the 2011 edition.

academically selective students and more applicants. Admissions outcomes might carry more importance beyond the original weight given to this category. Retention and graduation rates are also evaluated by the rankings and student selectivity is potentially related to these outcomes. Thus, dependent variables in this category included expenditures on institutional grants and fellowships, as well as expenditures on non-educational services. The list of the variables and their definition are following (Table 3.1).

Expenditures related to financial resources. USNWR argues that *generous per-student spending indicates that a college can offer a wide variety of programs and services* (USNWR, n.d.). From this perspective, the ranking includes measures such as average spending per student on instruction, research, student services, and other educational expenditures. Detailed information for each variable is in Table 3.2.

Table 3.1 Dependent variables: expenditures related to student selectivity

Name	Definition	Years covered
Institutional Grants and Fellowships	Sum of institutional financial aid from restricted/private sources (e.g., business, foundations, individuals, foreign governments) and unrestricted resources (net assets) of the institution. The institutional matching portion of federal, state, or local grants is reported here; athletic scholarships are also included here.	Since 1986 Missing for the years of 1996-1998 (no reporting for GASB institutions)
Institutional Aid: % receiving	Proportion of full-time, first-time degree seeking undergraduate students who received institutional grants. Includes scholarships and fellowships funded by institution and/or individual departments.	1998-2011
Institutional Aid: Average amount	Average amount of institutional fellowships and scholarships conferred to each recipient.	1998-2011
Merit-based aid: % receiving	Proportion of students who received institutional grants that were based entirely on merit, excluding athletic scholarships, and non-need tuition waivers.	1992, 1995, 1999, 2007
Merit-based aid: Average amount	Average amount of merit based grant per recipient at each institution (excluding athletic scholarships).	1992, 1995, 1999, 2007
Need-based aid: % receiving	Proportion of students who received institutional grants that were based entirely on need or partly on need and partly on merit.	1992, 1995, 1999, 2007
Need-based aid: Average amount	Average amount of need-based grant received by students at each institution.	1992, 1995, 1999, 2007
Expenditure for non-educational services	Sum of all operating expenses associated with essentially self-supporting operations of the institution that exist to furnish a service to students, faculty, or staff, and that charge a fee (e.g., residence halls, food services, student health services, intercollegiate athletics, college unions, college stores, faculty/staff parking, faculty housing).	1980-2011

Expenditures related to faculty resources. USNWR measures expenditures related to faculty, as a proxy for a school's commitment to instruction. In particular, the ranking perceives that more contact with professors results in students' higher level of satisfaction, more learning, and increased probability of graduation. Measures include average faculty salary (pay and benefits), proportion of professors with highest degree in their fields, student-faculty ratio, and proportion of faculty who are full-time. The dependent variables related to this category focused on faculty compensation and composition (Table 3.3).

For all expenditure variables, institutions are not consistent in reporting missing and zero data. Among institutions in a given year, some schools reported zero while other institutions left zero as blank; or in one year, a school reported zero, but indicated no expenditure as blank in another year. To provide consistency across institutions and years, all reported zeroes on finance variables were turned to missing (Delta Cost Project, 2011). All expenditure variables were adjusted for inflation using the Consumer Price Index, and the dollar values were expressed in terms of 2011 dollars. Most dollar denominated variables were skewed to the left, and thus transformed by taking a natural logarithm. Finally, I divided expenditure variables by the number of all full-time equivalent (FTE) students[14] in order to account for heterogeneity of institutional size across institutions and over years (McPherson & Schapiro, 1991).

[14] Based on the fall student headcounts for the years 1980-2011.

Table 3.2 Dependent variables: expenditures related to financial resources

Name	Definition	Years covered
Total Education and General Expenditure	Sum of total expenses on instruction, research, public service, academic support, institutional support, and student services.	1980-2011
Expenditure for instruction	Sum of all operating expenses associated with the colleges, schools, departments, and other instructional divisions of the institution and for departmental research and public service that are not separately budgeted. This includes compensation for academic instruction, occupational and vocational instruction, community education, preparatory and adult basic education, and remedial and tutorial instruction conducted by the teaching faculty for the institution's students.	1980-2011
Expenditure for academic support	Sum of all operating expenses associated with activities and services that support the institution's primary missions of instruction, research, and public service.	1980-2011
Expenditure for student services	Sum of all operating expenses associated with admissions, registrar activities, and activities whose primary purpose is to contribute to students' emotional and physical well-being and to their intellectual, cultural, and social development outside the context of the formal instructional program. Examples include student activities, cultural events, student newspapers, intramural athletics, student organizations, supplemental instruction outside the normal academic program (remedial instruction), career guidance, counseling, financial aid administration, and student records.	1980-2011
Expenditure for research	Sum of all operating expenses associated with activities specifically organized to produce research outcomes and commissioned by an agency either external to the institution or separately budgeted by an organizational unit within the institution. The category includes institutes, research centers, and individual and project research.	1980-2011

Table 3.3 Dependent variables: expenditures related to faculty resources

Name	Definition	Years covered
Average salaries and benefits	Average salary and fringe benefits for instructional faculty (all academic rank), 9 month equated.	Missing in the years of 1983, 1986, 1988, and 2000.
Total number of faculty	Total number of full- and part-time faculty who are responsible for instruction, research, and/or public service.	Measured after 1987 and every odd year thereafter.
Student-faculty ratio	Total full-time undergraduate students divided by total number of faculty.	Measured after 1987 and every odd year thereafter.
Proportion of full-time faculty	% full-time faculty among all faculty whose major regular assignment is instruction, research, and/or public service.	Measured after 1987 and every odd year thereafter.
Proportion of tenured/tenure track faculty	% of faculty who are tenured or in positions that lead to consideration for tenure among total faculty.	Since 1993 and every odd year thereafter.
Proportion of professors	% of faculty whose academic rank is professor, associate professor, or assistant professor among total instructional faculty.	Missing in 1983, 1986, 1988, and 2000.

Explanatory variables

Numerically Ranked. The annual publication of USNWR started in 1987, and the expansion of numerical rankings from top 25 to top 50, and to top 120 occurred in 1995 and 2003, respectively. Along with this external change, some institutions were numerically ranked for the first time during different years throughout the analytic periods. Using the inclusion to the numerical rankings, I created a binary variable that indicates whether an institution was numerically ranked for the first time (Research Question 1). This variable is 0 if the institution was not numerically ranked at any time, 0 for the years leading up to the first year that the institution was numerically ranked. The code was 1 for years when the institution was numerically ranked.

Ranked at the margin. For Research Question 2, I created a set of indicators that specifies whether an institution was located at the upper or lower margins of a ranking group, if an institution was numerically ranked. USNWR distinguishes universities that are ranked at Top 1 from other universities which are grouped into the categories of top 1-25, 26-50 and 51-120. Taking the cut-off points (Top 1, 25, 50, and 120), I calculated the average distance from the cut for each institution. Then, a set of dummy variables was generated indicating whether an institution is ranked at the margin of ranking group cut-offs. I specified whether an institution is ranked at the upper margin (0 to 4 points from the cut) or lower margin (-1 to -4 points from the cut). I chose the 4-point interval because changes in the rankings mostly happen around the cut-offs (Dichev, 2001), and movements within 0-4 intervals from the cut-off points are due to statistical noise (Gnolek et al., 2014; Grewal et al., 2008). The descriptive statistics results also provided supports for this choice: the distance of an institution's ranking from the respective

ranking group cut-off point changed by about 2 to 6 standard deviations across the years (see Table 4.2). For each ranking group, changes in the ranking positions happened mostly within 4 points (Figure 4.2). Institutions that were ranked but not located at either the upper or lower margins served as the reference group.

Dropped vs. Maintained or Improved. The year-to-year changes in the rankings were captured by comparing an institution's ranking in year *t+1* with that of year *t*. This information was transformed into dummy variables that indicate *dropping* or *improving* from the previous year versus *maintaining* the same position, for all National Universities and National Liberal Arts Colleges (Research Question 3).

Control variables

According to the revenue theory of costs (Bowen, 1980), schools spend all the money they raise to maximize excellence, prestige, and quality, and the spending continues over time as there is no clear standard of achievement (Bowen, 1980; Leslie et al., 2011). Thus, my preferred specification allowed the revenue of schools for each year to vary.[15]

I included university fixed effects as well as year-by-public/private fixed effects. As such, I controlled directly for all time-invariant characteristics that might be unique to a given university, as well as accounted for any factors that are specific to a given year. Differences between public and private universities, as well as conditions for private/public universities that may vary over time were held constant. This is essential as administrative function and financial restriction might differ by institutional control.

[15] Since the scale and overall availability of resources might influence resource allocation (Baker, 2003), I also estimated models controlling for the total revenue of schools and endowment size (market value) for each year. The results from these models are reported in appendix Table A1-A6.

For example, public universities would have a greater reliance upon state and would spend a greater share of revenues on administrative offices that interface with the state office providing these revenue streams (Leslie & Rhoades, 1995).

Identification Strategy

I employed a differences-in-differences (DD) and differences-in-differences-in-differences (DDD) approach to examine the causal impact of rankings on institutional expenditure. I used the changes in the ranking methodology to guide the analysis (Research Question1). First, USNWR began the annual publication of college rankings in 1987, ranking the 25 schools in the National University and National Liberal Arts Colleges categories; also, it was the first year that the *objective* measures of input and output were introduced, reducing the weight for the reputation survey. Second, in 1995 and 2003, USNWR expanded the scope of numerical rankings by adding the top 26 to 50 to the top 25, and the top 51 to 120 in addition to the top 50. Along with this external change, some institutions were numerically ranked for the first time in different years.

The unexpected implementation of the new methodologies allowed me to identify the causal effect of the numerical rankings on institutional expenditure in the subsequent years, eliminating other confounding factors that also impact expenditures. The introduction of the annual ranking and measurement criteria distinguished the top 25 institutions from other institutions of a similar kind; the expansion of numerical rankings allowed the inclusion of some institutions that were alphabetically ordered but not numerically ranked (tiered).

The credibility of DD analysis depends on two assumptions. First, the *experimental assignments* are exogeneous, and beyond any possible manipulation by the

participants themselves (Angrist & Pischke, 2008). I argue that the first implementation of annual rankings and the expansion of numerical rankings meet this assumption. Although the schools have provided data to USNWR, they do not have authority to change the ranking methodology. Prior to 1987, the ranking was published only twice as a special issue, and schools did not anticipate its annual publication; also, the prior publications were based purely on a reputation survey, and schools did not know what organizational actions could help them to be included in the rankings. Therefore, schools were less likely to take strategic behaviors in relation to rankings. With regard to the expansion in 1995 and 2003, schools did not anticipate the numerical rankings to be changed from the top 25 to top 50, and top 50 to top 120. Therefore, the newly added schools could not have aimed at or taken action to claim specific positions in the rankings. Furthermore, because an institution's position is relative to other institutions, and institutional strategies do not guarantee certain ranking positions, institutions would have difficulty manipulating the probability of inclusion in the numerical ranking (treatment).

Another core assumption to identify the treatment effect in DD estimators is the parallel path assumption which states that the average change in outcome for the treated in the absence of treatment should be equal to the average change in outcome for the non-treated (Mora & Reggio, 2012). Using an event-study specification (equation (2)), I test whether treatment and control schools are trending similarly in the years leading up to the changes in the ranking methodology by adding flexible time dummy variables for the control group. This suggestive test of the common trends assumption expects all the pre-treatment coefficients to be equal to zero. In other words, ranked schools and tiered

schools would have been trended similarly if not ranking status was changed. The results of the event-study specification suggested that ranking methodology was not changed when institutional expenditures were trending differently at ranked and tiered schools, as the point estimates on the pre-treatment years are close to zero and insignificant (see Figures 4.5 - 4.10). This finding gives credibility to the parallel path assumption, and the coefficients from the DD analyses present the shifts in the expenditure due to the changes in the rankings.

The basic empirical strategy was to compare changes in institutional expenditures at colleges that were included in the numerical rankings to changes at colleges that were unranked but were grouped into tiers. For the purpose of a robustness check, I employed a different control group. Colleges that had been ranked prior to 2003 were compared to the schools that have been ranked since 2003. To implement this difference-in-differences strategy, I estimated regressions of the form:

$$EP_{it+1} = \beta Ranked_{it} + \delta_i + \lambda_{private*t} + \varepsilon_{it} \quad (1)$$

where EP_{it+1} is per FTE expenditure outcomes at university *i* during the year *t+1*; $Ranked_{it}$ is whether the institution *i*, is ranked in the annual rankings or received a specific numerical order during the year *t*; δ_i denotes college fixed effects, which controls for any differences in the dependent variable driven by time-invariant characteristics of a university (e.g., age); $\lambda_{private*t}$ is private-by-year fixed effects. Year specific conditions such as changes in federal expenditure on higher education or cost of living are controlled through the fixed effect. Differences between public and private universities such as in their source of funding, administrative models, or political pressures, as well as all interactions between year and institutional control are also differenced out of the

specification. Because most of the National Liberal Arts colleges are private (about 98% of the sample), only institution and year fixed effects were included for all specifications. ε_{it} is the residual error. The coefficient of interest (β) is the changes in the expenditure following the inclusion in the numerical rankings (Research Question 1). The statistical model was estimated separately for National Universities and National Liberal Arts Colleges, to compare the heterogeneous effect of rankings on different types of institutions. Standard errors were clustered by institutions to address the possibility that inclusion in the USNWR is a permanent shock and the outcomes I study are likely to be autocorrelated within the same college (Bertrand, Duflo, & Mullainathan, 2004).

Meanwhile, how quickly institutions respond to rankings by changing their resource allocation is not yet clear. If the proximal effect of rankings on financial resource attainment is weaker during shorter periods (e.g., 2-4 years) than longer periods (e.g., 8 or more years) (Bastedo & Bowman, 2011), institutions would learn the impact of USNWR on their resource attainment and take actions to improve their ranking positions over time. Employing an event-study specification, I examined the impact of USNWR changes over time:

$$EP_{it+1} = \sum_{k=-4}^{k=+10} \beta_k Ranked_{it+k} + \alpha X_{it} + \delta_i + \lambda_{private*t} + \varepsilon_{it} \qquad (2)$$

$\beta_k Ranked_{it+k}$ indicates that institution *i* was included in the annual ranking or numerical ranking *k* years before year *t*; the parameter β_k is the change in expenditure in university *k* years after the inclusion in the numerical rankings relative to the omitted category (k=-5

or earlier). For instance, β_{-4} is the changes in expenditure four years before the inclusion, β_0 is the change in the year of inclusion and β_{10} is the change in expenditure ten or more years after the inclusion in the numerical rankings (all relative to five or more years before the inclusion). Thus, I estimated the change in expenditure in a university -4 to 10 or more years after the inclusion in the numerical rankings relative to five or more years before the inclusion. The event study specification also allowed me to test whether treatment and control schools are trending similarly in the years leading up to the changes in the ranking methodology.

The status-based model implies that differently ranked institutions may have different levels of motivation and engagement in improving their rankings. Particularly, the response to USNWR should be larger when institutions are at the cusp of the ranking groups, as they are either scared of slipping from the current rankings or are motivated to rise up higher in the rankings. Also, when institutions observe drops in the rankings, they would engage in more actions to reclaim the original position in the next year. Therefore, I tested for heterogeneous responses along these lines. Using Differences-in-Differences-in-Differences (DDD), I analyzed whether the effect of being exposed to the numerical orders differs by an institution's a) proximity to the ranking groups (i.e. the distance of an institution from the ranking group cut-offs) (Research Question 2), and b) year-to-year changes in the ranking positions (declined or improved vs. maintained the previous year's position) (Research Question 3). Denoting these variables as *Margin* and *Change*, I extended the main specification above to

$$EP_{it+1} = \beta Ranked_{it} + \gamma Ranked * Margin + \delta_i + \lambda_{private*t} + \varepsilon_{it} \quad (3)$$

$$EP_{it+1} = \gamma Change_{it} + \delta_i + \lambda_{private*t} + \varepsilon_{it} \text{ if } Ranked = 1 \quad (4)$$

where vector γ captures the heterogeneous effect of the USNWR on expenditures by *Margin.* Whether rankings have a bigger impact on the institutions at the upper or lower margins, defined as being ranked 0 to 4 and -1 to -4 points away from cut-off, respectively, compared to their counterparts that are further away from the ranking group cut-offs (+/- 5 or more points) was estimated (Research Question 2). I chose the 4 point interval based on previous studies showing that changes in the rankings across different cut-off points are less likely occur (Dichev, 2001), and movement within 0-4 intervals from the cut-off points are due to statistical noise (Gnolek et al., 2014; Grewal et al., 2008). How schools interpret the arbitrary grouping of the rankings in relation to their respective rankings would be examined through this model.

Second, the effect of year-to-year changes in the rankings (*Change)* was estimated using a fixed effect model. I compared the changes in the expenditure (γ) among the numerically ordered institutions that experienced drops or improvements in their numerical rankings in year *t+1* compared to year *t* and their counterparts that maintained their ranking positions (Research Question 3).

Limitations

This study is subject to several limitations. First, the expenditures are only measured at the aggregate level. The lack of information on detailed spending limits this study in explaining specific strategies and motivations of colleges and universities responding to rankings. For example, each expenditure category includes all

administrative costs (e.g., salaries/wages and benefits, depreciation) as well as money distributed to related activities.[16] Without breaking down specific components of expenditures, it is difficult to conclude whether rankings encourage institutional spending on particular activities or administrative costs to manage the activities. In addition, some reporting only focuses on a limited scope of expenditures, not all related expenses. Faculty salaries and benefits are a good example of this. Only full-time faculty information is captured by the data, and salaries of part-time or adjunct faculty are unknown.

Second, this study is limited in its scope, as the study only focuses on institutions that are ranked by one particular organization−USNWR. Also, the schools that are addressed in this study are the National Universities and National Liberal Arts Colleges. Therefore, findings from this study may not be applicable for the schools outside these categories. Because there are multiple rankings that compare higher education institutions of different foci (e.g., specialty programs, community colleges, for-profit universities, and online programs) and locations (e.g., global rankings), future studies will need to investigate the dynamics among multiple rankings and institutions with different characteristics.

Third, this study does not address all the indicators that are employed by USNWR. The lack of data on institutional practices often prevents the investigation of several expenditures. For example, reputations and alumni donations account for 22.5% and 5% of the ranking criteria, respectively. Many institutions make significant investment to better market the institution by sending print materials to peer institutions,

[16] This is in part due to the changes in the IPDES reporting (accounting) standards. Although not exhaustive, the detailed items are provided in recent years.

advertising, or hiring outside consultants (Collis, 2004; Cunningham, 2012; Lipman Hearne, 2010). However, lack of data on marketing related expenditures did not allow investigating those outcomes. The efforts of higher education institutions and associations to collect information on those behaviors are new and incomplete. It is also important to mention that the ranking measurements have changed over time (Table 2.1). For example, USNWR started employing a *value-added* graduation rate measure in 1996, and reduced the weight of financial resources in some years. How institutions respond to the changes in particular measures needs to be investigated in the future.

Although expenditures are one of the ways to examine institutional behavior, this study is limited in capturing intra-organizational behaviors. For example, some institutions *game* the ranking system by distorting or falsifying the data reporting (Bialik, 2009; Crabbe, 2009; Sauder & Espeland, 2009). USNWR started to crosscheck the data provided by institutions with data from other sources in 1999. However, some criteria such as class-size are not verifiable as there is no available source of information. Whether this *gaming* behavior may have diminished or strengthened over time is also not clear. Responses to rankings may include changes in leadership (Fee, Hadlock, & Pierce, 2005), communication styles (Coley & Gioia, 2000), and division of labor (Espeland & Sauder, 2007; Hazelkorn, 2008). Departmental rankings may also generate political dynamics over resource allocation or authority for management within an institution (e.g., Barrow, 1996; Gumport & Snydman, 2002; Lebo, 2011). Analyzing the relationship between institutional emphasis on Engineering and Science, Cantwell and Taylor (2013) found that a greater number of Ph.D. degrees in Science and Engineering was a significant predictor for the Academic Ranking of World Universities rankings. The

authors argued that this relationship might motivate institutions to increase stratification within an institution. Future studies need to investigate how rankings affect the status of disciplines within an institution, and how the striving departments organize their academic and managerial practices (Massy & Zemsky, 1994).

Chapter 4

RESULTS: EFFECT OF RANKINGS ON INSTITUTIONAL EXPENDITURES

Chapters 4 and 5 will present results for the three research questions that examine how college rankings affect institutional expenditures. The first research question addresses the extent to which rankings affect expenditures in specified areas. The second research question focuses on the heterogeneous effect of rankings by institutional ranking positions. Finally, I examine how year-to-year changes in the ranking position leads to changes in expenditure behavior of colleges and universities. This chapter focuses on the first research question.

The main specification was inspired by unexpected changes to the number of schools ranked: the first implementation of annual rankings in 1987, and the expansion of numerical rankings from the top 25 to the top 50 in 1995, and to the top 120 in 2003. Using the time of first inclusion to the numerical rankings, I compared changes in expenditure at universities that were ranked to changes at universities that were grouped into tiers. In order to capture how institutional responses develop over time, an event specification analysis was followed. The robustness of the results was tested using alternative control groups.

The second and third research questions address how both the location of an institution in the rankings as well as year-to-year changes in the numerical positions differentiate expenditure behavior. In particular, how being ranked at the margin of a

ranking group cut-off as well as positive or negative movement in ranked positions affects institutional expenditures was analyzed.

This chapter begins by reporting descriptive statistics on independent and dependent variables used in this study. The effect of rankings on institutional expenditures is addressed by outcome categories, in the order of student selectivity, financial resources, and faculty resources. Each outcome is reported separately for National Universities and National Liberal Arts Colleges.

Descriptive Statistics

Independent variables

Explanatory Variables. The ranking variables were constructed based on the USNWR. This publication first defines the four comparison groups based on the Carnegie classification—National Universities, National Liberal Arts Colleges, Regional Universities, and Regional Liberal Arts Colleges. For National Universities and National Liberal Arts Colleges, the top 25, 50, and 120 schools are assigned at a specific number position, and the rest of the schools are categorized into tiers. Also, schools are included in the top 25, 50, and 120 for the first time in different years. Based on these two factors, the main explanatory variable for this study was the combination of whether an institution is ranked and when a university or college is numerically ordered for the first time.

Table 4.1 reports the number of institutions by the institutional type (National Universities/National Liberal Arts Colleges) and ranking status (Ranked/Tiered). Among the total 1,304 universities and colleges that offer at least a BA degree, there were 199 National Universities and 134 National Liberal Arts Colleges. Between 1987 and 2009,

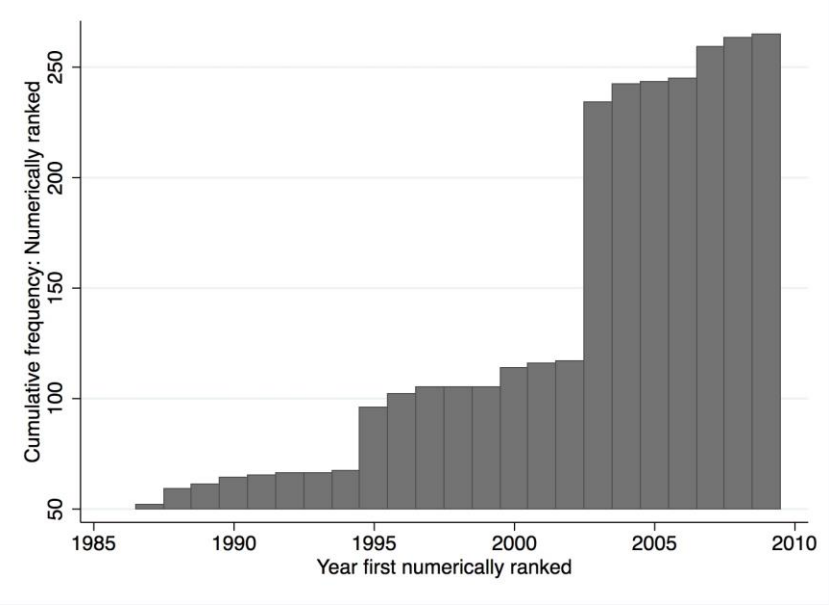
63.32% of the National Universities and 79.85% of the National Liberal Arts Colleges were numerically ranked. Changes from being grouped as a tier to being placed at a specific number occurred most frequently in 2003, when the numerical ranking was expanded from the top 50 to the top 120 (Figure 4.1). Among the ranked schools, 55.66% and 47.66% of National Universities and National Liberal Arts Colleges respectively were ranked for the first time after 2003.

An institution's distance from the ranking group cut-offs (e.g., Top 1, 25, 50, and 120) was measured in order to identify the margins. In this study, I defined margin as +/- 4 points from each cut-off, based on findings of previous research. Changes in the rankings often occur at +/- 4 points from the cut-offs (Dichev, 2001) and movements within 0-4 intervals from the cut-off points are due to statistical noise (Gnolek et al., 2014; Grewal et al., 2008). The descriptive statistics findings also provided support for this choice. Table 4.2 shows the average distance of an institution's ranking from each respective ranking group cut-off point. In particular, the within institution standard deviation indicates that an institution's ranking position relative to its ranking group only change within 1.45 to 5.13 points and 1.59 to 5.96 points at National Universities and National Liberal Arts Colleges, respectively. Furthermore, Figure 4.2 captures the average changes in the ranking position at different ranking groups. The mean and standard deviation presented in the graph indicate that an institution's ranking mostly changed by +/- 3 to 5 points at the ranking groups of Top 1-25 and 26-50; the ranges were bigger for the ranking groups of Top 51-120.[17]

[17] For some years, the maximum ranking exceeds 120. This is due to the USNWR approach to dealing with tied ranks. Schools that have the same total score are ranked at the same number, and the next ranking starts at the number that accounts for the number of tied schools. For example, if three schools were ranked at the top 118, the next rank would be 121, instead of 119.

Table 4.1 Descriptive statistics: Independent and control variables

Variables	All 4-year	National Universities		Liberal Arts Colleges	
		Ranked	Tiered	Ranked	Tiered
Number of Institutions	1,304	126 (63.32%)	73 (36.68%)	107 (79.85%)	27 (20.15%)
Private	815 (62.50%)	60 (47.62%)	12 (16.44%)	105 (98.13%)	26 (96.30%)
Year First Numerically Ranked: 1987-1994		32 (25.40%)		35 (32.71%)	
1995-2002		24 (19.05%)		21 (19.63%)	
2003-		70 (55.66%)		51 (47.66%)	
Total FTE	4706.52 (6530.10)	16532.32 (11194.88)	11450.71 (6261.41)	1688.02 (727.49)	1034.69 (514.18)
Observations	41,628	4,030	2,336	3,424	864
Total (N)	1,304	199		134	

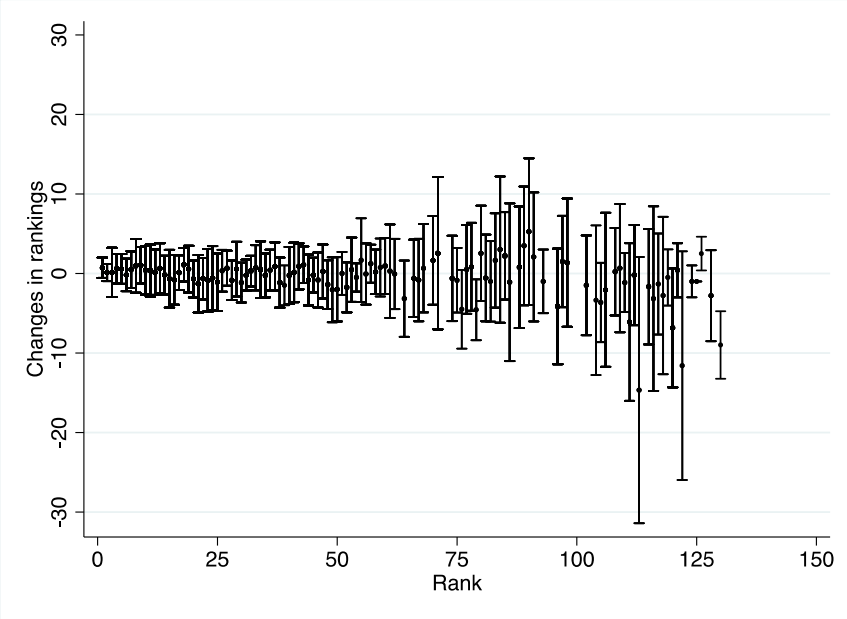


Note. The number of ranked institutions includes both National Universities and National Liberal Arts Colleges.

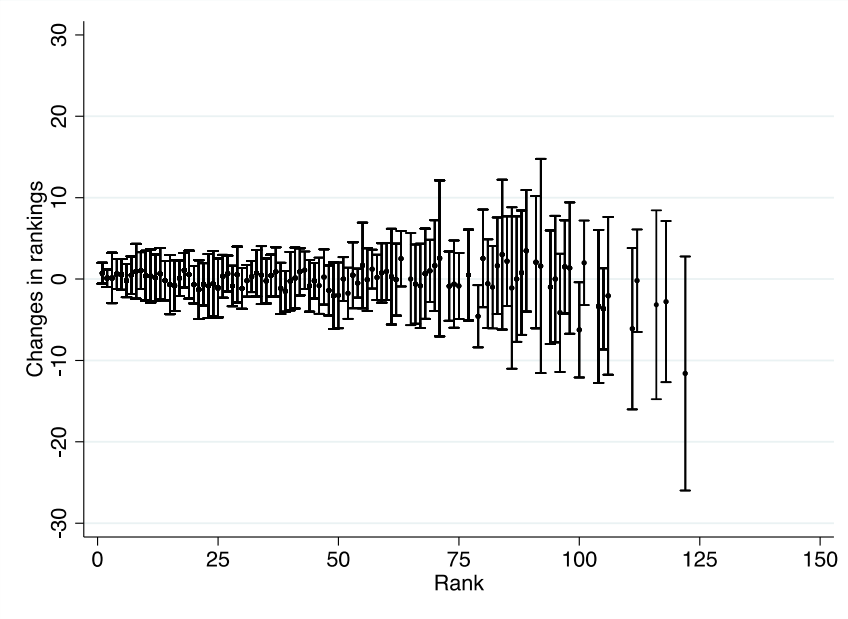
Figure 4.1 Expansion of numerical rankings

Table 4.2 Average changes in the ranking at different ranking group cut-off points

	National Universities					National Liberal Arts Colleges				
	All ranked	Top 1	Top 25	Top 50	Top 120	All ranked	Top 1	Top 25	Top 50	Top 120
Mean Distance (overall SD)	-.94 (13.66)	-5.34 (3.48)	1.18 (7.14)	-8.76 (15.44)	18.32 (10.08)	-.87 (13.59)	-5.41 (3.44)	1.29 (7.03)	-8.78 (14.84)	23.91 (7.90)
Standard Deviation Between Institutions	12.63	3.17	7.76	16.81	10.26	12.90	3.22	7.62	16.86	6.65
Standard Deviation Within Institution	9.37	1.45	2.38	3.55	5.13	9.40	1.59	2.98	4.12	5.96
Observations	1,397	286	470	446	195	1,246	285	451	377	133
Number of institutions	123	21	37	65	45	107	19	40	63	30



National Universities



National Liberal Arts Colleges

Figure 4.2 Average changes in positions by rank

Table 4.3 Ranking positions: Year-to-year changes

	National Universities: Ranked			National Liberal Arts Colleges: Ranked		
Year	Dropped	Maintained	Improved	Dropped	Maintained	Improved
1987	N/A	N/A	N/A	N/A	N/A	N/A
1988	11 (50.00)	0 (0.00)	11 (50.00)	7 (33.33)	2 (9.52)	12 (57.14)
1989	13 (54.17)	3 (12.50)	8 (33.33)	10 (41.67)	7 (29.17)	7 (29.17)
1990	14 (56.00)	2 (8.00)	9 (36.00)	9 (36.00)	4 (16.00)	12 (48.00)
1991	10 (31.25)	12 (37.50)	10 (31.25)	15 (46.88)	11 (34.38)	6 (18.75)
1992	12 (37.50)	10 (31.25)	10 (31.25)	9 (27.27)	13 (39.39)	11 (33.33)
1993	8 (25.00)	15 (46.88)	9 (28.12)	12 (35.29)	14 (41.18)	8 (23.53)
1994	9 (28.12)	12 (37.50)	11 (34.38)	10 (29.41)	13 (38.24)	11 (32.35)
1995	10 (31.25)	5 (15.62)	17 (53.12)	13 (37.14)	6 (17.14)	16 (45.71)
1996	23 (46.00)	7 (14.00)	20 (40.00)	21 (47.73)	6 (13.64)	17 (38.64)
1997	17 (30.91)	11 (20.00)	27 (49.09)	10 (22.22)	15 (33.33)	20 (44.44)
1998	22 (40.00)	13 (23.64)	20 (36.36)	18 (38.30)	12 (25.53)	17 (36.17)
1999	24 (43.64)	10 (18.18)	21 (38.18)	19 (40.43)	14 (29.79)	14 (29.79)
2000	19 (34.55)	17 (30.91)	19 (34.55)	18 (38.30)	11 (23.40)	18 (38.30)
2001	12 (21.43)	26 (46.43)	18 (32.14)	26 (47.27)	8 (14.55)	21 (38.18)
2002	14 (25.00)	20 (35.71)	22 (39.29)	20 (35.71)	16 (28.57)	20 (35.71)
2003	25 (44.64)	12 (21.43)	19 (33.93)	25 (44.64)	4 (7.14)	27 (48.21)
2004	45 (38.14)	17 (14.41)	56 (47.46)	44 (43.14)	17 (16.67)	41 (40.20)
2005	46 (37.70)	28 (22.95)	48 (39.34)	56 (53.85)	9 (8.65)	39 (37.50)
2006	49 (40.16)	21 (17.21)	52 (42.62)	44 (42.31)	22 (21.15)	38 (36.54)
2007	52 (42.28)	30 (24.39)	41 (33.33)	59 (57.84)	15 (14.71)	28 (27.45)
2008	42 (33.87)	30 (24.19)	52 (41.94)	42 (40.78)	24 (23.30)	37 (35.92)
2009	42 (33.33)	41 (32.54)	43 (34.13)	41 (39.05)	25 (23.81)	39 (37.14)

Notes. % in parentheses. The denominator is the total number of National Universities and National Liberal Arts Colleges that are ranked in the previous year and the respective year.

Finally, year-to-year changes in ranking positions were measured for ranked schools for all years following their first inclusion (Table 4.3). Across the analytic periods, the proportion of institutions that maintained and changed from the previous year's ranking varies. On average, 21.73% (ranged from 0 to 46%) of National Universities and 23.15% (ranged from 7 to 41%) of National Liberal Arts Colleges maintained the same rank; 37.50% (ranges from 21 to 56%) of National Universities and 39.93% (ranges from 22 to 48%) of National Liberal Arts Colleges observed a drop in their positions. 36.44% (ranges from 31 to 50%) of National Universities and 36.91% (ranges from 19 to 57%) of National Liberal Arts Colleges experienced an increase in the ranking position, compared to the previous year. In most recent years, the number of schools across the three categories became more balanced. For example, in 2009, the number of National Universities that maintained, dropped, and improved relative to their 2008 year's ranking was 41, 42, and 43, respectively (N=126); similarly, the numbers for National Liberal Arts Colleges that maintained, dropped, and improved relative to their 2008 year's ranking was 25, 41, and 39, respectively (N=105).

Control Variables. A number of school characteristics were controlled in the model. Private institutions comprised of about 47.62% of ranked National Universities, whereas almost all schools (98%) ranked National Liberal Arts Colleges were private. Ranked schools tended to be bigger in size than their tiered counterparts in the same category. For example, ranked National Universities had 16,532 FTE students on average, which was bigger than 11,451 FTE of tiered National Universities; FTE was larger for the ranked National Liberal Arts Colleges (1,688) compared to their tiered counterparts (1,035) (Table 4.1).

Dependent variables

Means and standard deviations of the dependent variables are summarized by ranking status in Table 4.4. For a better comparison, I calculated and reported the per FTE student expenses. Figures 4.2 – 4.4 capture the trends for each outcome throughout the analytic period by ranking status. I compared the trends between ranked and tiered institutions for National Universities and National Liberal Arts Colleges, respectively.

Table 4.4 Descriptive statistics: Dependent variables

		National Universities (N=199)		National Liberal Arts Colleges (N=134)	
	All 4-year Universities/ Colleges	Ranked	Tiered	Ranked	Tiered
Student selectivity					
Institutional grants and fellowships	4060.14 (4406.83)	4851.24 (4825.61)	1668.22 (1982.72)	9270.23 (4660.27)	7442.12 (4000.31)
Institutional aid: % receiving	63.33 (30.67)	52.37 (21.06)	44.93 (23.10)	72.37 (21.93)	90.43 (12.39)
Institutional aid: Average amount	8329.28 (6371.88)	11863.90 (8633.01)	4547.46 (2968.79)	18714.97 (6648.16)	11821.48 (4317.56)
Merit-based aid: % receiving	.16 (.20)	.13 (.16)	.12 (.13)	N/A	N/A
Merit-based aid: Average amount	1082.31 (1731.38)	1027.24 (1552.13)	456.97 (731.83)	N/A	N/A
Need-based aid: % receiving	.25 (.21)	.28 (.21)	.14 (.14)	N/A	N/A
Need-based aid: Average amount	1613.47 (2401.12)	2009.85 (2572.11)	323.75 (649.78)	N/A	N/A
Non-educational services	3892.85 (7026.03)	5842.19 (3896.07)	3401.88 (1780.81)	6818.33 (2672.99)	4834.85 (1810.76)
Financial Resources					
Total Education and General	27182.45 (78553.84)	49442.29 (39316.24)	26665.80 (13119.72)	36932.06 (14570.09)	27059.89 (9739.40)

Instruction	9463.75 (18106.12)	17514.64 (14586.26)	10447.33 (4909.02)	12171.2 (4936.37)	8130.52 (2791.94)
Academic Support	2341.93 (8896.26)	4290.52 (3935.41)	2534.26 (1897.80)	3059.39 (1709.68)	1885.75 (1115.13)
Student Services	2563.41 (20471.45)	2161.33 (1911.73)	1413.66 (809.99)	4167.40 (2053.82)	3629.17 (1628.06)
Research	2934.50 (17979.29)	10783.68 (14239.25)	3701.61 (4026.37)	747.99 (1067.79)	186.90 (321.70)
Faculty Resources					
Average faculty salaries and benefits	77433.09 (22955.31)	108872.4 (21285.11)	89054.98 (16974.38)	90346.54 (17817.52)	69507.2 (13458.5)
Total faculty	490.62 (745.77)	1930.53 (1385.66)	1104.62 (721.53)	182.94 (78.33)	108.03 (54.01)
Student-faculty ratio	.11 (.13)	.12 (.07)	.10 (.04)	.11 (.03)	.11 (.04)
% Full-time	.68 (.22)	.78 (.15)	.74 (.17)	.78 (.12)	.70 (.16)
% Tenured/ tenure track	.53 (.20)	.53 (.16)	.53 (.16)	.66 (.12)	.60 (.16)
% Professor	.30 (.12)	.40 (.09)	.33 (.10)	.37 (.09)	.36 (.13)

Student selectivity related expenditures. While National Liberal Arts Colleges tended to spend a more generous level of institutional fellowships and scholarships than National Universities, numerically ranked schools spent more on this area than non-numeric schools in the same ranking category. The per FTE student institutional grant was $ 4,851 and $ 1,668 for ranked and tiered National Universities, and $ 9,270 and $7,442 for ranked and tiered National Liberal Arts Colleges. Within all ranking categories, institutions increased expenditures on institutional fellowships over time, at a similar rate. Yet, the tiered National Universities observed an increase at a higher rate at the end of the 1990s and early 2000s (Figure 4.2, panel A).

How institutions distribute institutional scholarships within an institution also differed across the ranked and tiered National Universities and National Liberal Arts. In terms of the National Universities, ranked schools distributed fellowships to a relatively

greater number of students, and also gave away greater average amounts to each fellowship recipient. For National Liberal Arts Colleges, ranked colleges tended to distribute more fellowship money but to fewer students. All schools maintained a similar percent level of students receiving institutional aid, and tiered National Universities increased the number of students receiving institutional fellowships, yet maintained a stable trend in terms of the average amount granted to students. About 13% of students received merit-based aid both at ranked and tiered National Universities. However, the average amount of merit aid per recipient was higher at the ranked National Universities by $ 570. In case of need-based aid, both the percent of recipients and average amount received were higher at the ranked National Universities, compared to the tiered National Universities.[18]

[18] The same information is not available for National Liberal Arts Colleges due to the insufficient sample size.

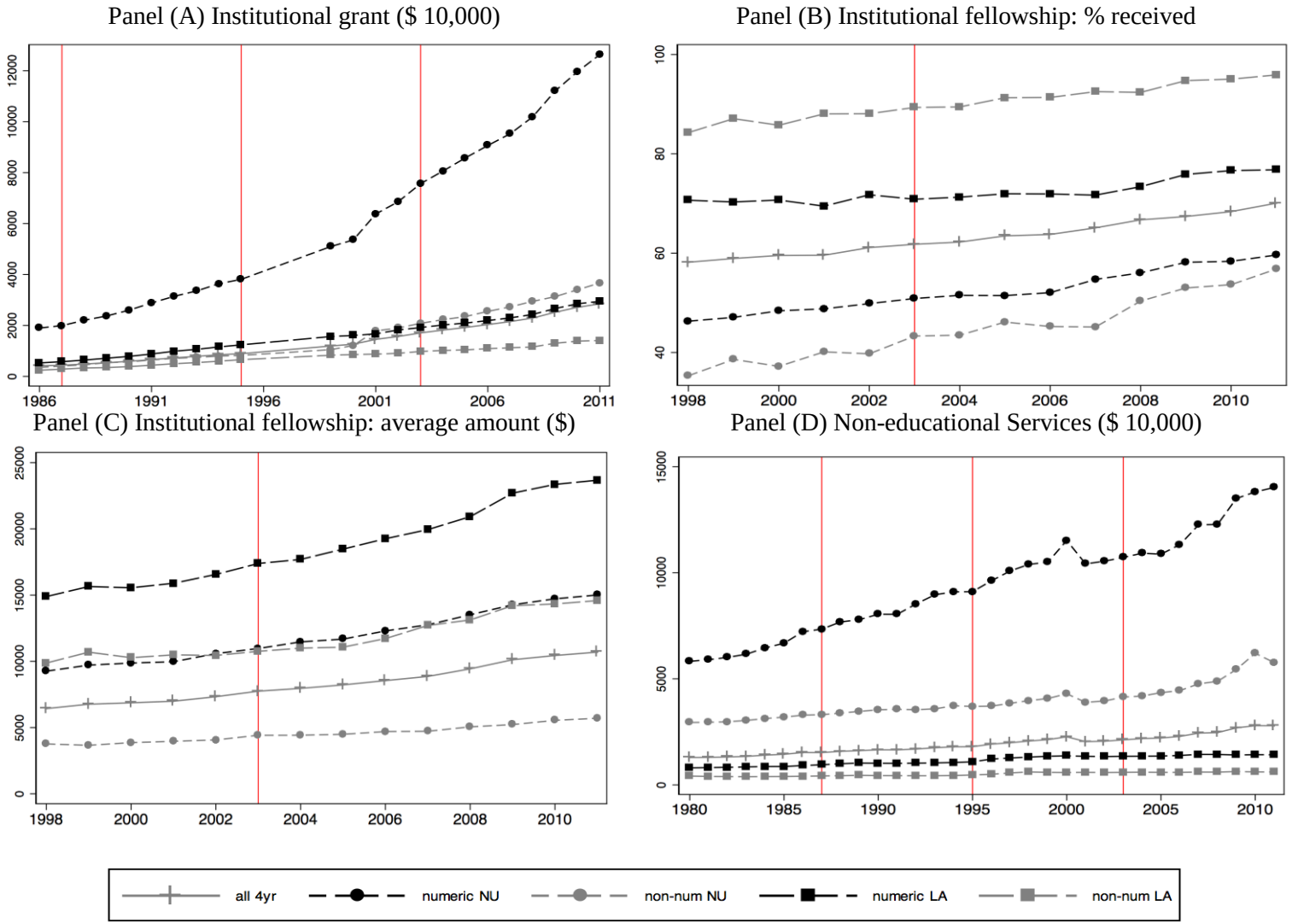
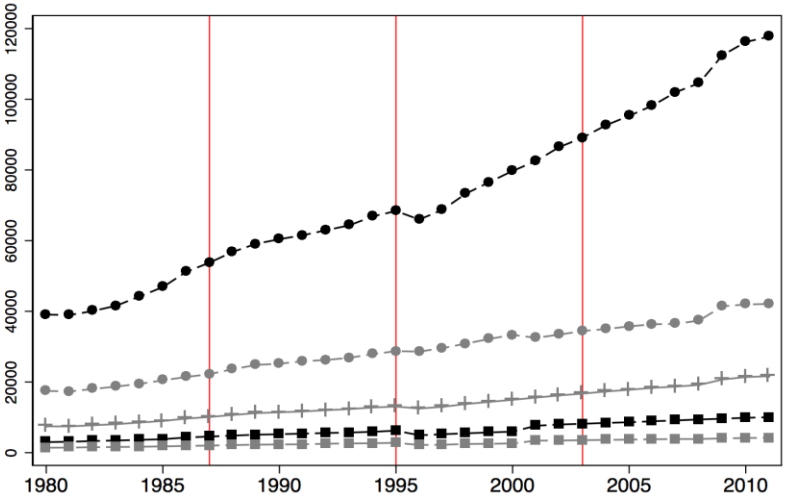


Figure 4.3 Trends in student selectivity related expenditures and outcomes

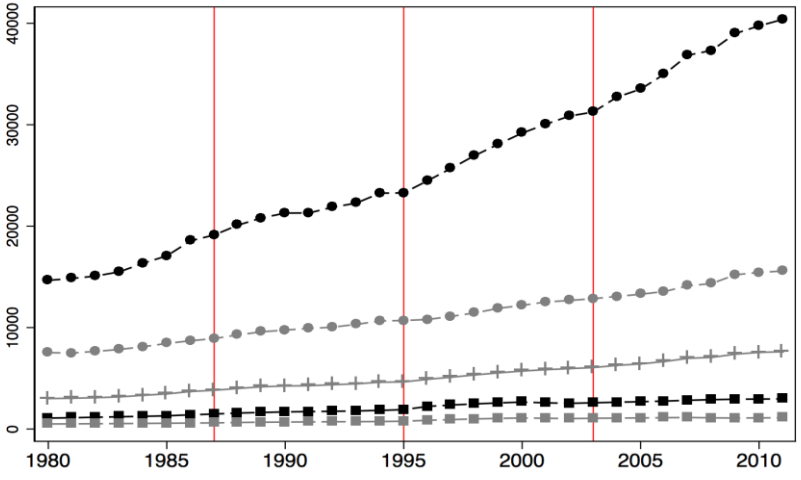
Finally, institutions that are ranked at the top 25, 50, and 120 tended to spend more on non-educational services, which include residential halls, food services, student health services, intercollegiate athletics, college unions and stores. This trend was stable, with a slight increase over the 32 years.

Financial resources related expenditures. On average, ranked schools had a higher level of total expenses that are related to the functions of education and research. While ranked National Universities and National Liberal Arts Colleges spent about $49,442 and $36,932 for each full-time equivalent student, tiered National Universities and National Liberal Arts Colleges spent about $27,000, which was close to the average educational and general expenses of all four-year colleges and universities. Among various activities, instructional expenses were mostly incurred. For National Universities, research, academic support, and student services followed the expenses on instruction in rank order. After instruction, National Liberal Arts Colleges spent more on student services, academic support, and research. The biggest difference between ranked and tiered schools were found in the category of research expenses. Tiered National Universities and National Liberal Arts Colleges had 34% and 25% of the research expenses of ranked National Universities and National Liberal Arts Colleges. All expenses showed an upward movement between 1980 and 2011, for all institutional groups (Figure 4.3).

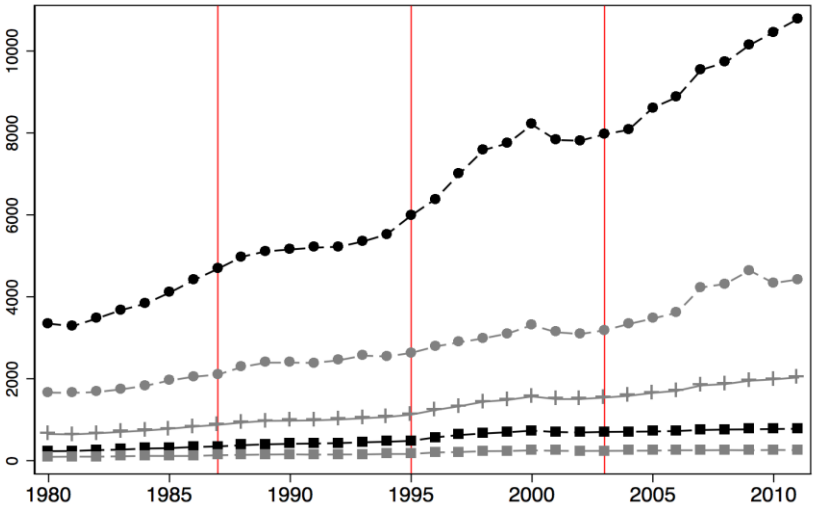
Panel (A) Total education and general ($ 10,000)



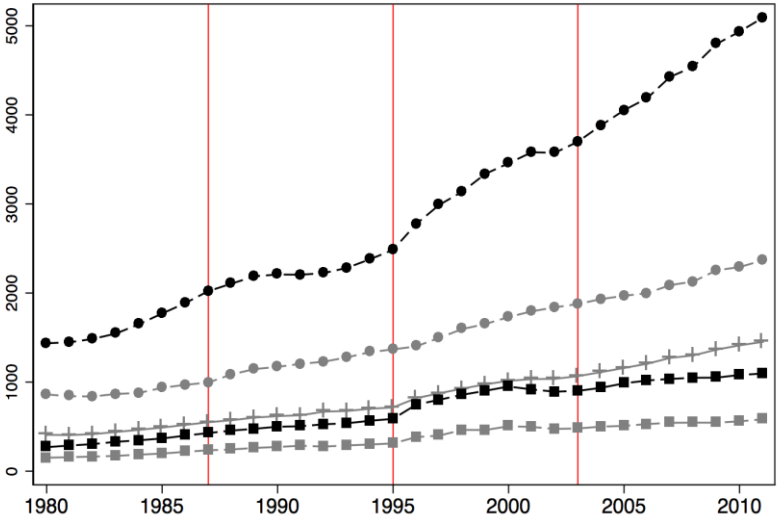
Panel (B) Instruction ($ 10,000)



Panel (C) Academic support ($ 10,000)



Panel (D) Student services ($ 10,000)



Panel (E) Research ($ 10,000)

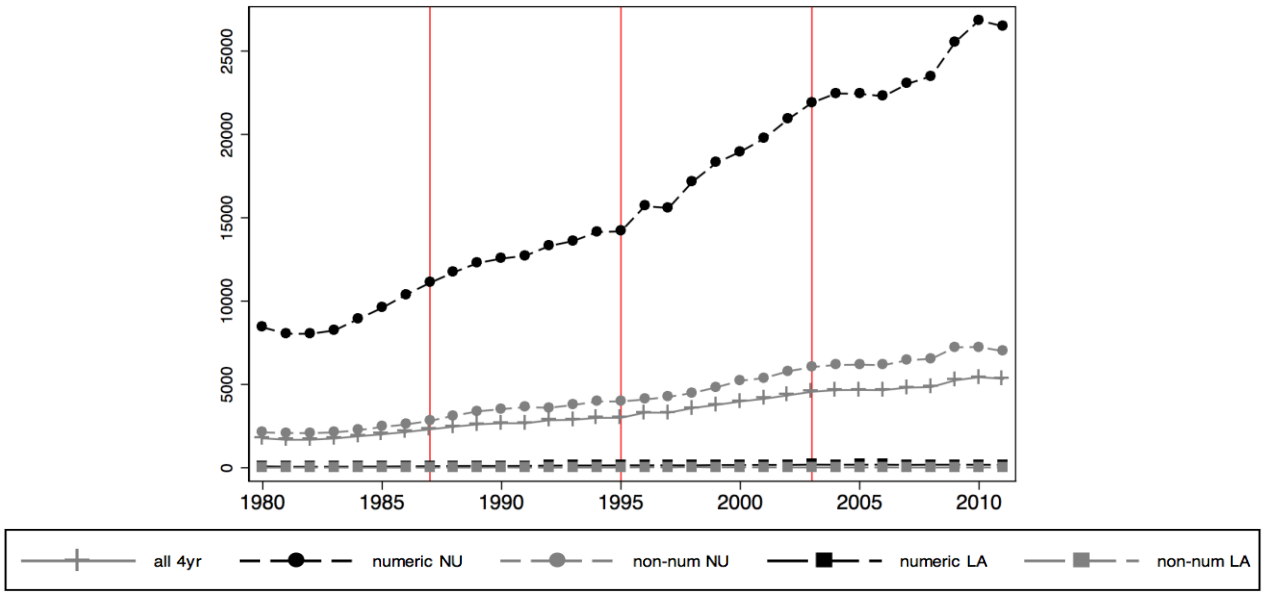
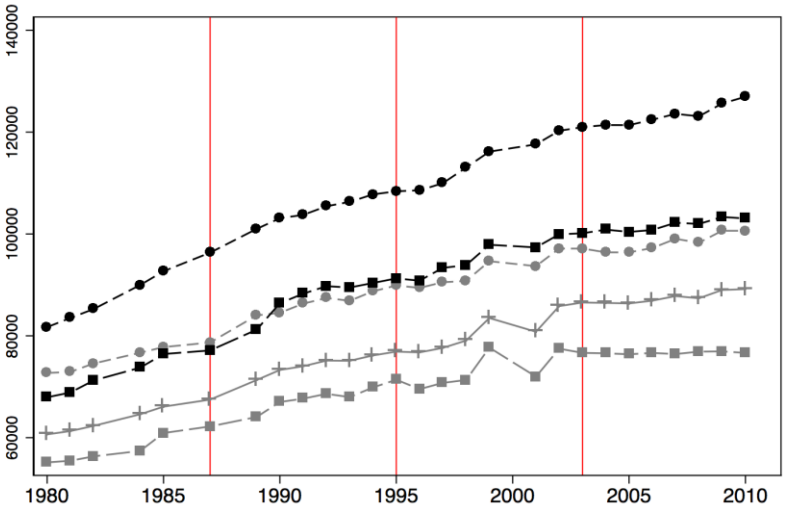
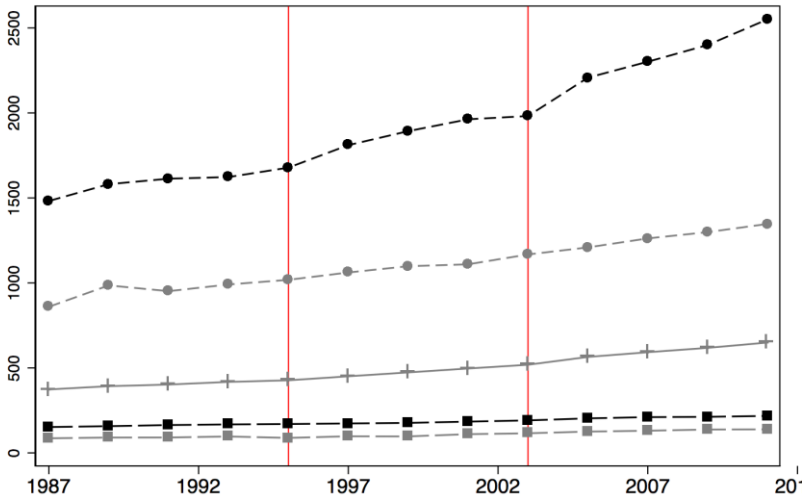


Figure 4.4 Trends in financial resources related expenditures

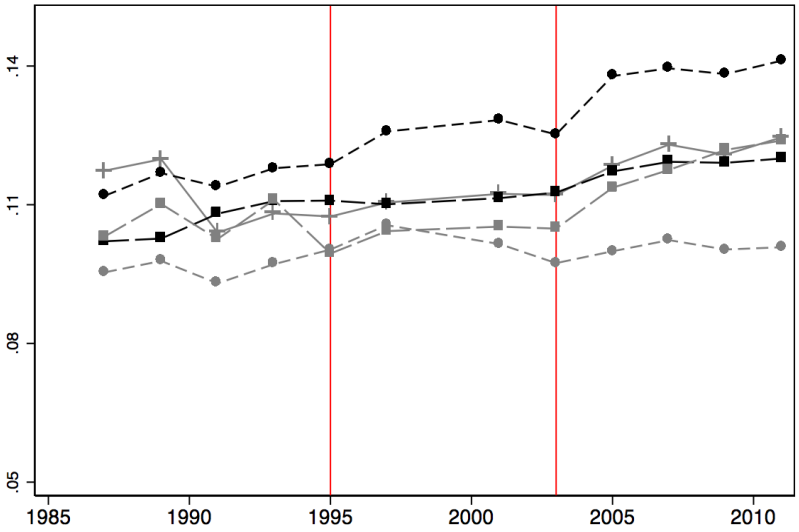
Panel (A) Average faculty salaries and benefits



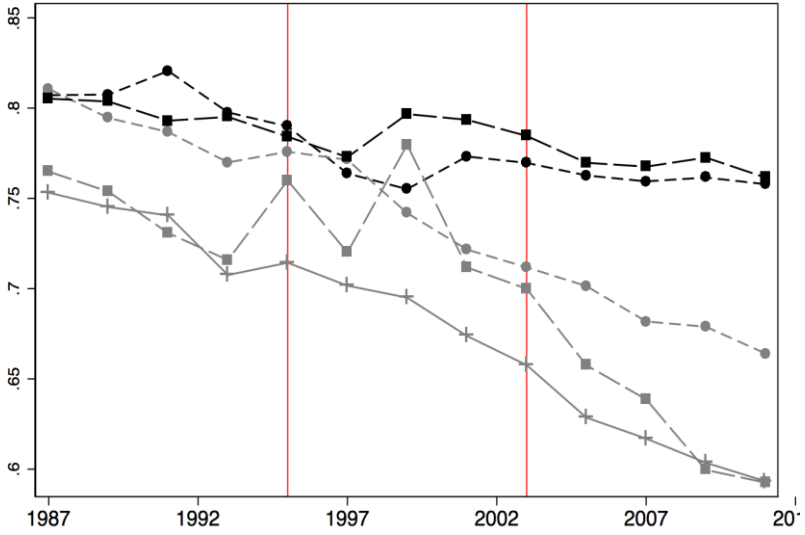
Panel (B) Total number of faculty



Panel (C) Student-faculty ratio



Panel (D) % of full-time faculty



Panel (E) % of tenured/tenure track faculty

Panel (F) % of professors

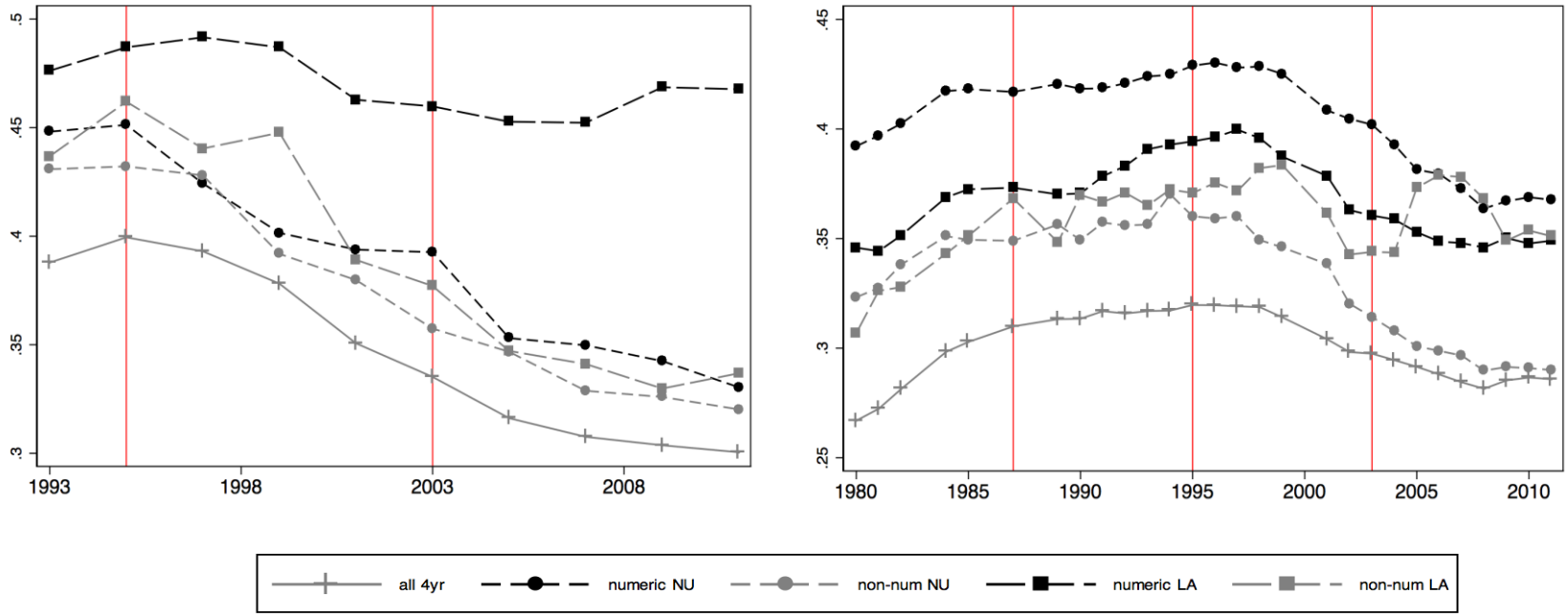


Figure 4.5 Trends in faculty resources related expenditure and outcome

Faculty resources related expenditures. Average salaries and benefits for faculty were higher at ranked institutions, and the gap between the ranked and tiered schools was bigger for National Liberal Arts Colleges than National Universities. While the average salaries and benefits for ranked National Liberal Arts Colleges was $90,347, that of tiered National Liberal Arts Colleges was $69,507, which was smaller than the average of all four-year institutions ($71,202). This, in part, might reflect different level of faculty compensation at private and public institutions. Faculty compensation increased between 1980 and 2000, and was flat afterwards (Figure 4.4).

In terms of faculty composition, the number of faculty was larger for the ranked institutions, reflecting the size of the institutions. The student-faculty ratio was similar across the different ranking categories, having 0.12 faculty per student. The proportion of faculty by full-time and tenure status, as well as position rank (professor) was higher at ranked schools, compared to their unranked counterparts. The share of full-time faculty among the total instructional staff has been maintained at ranked National Universities and National Liberal Arts Colleges, while the average for all four-year colleges and universities suggested a minor decrease over time. Tenured or tenure track faculty also have decreased at a similar rate for ranked and tiered universities. The proportion of professors among all academic staff increased until the end of 1990s, followed by a small decrease and a flat pattern in later 2000s.

Table 4.5 Effect of rankings on institutional expenditures: summary

	National Universities	National Liberal Arts Colleges
Dependent Variables	Explanatory variable: *Ranked*	
Student selectivity		
Institutional grants and fellowships	+	
Institutional aid: % receiving		
Institutional aid: Average amount		
Merit-based aid: % receiving	+	
Merit-based aid: Average amount		
Need-based aid: % receiving		
Need-based aid: Average amount		
Non-educational services		+
Financial resources		
Total Education and General	+	+
Instruction	+	+
Academic Support		+
Student Services		+
Research	−	
Faculty resources		
Average faculty salaries and benefits	+	+
Total faculty		−
Student-faculty ratio		
% Full-time	+	+
% Tenured/tenure track		+
% Professor		

Note. Indicates the sign of estimated coefficients. + and – present increases and decreases in the expenditures, respectively.
Summary based on the event-study specification and DD results.

Effect of Rankings on Institutional Expenditures: National Universities

Tables 4.6 through 4.8 present the differences-in-differences results for the national universities sample. Each table includes the estimated effect of rankings from the event specification (0-2 years and 3 or more years after the first inclusion), main specification (ranked vs. tiered), and robustness check using a different comparison group (ranked for the first time prior to 2003 vs. since 2003).[19]

Student selectivity related expenditures

Figure 4.5 presents estimates of the event study model for student selectivity related expenditures using the restricted (-5 / +10 year window) sample.[20] The figure presents the estimated effect of the numerical ranking (β_k in equation (2)) with 95% confidence interval. The key assumption of the difference-in-differences approach is that the time trend in expenditures at tiered universities (schools that were not numerically ranked) is what ranked universities (schools that were numerically ranked due to the changes in the ranking methodology) would have experienced were they not ranked. Although this assumption is untestable, the event-study specification allows us to examine the credibility to this assumption. Figure 4.5 indicates that changes in the ranking status (a movement from tiered to ranked) did not happen when expenditures were trending differently at ranked and tiered National Universities. The point estimates on the pre-ranked years were close to zero and not statistically significant. This finding gives some credibility to the key differences-in-differences assumption that both ranked

[19] I also estimated models with different control variables and fixed effects. The results from different specification are reported in the Appendix Table A1-A6.
[20] Event-study estimates using the full balanced panel (all years) and +/- 5-year windows were similar, though less precise. The results are reported in Appendix Figure A1-A6.

and tiered schools would have similar trends in the expenditures if not for the inclusion of the numerical rankings.

Second, Figure 4.6 shows how the impact of rankings on financial aid related variables develops over time. Following the changes in the ranking status, institutional grants and fellowships per FTE increases, while there was no change in the proportion of students receiving institutional aid and the average amount distributed to each recipient. The event-study estimates also suggest that the increase in institutional fellowship would happen immediately after an institution is ranked, then the effect disappears after 3 to 4 years. The level of expenditure on non-educational services was not related with the rankings.

To gain precision and to discuss the effect of rankings across many specifications, I present a differences-in-differences model that permits separate effects for the immediate (0, 1, and 2 years after ranked) and longer (3 to 10 years after ranked) time periods. Consistent with the event-study estimates, Panel (A) of Table 4.6 indicates that that rankings significantly affect institutional expenses in admissions related areas, particularly in institutional fellowships. After National Universities were ranked for the first time, schools increased expenditures in institutional aid in the subsequent years. The effect of rankings on total institutional fellowship amount lasted up to two years after the first inclusion, increasing the spending up to 16.6% (about $ 280 per student) during these years. The effect became insignificant three or more years after the first inclusion.

Broken down to specific aid type, numeric rankings encouraged institutions to provide more students with merit-based financial aid (increased by 7.2%), without

significant changes in the average amount received by each student. There was no statistically significant impact of rankings on need-based aid.

This pattern in financial aid practice is profound when I compare schools that were ranked for the first time after 2003 with their counterparts that were ranked prior to the 2003 expansion (Panel (C)). When the institution's position changed from inclusion in a tier to a specific numeric rank, schools that were ranked after 2003 increased the proportion of students receiving institutional aid by 3.3%, compared to their counterparts that were ranked before 2003. At the same time, the average amount distributed to institutional scholarship recipients decreased by 13.3%. Specific changes in the aid behavior included an increase in the proportion of merit recipients (14.6%), but a decrease in need-based aid recipients (by 9.9%) and the average need-based aid per recipient.

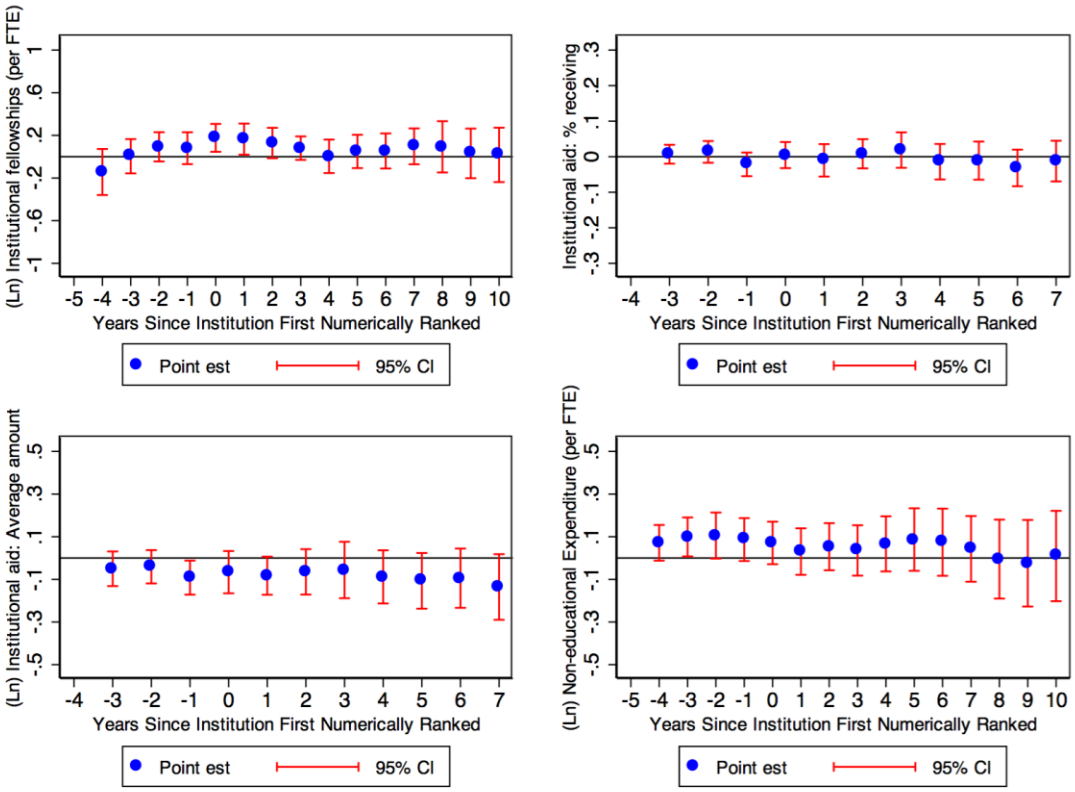


Figure 4.6 Event-study estimates of effect of rankings on admission related expenditures: National Universities

Notes. Graphs plot the point estimates from the event study model using the restricted (-5/+10 year window) sample. Institution sample includes 199 National Universities.

Table 4.6 Effect of rankings on admission related expenditures: National Universities

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel (A) Event-study analysis								
Dependent Variables	Institutional grants & fellowships	Institutional aid: % receiving	Institutional aid: Average amount	Merit-based aid: % receiving	Merit-based aid: Average amount	Need-based aid: % receiving	Need-based aid: Average amount	Non-educational services
0-2 years after ranked	0.166**	0.002	-0.033					-0.010
	(0.068)	(0.013)	(0.032)					(0.023)
3+ years after ranked	0.073	-0.008	-0.056					-0.021
	(0.089)	(0.021)	(0.054)					(0.049)
Panel (B) Differences-in-differences analysis								
Ranked	0.103	-0.004	-0.052	0.072**	-0.081	-0.020	-0.214	-0.018
	(0.083)	(0.017)	(0.041)	(0.031)	(0.222)	(0.037)	(0.266)	(0.038)
Observations	2,950	2,004	2,006	558	441	558	507	4,011
Number of institutions	199	170	170	165	164	165	164	199
Panel (C) Robustness check analysis								
Ranked	0.105	0.033**	-0.133***	0.146***	0.270	-0.099**	-0.587**	0.006
	(0.089)	(0.015)	(0.045)	(0.036)	(0.252)	(0.045)	(0.259)	(0.046)
Observations	1,460	1,101	1,101	369	285	369	343	1,780
Number of institutions	126	100	100	106	105	106	106	126

Notes. All specifications include school fixed effects and private-by-year fixed effects, and are restricted to 5 years before and 10 years after being ranked. Robust standard errors clustered by school in parentheses. *** p<0.01, **p<0.05, *p<0.1

Financial resources related expenditures

Figure 4.7 captures the event-study model estimates for financial resources related expenditures. Consistent with the assumption that an institution's ranking status was not altered when the expenses were trending differently, the point estimates on the pre-ranked years were close to zero and insignificant. Thus, the results provide some validity to the DD analyses, and the estimated effects in the post periods are induced by the numerical rankings.

The event-study estimates suggest that institutions would have a notable change in the total educational and general expenses, mirroring the changes in the instructional expenses. The changes in these expenditures started to emerge two years after a university was ranked, and the effect grew over time. Panel (A) of Table 4.7 captures this trend: the effect of rankings was larger three years after being ranked than immediately following. When National Universities were ranked for the first time, schools increased the total amount spent on educational and relevant activities by 4.9% in the following year (Panel (B)). To contextualize, this change translates into about additional $ 1,643 per FTE spending for each school.

For National Universities, most of this increase came from the increase in instruction (Column (2)), and the spending on instruction grew over time. After being ranked at top 25, 50, or 120 for the first time, institutions increased instructional expenses by 3.1% within two years, and 8.9% for three years and thereafter. Overall, this is about $ 851 per FTE increase every year. No changes occurred in student services and academic services expenditures. Being included in the numerical rankings lead to a 4.8% decrease in research, within a shorter period of time (0-2 years after ranked).

Yet, the results in Panel (C) indicate that rankings might not have a significant impact on expenditures on education, research, or other related activities for institutions that were ranked after 2003 (mostly ranked at the top 51-120), compared to their counterparts that were ranked before 2003 (mostly ranked at the top 50).

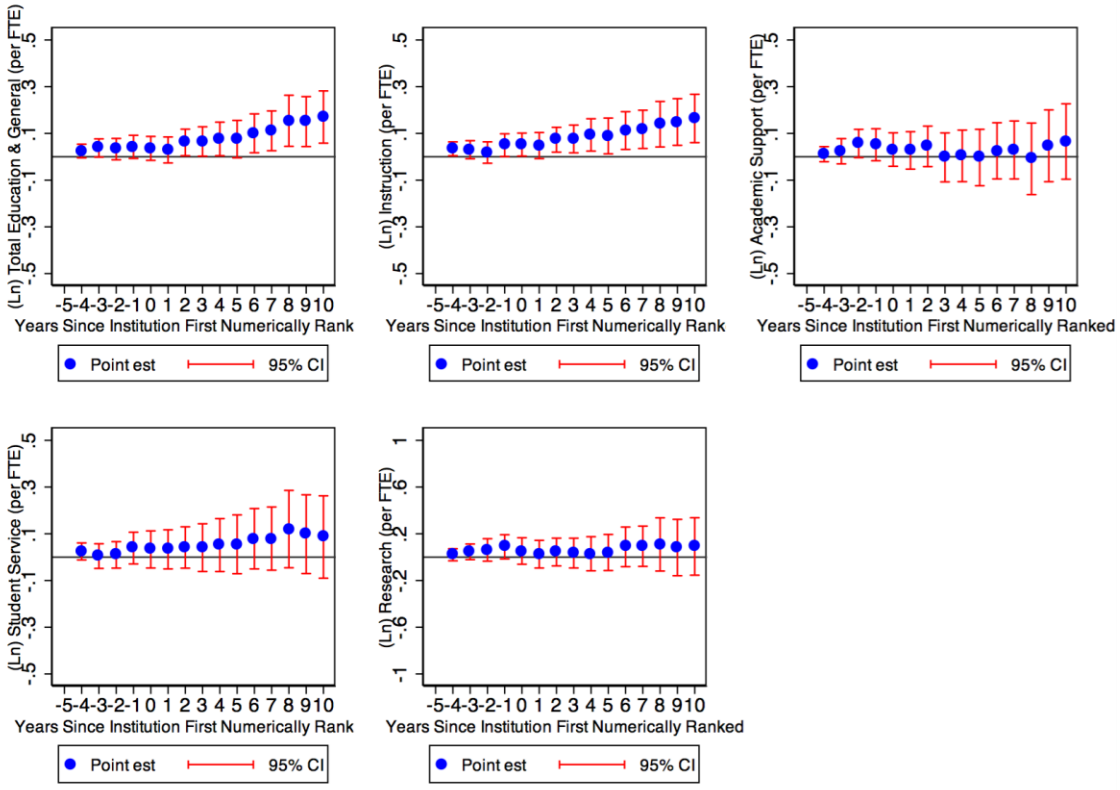


Figure 4.7 Event-study estimates of effect of rankings on financial resources related expenditures: National Universities

Notes. Graphs plot the point estimates from the event study model using the restricted (-5/+10 year window) sample. Institution sample includes 199 National Universities.

Table 4.7 Effect of rankings on financial resources related expenditures: National Universities

	(1)	(2)	(3)	(4)	(5)
Panel (A) Event-study analysis					
	Total Education and General	Instruction	Academic support	Student services	Research
0-2 years after ranked	0.007	0.031**	0.007	0.010	-0.048*
	(0.013)	(0.014)	(0.025)	(0.025)	(0.025)
3+ years after ranked	0.071**	0.089***	-0.009	0.043	-0.033
	(0.029)	(0.030)	(0.054)	(0.043)	(0.055)
Panel (B) Differences-in-differences analysis					
Ranked	0.049*	0.069***	-0.004	0.032	-0.038
	(0.023)	(0.024)	(0.042)	(0.034)	(0.042)
Observations	4,044	4,043	4,043	4,029	3,990
Number of institutions	199	199	199	199	198
Panel (C) Robustness check analysis					
Ranked	-0.016	-0.026	0.028	-0.021	-0.028
	(0.022)	(0.030)	(0.059)	(0.041)	(0.036)
Observations	1,781	1,780	1,780	1,766	1,771
Number of institutions	126	126	126	126	126

Notes. All specifications include school fixed effects and private-by-year fixed effects, and are restricted to 5 years before and 10 years after being ranked. Robust standard errors clustered by school in parentheses. *** p<0.01, **p<0.05, *p<0.1

Faculty resources related expenditures

Figure 4.7 and Table 4.8 indicate how institutions change resource allocations in the areas that are related with faculty as defined by the USNWR. The direct measures of faculty resources include faculty salaries and benefits, class-sizes, proportion of professors with the highest degree in their fields, student-faculty ratio, and full-time faculty. Figure 4.7 reports the event-study estimates for these outcomes. The graphs suggest that there was no pre-trend in faculty compensations and compositions between the ranked and tiered institutions. This suggests that faculty related variables would have trended similarly if the implementation or expansion of the numerical ranking were not happened. Thus, the DD estimated results would indicate the effect of rankings on the outcomes presented here.

Furthermore, the figure shows that student-faculty ratio, the proportion of tenured or tenure-track faculty, and the proportion of professors were not changed by rankings. The average faculty salaries and benefits increased 2 years after National Universities were numerically ranked, followed by a notable increase over 8 or more years. Demonstrated in Panel (A) of Table 4.8, the average faculty salaries and benefits increase by $ 5,880 for 3 or more years after an institution is ranked for the first time. On average, faculty salaries and benefits rose by $ 3,790 the year after an institution was numerically ranked. Since the average number of full-time instructional faculty at the ranked National Universities was 938, the average total salaries and benefits outlay would increase by about $ 3.6 million at each institution.

While rankings did not significantly change the total number of faculty and the student-faculty ratio, the proportion of full-time faculty across all institutions increased

by 3.1% for the two years after the first inclusion in USNWR, and by 7.8% over the period of three or more years (Panel (A), Column (4)). The composition of the faculty, in terms of the proportion of professors and the proportion of faculty who are tenured or on tenure track, did not change significantly due to the rankings.

When comparing the National Universities that were ranked before 2003 and schools ranked in 2003 and thereafter, rankings seemed to affect the average faculty salary and the proportion of faculty who are tenured or on tenure track. For the schools ranked after 2003, a change in the ranking status (tiered to ranked) was associated with a decrease in average salary by $ 4,160 and the proportion of tenured/tenure track faculty by nearly 8% (Panel (C)).

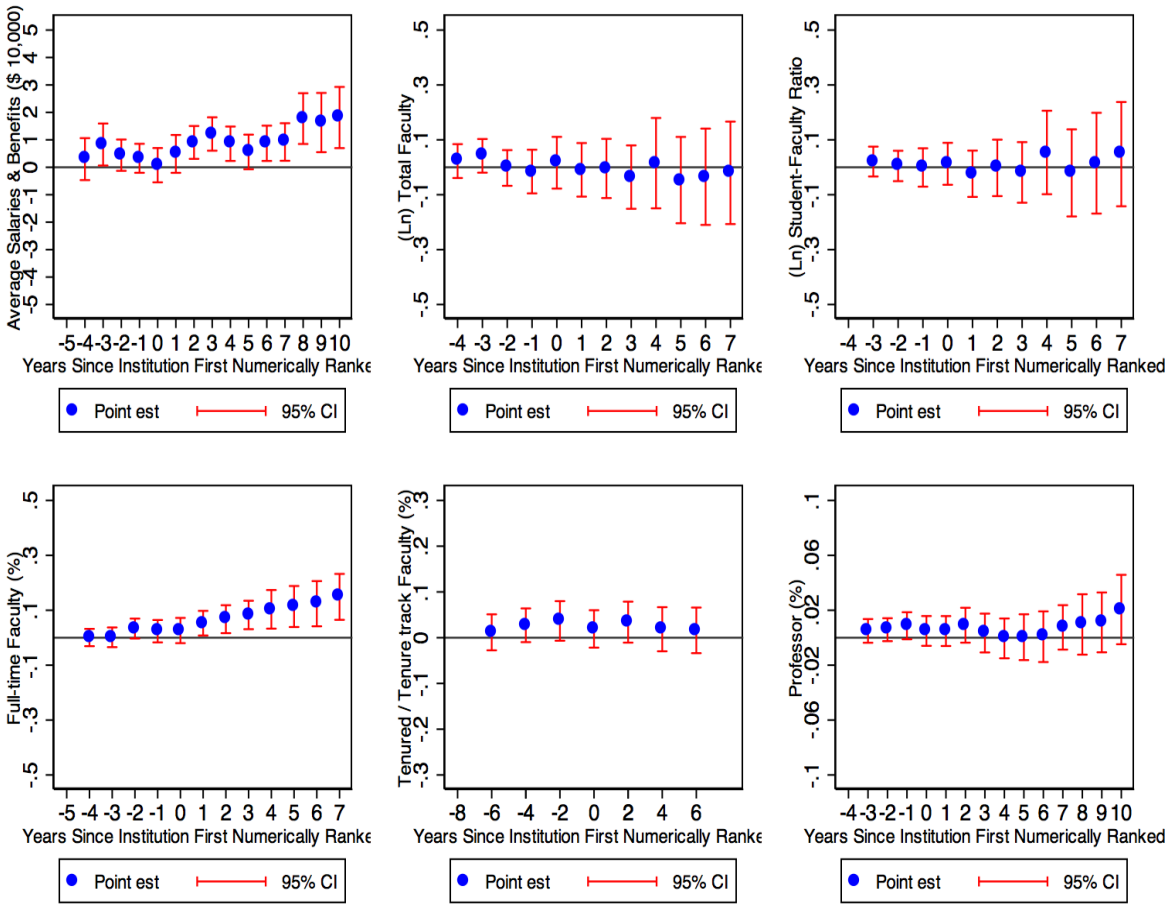


Figure 4.8 Event-study estimates of effect of rankings on faculty resources related expenditures: National Universities

Notes. Graphs plot the point estimates from the event study model using the restricted (-5/+10 year window) sample. Institution sample includes 199 National Universities.

Table 4.8 Effect of rankings on faculty resources related expenditures and outcomes: National Universities

	(1)	(2)	(3)	(4)	(5)	(6)
Panel (A) Event-study analysis						
	Average faculty salaries & benefits	Total faculty	Student-faculty ratio	% full-time	% tenured/ tenure track	% professor
0-2 years after ranked	-0.016	-0.012	-0.015	0.031**	0.007	0.002
	(0.210)	(0.031)	(0.030)	(0.013)	(0.012)	(0.011)
3+ years after ranked	0.588***	-0.038	-0.010	0.078***	-0.002	0.002
	(0.202)	(0.050)	(0.052)	(0.023)	(0.017)	(0.020)
Panel (B) Differences-in-differences analysis						
Ranked	0.379***	-0.016	-0.012	0.043***	0.003	-0.000
	(0.183)	(0.033)	(0.032)	(0.015)	(0.014)	(0.005)
Observations	3,565	1,784	1,782	1,784	1,192	3,546
Number of institutions	199	167	167	167	141	199
Panel (C) Robustness check analysis						
Ranked	-0.416*	-0.007	-0.054	-0.022	-0.084***	-0.002
	(0.237)	(0.046)	(0.045)	(0.020)	(0.023)	(0.011)
Observations	1,599	910	908	910	553	1,599
Number of institutions	126	94	94	94	70	126

Notes. All specifications include school fixed effects and private-by-year fixed effects, and are restricted to 5 years before and 10 years after being ranked. Robust standard errors clustered by school in parentheses. *** p<0.01, **p<0.05, *p<0.1

Effect of Rankings on Institutional Expenditures: National Liberal Arts Colleges

Figures and Tables 4.9 through 4.11 present differences-in-differences results on expenditures at National Liberal Arts colleges. Each table includes the estimated effect of rankings from the event specification (0-2 years and 3 or more years after the first inclusion), main specification (ranked vs. tiered), and robustness check using a different comparison group (ranked before 2003 vs. ranked in 2003 and thereafter).

Student selectivity related expenditures

Figure 4.9 presents the event-study specification results for student selectivity related expenditures using the restricted (-5 / +10 year window) sample. Each graph indicates that changes in the ranking status (a movement from tiered to ranked) did not happen when expenditures were trending differently at the ranked and tiered National Liberal Arts Colleges. The point estimates on the pre-ranked years were close to zero and not statistically significant at the 95% confidence level. Thus, it is assumable that the time path for the admission related outcomes experienced by tiered schools would be the time path of ranked schools if they were not numerically ranked.

The event-study specification results also suggested that schools do not alter institutional fellowships in response to rankings. Yet, the effect of rankings might take longer to emerge for specific aid behaviors. In particular, the average institutional grant amount changed 7 or more years after a Liberal Arts College was ranked. Moreover, the numerical rankings have a significant impact on the non-educational expenditure. The effect started to emerge two years after institutions were ranked first time, and the effect lasted over time.

Table 4.9 summarizes how numerical rankings impact institutional financial aid and non-educational services expenditures at Liberal Arts Colleges. Accounting for institutional and year related factors, institutional fellowship behavior did not change due to rankings at Liberal Arts Colleges. This result was consistent when comparing schools that were ranked after 2003 and before 2003 (Panel C).

Being assigned a numerical position in the ranking increased an institution's expenses related to non-educational services (e.g., residential halls, gyms, cafeterias, union building, etc.) by 4.8% (Panel B). Given that the average per FTE expenditure on this area is about $ 5,908, expenditures increase about $ 284 per student every year once a Liberal Arts College was ranked. The increase develops beginning three or more years after being numerically ranked for the first time (6.4%) (Panel A, Column (4)). When I employed a different counterfactual, no significant difference was found in non-educational expenses between the schools ranked prior to 2003 and schools ranked after 2003.

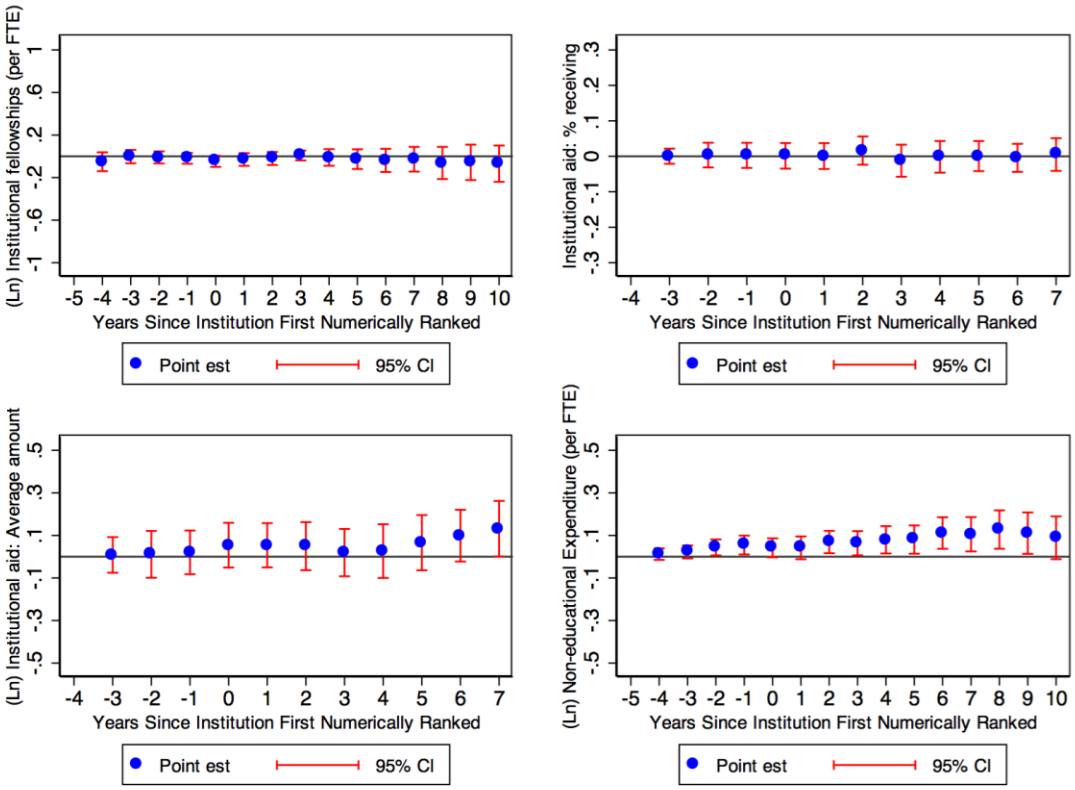


Figure 4.9 Event-study estimates of effect of rankings on admission related expenditures: National Liberal Arts Colleges

Notes. Graphs plot the point estimates from the event study model using the restricted (-5/+10 year window) sample. Institution sample includes 134 National Liberal Arts Colleges.

Table 4.9 Effect of rankings on admission related expenditures: National Liberal Arts Colleges

	(1)	(2)	(3)	(4)
Panel (A) Event-study analysis				
Dependent Variables	Institutional grants & fellowships	Institutional aid: % receiving	Institutional aid: Average amount	Non-educational services
0-2 years after ranked	-0.003	0.004	0.043	0.022
	(0.037)	(0.012)	(0.029)	(0.018)
3+ years after ranked	0.002	-0.005	0.056	0.064**
	(0.061)	(0.016)	(0.043)	(0.030)
Panel (B) Differences-in-differences analysis				
Ranked	-0.000	0.001	0.057	0.048**
	(0.050)	(0.014)	(0.037)	(0.024)
Observations	1,786	1,233	1,235	2,350
Number of institutions	134	107	108	134
Panel (C) Robustness check analysis				
Ranked	0.046	0.012	0.039	-0.032
	(0.039)	(0.019)	(0.037)	(0.032)
Observations	1,222	885	887	1,517
Number of institutions	107	80	81	107

Notes. All specifications include school fixed effects and year fixed effects, and are restricted to 5 years before and 10 years after being ranked. Robust standard errors clustered by school in parentheses. *** p<0.01, **p<0.05, *p<0.1

Financial resource related expenditures

Figure 4.9 and Table 4.10 indicate how rankings change institutions' allocation to education and research related activities. The estimates from the event-study specification suggest that the ranked and tiered Liberal Arts Colleges were trending similarly when they were not numerically ranked. For the periods prior to the introduction of numerical rankings, the relationship between being ranked and all educational related expenses was zero and insignificant. Thus, I argue that the changes in the ranking status were not happening when the expenditures were trending differently at the ranked and tiered schools.

The figure also depicts that the numerical ranking increases all education and general expenses, except research spending. The impact seems to develop immediately after schools are ranked for the first time. Table 4.10 reports the size of these changes. A numeric ranking is associated with a 5.9% increase in the total expenses on educational and general activities at Liberal Arts Colleges (Panel B, Column (1)). The average increase was about 4% within two years, and 7.2% after three or more years (Panel A, Column (1)). The specific areas that institutions expanded were academic support (7.7%), followed by instruction (7.4%) and student services (5%) (Panel B). Taken together, this would be an approximately $ 1,900 increase in overall educational and general expenses per FTE student, which includes an additional $ 770 in instruction, $182 in academic support, and $ 180 in student services per year.

The increases started to emerge 0-2 years after being ranked, and continued after three or more years: academic support expenditure increased by 5.6% in the short term (0-2 years) and by 9% after three or more years. Similarly, instructional expenditures

increased by 4.8% and 8.9% in 0-2 years and 3+ years after being ranked, respectively. The effect of numerical rankings on student services lasted only for the first two years (Panel A).

Among the numerically ranked institutions, National Liberal Arts Colleges that were ranked before 2003 (mostly the top 50) and colleges that were ranked after 2003 (mostly the top 51-120) were not different in terms of the total amount for education and general expenses. However, schools that were ranked in 2003 and thereafter in the top 51-120 decreased instructional expenses by 3.4% but increased student services expenses by 9.2% following the changes in the ranking status (Panel C, Columns (2) and (4)).

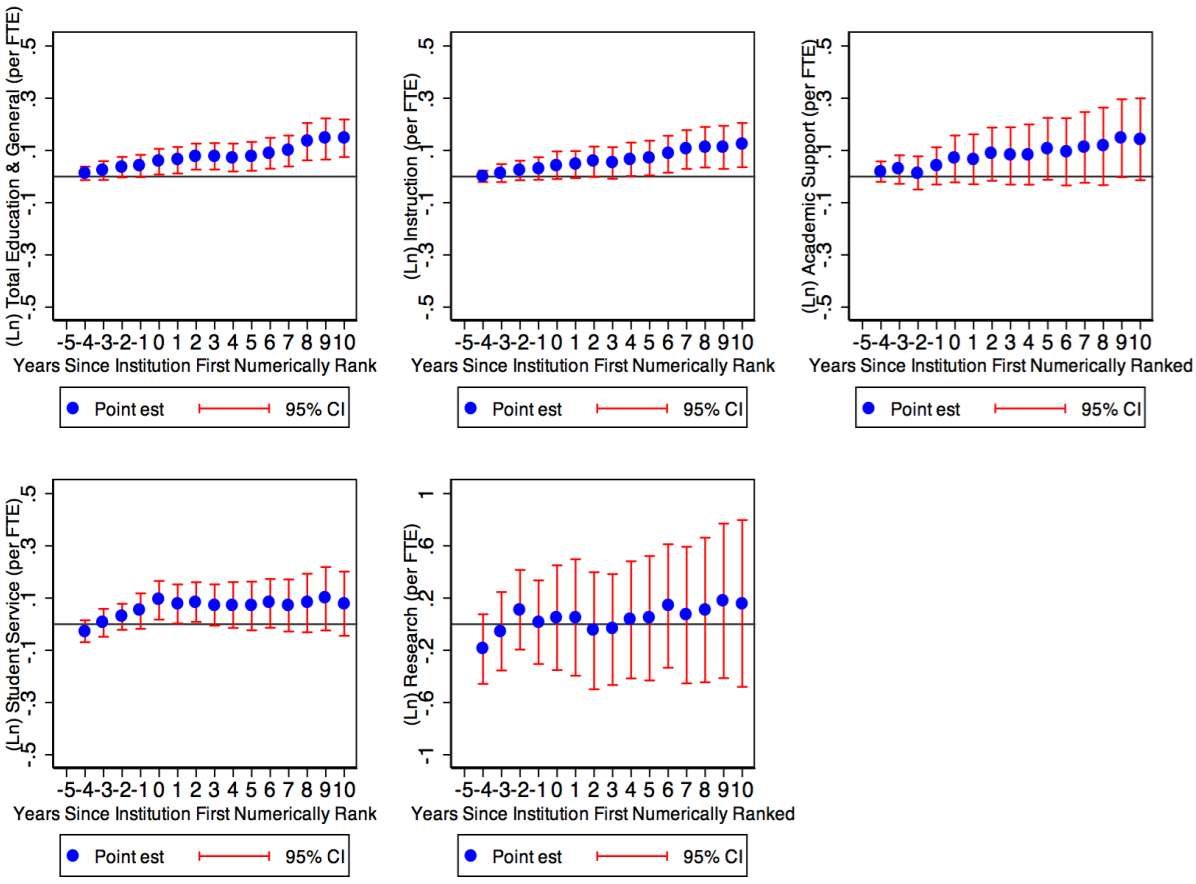


Figure 4.10 Event-study estimates of effect of rankings on financial resources related expenditures: National Liberal Arts Colleges

Notes. Graphs plot the point estimates from the event study model using the restricted (-5/+10 year window) sample. Institution sample includes 134 National Liberal Arts Colleges.

Table 4.10 Effect of rankings on financial resources related expenditures: National Liberal Arts Colleges

	(1)	(2)	(3)	(4)	(5)
Panel (A) Event-study analysis					
	Total Education and General	Instruction	Academic support	Student services	Research
0-2 years after ranked	0.038***	0.048***	0.056**	0.057***	0.089
	(0.012)	(0.013)	(0.025)	(0.021)	(0.130)
3+ years after ranked	0.072***	0.089***	0.090**	0.045	0.178
	(0.017)	(0.023)	(0.041)	(0.032)	(0.162)
Panel (B) Differences-in-differences analysis					
Ranked	0.059***	0.074***	0.077**	0.050**	0.137
	(0.014)	(0.018)	(0.034)	(0.027)	(0.135)
Observations	2,378	2,378	2,365	2,375	1,503
Number of institutions	134	134	134	134	99
Panel (C) Robustness check analysis					
Ranked	0.001	-0.034*	-0.062	0.092**	0.005
	(0.025)	(0.020)	(0.047)	(0.044)	(0.202)
Observations	1,541	1,541	1,528	1,538	1,207
Number of institutions	107	107	107	107	84

Notes. All specifications include school fixed effects and year fixed effects, and are restricted to 5 years before and 10 years after being ranked. Robust standard errors clustered by school in parentheses. *** p<0.01, **p<0.05, *p<0.1

Faculty resources related expenditures

Figure 4.10 captures the correlations between the numerical rankings and faculty resources outcomes at 5 years prior to and up to 10 or more years after being ranked. The estimated coefficients were not different from zero; this indicates that the trends in faculty compensations and compositions were parallel between the ranked and tiered Liberal Arts Colleges, and the time trend in the pre-ranked period might have continued if all colleges were not numerically ranked. This provides some evidence that the DD analyses employing ranked and tiered status as treated and counterfactual are fairly credible for estimating the effect of rankings on the faculty resources outcomes.

Moreover, the graphs suggest a constant increase in average salaries and benefits as well as increase in the proportion of full-time faculty and tenured/tenure track faculty following immediately after an institution's inclusion in the rankings. Panel A of Table 4.11 reports this trend from the event study specification estimates. Following a numerical ranking, the average amount of salaries and benefits increased by $ 3,820 within two years and by $ 6,060 after 3 or more years. The average number of full-time instructional faculty at the ranked National Liberal Arts Colleges is about 133, this increase would require an extra $ 508,060 each year.

While the total number of faculty slightly decreased for a short term (4%), student-faculty ratios did not change. The proportion of full-time instructional faculty increased by about 4% within two years, and 7.9% after an institution was ranked numerically (Panel A, Column (3)). The proportion of faculty who are tenured or on tenure track also increased by 4.8% within two years, and by 9.2% three or more years

after a campus was ranked. Yet, faculty composition, measured through academic rank, was not affected by rankings.

The comparison among the ranked National Liberal Arts Colleges suggested that the effect of numerical rankings on faculty compensation was not different for the National Liberal Arts Colleges that were ranked before and after 2003. Yet, the schools ranked after 2003 tended to have a lower proportion of tenured/tenure track faculty (about 4.6%) but a higher proportion of professors (2.3%) after receiving a numerical order (Panel C, Columns (4) and (5)).

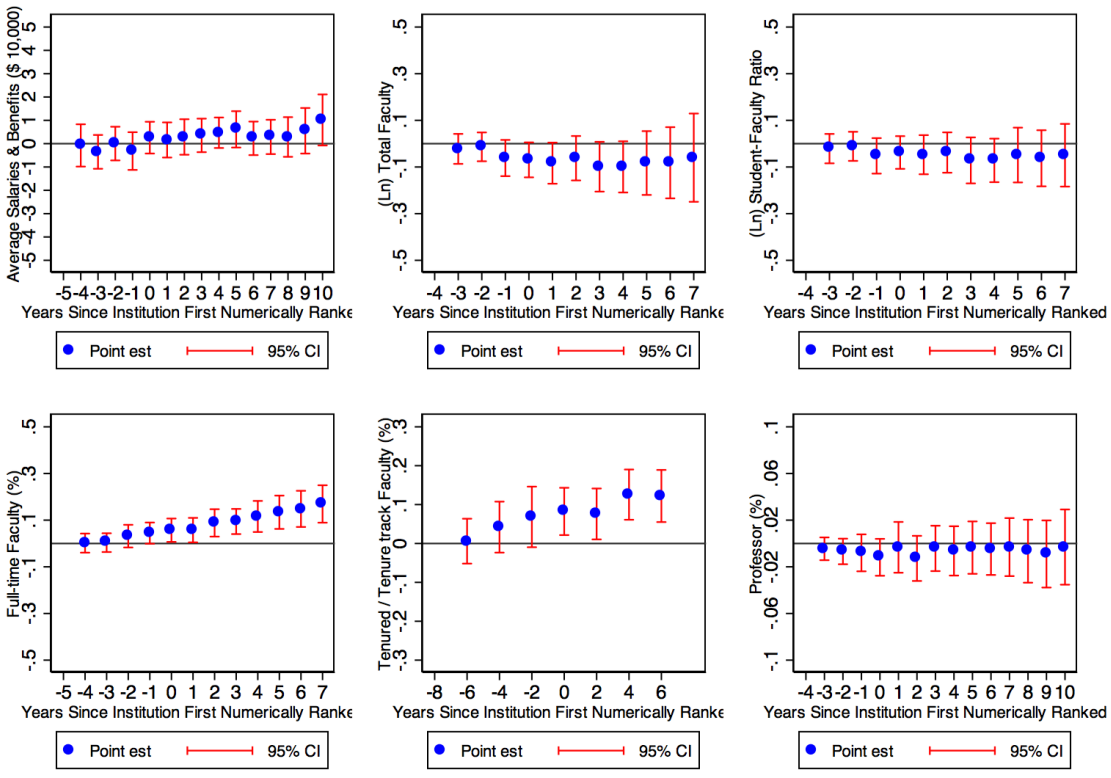


Figure 4.11 Event-study estimates of effect of rankings on faculty resources related expenditures: National Liberal Arts Colleges

Notes. Graphs plot the point estimates from the event study model using the restricted (-5/+10 year window) sample. Institution sample includes 134 National Liberal Arts Colleges.

Table 4.11 Effect of rankings on faculty resources related expenditures and outcomes: National Liberal Arts Colleges

	(1)	(2)	(3)	(4)	(5)	(6)
Panel (A) Event-study analysis						
	Average faculty salaries & benefits	Total faculty	Student-faculty ratio	% full-time	% tenured/ tenure track	% professor
0-2 years after ranked	0.382**	-0.040*	-0.022	0.040***	0.048***	-0.006
	(0.167)	(0.024)	(0.022)	(0.014)	(0.020)	(0.019)
3+ years after ranked	0.606***	-0.044	-0.030	0.079***	0.092***	0.000
	(0.197)	(0.040)	(0.031)	(0.018)	(0.025)	(0.031)
Panel (B) Differences-in-differences analysis						
Ranked	0.520***	-0.042*	-0.028	0.048***	0.073***	-0.002
	(0.162)	(0.024)	(0.024)	(0.015)	(0.022)	(0.008)
Observations	2,099	1,018	1,018	1,018	619	2,022
Number of institutions	134	99	99	99	75	132
Panel (C) Robustness check analysis						
Ranked	0.248	-0.051	-0.032	-0.020	-0.046**	0.023**
	(0.236)	(0.046)	(0.031)	(0.023)	(0.021)	(0.012)
Observations	1,372	694	694	694	385	1,334
Number of institutions	107	72	72	72	49	105

Notes. All specifications include school fixed effects and year fixed effects, and are restricted to 5 years before and 10 years after being ranked. Robust standard errors clustered by school in parentheses. *** p<0.01, **p<0.05, *p<0.1

Summary

This chapter addressed the first research question: *How do rankings affect institutional expenditures in the areas that rankings emphasize, particularly student selectivity, financial resources, and faculty resources over time?* Using the changes in the USNWR—the expansion of the numerical rankings—as a treatment, I estimated the causal impact of college rankings on institutional expenses that are related with the ranking measurements. Particularly, expenditures associated with student selectivity, educational resources, and faculty resources were analyzed. How National Universities and National Liberal Arts Colleges react to rankings differently were estimated.

The results from this chapter supported the hypothesis based on the institutional theory. The numerical positions allow colleges and universities to compare their relative positions to their peers and to the benchmarks. To achieve a better position, institutions increased expenditures in the three areas that rankings measure. In particular, increase in these expenditures cost National Universities an average of $ 27 million and National Liberal Arts Colleges about $ 4 million per year.[21] Considering that there are other expenditures not captured in this study (e.g., marketing and outreach), the cost associated with ranking behavior might be even higher. Institutions respond to some expenses immediately after the respective schools are ranked, while other changes in other expenditure develop after a longer period of time.

The changes in the resource allocation due to rankings were different between the National Universities and National Liberal Arts Colleges. While USNWR uses the same

[21] Calculation based on the number of FTE undergraduate student and full-time instructional faculty at the ranked National Universities (12,364 and 938, respectively) and at National Liberal Arts Colleges (1,571 and 133, respectively).

criteria and weights for the National Universities and National Liberal Arts Colleges, particular expenses and the degree to which schools make changes differed between the two groups. Once the institution was numerically ranked, National Universities increased institutional grant and fellowship expenditures, providing more students with merit-based aid. Yet, the significant increase due to the ranking in student selectivity related expenditures continued only for a short time. Meanwhile, National Liberal Arts Colleges increased expenditures in non-educational services when their respective institutions were ranked in the top 25, 50, and 120. The effect of rankings on non-educational services took longer time to emerge (3 or more years after being ranked).

In response to rankings, both National Universities and National Liberal Arts Colleges constantly increased what USNWR measures as resources for educational activities. For National Universities, rankings constantly increased the total amount spent on educational activities, and the increased amount was mostly directed to costs of instruction. It is also notable that research expenditures of National Universities decreased as the institution was numerically ranked. On the other hand, the increase in the total educational and general expenses for National Liberal Arts Colleges was attributable to the escalated spending in academic support, instructions, and student services.

The results for faculty resources suggested that rankings affect faculty compensations at both National Universities and National Liberal Arts Colleges. In terms of faculty composition, the proportion of full-time faculty increased over time. National Liberal Arts Colleges also boosted the proportion of tenured or tenure track

faculty, and this change was bigger for three or more years after the initial numerical ranking.

Previous research has argued that institutions would increase spending in research in pursuit of prestige (Brewer et al., 2002; Morphew & Baker, 2004). Yet, the analysis from this study found a contradiction trend: National Universities decreased research expenditure immediately after the school was ranked for the first time (within 0-2 years), accounting for the time specific context such as decrease in federal and foundation funding priorities. This finding might be related to the definition and operationalization of prestige in the existing research (e.g., Carnegie classification) and rankings. Also, understanding how funding for research activities is acquired and distributed within an institution would help explain this finding.

Overall, rankings affect colleges and universities through the hierarchical numerical order and a set of measurements. Yet, institutional responses to rankings might be more complex as USNWR specifies ranking groups and the numerical positions change every year. The arbitrary groupings might create different motivation and behaviors for the schools that try to maintain their membership within their current group or institutions that aim to move into the next most prestigious group. The volatility in the rankings might serve as a feedback system that institutions attend to and alter their resource behaviors in the following year. The next chapter will address the results of the second and third sub-questions and explain how these dimensions differentiate the effect of rankings on colleges and universities.

Chapter 5

HETEROGENEOUS EFFECTS: LOCATIONS AND YEAR-TO-YEAR CHANGES IN THE RANKINGS

In the previous chapter, I investigated the effect of numerical rankings on institutional expenses and faculty composition, in relation to the USNWR measurements. In particular, how resource allocation changes in the three major areas that USNWR emphasizes—student selectivity, financial resources, and faculty resources—was analyzed. National Universities and National Liberal Arts Colleges increased expenses that were related to these areas, and the growth in selectivity and financial resources related expenditures followed immediately after the first time that institutions were numerically ranked. Faculty related strategies took a longer time to appear. These findings support the hypothesis based on institutional theory. That is, the numerical positions allow colleges and universities to compare their relative positions to their peers and to the benchmarks. To achieve a better position, institutions change their resource allocations in a way that conforms to what rankings measure and weight heavily.

Meanwhile, the status-based model explains that all institutions might not have the same level of motivation and capability for changing the resource allocation. Thus, the level of institutional reactivity differs across the rankings. As being in a particular ranking group (e.g., Top 1, 25, 50, and 120) signifies the preeminence of an institution in relation to its competitors, going up the ladder or maintaining its position in the ranking

groups becomes important. From this perspective, schools near the margins of the ranking groups would conform to rankings more aggressively than institutions that are far from the margins.

This chapter presents findings regarding how an institution's position from the ranking group cut-offs influences the school's resource allocations. I identified whether an institution was located at the upper or lower margins of a ranking group (Top 1-25, 26-50, and 50-120). I examine how institutions that are trying to maintain their membership within their current group or institutions that are trying to move into the next most prestigious group would behave differently compared to other ranked institutions. While previous research showed that changes in the rankings across different cut-off points are difficult to achieve (Dichev, 2001), and movements within 0-4 intervals from the cut-off points are due to statistical noise (Gnolek et al., 2014; Grewal et al., 2008), the heterogeneous effect of rankings for institutions ranked at the margins will further explain how institutions respond to the arbitrary groupings of rankings.[22]

Another important feature of the ranking system is volatility. Thus, an institution's ranking position will fluctuate year-to-year. Universities might perceive that changes in institutional rankings, particularly a drop from their original positions, are directly related to their legitimacy and have significant consequences for the respective institution. Therefore, schools will direct their resources to the areas that rankings weigh most heavily in order to improve or maintain their positions. On the other hand, improvement in the ranking position might function as positive feedback and incentivize

[22] I also analyzed the heterogeneous effect rankings by the distance to the cut-offs using an institution's position in the first year ranked, as well as the average distance for the first three years since ranked. The results from these models were qualitatively similar to those from the main specification reported here.

the schools to increase spending. Thus, I hypothesized that negative or positive changes in the ranking positions would encourage institutions to respond to rankings more intensively. The regression analysis with fixed effects estimated how institutions that observed a drop or improvement in the ranking positions (in year $t+1$) react to rankings compared to their counterparts that maintained the same ranking position (year t).

Table 5.1 Heterogeneous effect of rankings on institutional expenditures by locations in the rankings: summary

	National Universities	National Liberal Arts Colleges	National Universities	National Liberal Arts Colleges
Dependent Variables	Explanatory variable: Ranked*_Margin_ (lower or upper margin) (vs. +/-5 or more points from the top 1, 25, 50 and 120 cut-offs)		Explanatory variable: _Drop_ or _Improved_ (vs. _Maintained_)	
Student selectivity				
Institutional grants and fellowships	− lower margin	− lower margin	+ drop + improved	
Institutional aid: % receiving	− lower margin			
Institutional aid: Average amount		− lower margin		+ drop
Non-educational services		+ lower margin		
Financial resources				
Total Education and General				
Instruction	+ lower margin	+ upper margin	− improved	− drop − improved
Academic Support				
Student Services				
Research				
Faculty resources				
Average faculty salaries and benefits				
Total Faculty				
Student-faculty ratio				− drop − improved
% Full-time	+ upper margin	+ upper margin		+ improved
% Tenured/tenure track		+ upper margin		
% Professor				

Notes. Indicates the sign of estimated coefficients. + and – present increases and decreases in the expenditure, respectively.

Heterogeneous Effect of Rankings on Institutional Expenditures: National Universities

Tables 5.2 through 5.4 present the differences-in-differences-in-differences results for the National Universities sample. Each table includes the estimated effect of being located at the upper and lower margin (0 to 4 and -4 to -1 points from the cut, respectively) compared to other ranked institutions (+/-5 or more points from the cut-offs) as well as the effect of changes in the rankings (drop or improve versus maintained), conditional on being ranked. Panel (A) compares the effect of rankings across the ranking positions (ranked at the margin) for all ranked National Universities. Panel (B) reports how negative and positive changes in the ranking positions affect institutional expenses in the following year.

Student selectivity related expenditures

Panel (A) of Table 5.2 suggests that the effect of rankings on institutional fellowship behavior was varied among institutions with different ranking positions relative to the ranking group cut-offs. National Universities that were located at the lower margin decreased the overall expenses spent on institutional grants by 27.7%, reducing the proportion of students receiving institutional fellowships by about 5.2%. The changes in the total institutional fellowship are equivalent to $ 466 per FTE.

Panel (B) indicates the correlations between student selectivity related expenditures and year-to-year changes in the ranking positions. National Universities responded to both negative and positive changes in the positions in terms of the overall institutional grant and fellowships. Dropping from the previous year's position led to a

7.9% increase in institutional grants and fellowships in the following year, which is a slightly bigger than the changes in the expenditure associated with a positive change in the rankings (7%). To contextualize this, schools would increase expenses in the institutional grants and fellowship category slightly by $ 133 (per FTE) to respond to a decrease in the ranking. An upward movement in the ranking led to a $118 per FTE increase. However, there was no significant change in the distribution of institutional aid as well as non-educational services expenditure in relation to the year-to-year changes in the rankings.

Table 5.2 Heterogeneous effect of rankings on admission related expenditures: National Universities

	(1)	(2)	(3)	(4)
Panel (A) Explanatory variable: Ranked*_Margin_				
Dependent Variables	Institutional grants & fellowships	Institutional aid: % receiving	Institutional aid: Average amount	Non-educational services
Ranked	0.125	1.432	-0.062*	0.052
	(0.092)	(1.505)	(0.036)	(0.042)
Margin: upper	0.167	-1.508	0.035	-0.018
	(0.158)	(2.278)	(0.040)	(0.053)
Margin: lower	-0.277***	-5.198*	0.042	-0.039
	(0.083)	(3.066)	(0.038)	(0.073)
Observations	4,107	2,731	2,733	6,115
Number of institutions	199	196	196	199
Panel (B) Explanatory variable: *Drop / Improve* vs. *Maintain*				
Drop	0.079*	-0.000	0.005	-0.006
	(0.042)	(0.008)	(0.014)	(0.018)
Improve	0.070**	0.003	-0.006	-0.008
	(0.030)	(0.007)	(0.015)	(0.015)
Observations	1,280	1,067	1,067	1,403
Number of institutions	126	126	126	126

Notes. All specifications include school fixed effects and private-by-year fixed effects. Robust standard errors clustered by school in parentheses. *** p<0.01, **p<0.05, *p<0.1

Financial resources related expenditures

Panel (A) of Table 5.3 reports the differential effect of rankings on resource related outcomes by an institution's location in the ranking, measured through the relative distance from the ranking group cut-offs. Although schools at the margin tended to spend more on expenditures that are related to educational and general activities, the differences across the ranking positions were not statistically significant. Yet, the DDD estimates suggest that schools ranked at the margin develop different ranking strategies. Specifically, National Universities at the lower margin of the cut-off, particularly within a 4-point interval significantly increased the amount spent on instruction by 8%. On average, this increase is equivalent of $ 987 per FTE per year at the respective universities.

Panel (B) of Table 5.3 shows that schools continue their spending level regardless of the year-to-year changes in the position. Dropping from the original position did not affect the any educational related expenditure in the following year. However, when an institution's ranking in one year was higher compared to the previous year, the ranked National University decreased instructional expenditure by 1.6% compared to the schools that stayed at the same position.

Table 5.3 Heterogeneous effect of rankings on financial resources related expenditures: National Universities

	(1)	(2)	(3)	(4)	(5)
Panel (A) Explanatory variable: Ranked*_Margin_					
Dependent Variables	Total Education and General	Instruction	Academic support	Student services	Research
Ranked	0.030	0.051*	-0.029	-0.008	-0.134***
	(0.027)	(0.028)	(0.046)	(0.040)	(0.049)
Margin: upper	0.012	0.009	0.023	0.002	0.039
	(0.028)	(0.032)	(0.050)	(0.051)	(0.056)
Margin: lower	0.054	0.080**	0.151	0.067	0.058
	(0.034)	(0.039)	(0.148)	(0.073)	(0.062)
Observations	6,164	6,163	6,158	6,143	6,095
Number of institutions	199	199	199	199	198
Panel (B) Explanatory variable: *Drop / Improve* vs. *Maintain*					
Drop	-0.012	-0.016	0.000	-0.014	-0.009
	(0.011)	(0.011)	(0.018)	(0.018)	(0.014)
Improve	-0.009	-0.016*	0.009	-0.017	-0.011
	(0.011)	(0.009)	(0.017)	(0.020)	(0.013)
Observations	1,416	1,415	1,411	1,400	1,412
Number of institutions	126	126	126	126	126

Notes. All specifications include school fixed effects and private-by-year fixed effects. Robust standard errors clustered by school in parentheses. *** p<0.01, **p<0.05, *p<0.1

Faculty resources related expenditures

While an institution's position from the ranking group cut-offs differentiated the degree to which the ranked National Universities changed resource allocation in different expenses, an institution's location on the ranking did not significantly affect faculty compensations and composition (Table 5.4). Yet, schools ranked at the upper margin of the ranking group cut-offs (0 to 4 points) increased the proportion of full-time faculty among the instructional faculty by 4.4%, accounting for institutional, year, and private/public differences (Panel (A), Column (4)).

Furthermore, results in Panel (B) suggest that faculty resources did not alter by year-to-year changes in the ranking position. Although a positive (negative) change in an institution's ranking position tended to be related with an increase (decrease) in the average faculty compensations and proportion of tenure or tenure track faculty and professors, the point estimates were not statistically significant.

Table 5.4 Heterogeneous effect of rankings on faculty resources related expenditures and outcomes: National Universities

	(1)	(2)	(3)	(4)	(5)	(6)
Panel (A) Explanatory variable: Ranked*_Margin_						
Dependent Variables	Average faculty salaries & benefits	Total faculty	Student-faculty ratio	% full-time	% tenured/ tenure track	% professor
Ranked	0.691***	-0.047	-0.065*	0.003	-0.000	0.006
	(0.208)	(0.034)	(0.033)	(0.016)	(0.016)	(0.007)
Margin: upper	-0.359	0.045	0.079	0.044*	0.011	-0.006
	(0.332)	(0.060)	(0.057)	(0.023)	(0.025)	(0.010)
Margin: lower	0.344	0.059	0.018	0.012	0.001	-0.006
	(0.430)	(0.083)	(0.071)	(0.032)	(0.026)	(0.013)
Observations	5,358	2,377	2,375	2,377	1,773	5,339
Number of institutions	199	199	199	199	197	199
Panel (B) Explanatory variable: *Drop / Improve* vs. *Maintain*						
Drop	-0.075	0.021	0.011	-0.004	-0.002	-0.002
	(0.161)	(0.020)	(0.022)	(0.007)	(0.010)	(0.004)
Improve	0.080	0.018	0.016	-0.007	0.005	0.002
	(0.138)	(0.024)	(0.027)	(0.010)	(0.012)	(0.004)
Observations	1,363	714	712	712	657	1,363
Number of institutions	126	126	126	126	126	126

Notes. All specifications include school fixed effects and private-by-year fixed effects. Robust standard errors clustered by school in parentheses. *** p<0.01, **p<0.05, *p<0.1

Heterogeneous Effect of Rankings on Institutional Expenditures: National Liberal Arts Colleges

Next, I present the differential effect of rankings by the distance from the ranking group cut-offs (top 1, 25, 50 and 120) for National Liberal Arts colleges. Tables 5.5 through 5.7 present the estimated effect of being ranked at upper and lower margins by 4 points (0 to 4 and -1 to -4 points from the cut, respectively) and year-to-year changes in the rankings, conditional on being ranked. I first report the coefficients from the differences-in-differences-in-differences that estimate the effect of rankings by the ranking positions (located at margin) for all ranked National Liberal Arts Colleges (Panel (A)). The effect of volatility in the rankings on the ranked Liberal Arts colleges will be then addressed (Panel (B)).

Student selectivity related expenditures

Table 5.5 indicates that the distance of an institution's position may differentiate a Liberal Arts College's expenditure in the admission related variables. Panel (A) suggests some evidence for the status-based model hypothesis that institutions that are located merely above and below the next level might have different responses to the status, here specified by USNWR. The DDD estimates indicate the strategic behavior of institutions that are closest to the lower margin of ranking groups would reduce expenditure on institutional fellowships: compared to other ranked National Liberal Arts Colleges (ranked at +/-5 or more points from the ranking group cut-offs), schools ranked up to 4 points below the cut would have smaller changes in the total spending in institutional fellowship by decreasing the expenditure by 14.2%. This decrease, which is

approximately $ 1,024 per FTE, might result in a smaller average aid amount distributed to each recipient. The decrease is about 6.1%, which is about $ 947.

Meanwhile, Column (4) of Panel (A) suggests some evidence that the expenditure on non-educational services was significantly higher for the institutions near to the cut-off point, particularly at the lower margin. Compared to other ranked National Liberal Arts Colleges, schools ranked at the lower margin of each ranking group cut-off increased non-educational services expenses by 10.6%. This means an annual increase of about $ 627 per FTE at the respective Liberal Arts Colleges.

Panel (B) indicates that a negative change in the ranking position might encourage universities to alter their financial aid behavior in the following year. Although the overall amount did not change, a negative change in the numerical order induced a Liberal Arts college to allocate 2.2% more (about $ 351) average amount per student in terms of institutional aid.

Table 5.5 Heterogeneous effect of rankings on admission related expenditures: Natioanl Liberal Arts Colleges

	(1)	(2)	(3)	(4)
Panel (A) Explanatory variable: Ranked*_Margin_				
Dependent Variables	Institutional grants & fellowships	Institutional aid: % receiving	Institutional aid: Average amount	Non-educational services
Ranked	0.061	1.216	0.027	0.035
	(0.047)	(1.221)	(0.033)	(0.031)
Margin: upper	-0.114	-3.951	0.021	-0.054
	(0.099)	(2.750)	(0.068)	(0.059)
Margin: lower	-0.142**	1.118	-0.061*	0.106**
	(0.057)	(3.112)	(0.031)	(0.045)
Observations	2,808	1,866	1,868	4,121
Number of institutions	134	134	134	134
Panel (B) Explanatory variable: _Drop / Improve_ vs. _Maintain_				
Drop	0.003	-0.007	0.022*	0.004
	(0.019)	(0.006)	(0.013)	(0.025)
Improve	0.003	-0.004	0.022	0.001
	(0.017)	(0.006)	(0.016)	(0.018)
Observations	1,150	931	933	1,255
Number of institutions	106	106	106	105

Notes. All specifications include school fixed effects and year fixed effects. Robust standard errors clustered by school in parentheses.
*** p<0.01, **p<0.05, *p<0.1

Financial resource related expenditures

Table 5.6 reports the effect of USNWR for National Liberal Arts Colleges of different ranking positions on the total educational and related expenses, as well as on the detailed areas of expenses that are measured by the rankings. Panel (A) of the table shows that rankings make National Liberal Arts Colleges increase instructional expenses on average. The instructional expenses for the ranked National Liberal Arts Colleges due to the ranking changes were significantly higher for institutions ranked at the upper margin of cut-off points (a 4.7% increase) (Panel A, Column (2)). The increase in the expenditure suggests that schools at the margin (+ 0-4) would spend extra $ 580 per student than the rest of ranked schools.

Panel (B) indicates that institutions responded to changes in ranking positions by altering the expenses on the instruction. The size of the change was bigger when the ranking position changed negatively (3.3% decrease in instructional expenditure) than when there was a positive change in the rankings (1.5%).

Faculty resources related expenditures

Panel (A) of Table 5.7 reports whether the effects of rankings vary across the ranking positions, in the areas that are related to faculty resources. The results suggest that an institution's ranking relative to the arbitrary cut-offs for ranking groups differentiate the ranked National Liberal Arts Colleges' responses to rankings in faculty composition measured through the proportion of full-time and tenure or tenure track faculty. For the institutions that were included to a ranking group at the margin (upper margin), the strategic response to rankings might be to increase the proportion of full-

time faculty and hire more tenure track faculty. Liberal Arts Colleges ranked at 0 to 4 points from the cut-offs increased the proportion of full-time faculty and tenured/tenure track faculty by 4.5% and 2.4%, respectively.

Panel (B) suggests how the ranked National Liberal Arts responded to the volatility of rankings. The year-to-year changes resulted in significant changes in the direct measures of USNWR, particularly the student-faculty ratio and proportion of full-time faculty. When an institution's ranking was changed in a negative direction (*Drop*), schools decreased student faculty ratio by 2.4%. Positive changes in the rankings compared to the previous year's position led to a decrease in student faculty ratio (3%), and increase in the proportion of full-time faculty (1.5%).

Table 5.6 Heterogeneous effect of rankings on financial resources related expenditures: National Liberal Arts Colleges

	(1)	(2)	(3)	(4)	(5)
Panel (A) Explanatory variable: Ranked*_Margin_					
Dependent Variables	Total Education and General	Instruction	Academic support	Student services	Research
Ranked	0.060***	0.050**	0.052	0.059*	0.225
	(0.019)	(0.025)	(0.039)	(0.035)	(0.167)
Margin: upper	0.012	0.047*	0.073	-0.052	-0.196
	(0.027)	(0.028)	(0.063)	(0.059)	(0.239)
Margin: lower	-0.009	0.025	0.037	0.041	-0.309
	(0.024)	(0.027)	(0.060)	(0.054)	(0.194)
Observations	4,154	4,154	4,136	4,150	2,753
Number of institutions	134	134	134	134	111
Panel (B) Explanatory variable: *Drop / Improve* vs. *Maintain*					
Drop	-0.003	-0.033*	-0.005	-0.019	-0.028
	(0.006)	(0.018)	(0.030)	(0.024)	(0.051)
Improve	-0.000	-0.015*	0.018	-0.001	-0.017
	(0.005)	(0.008)	(0.022)	(0.019)	(0.044)
Observations	1,277	1,277	1,261	1,275	1,062
Number of institutions	106	106	106	106	83

Notes. All specifications include school fixed effects and year fixed effects. Robust standard errors clustered by school in parentheses.
*** p<0.01, **p<0.05, *p<0.1

Table 5.7 Heterogeneous effect of rankings on faculty resources related expenditures and outcomes: National Liberal Arts Colleges

	(1)	(2)	(3)	(4)	(5)	(6)
Panel (A) Explanatory variable: Ranked*_Margin_						
Dependent Variables	Average faculty salaries & benefits	Total faculty	Student-faculty ratio	% full-time	% tenured/ tenure track	% professor
Ranked	-0.015	0.007	-0.014	0.002	0.007	0.001
	(0.206)	(0.024)	(0.021)	(0.014)	(0.015)	(0.009)
Margin: upper	0.090	-0.022	-0.019	0.045*	0.024*	-0.010
	(0.229)	(0.059)	(0.037)	(0.024)	(0.015)	(0.017)
Margin: lower	0.264	0.001	0.019	0.009	0.025	-0.008
	(0.254)	(0.045)	(0.035)	(0.025)	(0.031)	(0.017)
Observations	3,607	1,608	1,608	1,607	1,179	3,489
Number of institutions	134	134	134	134	131	132
Panel (B) Explanatory variable: *Drop / Improve* vs. *Maintain*						
Drop	-0.150	-0.015	-0.024*	0.013	0.003	0.001
	(0.207)	(0.016)	(0.014)	(0.008)	(0.006)	(0.004)
Improve	-0.128	-0.024	-0.030*	0.015*	0.004	0.002
	(0.219)	(0.018)	(0.016)	(0.009)	(0.010)	(0.004)
Observations	1,228	648	648	648	580	1,189
Number of institutions	106	106	106	106	104	103

Notes. All specifications include school fixed effects and year fixed effects. Robust standard errors clustered by school in parentheses.
*** p<0.01, **p<0.05, *p<0.1

Summary

In order to answer the second sub-question, *How do arbitrary groupings of rankings affect institutions' expenditure behaviors?*, I estimated whether being ranked at the margin of ranking group cut-offs affected the changes in both National Universities and National Liberal Arts Colleges' resource allocation due to the rankings. While previous studies suggested that the changes within 0-4 intervals from the cut-off points are due to statistical noise (Gnolek et al., 2014; Grewal et al., 2008), schools ranked at the 4-point margin (i.e. institutions being located at the top 1, 25, 50, and 120 or +/- 4 windows from the cut-offs) differently reacted to rankings. Depending on the expense areas, schools at the upper or lower margins experienced a bigger or smaller rate of change, compared to other ranked institutions. How an institution's location in the rankings differentiated the effect of rankings on a set of outcomes varied between the National Universities and National Liberal Arts Colleges.

The results indicated the heterogeneous effect of rankings by institutional position on the outcomes related to student selectivity, financial resources, and faculty resources. First, institutions at the lower margin—just below the arbitrary cut-offs of ranking groups—were less intense in increasing fellowship expenditure. In particular, National Universities at the margin distributed institutional fellowships to a smaller proportion of recipients. Meanwhile, National Liberal Arts Colleges at the lower margin spent more on non-educational services, but decreased expenses on institutional fellowships, in terms of the total amount as well as the average amount received by each student.

In terms of financial resources related outcomes, schools at the margin of the ranking groups had a bigger increase in a number of outcomes. In particular, the

National Universities that were ranked at the lower margin of the cut-offs (-1 to -4 points away from the cut) increased the instructional expenses at a higher rate. On the other hand, it was the upper margin that was associated with a higher increase in the total amount spent on instruction among the National Liberal Arts Colleges.

Both at National Universities and National Liberal Arts Colleges, institutions ranked at the upper margin of ranking group cut-offs (0 to 4 points above the cut) had relatively bigger increases in the proportion of full-time faculty measured directly by USNWR. Liberal Arts Colleges that were ranked at the upper margin of ranking groups (0-4 points) also increased the proportion of tenured or tenure track faculty.

Taken all together, an institution's position in the rankings, defined as whether an institution is ranked at the upper or lower margins of the ranking group cut-offs, led to different degree of changes in particular resource areas. This supports the status-based model argument that an institution's position influences the level of compliance with ranking measures and strategic behaviors. When being included to a particular ranking group leads to critical benefits (Bowman & Bastedo, 2009; Luca & Smith, 2011), schools that are close to each cut-off (particularly at the 4 point margin) demonstrated a bigger increase in the expenditures in the areas that rankings directly measure. The motivation is different across the institutions of different positions, and thus schools take different strategies depending on the relative standing from the ranking groups' margins.

It is also notable that changes within the 0-4 intervals in the USNWR are considered to be due to statistical noises (Gnolek et al., 2014; Grewal et al., 2008), but being located at this window matters to the degree to which institutions take actions in their resource allocations. This finding was aligned with previous research that argues

higher education institutions fear that not engaging in the rankings game will hurt their school (Corley & Gioia, 2000) and thus become attentive to a small difference in the rankings.

This chapter also addressed the third sub-question, *How do year-to-year changes in ranking positions lead to changes in expenditure behaviors?* The results reveal that volatility in the rankings, operationalized as a negative change (drop) or a positive change (improved) in rankings compared to the previous year's position, did not necessarily lead to increased expenses of colleges and universities in all expenditures.

When rankings declined, both National Universities and National Liberal Arts colleges increased the overall expenses on institutional fellowships or the average amount of institutional aid distributed to each recipient. Negative changes in the ranking position encouraged National Liberal Arts Colleges to reduce expenses on instruction but to enhance performances on student-faculty ratio measure.

The positive change in the rankings was also related with changes in resource allocation at colleges and universities. In particular, National Universities spent more on institutional grants and fellowships but decreased instructional expenditure as they observe a positive change in the rankings. The improvement in the ranking position led to a decrease in instructional expenditure but to an increase in the proportion of full-time faculty as well as a lower student-faculty ratio.

Taken all together, the results suggested that the volatility in rankings might function as a feedback mechanism for schools and encourage schools to move their resources from a routinized, universal expenditure to categories that are perceived to provide more leverage to improve rankings. For instance, a positive change in the

ranking, as a positive feedback, might incentivize institutions to increase student selectivity and direct measures of faculty resources to continue the increase in the position. On the other hand, a drop in ranking position would motivate institutions to at least move back to the original position. Furthermore, if a decrease in the ranking positions is perceived to have a negative consequence on the admission in the coming year (Monks & Ehrenberg, 1999), institutions might change the financial aid practices to minimize the impact of rankings.

The decrease in instructional expenditure might be explained by the importance of this measure in the USNWR and the relative difference across the institutions in the expenditure. Instructional expenditure is only a part of the aggregated overall educational expenditures and the spending per student credit hour might not be significantly different among the institutions that are competing at similar ranking positions. Thus, this expenditure might not add much leverage to improve an institution's relative position in the rankings. It is also important to point the varying degree of flexibility in decision-making on different outcomes. For example, changes in the admissions and distribution of financial aid or increasing full-time instructional staffs can happen quickly than making significant changes to faculty quality (e.g., increasing tenured/tenure track faculty (professors) with highest degree in the field).

Based on the detailed results presented in the last two chapters, I will discuss the outcomes and implications for future research. I finally conclude this dissertation with suggestions for policy and institutional practices.

Chapter 6

CONCLUSION

Rankings have gained popularity as they claim to offer information for college choice (Stensaker & Kehm, 2009), allowing students to compare the relative quality of universities (Brown, 2006). The growing interest in college rankings intensified concerns in the higher education community about institutional aspirations for a higher ranking (O'Meara, 2007) and their consequences on accelerating costs (Ehrenberg, 2003). Also, competition for selective students and faculty with the goal of improving rankings might have important implications for access and diversity (Meredith, 2004; Shaw & LeChasseur, 2005). Although concerns about unintended consequences are valid, rankings/ratings systems have attracted the interest of policy makers as a way to achieve policy goals, such as affordability and access.

While previous studies found that rankings impact student choices and resource attainment of colleges and universities, a dearth of research exists on how universities respond to rankings by changing their resource allocation behaviors. In particular, the degree to which universities change specific expenditures in response to rankings presents a challenge in previous research. Considering how the unique characteristics of rankings function as mechanisms that influence institutional behavior provides an opportunity to expand the literature. In response to this gap in research, this dissertation contributes to the literature by exploring the effect of rankings on the management of

colleges and universities. In particular, the project focuses on how the three distinctive features of the college rankings—numerical order, arbitrary grouping, and volatility—stimulate colleges and universities to respond to the rankings criteria. In this final chapter, I discuss key findings, provide directions for future research, and offer implications for policy and practice.

Discussion of Key Findings

This discussion is organized in the following order. First, I explain how the rankings system affects the resource allocation behavior of universities. I particularly attend to the two dimensions of rankings—measurements and presentation of the results—as mechanisms that drive institutional conformity to rankings. I synthesize the findings, highlighting the areas in which institutions alter resource allocations, in relation to what rankings measure and what institutions can manipulate. I also discuss how the numerical order as well as arbitrary groupings and volatility of rankings affect institutional behavior. Taken together, the results will shed light on what people can infer from rankings/ratings. The potential consequences of resource allocation behaviors on higher education will be also considered. Second, I address how National Universities and Liberal Arts Colleges respond to rankings differently, with an eye on the different contingencies that each type of university faces. Finally, I consider the practice of rankings in the broader context of the pursuit of prestige.

Measurements of rankings and resource allocation behavior

The results of this dissertation confirmed that ranking systems have become a significant influence over time, through what they measure as well as how they present

the results of their evaluation of colleges and universities (Sauder & Fine, 2008; Wedlin, 2010). The numerical ordering of universities determined by a set of measurement criteria significantly increased expenditures in the all areas that USNWR evaluates—student selectivity, financial resources, and faculty resources. The arbitrary classification of universities as well as year-to-year changes in rankings accelerated the changes in expenditures. Overall, the total educational expenditures, particularly instructional expenditures, as well as the proportion of full-time faculty and the student-faculty ratio were the areas in which institutions consistently altered the greatest number of resources. Institutional fellowships increased only in the short term, while changes in non-educational services as well as faculty compensation developed over a longer term.

These expenditures reflect USNWR methodology as the connection between the resource items and rankings are clear. Also, these expenditures are flexible and easy to modify immediately. I argue that expenditures that meet these two conditions are those that institutions can manipulate among the ranking criteria. The financial resources measure presents a good example of the criteria on which institutions can take action. The dollar amount spent on educational activities is a stand-alone measure in USNWR, which takes 10% of the overall ranking score. Furthermore, increases in educational expenditures are accomplishable as educational needs are often prioritized in resource allocation (Lasher & Greene, 2001). In terms of faculty resources, the proportion of full-time faculty and student-faculty ratio are easier to manipulate without a significant cost increase by hiring adjunct faculty or full-time instructors (Perez & Litt, 2012; Toutkoushian, 1999). Faculty salaries and benefits are something that institutions can adjust, but at a slower rate. On student selectivity related expenditures, the ranking

measurements have no direct connection with resources. Yet, institutional fellowships have been often used to create a selective class (Winston, 1997; 2000; McPherson & Schapiro, 1991; 1998) and therefore, schools are familiar with adjusting the respective practices in a short period of time.

Together with previous studies, the findings of the current study suggest that what rankings measure and present reflects resources that institutions spent, as expenditures are alterable by universities, whereas other measures such as reputation are hard to change (Webster, 1992). This factor might explain why rankings are self-perpetuating and institutions' positions do not change significantly. As higher ranking positions are associated with considerable benefits in resource attainment, the *Matthew Effect* (Merton, 1968) intensifies stratification as schools with high status gain greater resources and again increase spending to further move up the ladder. Thus, factors that ranking organizations put forward as representing the quality of institutions, as well as the comparison across institutions and year-to-year changes in the rankings need be carefully interpreted.

The emphasis on resources and increasing institutional expenditures on ranking criteria raises an important question about the direct and indirect costs of rankings. The institutional responses to rankings might accompany significant financial costs when there is no clear connection between the increase in expenditure and the movement in the rankings. Furthermore, the gains from a higher ranking might not be sufficient to cover the increased expenses incurred. Previous research suggested a limited effect of rankings on resource attainment other than increases in out-of-state tuition as well as funding from government and industry (Bastedo & Bowman, 2011; Grunig, 1997; Meredith, 2004; Jin

& Whalley, 2007). Yet, movement in rankings requires enormous investment. Gnolek et al., (2014) simulated the average increase required for a 10-point movement (from top 30 to top 20) as $ 112,000,000 per year. This amount is significantly larger than the average change I observed from this study. This might suggest that the probability of changing an institution's ranking is low, despite the school's constant increase in expenditures. If institutions raised all they could and spent all they raised for higher prestige (Bowen, 1980), the conformity to rankings might result in net losses or increased costs for students, particularly those who pay out-of-state tuition.

The conformity to rankings might involve indirect costs in the core activities at campuses. The changes in faculty composition with increased faculty compensation might imply a teaching-research trade-off for tenured faculty and higher burden on non-professorate, non-tenure track teaching staff in terms of teaching load (Bettinger & Long, 2010; Cantwell & Taylor, 2013; Zhang & Liu, 2009). The current explanation of resource allocation behaviors is limited, as we do not know how institutions raise revenue for continuing strategic behaviors. In addition, how the increased expenditures are used for specific activities on campus is not captured in the data. Future investigations are needed to address how the institutional response to rankings impacts revenue streams (e.g., tuition, research funding, donations) as well as core activities of higher education institutions, particularly teaching and research.

Presentation of rankings and resource allocation behavior

The results suggested that institutional behavior was driven by the unique characteristics of rankings that a) present the evaluation results in a numerical order and arbitrary ranking groups and b) create year-to-year changes. The numerical order, by

presenting an institution's position relative to competing schools, creates the mechanisms that compel institutions to develop responses to rankings. Being *reactive,* schools monitor their numerical position and respond promptly to rankings by changing resource allocations in the areas that are directly or indirectly related to ranking measurements, even without guarantees for increasing prestige and the quality of educational activities (Oliver, 1991).

In addition to the numerical order, the arbitrary grouping in the USNWR provides different motivation and strategic behavior for the institutions at different ranking positions. The results of this study indicated that schools located at the lower margin (-1 to -4 points below the ranking group cut-offs) had a lower level of increase in institutional fellowship but higher spending on non-educational services and instruction. On the other hand, schools located at the upper margin (0 to 4 points above the ranking group cut-offs) had a proportionally higher increase in the proportion of full-time faculty as well as tenured/tenure track faculty.

Previous studies pointed out that membership in a ranking group matters, through the front-page effect (being included to the top 25), on resource attainment (Bowman & Bastedo, 2009; Luca & Smith, 2011). Using the status-based model, I argue that this process allows rankings to define an institution's status, creating a *competing network* among the ranked National Universities and National Liberal Arts Colleges. This theory explains that the aspiration for status homophily—to maintain the membership within each ranking group—would lead to schools at the cusp of tiers or schools with closely ranked nearby elite schools facing greater pressure to comply with rankings (Sauder & Espeland, 2009). The findings from the current study add to this explanation by

providing insight into the different behavioral strategies of institutions at the lower and upper margins. The expectation to move up to the next level would lead to increased expenses in areas that have clear links with ranking measurements, such as instructional expenditures. On the other hand, schools would try to maintain the current position in the ranking group by complying with rankings criteria that do not necessarily require additional resources. These schools also continue building institutional capacity by adding faculty who are likely to have a terminal degree and high status in their field, thereby contributing to the institution's reputation (O'Meara, 2007).

Meanwhile, studies have identified that the probability of an institution moving across ranking groups is very low (Dichev, 2001), and the changes within 0-4 intervals from the cut-off points are due to statistical noise (Gnolek et al., 2014; Grewal et al., 2008). Analyzing the rankings and total scores for the top 50 National Universities for 1996-2014 USNWR, Martins (2015) identified distinct bands in which institutions fluctuate but above which they are unable to rise. Within these competing groups, minor differences in scores can result in substantial differences in rank for those institutions. Capturing this feature of rankings as *neighborhood*, Martins (2015) documented the anxious responses of some university leaders to small drops in the rankings. Thus, the arbitrary groupings of rankings, which classify institutions into a different level of status based on insignificant differences between the institutions, would encourage institutions to respond to rankings with greater intensity.

Another mechanism that encourages institutions to attend to minor differences in the rankings is the year-to-year changes. Considering the fact that schools are limited in their ability to directly manipulate any ranking criteria except educational expenditures

and several measures of faculty resources, changes in an institution's position might represent statistically minor differences. This volatility is identified as a marketing strategy of the media rankings, in order to continue their sales (Federkeil, 2009; Stella & Woodhouse, 2006). However, institutions were attentive to year-to-year changes and altered their resource behaviors when they experienced both negative and positive changes in position. In particular, changes in the ranking position led to immediate increases in institutional fellowships and the proportion of full-time faculty and decreases in student faculty ratio, while instructional expenses declined. This suggests that institutions try to recover the original position or continue improving their current positions based on the *feedback* provided by the rankings. It is possible that schools acknowledge that students are one of the major stakeholders of rankings (Luca & Smith, 2011; McDonough et al., 1998; Monks & Ehrenberg, 1999) and try to control damage on student selectivity due to the ranking by providing more scholarships to students, which will again impact upon their upcoming year's rankings. When 80% of ranking positions change every year, schools would hesitate to make significant changes to their expenses, but continue the status quo expenditure behavior.

The conformity to rankings, in relation to what rankings measure and how the results are presented suggests that rankings shape the image of legitimate universities to reflect that universities spend significant resources to be selective and possess financial and human resources. Also, institutional responses to arbitrary groupings and insignificant changes suggest that institutions internalize ranking behaviors and cannot decouple themselves from rankings, under pressure for higher ranking positions and competition with other universities (Corley & Gioia, 2000; Sauder & Espeland, 2009). In

the field of higher education where the end-means uncertainty is high and quality is hard to define and measure (Dill & Soo, 2004; DiMaggio & Powell, 1991), compliance to rankings would continue. Yet, whether more resources would translate into better quality in their core practices is an open question. While schools that are highly ranked in USNWR do not necessarily have high retention and graduation rates relative to their student, faculty, and financial related resources (Breu & Raab, 1994), some studies found significant relationships between the levels of expenditures on educational activities and institutional grants retention and graduation outcomes (Eckles, 2010; Gansemer-Topf & Schuh, 2006; Webber & Ehrenberg, 2009). In order to explain the consequences of institutional compliance, how the expenditures are used in terms of particular academic disciplines and activities should be examined.

Response to rankings at National Universities and National Liberal Arts Colleges

While institutions comply with what rankings measure, the specific expenditures that National Universities and National Liberal Arts Colleges undertake were different. In particular, National Universities responded to selectivity measures by increasing total institutional fellowships, and National Liberal Arts Colleges did so by changing non-educational expenditures. The increased total expenditure in educational and related activities was particularly driven by instructional expenses for National Universities, whereas National Liberal Arts Colleges raised spending on academic support, student services, and instruction. Colleges and universities increased the proportion of full-time faculty regardless of the type; it was only National Liberal Arts Colleges that increased the proportion of tenured or tenure track faculty.

I argue that universities employ strategic behaviors in response to the rankings by not only comply with rankings (*acquiesce*), but also by balancing tactics to improve rankings with different contingencies (*compromising*) (Oliver, 1991). To explain the different responses of National Universities and National Liberal Arts Colleges, the distinctive mission, size, control, and expectation of constituencies would be influential contingencies (Beck & Walgenbach, 2005; Labianca et al., 2001; Oliver, 1991).

Liberal Arts Colleges have long been noted for their commitment to teaching (Bourque, 1999) and support of academic and extracurricular experiences, compared to research universities (including National Universities) (Pascarella, Wolniak, Cruce, & Blaich, 2004). Given this unique mission, the factors that are communicated for legitimizing a liberal arts college include intimate learning, particularly focusing on student life and academic programs, as well as modern residence halls, infrastructure, and athletics (Fugate, 2012; Hartley & Morphew, 2008).

Thus, the constituencies for liberal arts colleges, particularly prospective students and parents, have been a highly self-selecting group, with far more knowledge about higher education. For instance, rankings are found to be influential for admission outcomes of National Universities but not for those of National Liberal Arts Colleges (Bowman & Bastedo, 2009). Thus, it is possible that investment in amenities, student services, academic services are more important for liberal arts to legitimize their practice than simply having a higher ranking.

Also, Liberal Arts Colleges were considered to be especially susceptible to striving behavior because of their small size. Previous research has found that small institutions are more in need of the resources and vulnerable to market trends

(McPherson & Schapiro, 1997; Zemsky, Wegner, & Massy, 2005). Selective liberal arts colleges, are particularly so as they compete for a small number of highly qualified students and external funds (Ehrenberg, 2003; Winston, 2000). Yet, being mostly private institutions, these selective liberal arts might have more flexibility than their National University counterparts in moving resources under the direction of leadership.

One of the criticisms of the USNWR is that the measurements for National Universities and National Liberal Arts Colleges are the same, and the ranking overlooks the differences between the two institutional types. The different resource allocation behaviors at the different college types raise an important question about how measures and weights might consider the different approaches taken by different types of universities. More in-depth understanding is required of how the audiences of rankings use the overall and sub-ranking, and how schools interpret the rankings in relation to their core activities.

College rankings, prestige, and striving behaviors

Prestige seeking behaviors have been considered as a cause of continuing increase in costs for higher education institutions. Bowen (1980) discussed that the dominant goal of institutions is prestige, and they would raise all they could and spend all they raise to achieve this goal. Furthermore, he argued that institutional affluence leads to a proportionately greater spending on institutional support than instruction. Several empirical studies reinforced this argument, showing a persistent increase in administrative costs among the striving institutions (Alpert, 1985; Clotfelter, 1996, Morphew & Baker, 2004). Furthermore, based on the idea that prestige comes from students and research, striving behaviors were documented as rises in institutional student

grants and fellowships, competitive amenities, and faculty salaries with emphasis on research rather than teaching (Brewer et al., 2002; O'Meara, 2007).

The findings of this dissertation suggest that rankings would intensify the striving behavior as the measurements of rankings based on the traditional resource-reputation model of prestige that emphasizes faculty and financial resources as well as student selectivity (Astin, 1985; Volkwein & Grunig, 2004). Since the components institutions can directly manipulate are mostly resources, this link between prestige and resources would be reinforced. Rankings or ratings make prestige tangible by creating a hierarchical order or classification of institutions. The cross-institutional comparison as well as year-to-year changes presented by rankings would further intensify institutions' striving strategies.

In response to the resource-centered definition of prestige and ranking criteria, some researchers argued that the definition of prestige should be expanded to reflect institutional support and responses to students (Seymour, 1992) or student experiences and educational outcomes (Chun, 2002). Some recent rankings (e.g., the *Washington Monthly*) introduced criteria such as social mobility (recruiting and graduating low-income students) and service (encouraging students to give something back to their country). When it comes to specific measurements used to evaluate institutional practices and outcomes in these dimensions, it is still the resource related measurements that are employed by the rankings (e.g., net price that students pay or number of courses and staff that are allocated for the service activities). This presents a continuing and significant challenge in higher education to define important goals and practices of universities and proxies that can accurately capture these dimensions. I expect different

evaluation systems with various measurements to be proposed and debated in the higher education community to better adjust and use the system of rankings or ratings.

The ranking behaviors were aligned with what was documented as striving behaviors in the previous literature. The effect of rankings on selectivity related expenditures were significant. The effects develop immediately, and are considered to have a marginal impact on ranking position. Additionally, colleges that are at the margin of ranking groups and are dropped from an original position increase spending on selectivity by providing more non-educational services and institutional aid, respectively. As the selectivity of students is also related with other measures, such as graduation and retention measures, this area might be considered even more critical. While concerns about rankings often include unintended consequences on access, implications on the admission policy and outcomes, as well as effect on price (e.g., high tuition/high aid model) should be investigated.

In addition, ranking organizations argue that the *educational expenses* category is a proxy for educational and academic quality, and class size measures are indicators for instructional experience. Despite these measures, it seems that resources are shifted to administrative support rather than instruction. Although instructional expenses increase, the rise is mostly explained by the increase in faculty compensation. Also, the increase happens at a smaller rate than other student services, particularly at National Liberal Arts Colleges. The significant increases in educational and related activities expenditures may include the *administrative lattice* (Massey & Zemsky, 1994), which explains the increasing administrative costs to support nonacademic support (Morphew & Baker, 2004). Furthermore, the increased faculty salaries and benefits as well as tenured faculty

suggest the continuing "faculty driven strategy" of striving (O'Meara, 2007; Toma, 2008). Selective liberal arts colleges and research universities try to attract faculty with an emphasis on research, scholarship, and other professional activities, with decreased course load, which is considered the *academic ratchet* (Volwein & Sweizer, 2006). This assertion could be empirically tested through changes in faculty work and evaluation, as well as changes in the curriculum.

While changes in the other expenditure areas align with the striving behaviors documented in previous literature, a contrasting trend was found in terms of research expenses. In order to explain this contradictory finding, information about where the research revenue is obtained and distributed within an institution is essential. Although a few studies exist in this area, one study suggests that some prestigious institutions may limit university funds and rely more on external funding to support research. Using the case of MIT and UT-Austin, Liefner (2003) suggested that many research activities are directly funded by competitive funding sources, particularly grants and contracts. Only limited institutional funds are allocated to the schools and colleges to meet fixed operational costs in the form of faculty salaries and to maintain the university infrastructure. Thus, it is possible that faculty are expected to attract external funding for research, in part based on the competitive advantage of their ranking positions. The intensified expectations and requirements for research in tenure and promotion process might reflect this trend (Finnegan & Gamson, 1996; O'Meara & Bloomgarden, 2006; Wolf Wendel & Ward, 2005).

Furthermore, this finding also raises an interesting question about the definition of prestige. Often, the concept of prestige has been operationalized by the ratings of the

graduate faculty and programs (Abbott & Barlow, 1972), and Carnegie classification in a later period (e.g., Aldersley, 1995; Finnegan & Gamson, 1996; Huisman, 1995; Iglesias, 2014; Morphew & Baker, 2004). According to these studies, the increase in research expenditure was at the schools that aimed at moving to the upper classification, particularly from the non-research group to research universities. For example, Iglesias (2014) showed that Master's colleges and universities and Research Universities/high research activity (RU/H) demonstrated a dramatic increase in research, whereas Doctoral/Research Universities (DRU) and Research Universities/Very High Research activity (RU/VH) directed more money to academic support and institutional scholarships and fellowships to solidify their ability to attract and retain the highest-quality students. If we consider that the America's Best Colleges ranking only included schools that attained research university status, the upward drift to gain more prestige through enhanced research might not be found among those schools. That is, institutions already classified as research-intensive are less likely to focus on enhancing research activity as an organizational ranking strategy. It is possible that the growth in research expenditure is non-linear, and the spending level at the National Universities might have reached the threshold of possible increase in this expenditure.

Based on this exclusive competition of National Universities and National Liberal Arts Colleges, and possible differences in prestige seeking behaviors among colleges of varying characteristics, I argue that rankings provide an additional stratification among the schools that are above a certain prestige threshold. Rankings have made the prestige in American higher education more recognizable, more institutionalized, and more quantifiable (Geiger, 2000). Thus, identifying a striving institution requires a multi-

layered approach (O'Meara, 2007). For example, Brewer et al. (2002) provided a typology of prestige: reputation building, prestige seeking, or prestigious. These groups might display distinct practices in terms of USNWR. Since USNWR has not only National Universities and National Liberal Arts Colleges rankings, but also regional university rankings (comprehensive four-year colleges), future studies could compare how different groups of schools respond to rankings in varying manners.

Implications for Higher Education

Future research on rankings/ratings and prestige

This dissertation's findings contributed to the research on the effect of rankings on the management of colleges and universities. This study also expands the theoretical understanding of prestige seeking behavior of higher education institutions, identifying striving institutions and behavioral patterns. Based upon the research conducted, I identified four areas that deserve further examination.

First, in addition to resource allocation, institutions respond to rankings in various ways. As resource dependence theory suggests (Oliver, 1991; Pfeffer & Salancik, 1978; Ulrich & Barney, 1984), institutions manage rankings by applying various tactics such as cooptation (e.g., providing information to the ranking system), influence tactics (e.g., manipulating data), collective actions (e.g., associations and alliances among institutions), and executive contracts (e.g., tying rankings and incentives for presidents) (Bastedo & Bowman, 2011). Future studies need to address other ranking behaviors, including changes in institutional practices, as well as manipulation or misreporting of data. Admission practices are where those gaming behaviors have been publically uncovered. Some researchers suspected the increasing popularity of early admissions or

common application as an institutional strategy to boost applications and matriculation rates (Avery et al., 2005; Chaker, 2004; Liu, Ehrenberg, & Mrdjenovic, 2007). A number of universities offer financial rewards to admitted students to retake SAT in hopes of increasing their average scores (Rimer, 2008). Others have inflated reported SAT scores several times (Hechinger, 2013; Perez-Pena & Slotnik, 2012).

Also not captured in the study is institutional strategies to enhance the reputation score in the rankings. While the criterion accounts for about 25% of the ranking matrix, lack of data on relevant expenditures limited empirical examination of institutional behavior for improving the reputation sub-rankings. Understanding whether or not highly organized marketing at colleges and universities, such practices as establishing marketing departments and hiring professional directors to head them (Bok, 2003; Kirp, 2003; Pulley, 2003), is attributable to rankings would assist us in fully explaining the expensive competition caused by the rankings. Studying how universities use USNWR to promote the most intangible but important feature they offer, academic teaching and learning, will also add to our understanding of the impact of rankings on institutions' marketing efforts (Anticil, 2008; Frederickson, 2001).

Second, a dearth of research exists on departmental rankings. Specifically, the way that departmental rankings affect the inter-institutional organizations has not been investigated. Although the halo-effect of institutional rankings on departmental rankings has been highlighted (Brooks, 2005; Clarke, 2007; Dill & Soo, 2005), research on prestige often hypothesized that the institutional prestige is a function of departmental prestige (Abbott & Barlow, 1972; Grunig, 1997; Volkwein, 1986; 1989). To maximize prestige under the limited financial resources, universities need to scale down their

departments and programs (Abe & Watanabe, 2012). Myers (1996) revealed that universities strategically downsize academic programs in an effort to improve undergraduate education and achieve excellence in selected graduate programs, based on their performance on national rankings. Based on the National Research Council's rankings of research-doctorate programs, Lebo (2011) argued that program strengths vary within a division, within a university, and over time, and therefore, the best strategies for institutional success is to limit coverage in smaller programs so that an institution has a comparative advantage. The relationship between departmental rankings and institutional rankings would generate internal competition over resource allocation (e.g., Barrow, 1996; Gumport & Snydman, 2002; Johnson & Turner, 2009; Massy, 1996), and thus increase stratification within an institution (Cantwell & Taylor, 2013). Future studies need to investigate how rankings affect the stratification of disciplines within an institution, and how the striving departments organize their academic and managerial practices (Massy & Zemsky, 1994).

Third, future study could investigate organizational behavior of universities facing multiple external validating organizations. Since the introduction of USNWR, various rankings, ratings, or classification systems have emerged over time. The new systems have been developed by various agencies (e.g., governments, non-profit organizations, and universities), dealing with different sets of institutions in terms of focus, (e.g., specialty programs, community colleges, for-profit universities, and online programs), locations (e.g., global rankings), and emphasis (e.g., research, price, and educational outcomes). While studies have identified high correlations among multiple rankings (Aguillo, Bar-Ilan, Levene, & Ortega, 2010), the way that colleges and universities

strategize institutional practices to enhance their legitimacy in various systems should also be studied. How schools other than National Universities and National Liberal Arts Colleges addressed in this study respond to the external measurements should also be examined. This line of research would contribute to explaining the stratification of higher education at both domestic and international levels.

Finally, empirical research that focuses on the potential consequences of rankings behavior is essential. Perrow (1961) argued that strategies to gain external validation might result in increased resources but at the expense of neglecting the core activities, as resources are diverted from the organization's core purposes to nonessential programs or activities. From this perspective, the ranking behaviors might involve unintended consequences on the central mission of higher education.

Expensive competition for USNWR might influence affordability and access. As colleges increase expenses on institutional fellowships, amenities, and other services under financial constraints, schools might move to a high-tuition, high-aid model (Geiger, 2002), as well as establish or increase student fees (Schuh, 2003) in order to compensate for the expenses. Future research should address the extent that the increases in expenditures due to rankings are related to tuition increases (McPherson & Shulenburger, 2008). The ranking competition also raises concerns about aggressive student recruiting practices that places more value on positioning the institution and skimming the best students from the applicant pool and far less value on personal contact, ensuring a good fit, and delivering a quality education from admission to graduation (Thacker, 2005). The extent to which colleges focus on recruiting physically/financially certain

populations and the effects on student composition on campus should be investigated (Rhoades, 2014).

The other dysfunction of rankings behavior in need of further investigation is the administrative lattice, a growth in administrative functions that do not necessarily lead to a better experience and outcome in terms of teaching, learning, and research. Since the expenditure data in IPEDS is reported at the aggregated level, our understanding of how the increased expenditure impacts the actual teaching, learning, or research function is limited. Furthermore, some studies indicated no significant relationship between what rankings measure and the actual learning experience of students. Pike (2002) and Kim and Shim (2014) tested the associations between the six major criteria of USNWR and learning experience at Liberal Arts Colleges. The studies found that only student selectivity is positively related with students' engagement in enriching educational experiences, and selectivity and financial resources measures are negatively related with engagement in diversity experiences. How institutional responses to ranking measures are related to the organization and management of the core activities of colleges as well as policy values will provide important implications for the methodology and use of college rankings in the field of higher education.

Policy and institutional practices

This research is very timely given the increasing policy interest in information sharing and measurements as a way of assessing, tracking, and promoting accountability and excellence of higher education. These include performance funding matrices, research-academic program rankings, and College Scorecards for affordability and value. Most recently, the Obama administration has proposed the Postsecondary Institution

Ratings System (aiming for delivery in the academic year of 2015-16) that would rate colleges and universities and tie the results to institutional eligibility for federal student financial aid programs. Although the administration has tried to quell the controversy (Stratford, 2014), the premises of ratings have generated concerns. Many in the higher education community still believe that the ratings scheme will become a *de facto* ranking (Espinosa, Crandall, & Tukibayeva, 2014). Furthermore, there has been a fear about the ratings system driving institutional behavior, especially when the result is tied to federal funding (Bastedo, 2014). The possible unintended consequences on student composition (e.g., minority access), as well as teaching and learning at institutions (e.g., lower academic bars for graduation rate performance) have been the major concern (Hillman, 2014).

The findings of this study provide empirical evidence supporting these concerns. Policy makers and ranking providers need to scrutinize the structure of the measurement systems. First, the measurements need to be carefully chosen, as colleges and universities change practices in ways that conform to the evaluation criteria. Increase and reallocation of resources to those areas might be related to unintended consequences on cost and affordability, access, education, and research. In the absence of agreed-upon comprehensive measures of higher education practice and outcomes, ad-hoc measures such as graduation rates and tie-to- or cost-of degree statistics are likely to be incomplete and misleading (Casper, 1996; Massy, Sullivan, & Mackie, 2013).

Detailed measurements that adjust for the baseline differences and trends in inputs and outputs, as well as information that closely reflect the experience of key stakeholders, should be developed over time. In part, this practice is currently limited by data that are

often reported only at the aggregated level, with specific information grouped under larger categories. For example, instructional expenditure is only captured at the institutional level, not differentiated by fields or academic units. Also, we do not know the graduation rates of different demographic and academic characteristics of students. Disconnection between the data on student learning and outcomes and measures of college's performance is also an issue (Brooks, 2005; Kuh & Pascarella, 2004). By incorporating disaggregated measures of input and outcomes as well as longitudinal changes of student experience and learning outcomes into the measurements, policy makers can encourage institutions to systematically collect and manage their data, and improve institutional progress through competitive mechanisms.

Also, the difference between higher education institutions, programs, and students need to be recognized. This study found that different competition strategies developed among the comparison groups—Research Universities and Liberal Arts Colleges. In particular, the two types of institutions increased different resources in relation to student selectivity; research universities increased instructional expenditures, while their Liberal Arts counterparts increased spending on academic support and student services, in addition to instruction. If these strategies were adopted due to different demands and expectations for colleges of different characteristics, evaluation measurements should reflect dimensions that recognize the mission and core practices of different types of institutions.

In addition to the measurements, the way the results are presented and communicated in the ranking systems is important. In particular, a rank order is considered as a publically acceptable method (Sanoff, 1998) because it is a less complex

way to provide information to consumers and stakeholders (O'Meara & Meekins, 2012). However, numerical order, along with recognizing specific cut-offs (ranking groups) drives the reactivity of institutions. The significant impact of these mechanisms is alarming, as the numbers tend to exaggerate differences between institutions (Federkeil, 2008; Locke, 2011; van Vught & Westerheijden, 2010) without scientific precision for distinguishing institutions of close rank (Stella & Woodhouse, 2006). It is notable that the Carnegie classification, which groups universities rather than placing them in a pecking order, also has similar ramification (McCormick & Zhao, 2005) as schools aspire to be research universities (Aldersley, 1995; Finnegan & Gamson, 1996; Morphew & Baker, 2004). Thus, the attributes that might be attached to the arbitrary ratings, ranking points, or scores that are related to the vertical stratification of higher education should be considered. How the outputs of particular formats are consumed and by whom, and the consequences of these activities on schools need to be carefully investigated.

Again, the current study confirmed that higher education institutions are responsive to external validations, particularly USNWR, despite their skepticism about the ranking systems. Colleges and universities of different missions significantly increased expenses in all areas that USNWR evaluates, regardless of year-to-year changes in ranking positions and the timing of first inclusion to the numerical rankings. At the margin of ranking group cut-off points, where changes in the position are due to statistical noise, the response to ranking was happening at a higher rate. Although controversial, rankings are enduring part of the educational landscape (Clarke, 2007). As universities actively engage in the rankings competition, not playing the *game* will be perceived as hurting their schools (Corley & Gioia, 2000). Top administrators at a

number of colleges that tried but failed to opt out from the influence of rankings (e.g., de Vise, 2010; Keenan, 2007) are often referred to as examples of this pressure. In many universities, achieving a particular position in the rankings (or number of departments/programs to be recognized by rankings) is listed as a managerial goal.

Under these circumstances, institutions try to garner some degree of managerial autonomy under the effect of rankings. Sauder and Fine (2008) employed the concept of *institutional entrepreneurs* to explain institutional managers who manipulate rankings to suit their purposes, representing their institutions in the best light for ranking providers and the public. Elsbach and Kramer (1996) insisted that this is for managing identity of the institution among the faculty and administrators. Yet, I argue that administrators and decision makers at colleges and universities need to find ways to make rankings useful internally. For example, while USNWR measure the aggregated dollar amount spent on educational and relevant expenses, liberal arts colleges increased expenditures on the areas that might be related to its educational emphasis, such as intimate learning experiences. Identifying strategies that emanate from the core activities, constitution of student and faculty body, and missions would allow colleges, with limited resources, to balance the pressure of competition and the needs of students and faculty.

Conclusion

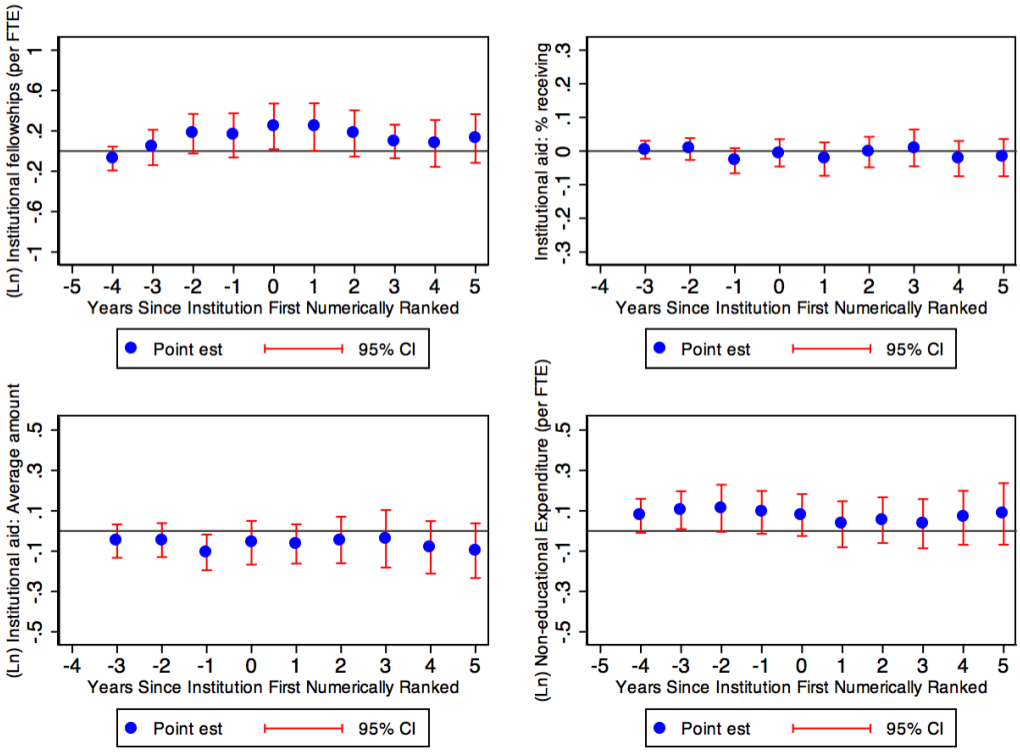
College ranking is a topic of national importance given its popularity and influence on students as well as on management of higher education. Over the last decade, college rankings have become a pervasive influence on the higher education landscape. Some researchers and practitioners in higher education have worried that rankings would intensify the aspiration for prestige, as higher positions in rankings are

associated with significant benefits (Hossler, 2000). In particular, rankings reward increased spending on what rankings measure, and this factor leads to *management by the U.S. News and World Report (USNWR) rankings* (Ehrenberg, 2003) as well as an *expensive competition* (Machung, 1998; Michael, 2005).

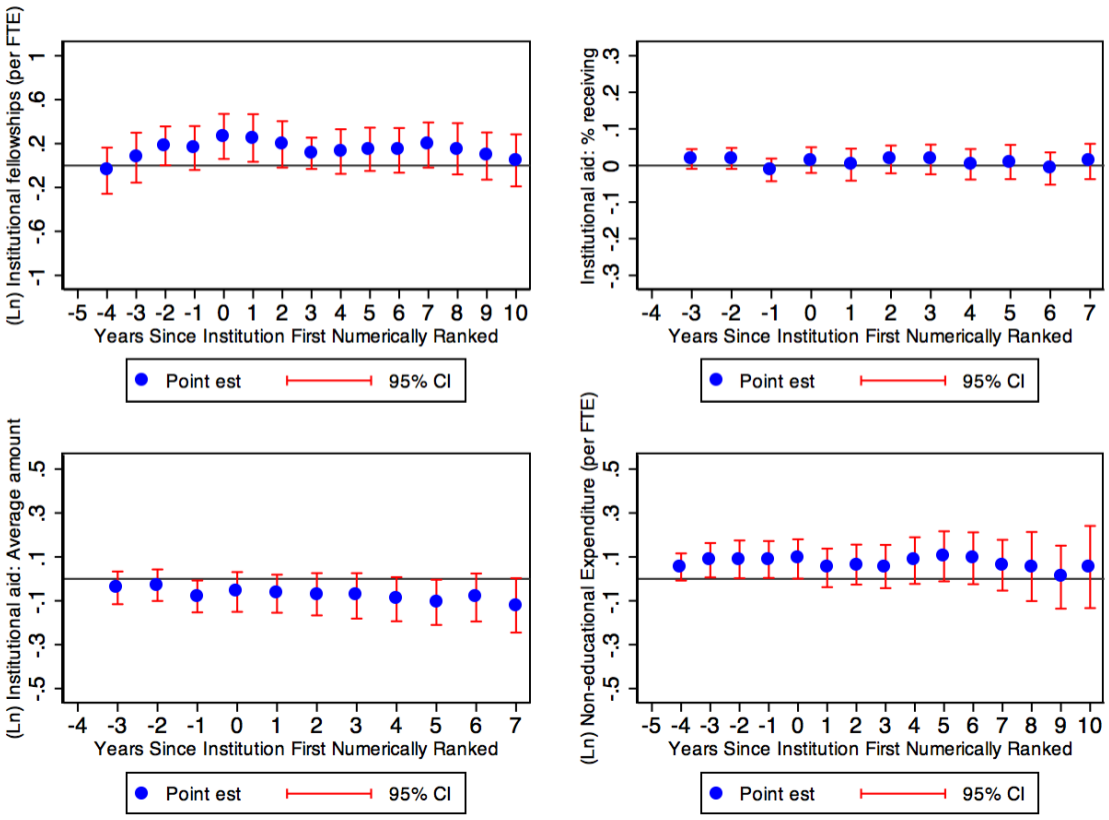
This dissertation explained the mechanisms that rankings influence institutional behavior given the unique characteristics of rankings—numerical order, arbitrary grouping, and volatility. Analyzing the causal link between rankings and institutional expenditure, particularly in the areas that are heavily weighted in rankings—student selectivity, financial resources, and faculty resources—I found significant effects on institutional management caused by rankings. Institutions constantly increase spending for rankings, and organize strategic behavior according to the arbitrary groupings in the rankings.

Prior to using college rankings in construction of public policy, policymakers need to consider the structure of rankings, in terms of measurement criteria and the presentation of results. Unintended consequences of rankings on policy goals, such as equity and diversity, financial efficiency, and effectiveness, should be closely examined. If rankings are here to stay, the questions of how we could improve the ranking practice and how stakeholders could make better use of rankings are critical. I hope this research will foster dialogue around measures of higher education institutions, including ratings and rankings, in order to support those systems to contribute to achieving policy goals and improving excellence of academic practices at institutions of higher education.

Appendix

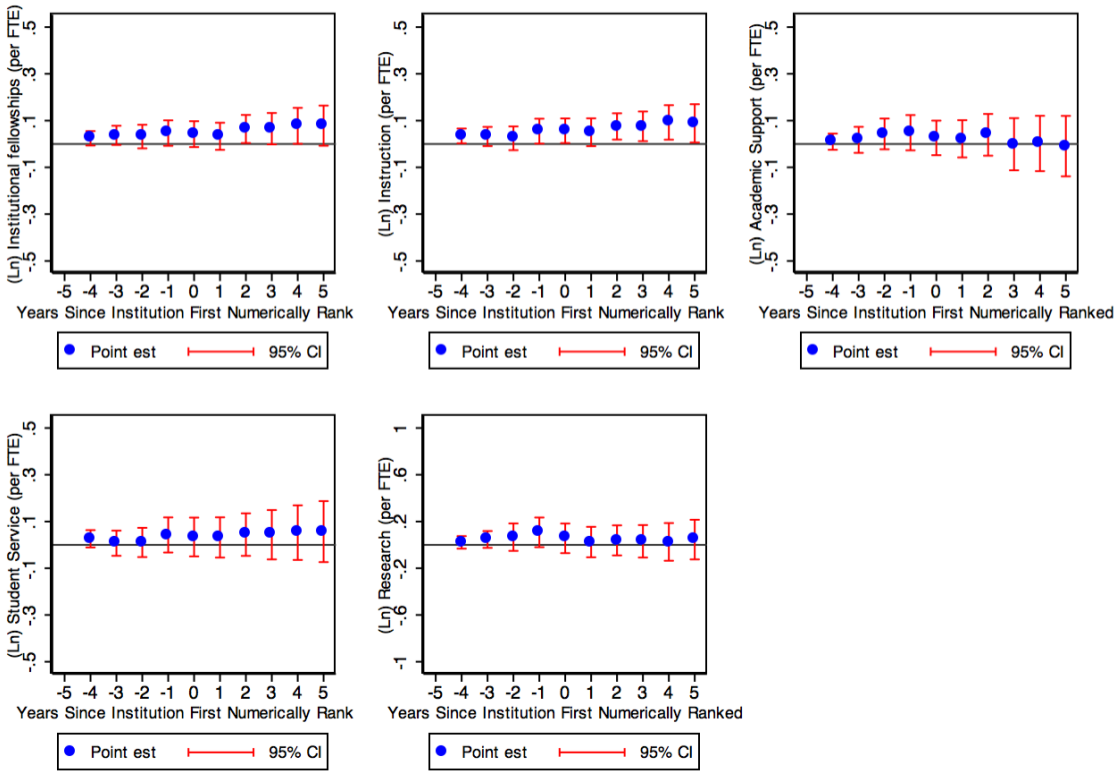


Notes. Graphs plot the point estimates from the event study model using the restricted (-/+5 year window) sample. Institution sample includes 199 National Universities.

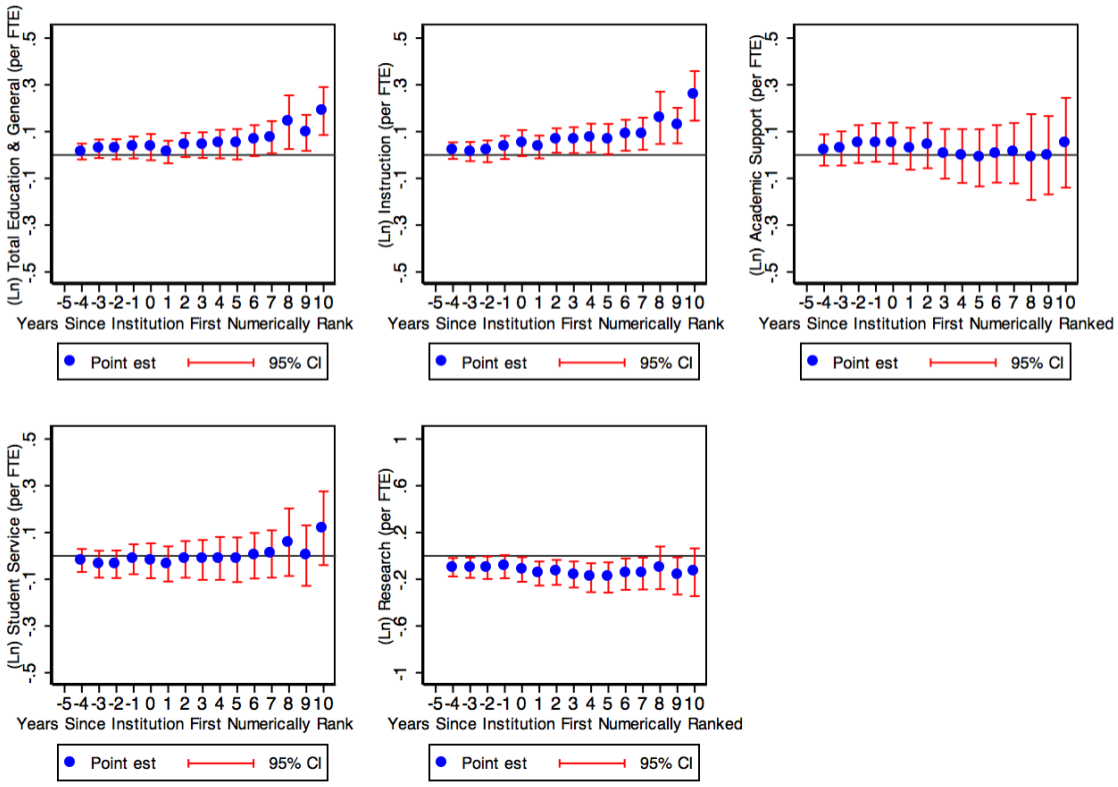


Notes. Graphs plot the point estimates from the event study model using the full balanced panel sample. Institution sample includes 199 National Universities.

Figure A.1 Event-study estimates of effect of rankings on admission related expenditures: National Universities

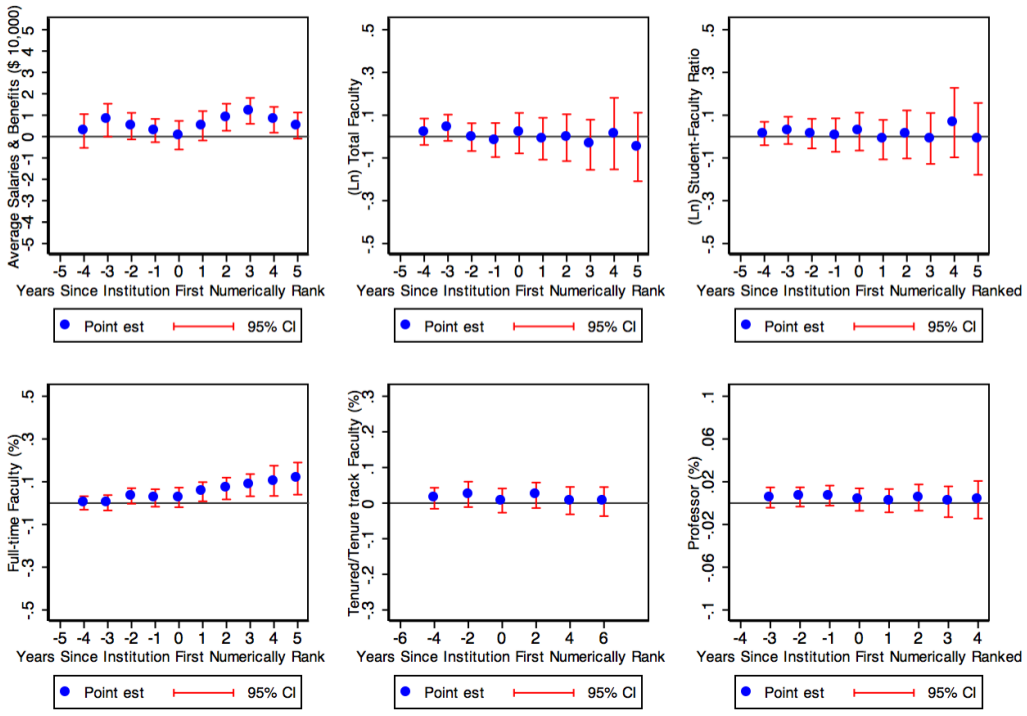


Notes. Graphs plot the point estimates from the event study model using the restricted (-/+5 year window) sample. Institution sample includes 199 National Universities.

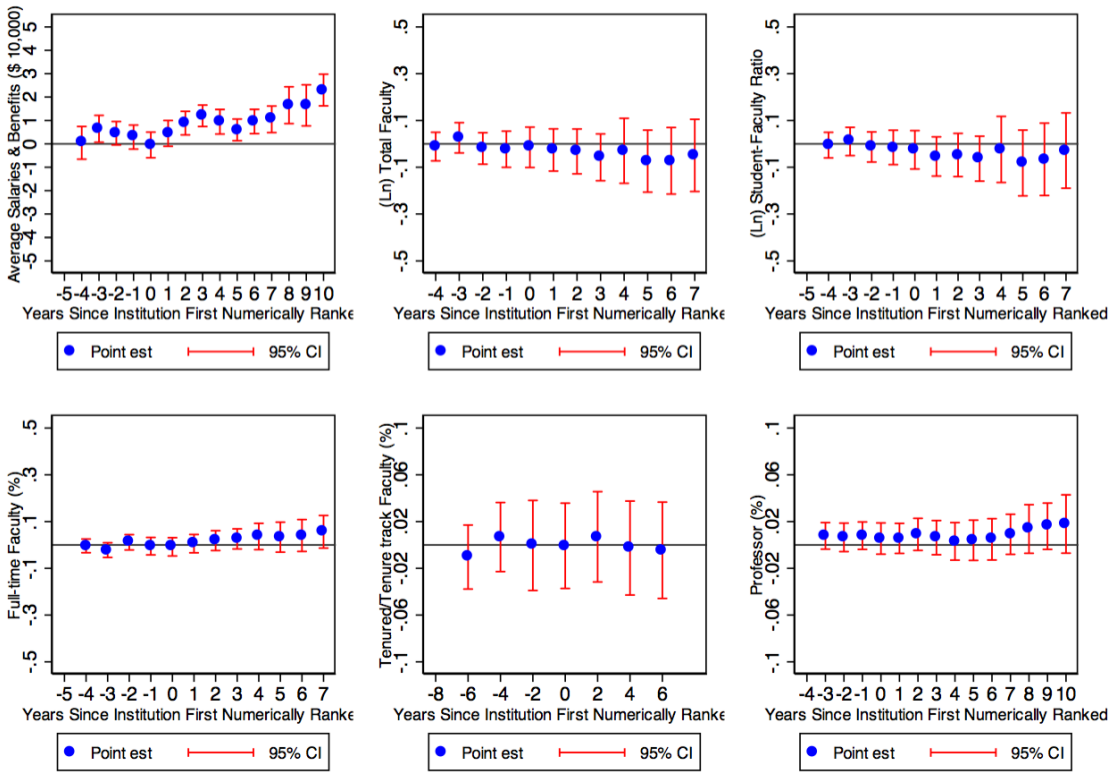


Notes. Graphs plot the point estimates from the event study model using the full balanced panel sample. Institution sample includes 199 National Universities.

Figure A.2 Event-study estimates of effect of rankings on financial resources related expenditures: National Universities

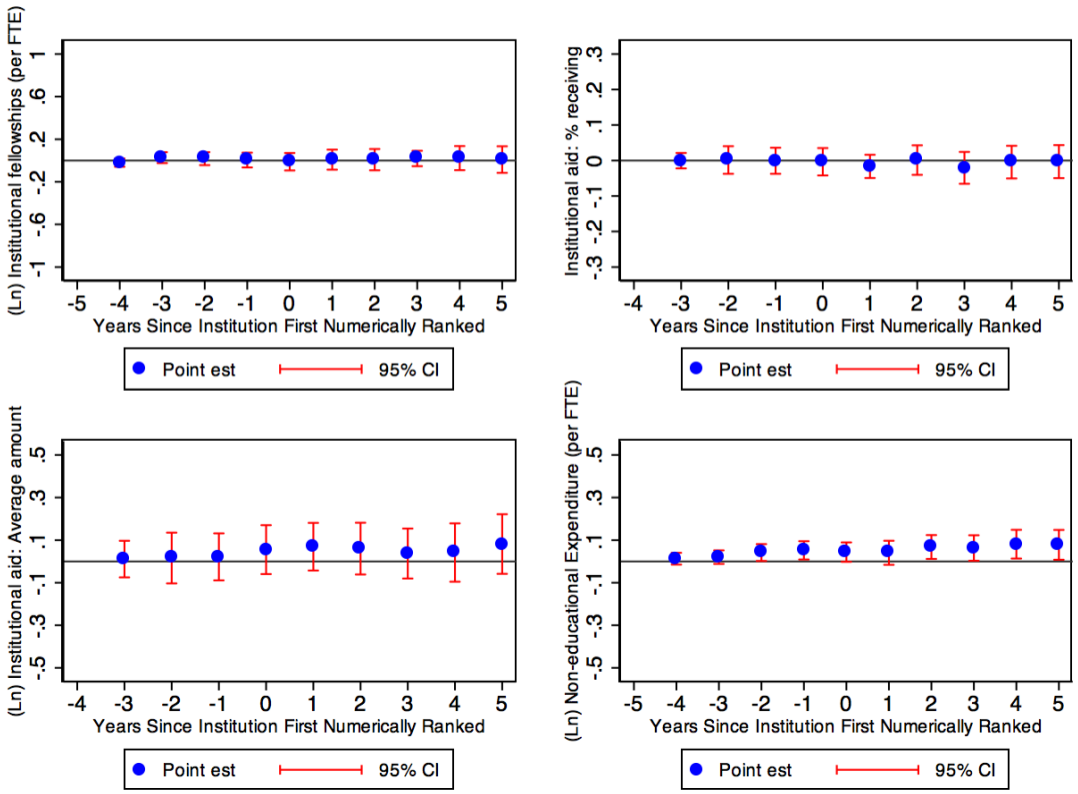


Notes. Graphs plot the point estimates from the event study model using the restricted (-/+5 year window) sample. Institution sample includes 199 National Universities.

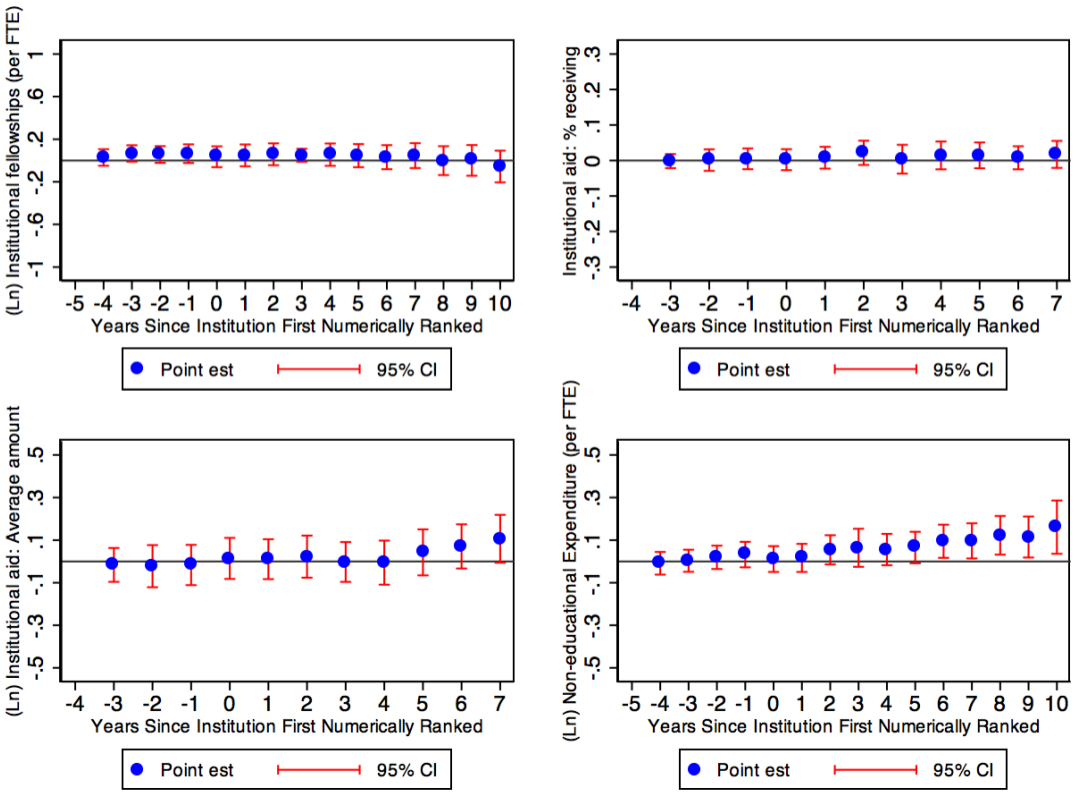


Notes. Graphs plot the point estimates from the event study model using the full balanced panel sample. Institution sample includes 199 National Universities.

Figure A.3 Event-study estimates of effect of rankings on faculty resources related expenditures: National Universities

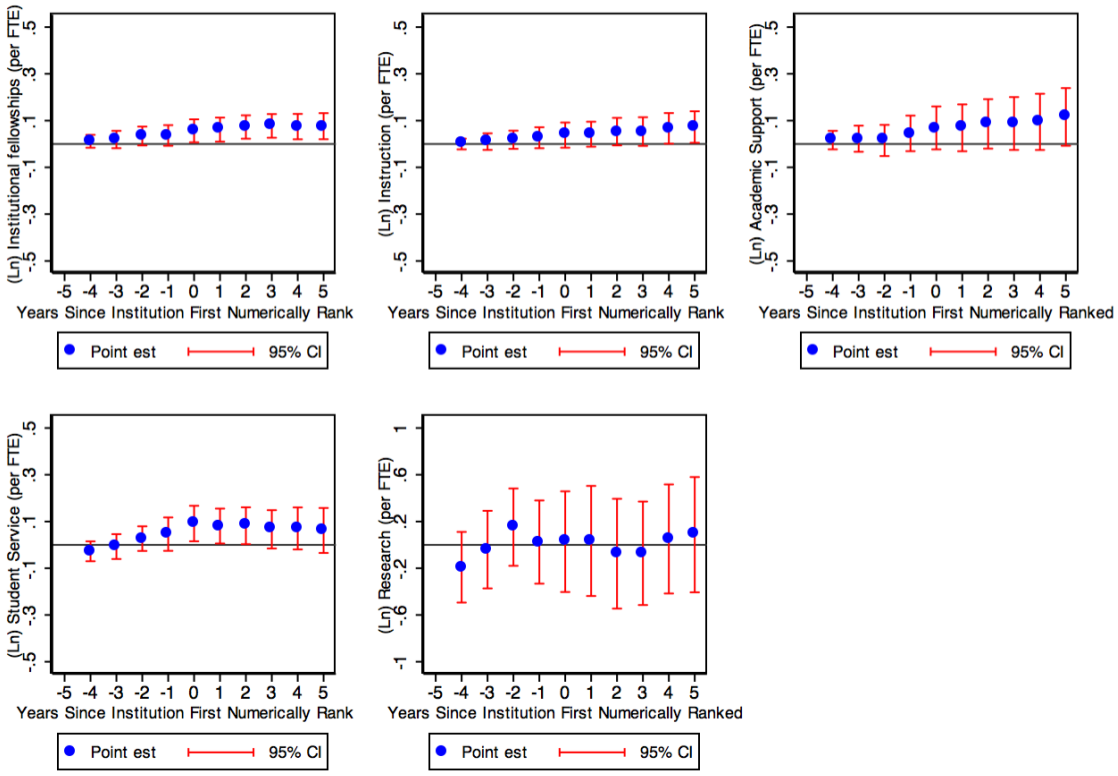


Notes. Graphs plot the point estimates from the event study model using the restricted (-/+5 year window) sample. Institution sample includes 134 National Liberal Arts Colleges.

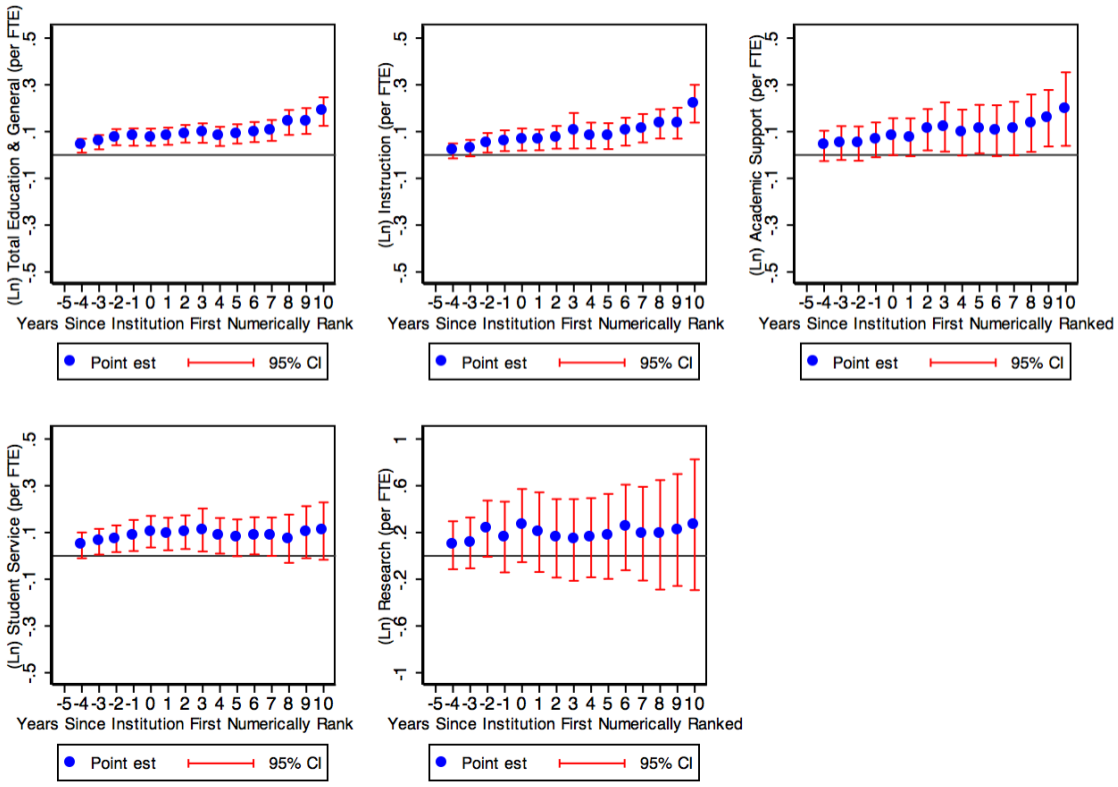


Notes. Graphs plot the point estimates from the event study model using the full balanced panel sample. Institution sample includes 134 National Liberal Arts Colleges.

Figure A.4 Event-study estimates of effect of rankings on admission related expenditures: National Liberal Arts Colleges

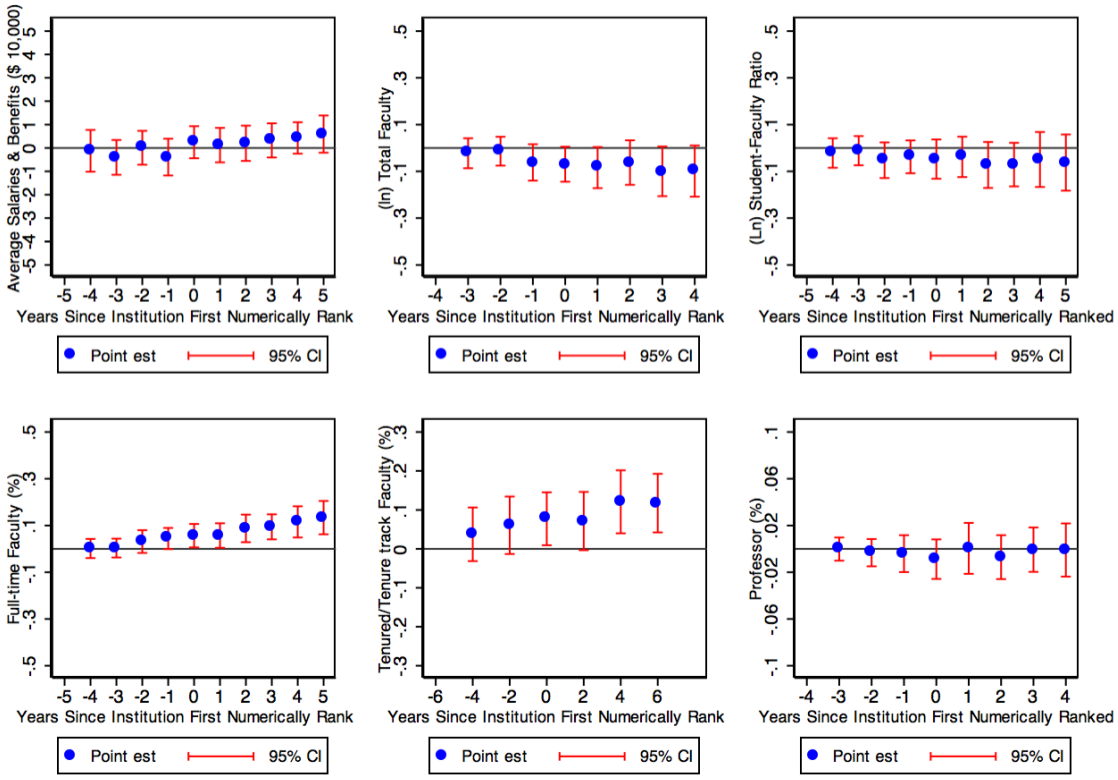


Notes. Graphs plot the point estimates from the event study model using the restricted (-/+5 year window) sample. Institution sample includes 134 National Liberal Arts Colleges.

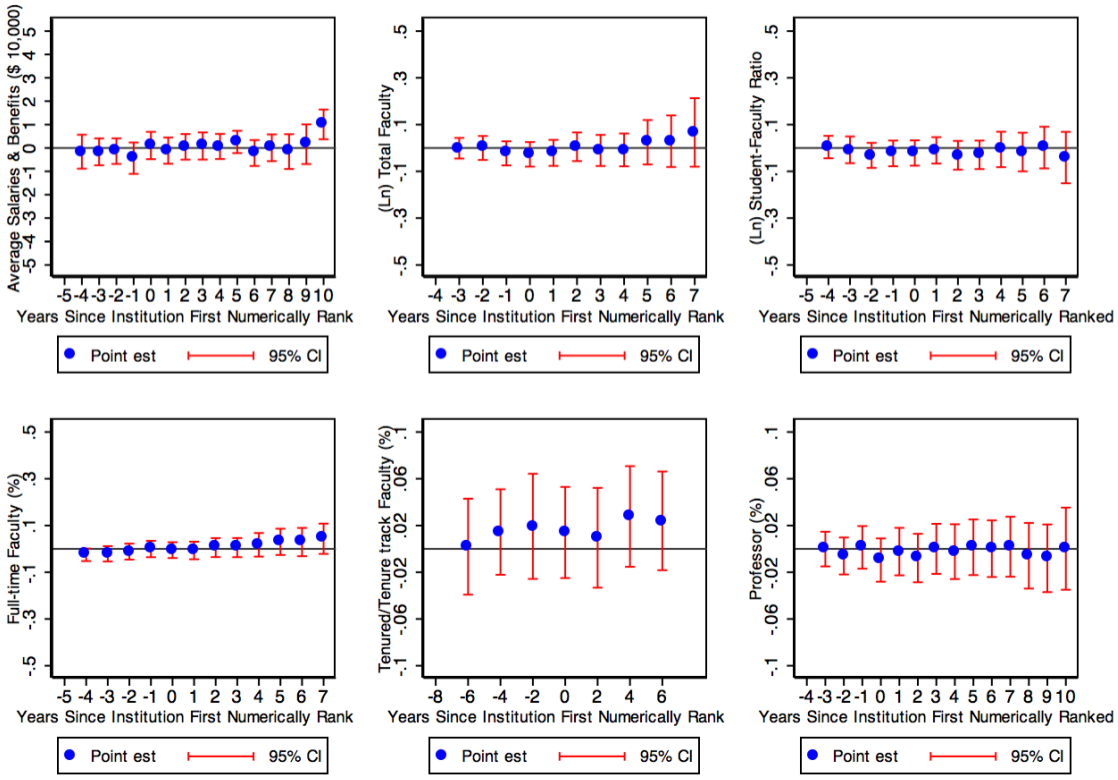


Notes. Graphs plot the point estimates from the event study model using the full balanced panel sample. Institution sample includes 134 National Liberal Arts Colleges.

Figure A.5 Event-study estimates of effect of rankings on financial resources expenditures: National Liberal Arts Colleges



Notes. Graphs plot the point estimates from the event study model using the restricted (-/+5 year window) sample. Institution sample includes 134 National Liberal Arts Colleges.



Notes. Graphs plot the point estimates from the event study model using the full balanced panel sample. Institution sample includes 134 National Liberal Arts Colleges.

Figure A.6 Event-study estimates of effect of rankings on faculty resources related expenditures: National Liberal Arts Colleges

Table A.1 Effect of rankings on admission related expenditures: National Universities

	Institutional grants & fellowships					Institutional aid: % receiving				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Sample	All NU	Ranked NU	All NU	All NU	All NU	All NU	Ranked NU	All NU	All NU	All NU
Year	All Years	All Years,	All Years	All Years	All Years	All Years	All Years,	All Years	All Years	All Years
Control			Revenue controlled	Endowment controlled				Revenue controlled	Endowment controlled	
Fixed effects	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year-by-state FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year-by-state FE
Panel (A) Event-study analysis										
0-2 years	0.206**					-0.223***				
	(0.087)					(0.025)				
3+years	0.104					-0.226***				
	(0.080)					(0.025)				
Panel (B) Differences-in-differences analysis										
Ranked	0.128	0.162*	0.129	0.178	0.082	0.007	0.027*	0.007	0.022	-0.007
	(0.079)	(0.092)	(0.080)	(0.110)	(0.100)	(0.015)	(0.014)	(0.015)	(0.015)	(0.017)
Revenue			0.026					-0.000		
			(0.084)					(0.000)		
Endowment				-0.013					0.000**	
				(0.047)					(0.000)	
Observations	3,891	2,483	3,883	2,657	3,891	2,540	1,637	2,532	1,762	2,540
Nuber of institutions	199	126	199	198	199	196	126	196	196	196

	Institutional aid: Average amount					Non-educational services				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Sample	All NU	Ranked NU	All NU	All NU	All NU	All NU	Ranked NU	All NU	All NU	All NU
Year	All Years	All Years,	All Years	All Years	All Years	All Years	All Years,	All Years	All Years	All Years
Control			Revenue controlled	Endowment controlled				Revenue controlled	Endowment controlled	
Fixed effects	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year-by-state FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year-by-state FE
Panel (A) Event-study analysis										
0-2 years	-0.036					0.052				
	(0.030)					(0.033)				
3+years	-0.065					0.034				
	(0.043)					(0.046)				
Panel (B) Differences-in-differences analysis										
Ranked	-0.054	-0.093***	-0.052	0.005	-0.065*	0.040	0.079	0.037	0.082	0.010
	(0.034)	(0.034)	(0.035)	(0.040)	(0.034)	(0.038)	(0.052)	(0.038)	(0.051)	(0.053)
Revenue			0.000					0.123**	0.021	
			(0.000)					(0.063)	(0.016)	
Endowment				0.000**						
				(0.000)						
Observations	2,542	1,637	2,534	1,763	2,542	6,115	3,884	6,106	3,968	6,115
Nuber of institutions	196	126	196	196	196	199	126	199	199	199

Table A.2 Effect of rankings on financial resources related expenditures: National Universities

	Total Education & General					Instruction					Academic Support				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Sample	All NU	Ranked NU	All NU	All NU	All NU	All NU	Ranked NU	All NU	All NU	All NU	All NU	Ranked NU	All NU	All NU	All NU
Year	All Years	All Years,	All Years	All Years	All Years	All Years	All Years,	All Years	All Years	All Years	All Years	All Years,	All Years	All Years	All Years
Control			Revenue controlled	Endowment controlled				Revenue controlled	Endowment controlled				Revenue controlled	Endowment controlled	
Fixed effects	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year-by-state FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year-by-state FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year-by-state FE
Panel (A) Event-study analysis															
0-2 years	-0.002					0.012					0.020				
	(0.019)					(0.019)					(0.036)				
3+years	0.068**					0.098***					-0.011				
	(0.027)					(0.027)					(0.052)				
Panel (B) Differences-in-differences analysis															
Ranked	0.042*	-0.058**	0.040*	0.073**	0.070**	0.066***	-0.144***	0.064***	0.097***	0.099***	0.001	0.034	0.001	0.025	-0.017
	(0.023)	(0.029)	(0.023)	(0.031)	(0.031)	(0.023)	(0.034)	(0.023)	(0.030)	(0.032)	(0.043)	(0.069)	(0.043)	(0.053)	(0.061)
Revenue			0.096**					0.099**					0.040		
			(0.042)					(0.048)					(0.076)		
Endowment				0.010					0.010					0.010	
				(0.008)					(0.009)					(0.015)	
Observations	6,164	3,901	6,154	3,995	6,164	6,163	3,900	6,153	3,995	6,163	6,158	3,895	6,148	3,994	6,158
Nuber of insti	199	126	199	199	199	199	126	199	199	199	199	126	199	199	199

	Student Services					Research				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
	All NU All Years	Ranked NU All Years,	All NU All Years Revenue controlled	All NU All Years Endowment controlled	All NU All Years	All NU All Years	Ranked NU All Years,	All NU All Years Revenue controlled	All NU All Years Endowment controlled	All NU All Years
	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year-by-state FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year-by-state FE
Panel (A) Event-study analysis										
0-2 years	-0.037					-0.113***				
	(0.029)					(0.037)				
3+years	0.026					-0.114**				
	(0.042)					(0.052)				
Panel (B) Differences-in-differences analysis										
Ranked	0.003	-0.111**	0.004	0.024	0.004	-0.114***	-0.038	-0.116***	-0.134**	-0.111*
	(0.035)	(0.056)	(0.035)	(0.044)	(0.044)	(0.044)	(0.059)	(0.044)	(0.058)	(0.063)
Revenue			-0.008					0.091*		
			(0.040)					(0.053)		
Endowment				0.003					0.062***	
				(0.013)					(0.018)	
Observations	6,143	3,880	6,133	3,984	6,143	6,095	3,876	6,085	3,960	6,095
Nuber of instit	199	126	199	199	199	198	126	198	198	198

Table A.3 Effect of rankings on faculty resources related expenditures and outcomes: National Universities

	Average Salaries & Benefits					Total Faculty					Student-Faculty Ratio				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Sample	All NU	Ranked NU	All NU	All NU	All NU	All NU	Ranked NU	All NU	All NU	All NU	All NU	Ranked NU	All NU	All NU	All NU
Year	All Years	All Years,	All Years	All Years	All Years	All Years	All Years,	All Years	All Years	All Years	All Years	All Years,	All Years	All Years	All Years
Control			Revenue controlled	Endowment controlled				Revenue controlled	Endowment controlled				Revenue controlled	Endowment controlled	
Fixed effects	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year-by-state FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year-by-state FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year-by-state FE
Panel (A) Event-study analysis															
0-2 years	0.024					-0.019					-0.039				
	(0.031)					(0.029)					(0.028)				
3+years	0.110***					-0.050					-0.053				
	(0.032)					(0.042)					(0.044)				
Panel (B) Differences-in-differences analysis															
Ranked	0.638***	-0.995***	0.636***	0.833***	0.392	-0.028	-0.042	-0.023	-0.039	-0.060	-0.043	-0.088**	-0.042	-0.031	-0.062
	(0.172)	(0.261)	(0.170)	(0.206)	(0.247)	(0.030)	(0.047)	(0.029)	(0.039)	(0.048)	(0.030)	(0.045)	(0.030)	(0.036)	(0.047)
Revenue			0.079**					0.189**					0.000		
			(0.033)					(0.077)					(0.000)		
Endowment				-0.092*					0.014					0.000***	
				(0.056)					(0.009)					(0.000)	
Observations	5,358	3,392	5,348	3,611	5,358	2,377	1,503	2,375	1,301	2,377	2,375	1,501	2,373	1,388	2,375
Nuber of insti	199	126	199	199	199	199	126	199	199	199	199	126	199	199	199

	% Full-time					% Tenured/Tenure Track					% Professor				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
	All NU All Years	Ranked NU All Years,	All NU All Years Revenue controlled	All NU All Years Endowment controlled	All NU All Years	All NU All Years	Ranked NU All Years,	All NU All Years Revenue controlled	All NU All Years Endowment controlled	All NU All Years	All NU All Years	Ranked NU All Years,	All NU All Years Revenue controlled	All NU All Years Endowment controlled	All NU All Years
	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year-by-state FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year-by-state FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year-by-state FE
Panel (A) Event-study analysis															
0-2 years	0.007					0.004					0.008				
	(0.013)					(0.013)					(0.016)				
3+years	0.035*					-0.003					0.020				
	(0.020)					(0.016)					(0.021)				
Panel (B) Differences-in-differences analysis															
Ranked	0.016	-0.037**	0.021	0.028	0.031	0.001	-0.003	0.002	0.000	-0.078***	0.004	-0.010	0.003	0.005	0.000
	(0.014)	(0.019)	(0.013)	(0.017)	(0.019)	(0.014)	(0.020)	(0.014)	(0.021)	(0.010)	(0.006)	(0.010)	(0.006)	(0.007)	(0.008)
Revenue			0.000***					0.039					0.000		
			(0.000)					(0.024)					(0.000)		
Endowment				0.000***					-0.005					0.000	
				(0.000)					(0.005)					(0.000)	
Observations	2,377	1,503	2,375	1,390	2,377	1,773	1,134	1,772	1,121	1,773	5,339	3,392	5,329	3,951	5,339
Nuber of insti	199	126	199	199	199	197	126	197	197	197	199	126	199	199	199

Table A.4 Effect of rankings on admission related expenditures: National Liberal Arts Colleges

	Institutional grants & fellowships					Institutional aid: % receiving				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Sample	All LA	Ranked LA	All LA	All LA	All LA	All LA	Ranked LA	All LA	All LA	All LA
Year	All Years	All Years,	All Years	All Years	All Years	All Years	All Years,	All Years	All Years	All Years
Control			Revenue controlled	Endowment controlled				Revenue controlled	Endowment controlled	
Fixed effects	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year-by-state FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year-by-state FE
Panel (A) Event-study analysis										
0-2 years	0.029					0.287***				
	(0.041)					(0.005)				
3+years	0.020					0.281***				
	(0.049)					(0.014)				
Panel (B) Differences-in-differences analysis										
Ranked	0.023	0.046	0.025	0.026	-0.013	0.009	0.018	0.008	0.006	0.007
	(0.046)	(0.044)	(0.047)	(0.058)	(0.051)	(0.012)	(0.012)	(0.012)	(0.015)	(0.012)
Revenue			0.028					-0.000		
			(0.023)					(0.000)		
Endowment				0.053					0.000	
				(0.045)					(0.000)	
Observations	2,671	2,137	2,624	1,844	2,671	1,735	1,387	1,687	1,204	1,735
Nuber of institutions	134	107	134	134	134	134	107	134	134	134

	Institutional aid: Average amount					Non-educational services				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
	All LA All Years	Ranked LA All Years,	All LA All Years Revenue controlled	All LA All Years Endowment controlled	All LA All Years	All LA All Years	Ranked LA All Years,	All LA All Years Revenue controlled	All LA All Years Endowment controlled	All LA All Years
	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year-by-state FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year-by-state FE
Panel (A) Event-study analysis										
0-2 years	-0.235***					0.004				
	(0.009)					(0.024)				
3+years	-0.215***					0.084***				
	(0.022)					(0.030)				
Panel (B) Differences-in-differences analysis										
Ranked	0.029	0.014	0.031	0.039	0.002	0.052**	-0.062	0.053**	0.061*	0.044
	(0.032)	(0.031)	(0.032)	(0.032)	(0.035)	(0.024)	(0.045)	(0.024)	(0.033)	(0.029)
Revenue			0.000					0.043		
			(0.000)					(0.027)		
Endowment				0.000					0.041	
				(0.000)					(0.025)	
Observations	1,737	1,389	1,689	1,205	1,737	4,121	3,288	4,073	2,754	4,121
Nuber of institutions	134	107	134	134	134	134	107	134	134	134

Table A.5 Effect of rankings on financial resources related expenditures: National Liberal Arts Colleges

	Total Education & General					Instruction					Academic Support				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Sample	All LA	Ranked LA	All LA	All LA	All LA	All LA	Ranked LA	All LA	All LA	All LA	All LA	Ranked LA	All LA	All LA	All LA
Year	All Years	All Years,	All Years	All Years	All Years	All Years	All Years,	All Years	All Years	All Years	All Years	All Years,	All Years	All Years	All Years
Control			Revenue controlled	Endowment controlled				Revenue controlled	Endowment controlled				Revenue controlled	Endowment controlled	
Fixed effects	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year-by-state FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year-by-state FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year-by-state FE
Panel (A) Event-study analysis															
0-2 years	0.038***					0.027					0.049*				
	(0.014)					(0.017)					(0.029)				
3+years	0.075***					0.092***					0.095**				
	(0.018)					(0.023)					(0.042)				
Panel (B) Differences-in-differences analysis															
Ranked	0.061***	-0.037	0.059***	0.075***	0.040**	0.066***	-0.106***	0.066***	0.081***	0.044*	0.077**	-0.121**	0.076**	0.082*	0.081**
	(0.015)	(0.023)	(0.015)	(0.021)	(0.019)	(0.020)	(0.028)	(0.020)	(0.025)	(0.024)	(0.034)	(0.051)	(0.034)	(0.046)	(0.040)
Revenue			0.042***					0.045***					0.044*		
			(0.011)					(0.017)					(0.022)		
Endowment				0.051**				-	0.086***					0.051	
				(0.023)					(0.027)					(0.043)	
Observations	4,154	3,317	4,105	2,775	4,154	4,154	3,317	4,105	2,775	4,154	4,136	3,299	4,087	2,763	4,136
Nuber of insti	134	107	134	134	134	134	107	134	134	134	134	107	134	134	134

	Student Services					Research				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
	All LA All Years Institution, private-by-year FE	Ranked LA All Years, Institution, private-by-year FE	All LA All Years Revenue controlled Institution, private-by-year FE	All LA All Years Endowment controlled Institution, private-by-year FE	All LA All Years Institution, private-by-year-by-state FE	All LA All Years Institution, private-by-year FE	Ranked LA All Years, Institution, private-by-year FE	All LA All Years Revenue controlled Institution, private-by-year FE	All LA All Years Endowment controlled Institution, private-by-year FE	All LA All Years Institution, private-by-year-by-state FE
Panel (A) Event-study analysis										
0-2 years	0.070***					0.112				
	(0.026)					(0.121)				
3+years	0.053*					0.080				
	(0.032)					(0.137)				
Panel (B) Differences-in-differences analysis										
Ranked	0.060**	0.037	0.058**	0.069*	0.054*	0.094	0.135	0.088	0.208	0.223
	(0.027)	(0.054)	(0.027)	(0.036)	(0.030)	(0.118)	(0.177)	(0.118)	(0.157)	(0.159)
Revenue			-0.002					0.023		
			(0.025)					(0.080)		
Endowment				0.059**					-0.040	
				(0.029)					(0.069)	
Observations	4,150	3,313	4,101	2,772	4,150	2,753	2,457	2,714	1,835	2,753
Nuber of instit	134	107	134	134	134	111	96	111	108	111

Table A.6 Effect of rankings on faculty resources related expenditures and outcomes: National Liberal Arts Colleges

	Average Salaries & Benefits					Total Faculty					Student-Faculty Ratio				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Sample	All LA	Ranked LA	All LA	All LA	All LA	All LA	Ranked LA	All LA	All LA	All LA	All LA	Ranked LA	All LA	All LA	All LA
Year	All Years	All Years,	All Years	All Years	All Years	All Years	All Years,	All Years	All Years	All Years	All Years	All Years,	All Years	All Years	All Years
Control			Revenue controlled	Endowment controlled				Revenue controlled	Endowment controlled				Revenue controlled	Endowment controlled	
Fixed effects	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year-by-state FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year-by-state FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year-by-state FE
Panel (A) Event-study analysis															
0-2 years	-0.140					-0.002					-0.010				
	(0.190)					(0.020)					(0.018)				
3+years	0.208					0.020					-0.008				
	(0.191)					(0.033)					(0.024)				
Panel (B) Differences-in-differences analysis															
Ranked	0.067	-0.750***	0.105	-0.102	-0.027	0.004	0.004	0.004	0.003	0.005	-0.013	-0.018	-0.013	-0.023	-0.040*
	(0.169)	(0.240)	(0.168)	(0.241)	(0.215)	(0.021)	(0.028)	(0.020)	(0.029)	(0.025)	(0.018)	(0.022)	(0.019)	(0.030)	(0.024)
Revenue			0.153					0.033*					0.000		
			(0.106)					(0.017)					(0.000)		
Endowment			-	0.110				-	0.015					0.000	
				(0.132)					(0.019)					(0.000)	
Observations	3,607	2,880	3,560	2,498	3,607	1,608	1,284	1,602	920	1,608	1,608	1,284	1,602	938	1,608
Nuber of insti	134	107	134	134	134	134	107	134	134	134	134	107	134	134	134

	% Full-time					% Tenured/Tenure Track					% Professor				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
	All LA All Years	Ranked LA All Years,	All LA All Years Revenue controlled	All LA All Years Endowment controlled	All LA All Years	All LA All Years	Ranked LA All Years,	All LA All Years Revenue controlled	All LA All Years Endowment controlled	All LA All Years	All LA All Years	Ranked LA All Years,	All LA All Years Revenue controlled	All LA All Years Endowment controlled	All LA All Years
	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year-by-state FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year-by-state FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year FE	Institution, private-by-year-by-state FE
Panel (A) Event-study analysis															
0-2 years	0.006					0.004					-0.017				
	(0.012)					(0.014)					(0.023)				
3+years	0.023					0.018					-0.005				
	(0.016)					(0.016)					(0.030)				
Panel (B) Differences-in-differences analysis															
Ranked	0.010	-0.040***	0.012	0.031*	0.012	0.010	-0.022	0.011	0.011	-0.038***	-0.003	0.015	-0.003	-0.007	-0.001
	(0.013)	(0.014)	(0.013)	(0.018)	(0.016)	(0.015)	(0.014)	(0.015)	(0.022)	(0.008)	(0.009)	(0.014)	(0.008)	(0.010)	(0.012)
Revenue			0.000*					0.012					-0.000		
			(0.000)					(0.011)					(0.000)		
Endowment				0.000***					0.005					-0.000	
				(0.000)					(0.009)					(0.000)	
Observations	1,607	1,283	1,601	938	1,607	1,179	945	1,173	772	1,179	3,489	2,801	3,442	2,586	3,489
Nuber of insti	134	107	134	134	134	131	105	131	131	131	132	105	132	132	132

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