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The Functions and Dysfunctions of College Rankings: An Analysis of Institutional Expenditure

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Abstract College rankings have become a powerful influence in higher education. While the determinants of educational quality are not clearly defined, college rankings designate an institution's standing in a numerical order based on quantifiable measurements that focus primarily on institutional resources. Previous research has identified the "functions" of rankings: higher ranking positions benefit institutions via admissions outcomes, resource attainment, and future reputation. On the other hand, this positive association between rankings and resource attainment has increased concerns among higher education community about "dysfunctions" of rankings. Rankings may encourage colleges and universities to spend more, moving resources from educational activities to research, amenities and facilities, and administrative expenditures. Filling the gap in the literature in empirically evaluating this hypothesis, this study examined the effect of ranking systems on resource allocation using *U.S. News and World Report*'s Best Colleges rankings. The numerical ranking resulted in an expansion in both educational and noneducational activities expenditures, including the escalation of student and academic services expenditures. Instruction expenditure was the major area in which institutions altered resource allocation in response to the distinctive nature of ranking systems, the numerical rankings and arbitrary groupings. These patterns were manifested differently among schools categorized as National Universities and those categorized as National Liberal Arts Colleges. The findings from this study provide important implications for understanding the role of college rankings that reinforce the resource-based view of institutional quality and institutional responses, as well as its ramifications to the missions of higher education.

Keywords College rankings · Resource allocation · Institutional strategy · Prestige · Differences–in–differences

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Introduction

The rapid increase in the cost of higher education over the last decades has raised concerns about quality and affordability (Archibald and Feldman 2012). Since the 1980s, expenses of colleges and universities have increased, exceeding the overall inflation rate. As costs have been growing at such a fast pace that colleges do not have revenue to cover them, the financial sustainability of many higher education institutions has become weaker (Denneen and Dretler 2013). These trends in college cost and financial consequences for students and families called for a need to collect and disseminate information about institutions to better inform students and parents, as well as to hold institutions accountable (Burke 2004).

Filling this need, college rankings, particularly those produced by the media, have gained growing attention from various stakeholders of higher education (Iglesias 2014; Stergiou and Tsikliras 2014). Ranking providers have argued that rankings provide information that should be relevant for the choices students make about where to study, and information that should be the basis for decisions about which universities should receive public money (Kehm and Stensaker 2009). Students describe the ratings as being very important in their choice of college. According to the CIRP Freshman Survey, the proportion of students who responded that rankings in national magazines are very important in deciding to go to their respective institutions was 10.5% in 1995, while that was almost doubled (20.1%) in 2015 (Eagan et al. 2016). Rankings and ratings have been folded into state policies (Morphew and Swanson 2011). For example, Minnesota, Indiana, and Texas included the performance of public institutions in media rankings in their state assessments and accountability policies (Sponsler 2009). Although it was not realized, President Obama's proposal for developing a rating system for evaluating colleges and linking student aid to those ratings (The White House 2013) demonstrates an example of policies incorporating ratings or ranking components. In some countries, ranking is used as a tool for international benchmarking and quality assurance and is linked with resource allocation (Hazelkorn 2011).

Ironically, college rankings are considered to exacerbate competition over prestige by increasing costs, because their numerical ordering manifests institutional prestige based on quantifiable measurements that are mostly related to resources (Michael 2005). After reviewing the methodology of *U.S. News and World Report*'s Best Colleges (*U.S. News*) ranking, Ehrenberg (2003) argued that the ranking encourages institutions to spend more, not to spend less, regardless of whether the increased expenditure makes sense educationally or would improve the efficiency of their operations. To improve their rankings, colleges and universities would emphasize research activities rather than teaching (O'Meara 2007), spend more on amenities and facilities (Hartley and Morphew 2008; Jacob et al. 2013), and increase administrative expenditures (Morphew and Baker 2004). These changes might have consequences for policy goals, such as equity and diversity (Meredith 2004; Shaw and LeChasseur 2005), as well as institutional effectiveness and efficiency (Hossler 2000; Winston 2000).

Although conceptual arguments have been developed on the function and dysfunction of rankings in the management of universities (e.g., Hazelkorn 2011; Shin and Toutkoushian 2011), empirical testing of how the evaluation of colleges and universities and publication of this evaluation impact institutions' behaviors is lacking. Thus, the contribution of the current study is to provide empirical evidence on the responses of higher education institutions to rankings. In particular, I examine how the system of rankings, by publishing institutions' positions in discrete numbers and arbitrary groups based on proxies for quality, impacts resource allocation in different areas. The following two research questions guide this study:

(1) How do rankings, the numerical ordering of institutions, affect institutional expenditures over time?
(2) How does the arbitrary grouping of institutions (e.g., top 1, 25, 50, and 120) affect institutional expenditures?

By examining the impact of rankings on institutions' resource-allocation behaviors, the current study provides implications for researchers and policymakers for understanding the consequences of the competition for rankings and prestige on institutional spending, in a context where college costs and cost containment are the top policy issues in higher education and ratings have been suggested as a solution to those issues.

This article is organized as follows. The next section summarizes prior literature on college rankings, including the slim literature on institutional responses to rankings. Then I introduce a conceptual framework for understanding the resource allocation behavior of institutions in relation to rankings. The methodology section discusses major changes in the *U.S. News* methodology—measurements and presentations of the results—that serve as the mechanisms for institutional behaviors and the empirical strategy employed by this study. After presenting the results, I discuss the main findings and identify implications for future work.

Literature Review

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 and Stensaker 2009). This line of research is based on the nature of the rankings, which provide information on institutional quality by simplifying complex information as discrete numbers and categories or classifications. Overall, studies have shown that an institution's numerical position is associated with the school's admissions and resource attainment in subsequent years, as the *salience of information* (Luca and Smith 2013) impacts people's judgement of colleges and universities. Moreover, some researchers found that being in a particular group (e.g., top 25 or 50) matters more than an institution's numerical position due to the *front-page effect* (Bowman and Bastedo 2009).

Arguing that students are the main consumers of the rankings, many studies have focused on students' responses to rankings. The findings have shown significant positive associations between rankings and admissions outcomes, measured through number of applications and acceptance rate, matriculation rates, and incoming students' academic achievement level (Bowman and Bastedo 2009; Griffith and Rask 2007; Luca and Smith 2013; Meredith 2004; Monks and Ehrenberg 1999; Sauder and Lancaster 2006). Yet higher rankings do not necessarily result in increased revenue through tuition, because institutions provide significant institutional financial aid while not altering their tuition and fees (Kim 2016; Monks and Ehrenberg 1999). The significant relationship between rankings and admissions outcomes is more profound among National Universities than among National Liberal Arts Colleges (Bowman and Bastedo 2009).[1]

[1] *U.S. News* categorizes colleges and universities as National Universities, National Liberal Arts Colleges, Regional Universities, and Regional Liberal Arts Colleges based on the Carnegie Classification of Institutions of Higher Education and generates separate rankings for each institutional category. This study focuses on the first two categories. Other rankings, such as rankings of specialty schools and professional and graduate programs, have been produced by *U.S. News and World Report* and other media, and study of these rankings can also provide insights into various institutional responses to ranking systems.

Meanwhile, a number of studies have analyzed the impact of rankings on institutions' attainment of financial resources in order to explain the motivation of institutions to react to rankings. While Meredith (2004) suggested that rankings do not make significant difference across institutions ranked at different positions in terms of overall grant, gift, and contract, Jin and Whalley (2007) argued that the publication of rankings functions as an exogenous information shock and promotes the provision of quality for public universities through a political channel. Using the data from 1987 to 1995, the authors found that the addition of a "tier" system[2] to the rankings increased revenue for those schools that were added to the ranking without being numbered, i.e., that were listed alphabetically within each tier. The increase in revenue was particularly from increased state appropriations; being listed in tier groups did not have a significant influence on other revenue streams including tuition and fees, government contracts, and endowment. The amount of private gifts received even decreased.

In addition, colleges and universities will react to rankings, as the constituencies that are directly related to colleges and universities are less likely to be able to buffer themselves from rankings compared to those who are not directly associated with the institutions. Bastedo and Bowman (2011) found that the arbitrary distinction of "top 25" is associated with greater gains in research and development funding from government and industry and from out-of-state tuition and fees, as well as from the proportion of alumni who donate to their university, while rankings do not have significant influence on funding from foundations. In addition, rankings' effect on constituencies and their behaviors may not be immediate and may change over time. Measuring the effects at different time periods, this study also found that the effect is weaker in a shorter period of time (i.e., 2–4 years later) than over a longer period (i.e., 8 years later). Bastedo and Bowman (2010, 2011) also found that rankings matter for the future reputation of institutions, by "anchoring" the image of the organization.

Despite the evidence that institutions are under the pressure of improving rankings and will change their management to achieve ranking goals, there is a dearth of empirical research on how universities respond to ranking systems. Literature on prestige and striving institutions provides hints for hypothesizing potential behavioral patterns. Prestige maximization has been one of the most critical goals of higher education institutions (Bowen 1980; Ehrenberg 2003; Melguizo and Strober 2007). While the concept of prestige is not clear, prestige is often judged by faculty and financial resources, external funding, and student selectivity, rather than educational process (Brooks 2005; Volkwein and Grunig 2004). Studies have documented strategic behavior of universities to improve prestige, defined as *striving* behavior. The desire to become prestigious, by moving up to the "next level" (e.g., nonresearch to research universities, or research universities to the highest research category in the Carnegie classification) can lead to an increase in expenditures (O'Meara 2007). Resources are allocated for attracting selective students and faculty by spending more on facilities or amenities (Winston 1999), institutional support (Morphew and Baker 2004), and research (Iglesias 2014; Zemsky and Massy 1990), but less is spent on teaching and learning (Brewer et al. 2002).

Meanwhile, a few studies have empirically investigated this hypothesis focusing on graduate, professional degree levels. Based on interviews, the major findings of these

[2] In 1990, *U.S. News* added a "tier" system that divides schools that are not included in the numerical rankings (Top 25) into quartiles and lists the name of institutions in alphabetical order. Due to the expansion of the numerical rankings in 1995, institutions other than the top 50 were grouped into tiers 2, 3, and 4. Similarly, between 2003 and 2009, schools other than the top 120 were listed as tiers 3 and 4.

studies indicate that top administrators at business or law schools perceive that the ranking system is not necessarily credible, but that not engaging in the ranking measures would have negative consequences to their respective institutions (Corley and Gioia 2000). The managerial anxiety about rankings and competition with other universities might lead universities to fail to resist rankings, and to succumb to the allure of gaming the rankings system (Sauder and Lancaster 2006). Rankings impact the definition of goals and work at institutions through what they measure (Espeland and Sauder 2007) and are used for strategic planning (Hazelkorn 2007) or leadership change (Fee et al. 2005). Institutions also alter their admissions and financial aid processes (Espeland and Sauder 2007) in order to attract selective students who will be beneficial for the institutions' future rankings. However, this strategy is employed for only a short period after the institution is ranked for the first time (Kim 2016).

While there is limited evidence for actual changes in resource allocation of colleges and universities, a number of simulation studies have suggested that the competition for a higher ranking position can be costly but not promising. Gnolek et al. (2014) simulated changes in each ranking criterion required to move an institution from the 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 0.01% probability of occurring. 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 that the authors forecast.

The costs for ranking competition might vary across the ranking positions. Analyzing 8 years (1999–2006) of *U.S. News* for the top 50 National Universities, Grewal et al. (2008) captured the localized nature of ranking competition. First, ranking positions are sticky, and do not move at a high rate. The study found that the probability of a university being ranked within 4 points of its current rank is about 90%. Second, in the analysis of how subranks on each ranking criterion are associated with the overall ranking, different criteria mattered for institutions of different rank positions. The results indicated that highly ranked universities get more leverage from growing expenses on educational resources measures, while lower ranked universities get more leverage from improvements in academic reputation.

In summary, rankings inspire higher education institutions to improve their rankings because rankings have a significant influence on admissions, financial resources, and reputation. Colleges consider that not engaging in the rankings competition will damage their institutions, and will incorporate changes in organizational practice and structure by conforming to ranking measures in order to secure a better position in the pecking order. While this trend might have significant consequences to the core activities of institutions, empirical research is limited in investigating how rankings, as a unique system, affect institutional behaviors over time. I expect that the current study will also contribute to improving methodological limitations of previous studies in institutional behaviors that have not accounted for other external factors that influence both institutions' rankings and resource allocations. How institutions alter resource allocation behavior in response to rankings over time, considering the unique characteristics of ranking systems—numeric order and arbitrary grouping—is a hole in this literature I aim to fill.

Theoretical Framework

In response to increasing demands for accountability, transparency, and efficiency, social measures to evaluate the performance of organizations have emerged in the public sector (Espeland and Sauder 2007). Because college rankings depict the proliferation of performance measurements (Dahler-Larsen 2014), conceptual frameworks from public administration as well as sociology provide implications to theorizing the impact of rankings on colleges and universities. The original "function" of measuring and publishing performance data is providing stakeholders with access to information, and through this motivating organizations to improve in efficiency and effectiveness in activities to support their mission. However, research has identified and conceptualized the "dysfunctional" consequences of those measures (Leeuw 2000). The *reactivity* of measures induces people to continue to monitor the measurements and respond to them in ways that might not contribute to the actual performance of organizations. Van Thiel and Leeuw (2002) pointed out the perverse behaviors that come from the "performance paradox," a weak correlation between performance indicators and performance itself. Due to the lack of congruence between organizational objectives and the measurement scheme, as well as the inability to measure complex phenomena with precision or fidelity (Smith 1995), those who are being assessed strive to maximize their results by improving the aspects that are being assessed (*positive learning*) and modifying their behavior in order to manipulate assessment (*perverse learning*) (Van Thiel and Leeuw 2002).

As a result, efforts are primarily put into what is measured, mostly quantitatively, in the performance measurement scheme without necessarily having improvement. Organizations might focus on the easiest indicators at the expense of unmeasured aspects of performance or measures that are difficult to change (*tunnel vision*). Other dysfunctional behaviors include *myopia*, where institutions focus on short-term targets rather than longer-term objectives, and *measure fixation*, where organizations emphasize single measures of success rather than the underlying objective or desired outcome of the organization (Smith 1995).

Applying these concepts to education, studies have shown that the limited measures that are employed to evaluate the complex process and multiple tasks related to what students experience and gain create perverse incentives for educational institutions (Brown 2005; Propper and Wilson 2003). In particular, resource allocation is concentrated on activities or processes that are included in the measurement scheme, possibly to the detriment of other, less quantifiable or nonmeasured tasks. Schools can also be encouraged to target departments and individuals who can bring advantage to the measures, rather than those in need of improvement (Propper and Wilson 2003).

Meanwhile, institutional theory 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 and Rowan 1977; DiMaggio and Powell 1983). Organizations gain legitimacy, and hence increase chances of organizational survival, by conforming to norms, values, and technology that are institutionalized in society (Baum and Oliver 1991; Scott 2008). Meyer and Rowan (1977) explained that those powerful "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., nongovernmental organizations that have power and/or legitimacy to promote prescribed organizational arrangements) (Meyer and Rowan 1977). The compliance with

institutionalized norms results in increased homogeneity of organizational structure over time, which is captured as "institutional isomorphism" (DiMaggio and Powell 1983). To attain legitimacy, organizations comply with regulations (coercive isomorphism) and adopt standards induced by environmental and informal external pressures (normative isomorphism). Also, organizations mimic goals, structures, and practices of successful or prestigious organizations (mimetic isomorphism) (Meyer and Rowan 1977; Rusch and Wilbur 2007; Scott 2008).

Rankings, as external validations, shape the prestige of higher education institutions. While the quality of academic programs is hard to define and evaluate (Brooks 2005), rankings employ a set of indirect measures of intrinsic characteristics of colleges and universities. In particular, the data on student selectivity, faculty resources, educational expenditures, and outcomes such as retention and graduation rates, as well as alumni giving rates, are used as proxies for quality of educational services that universities offer. Over time, rankings become a powerful institutional force as they decide what "best universities" should look like (Wedlin 2007) and present the prestige of institutions using discrete numbers that compare colleges and universities (Chang and Osborn 2005).

Shaping legitimacy by evaluating colleges and universities and publishing the results, rankings influence various constituencies (Bastedo and Bowman 2011). Higher rankings are significantly associated with benefits, including admissions outcomes, financial resource attainment, faculty hiring, and job placement of students (Boyd et al. 2010; Griffith and Rask 2007; Jin and Whalley 2007; Luca and Smith 2013; Monks and Ehrenberg 1999; Rindova et al. 2005; Sauder and Lancaster 2006). While this function of ranking makes institutions engage in efforts to improve their practices, the ranking system might also have unintended consequences (dysfunction), as institutions allocate more resources to indirect measures of intrinsic features that are used by rankings or to extrinsic features (Ehrenberg 2003). For example, rankings consider a higher average spending per student for offering various programs and services (10% of the overall score, originally 20% until 1993)[3] as an indicator of educational quality (Morse et al. 2015). Moreover, student selectivity (15% of the overall score, originally 25% until 1994), measured through admissions test scores (65%), high school academic achievement (25%), and acceptance rate (10%),[4] has been the most influential factor for an institution's ranking position (Webster 2001a, b). Thus, universities might increase spending on educational activities by directing more resources to student support and services at the expense of resources for teaching and learning. To attract more applicants, institutions are more likely to engage in signaling activities, such as construction of amenities like "lazy rivers" and climbing walls (Jacob et al. 2013). These attempts will coincide with an increase in administrative services, fiscal operations, and public relations development (Morphew and Baker 2004). The dysfunction of rankings, that is, the emphasis on these indirect measures of intrinsic characteristics and external characteristics, will have ramifications to the mission of higher education institutions—with regard to access and equity as well as teaching and learning,

[3] Other measures include reputation (22.5%; reduced from 25% in 2010), faculty resources (20%; reduced from 25% in 1993), retention and graduation (25%; gradually expanded from 5% over time), alumni giving (5%; since 1993), and graduation rate performance (7.5%; employed in 1996 at 5% and increased to 7.5% in 2010).

[4] In 2003, yield rate was dropped from the indicators. Weights on the remaining indicators were also changed: acceptance rate (reduced from 15 to 10%), percentage of freshmen who were in the top 10% of their high school class (increased by 5%), and average SAT/ACT scores (increased by 10%).

in relation to the unique missions of different types of institutions (Meredith 2004; Shaw and LeChasseur 2005).

Furthermore, the design of the ranking system might differentiate the degree in which the dysfunctions of rankings occur. The numerical order and arbitrary grouping dictate an institution's standing based on the comparison group and in relation to its peers' positions (Washington and Zajac 2005; Wedlin 2007, 2010). This feature creates pressure on institutions to move to the next level or not to slip from the current position. Schools at the margin of the arbitrary groups will then engage more aggressively in prestige-seeking behaviors by complying with ranking measurements and mimicking the features of highly ranked peers.

Using *U.S. News*, I will examine how rankings, as an external validation group, and institutional force increase the dysfunction of prestige among colleges and universities. In particular, I investigate how rankings, by (i) evaluating colleges based on quantifiable measures/proxies and (ii) publication of the results that places universities into numbers and arbitrary groups, influence the resource allocation of colleges and universities.

Methodology

Data and Sample

In order to examine the effect of rankings on institutional resource allocation, I employed data from *U.S. News*, the Higher Education General Information Survey (HEGIS), and the Integrated Postsecondary Education Data System (IPEDS). The ranking information came from the *U.S. News* rankings published between 1987 and 2009: 1987 marks the year when annual publication of the ranking based on the "objective" measurements was started; 2009 is the last time that the number of institutions that were numerically ranked was modified during the analytic period.[5] I documented each institution's numerical ranking or respective tier group for each year.

Institutional expenditures as well as other characteristics including control (public/private) and size were captured by HEGIS and IPEDS for the years 1980–2011. Two issues are worthy to note on the creation of the data. First, private and public institutions began to use different formats (FASB and GASB, respectively) for reporting their financial information in 1997. The operation and maintenance of plants and interest are included in expenses for each function for private institutions, but these are not included in GASB. I adjusted the expenditure variables by subtracting those amounts for the private university sample and made public and private reporting comparable. Also, 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 under the name of their main campus or the systems office, while others maintain individual reporting. To account for this issue, I employed the *collapsing solution* (Jaquette and 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.[6]

[5] Since 2010, all National Universities and National Liberal Arts Colleges have been assigned numerical positions (top 200 or more); however, for the periods included in the analysis of this study, only about 120 universities were numerically ranked in each ranking category.

[6] The number of schools that are affected by this was very small in the sample: 36 universities among the National Universities sample, 3 among the National Liberal Arts Colleges sample. On average, about 85%

The sample used in this study includes colleges and universities ranked in the National Universities and National Liberal Arts Colleges categories in *U.S. News*. Because the categories are determined based on the Carnegie Classification of Institutions of Higher Education, the modifications in the classification in 1994, 2000, and 2005 resulted in some schools' being included or excluded from the rankings. In order to exclude any biases due to the changes in the classification, I included only institutions that were consistently listed in each category. The final sample included 199 National Universities and 134 National Liberal Arts Colleges.

Explanatory Variables: The Design of *U.S. News*

The explanatory variables were created in relation to the design features of *U.S. News* as well as the changes in its methodology over time. In order to estimate the causal impact of numerical ranking, I created a variable, *Ranked*, that specifies if an institution is numerically ranked or not. *U.S. News* started its first annual publication in 1987 by ranking the top 25 institutions based on indirect measures of input and output quality. Then in 1995 and 2003, the number of institutions that were numerically ranked increased to top 50 and 120, respectively. Some institutions were numerically ranked for the first time during different years throughout the analytic periods. Using these changes, I coded the variable as 0 for the institutions that were not numerically ranked at any time or up to the first year that the institution was numerically ranked; 1 was assigned for the first year an institution was numerically ranked and the subsequent years. About 63 and 79% of National Universities and National Liberal Arts Colleges in the sample were numerically ranked at any time between 1987 and 2009, with half of these institutions ranked since 2003 due to the biggest expansion in the numerical rankings (Fig. 1).

The second explanatory variable is related to the *arbitrary groupings* employed by *U.S. News*. The ranking sanctions the top 1 (Best College) and classifies universities based on the cutoffs of top 25, 50, and 120 for the ranked universities. While some research found that being part of these groups makes bigger differences in admissions outcomes and resource attainment than an institution's particular ranking position (in number), I hypothesize that schools at the margins of the cutoffs would have different responses to rankings. Previous research indicated that changes in the rankings mostly happen within 0–4 intervals from the cutoff points, and those movements are due to statistical noise (Dichev 2001; Gnolek et al. 2014; Grewal et al. 2008). Also, the result from the author's analysis (see Appendix Fig. 4) showed that the distance of an institution's ranking from the respective ranking group cutoffs changed by about 2–6 points across the years, and changes in an institution's ranking happened mostly within four positions. Thus, a set of dummy variables were created to show if an institution was located at the upper margin (0–4 points from the cut; higher ranking (smaller numerical values) than cutoff) or lower margin (−1 to −4 points from the cut; lower ranking (bigger numerical values) than cutoff), compared to those schools that were ranked but not located at either the upper or lower margins.

Footnote 6 continued
of the enrollment was from the parent campus in this sample. Also, the schools evaluated by *U.S. News* were mostly main campuses, and only one case included both the main campus and another campus in the same ranking category: Rutgers–New Brunswick and Newark. As I aggregated variables for all Rutgers campuses to the New Brunswick campus, I dropped the Newark campus from the sample. Estimates did not change in terms of significance and magnitude when those schools were removed from the sample.

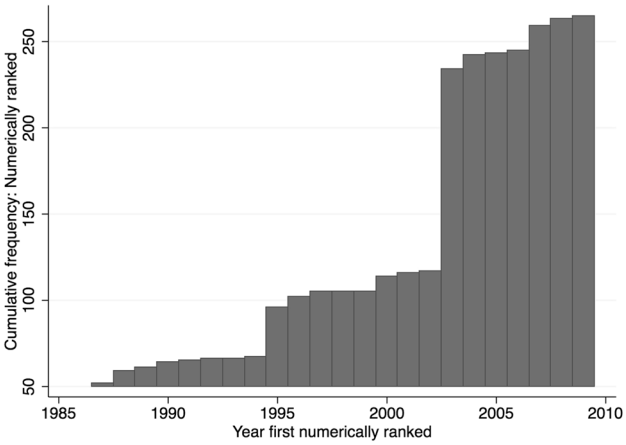

Fig. 1 Expansion of numerical ranking. The number of ranked institutions includes both National Universities and National Liberal Arts Colleges

Dependent Variables

I identified the dependent variables to be expenditures related to the indirect measures of intrinsic characteristics that are employed by *U.S. News* as well as extrinsic characteristics of universities. These included total education and general expenditure, further specified by the areas of spending: instruction, student services, academic support, research, and institutional support. Noneducational expenses, which refers to financial resources allocated to areas that are not directly related to teaching or research (e.g., residential halls, food services, student health services, intercollegiate athletics, and college unions and stores) were also measured. All expenditure variables were constructed accounting for the institutional size by calculating per-full-time equivalent (FTE) expenditures. I also adjusted for inflation using the Consumer Price Index (dollar values in 2011). I used the log transformation of the expenditure variables, as these variables were positively skewed. A descriptive analysis indicated that ranked universities spent more in all expenditure areas compared to institutions that were not ranked in the same category. Instructional expenditure marked the largest per-FTE spending, followed by research and noneducational services expenditures at National Universities and National Liberal Arts Colleges, respectively. In addition to these two categories, resources were allocated in the order of noneducational services, academic support, institutional support, and student services at National Universities, while National Liberal Arts Colleges spent more on student services and institutional support, followed by academic support and research. The descriptive statistics and definitions of all variables are available in Appendix Tables 7 and 8, respectively.

Identification Strategy

Several models were examined to address the causal impact of rankings on resource allocation of colleges and universities, considering the features of the ranking system—numerical order and arbitrary grouping. First, the effect of numerical rankings was estimated through a differences-in-differences (DD) model. I regress each expenditure measure in year $t + 1$ on an indicator for the institution being numerically ranked in the year t, a full set of college fixed effects as well as private-by-year fixed effects.

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

The coefficient β captures the changes in each expenditure following the inclusion in the numerical rankings, eliminating other confounding factors that also impact expenditure behaviors. Any differences in expenditure driven by time-invariant characteristics of a university, year-specific conditions, and differences between public and private universities were controlled in the model.[7] The DD model was possible due to the unexpected implementation of new ranking methodologies—annual publication and expansion of numerical rankings. To assure that the DD estimate is credible, the experimental assignments should be exogenous and beyond any possible manipulation by the participants themselves (Angrist and Pischke 2008). In relation to the study context, schools 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 get them into 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 that the numerical rankings would be changed from top 25 to top 50 and from top 50 to top 120. Therefore, the newly added schools could not have aimed at or taken actions 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).

In addition, this study examines how institutions develop their responses to rankings over time. Previous research showed that the proximal effect of rankings on financial resource attainment was stronger during longer periods than shorter periods (Bastedo and Bowman 2011). Thus, I employed an event-study specification to examine the impact of *U.S. News* on resource allocation changes over time:

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

The model produces a set of coefficients β_k indicating the differences in expenditure between ranked and unranked institutions in each year over and above when schools were included in numerical rankings. Basically, I compare expenditures in 5 or more years before the inclusion to those of years after the inclusion in the numerical rankings, up to 10 or more years. To gain precision, I report the effect of rankings for the immediate (0–2 years after ranking) and longer (3 or more years after ranking) time periods.

Coefficients for the years prior to the numerical ranking offer a test of whether ranked and nonranked institutions were trending similarly before the ranked schools were assigned to a specific number. In Figs. 2 and 3, the point estimates on the pretreatment years are close to zero and insignificant. This shows that the DD estimators satisfy 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 nontreated (Mora and Reggio 2012). Ranking methodology was not changed when institutional expenditure variables were trending differently at ranked and tiered schools.

[7] Considering the long periods of time used in the design, it is possible that other institutional factors such as endowment or total revenue from various sources including tuition and fees might also affect the expenditures, in addition to the rankings. When I include these variables in the DD model, results were similar to the results of the main specification; these results are available from the author by request.

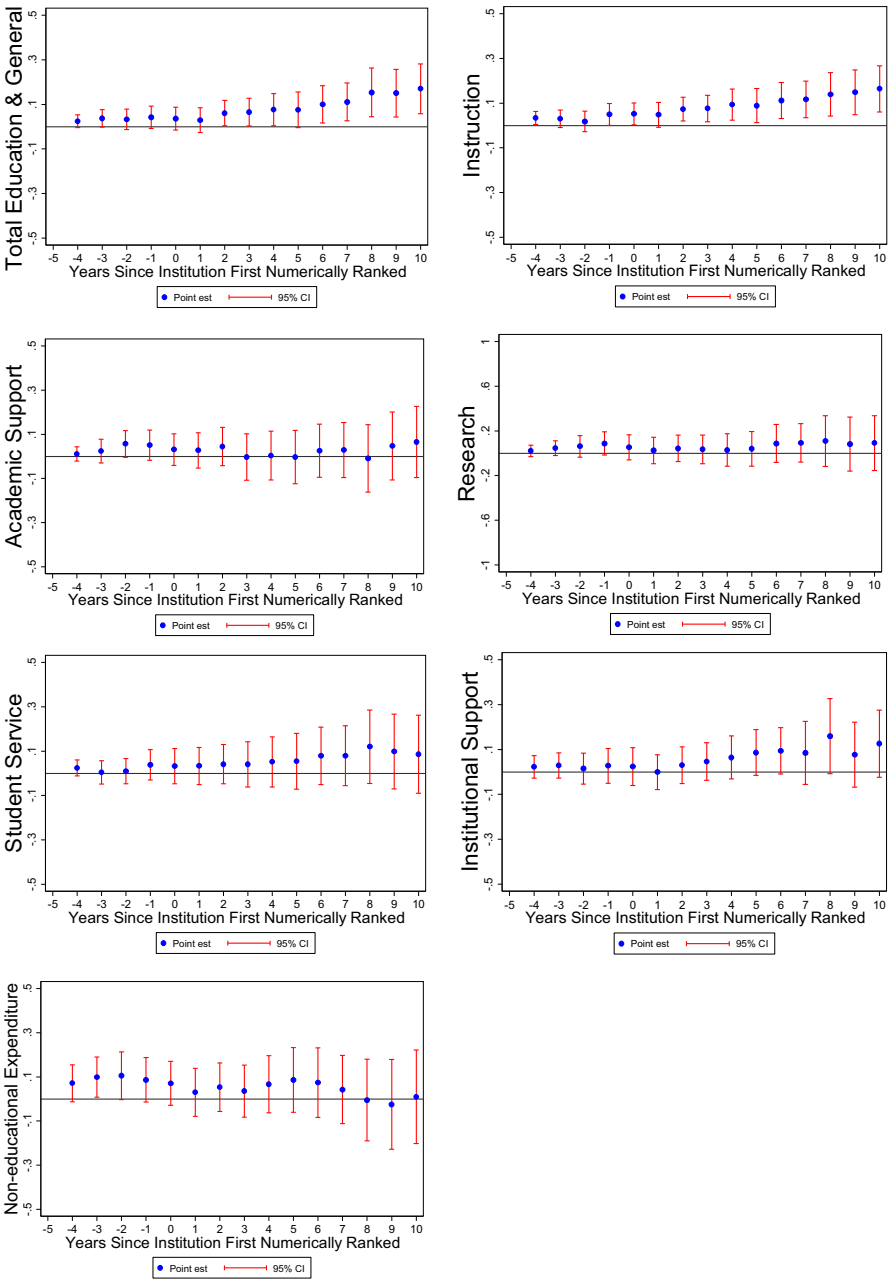

Fig. 2 Event-study estimates of effect of rankings on educational and noneducational expenditures: National Universities. *Graphs* plot the point estimates from the event study model using the restricted (−5/+10-year window) sample. Institution sample includes 199 National Universities. *FTE* full-time equivalent

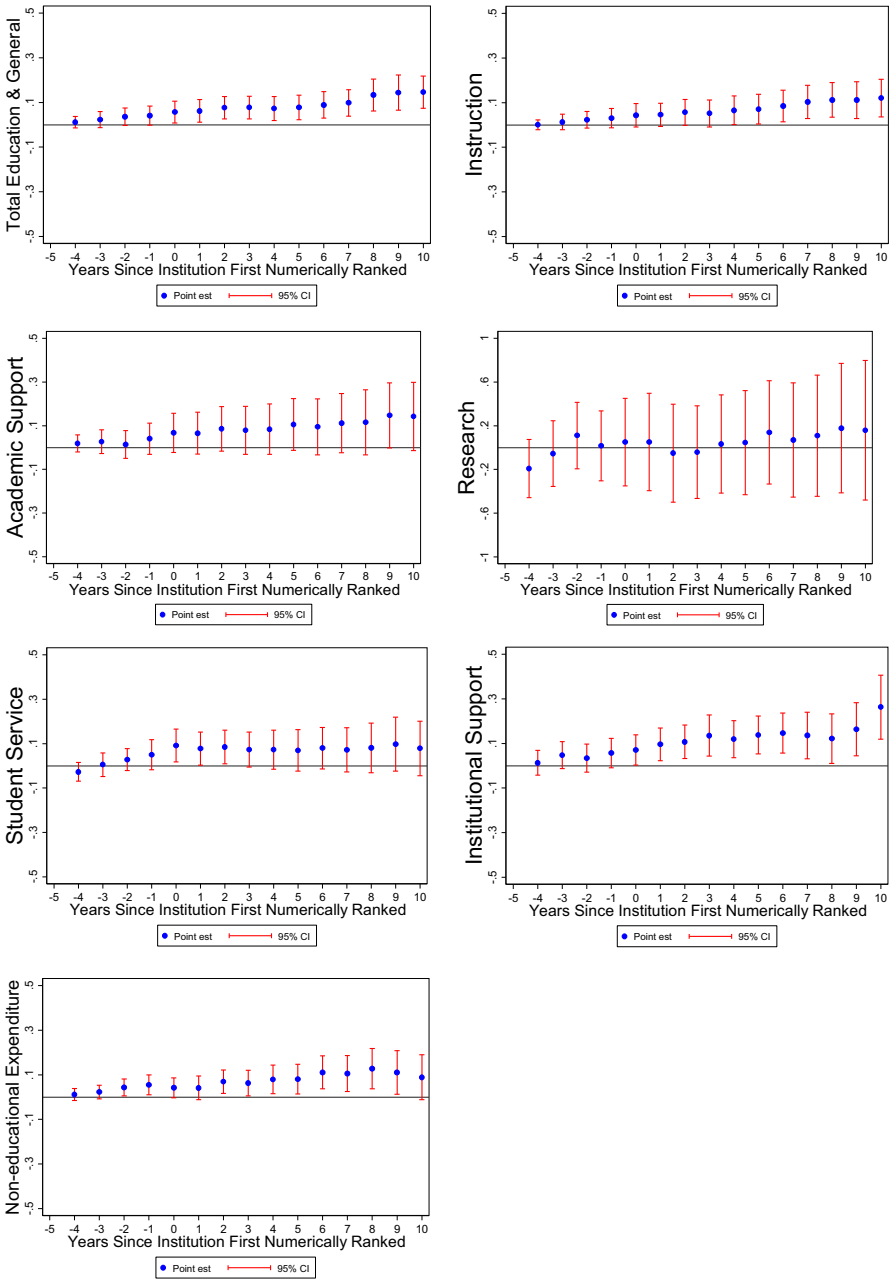

Fig. 3 Event-study estimates of effect of rankings on educational and noneducational expenditures: National Liberal Arts Colleges. *Graphs* plot the point estimates from the event study model using the restricted (−5/+10-year window) sample. Institution sample includes 134 National Liberal Arts Colleges. *FTE* full-time equivalent

The second feature addressed by this study is arbitrary groupings in *U.S. News*. To examine the heterogeneous responses of institutions if they are ranked at the upper or lower margin of the cutoffs, I extended the main specification in Eq. (1) to the differences-in-differences-in-differences (DDD) model:

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

γ captures whether rankings have a bigger impact on the institutions at the upper or lower margins, denoted as *Margin*. The identification strategy is to compare the effect of rankings on institutions ranked 0–4 and −1 to −4 points away from cutoff to their counterparts that are further away from the ranking group cutoffs (±5 or more points).

All models are analyzed separately for National Universities and National Liberal Arts Colleges.[8] Standard errors are clustered by institutions to address the possibility that inclusion in *U.S. News* is a permanent shock and the outcomes I study are likely to be autocorrelated within the same college (Bertrand et al. 2004). I also note that my preferred specification allowed the revenue of schools for each year to vary, assuming schools might raise more money and spend all of it to maximize excellence, prestige, and quality (Bowen 1980).[9]

Limitation

Although this study contributes to the current body of literature by examining the effect of rankings on institutional behavior and addressing three features of ranking systems, it also presents several challenges for future research. First, the expenditure data do not address some areas in which institutions might alter expenditures in relation to the *U.S. News* measurements. For example, reputations and alumni donation account for 22.5 and 5% of the ranking criteria, respectively. Many institutions make significant investment for marketing by sending print materials to peer institutions, advertising, or hiring outside consultants (Cunningham 2012; Lipman Hearne 2010). However, lack of data on marketing-related expenditures did not allow investigating those behaviors. The efforts of higher education institutions and associations to collect information on those behaviors are new and incomplete.

Also, I only document general trends in expenditures, and do not address how the resources are spent. In particular, each expenditure category includes all administrative costs (e.g., salaries/wages and benefits, depreciation) as well as money distributed to related activities.[10] 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.

While this study focuses on institutional-level changes, it is limited in capturing intraorganizational behaviors. The increased emphasis on indirect intrinsic measures or extrinsic factors might cause conflict among different stakeholders on campus. Faculty might complain that resources are diverted from essential to peripheral activities (O'Meara

[8] Because most of the National Liberal Arts Colleges (about 98% of the sample) are private, only institution and year fixed effects were included for all specifications for this sample.

[9] 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/or endowment size (market value) for each year. The results were similar to the results of the main specification and are available from the author by request.

[10] This is in part due to the changes in the IPEDS reporting (accounting) standards. For recent years, more, although not exhaustive, details have been provided.

2007). Staff might feel additional demand from students who request noneducational services. The university might be unwittingly encouraging the selection of a student who demands and can pay for more external services. Some previous research documented that rankings may influence changes in leadership (Fee et al. 2005), communication styles (Corley and Gioia 2000), and division of labor (Espeland and Sauder 2007; Hazelkorn 2008) on campus. Research needs to address how the ranking strategies bring changes to the core activities of institutions,[11] from different stakeholders' perspectives.

Results

Effect of Numerical Order on Institutional Expenditures

Figures 2 and 3 report the event-study specification results for National Universities and National Liberal Arts Colleges, respectively. First of all, the point estimates on the pre-ranked years were close to zero and not statistically significant. Thus, changes in the ranking status (a movement from tiered to ranked) did not happen when the expenditures were trending differently at ranked and nonranked institutions. As mentioned in above, the results provide some validity to the DD analyses, and the estimated effects in the post periods are induced by the numerical rankings.

National Universities responded to rankings by allocating more resources to indirect intrinsic measures used by *U.S. News*, rather than increasing spending on external features. Total educational and general expenses experienced a notable change, but the level of expenditure on noneducational services was not related to the rankings. The changes in total educational and general expenditures started to emerge 2 years after a university was ranked, and the effect grew over time. 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 (Table 1, Panel B). To contextualize, this change translates into about additional $1643 per FTE[12] spending for each school.

For National Universities, most of this increase came from the increase in instruction (Table 1, Column 2), and the spending on instruction grew over time. After being ranked in the top 25, 50, or 120 for the first time, institutions increased instructional expenses by 3.1% within 2 years and 8.9% for 3 years and thereafter. Overall, this is about $851 per FTE increase every year. No changes occurred in student services, academic services, or research expenditures. Administrative expenditure observed a 7% increase due to the ranking, but the effect was only significant for the longer term.

On the other hand, among National Liberal Arts Colleges, rankings increased all educational expenses except research spending, as well as noneducational expenditure. The impact of rankings on educational expenditure seems to develop immediately after schools

[11] Author (2016) investigated the effect of rankings on institutional financial aid, including the trade-offs between need- and merit-based aid; also, the author is currently investigating the effect of rankings on pricing and student composition.

[12] The dependent variables are log transformation of the expenditure. Therefore, the reported coefficients compare percentage changes in spending between ranked and unranked institutions. Considering the fact that the magnitude of expenditure per FTE varies across institutions, I also estimated the absolute change in dollar amount. For both National Universities and National Liberal Arts Colleges, the average change in raw dollar amount was bigger than the calculated amount based on the percentage points. For example, in actual dollars, total expenditure increased by about $4291 and $3314 at National Universities and Liberal Arts Colleges, respectively.

Table 1 Effect of rankings on expenditures: National Universities

	(1) Total Education and General	(2) Instruction	(3) Academic support	(4) Student services	(5) Research	(6) Institutional support	(7) Noneducational services
Panel (A) Event-study analysis							
0–2 years after ranked	0.007	0.031**	0.007	0.010	−0.048*	0.003	−0.010
	(0.013)	(0.014)	(0.025)	(0.025)	(0.025)	(0.028)	(0.023)
3+ years after ranked	0.071**	0.089***	−0.009	0.043	−0.033	0.070*	−0.021
	(0.029)	(0.030)	(0.054)	(0.043)	(0.055)	(0.042)	(0.049)
Panel (B): Differences-in-differences analysis							
Ranked	0.049*	0.069***	−0.004	0.032	−0.038	0.043	−0.018
	(0.023)	(0.024)	(0.042)	(0.034)	(0.042)	(0.035)	(0.038)
Observations	4044	4043	4043	4029	3990	3900	4011
Number of institutions	199	199	199	199	198	199	199

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

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$

are ranked for the first time. Table 2 reports the size of these changes. A numeric ranking was associated with a 5.9% increase in the total expenses on educational and general activities at National Liberal Arts Colleges (Panel B, Column 1). The average increase was about 4% within 2 years, and 7.2% after 3 or more years (Panel A, Column 1). The specific areas that institutions expanded were academic support (7.7%), instruction (7.4%) and student services (5%) (Panel B). Taken together, this would be an approximately $1900 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 3 or more years: academic support expenditure increased by 5.6% in the short term (0–2 years) and by 9% after 3 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 2 years (Table 2, Panel A).

Meanwhile, being assigned a numerical position in the ranking significantly increased institutional support expenditure. In particular, administrative cost increased by 4.9 and 13% in the short term and longer term, respectively (Panel B, Column 6). Also, in response to the ranking system, National Liberal Arts Colleges increased expenses related to noneducational services (e.g., residential halls, gyms, cafeterias, union buildings) by 4.8% (Panel B, Column 7). Given that the average per-FTE expenditure on this area was about $5908, expenditures increased about $284 per student every year once a National Liberal Arts College was ranked. The increase developed beginning 3 or more years after being numerically ranked for the first time (6.4%) (Panel A, Column 7).

Robustness Check and Other Analysis

As noted above, numerical rankings were assigned at three time points—1987, 1995, and 2003. Because the system was launched in 1987, and expanded only in 1995 and 2003, it is possible that the power of rankings increased or decreased over time. To test this, I analyzed the DD model for the three different windows of years: 1980–1994, 1987–2002, and 1995–2011, which include years before and after the 1987, 1995, and 2003 changes, respectively. Panel A of Tables 3 and 4 shows that the results were similar to those from the model that pooled all years (Panel B, Tables 1 and 2). Yet, among the National Universities, the impact of rankings seemed to decrease for later years. For example, when an institution was numerically ranked for the first time in 1987, instruction expenditure was increased by 8.7%. Meanwhile, for the institutions that were ranked for the first time in 2003, instruction expenditure observed a 3.1% increase. Similarly, among the Liberal Arts Colleges, institutions that were ranked in earlier years significantly increased expenditure in various areas including instruction, academic support, institutional support, and noneducational services. Institutions ranked in later periods changed expenditure in limited areas (e.g., student services and institutional support) by a smaller magnitude.

In addition, ranking measurements proxy for quality, but mostly evaluate resources, based on the expenditures included in the analysis (Ehrenberg 2003). Thus, it is arguable that more spending after the publication of the numerical position is almost mechanical as measurements are in part based on these expenditures. To gain more insights, I first examined how relative shifts to each expenditure area are associated with inclusion in the numerical ranking. Analyzing the relative expenditure for each category (percentage of

Table 2 Effect of rankings on expenditures: National Liberal Arts Colleges

	(1) Total Education and General	(2) Instruction	(3) Academic support	(4) Student services	(5) Research	(6) Institutional support	(7) Noneducational services
Panel (A): Event-study analysis							
0–2 years after ranked	0.038***	0.048***	0.056**	0.057***	0.089	0.049**	0.022
	(0.012)	(0.013)	(0.025)	(0.021)	(0.130)	(0.024)	(0.018)
3+ years after ranked	0.072***	0.089***	0.090**	0.045	0.178	0.130***	0.064**
	(0.017)	(0.023)	(0.041)	(0.032)	(0.162)	(0.037)	(0.030)
Panel (B): Differences-in-differences analysis							
Ranked	0.059***	0.074***	0.077**	0.050**	0.137	0.094***	0.048**
	(0.014)	(0.018)	(0.034)	(0.027)	(0.135)	(0.029)	(0.024)
Observations	2378	2378	2365	2375	1503	2289	2350
Number of institutions	134	134	134	134	99	134	134

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

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$

Table 3 Robustness check and additional analysis: National Universities

Panel (A): Differences-in-differences analysis by analytic periods

Analytic periods	(1) Total education and general	(2) Instruction	(3) Academic support	(4) Student services	(5) Research	(6) Institutional support	(7) Noneducational services
1980–1994							
Ranked: 1987	0.040	0.087**	0.047	0.002	−0.073*	0.065	0.077
	(0.038)	(0.041)	(0.077)	(0.077)	(0.043)	(0.071)	(0.063)
1987–2002							
Ranked: 1995	0.050**	0.052*	−0.040	−0.024	−0.039	0.009	−0.092
	(0.022)	(0.028)	(0.059)	(0.052)	(0.074)	(0.046)	(0.060)
1995–2011							
Ranked: 2003	0.041**	0.031*	0.005	0.043	−0.004	0.022	−0.023
	(0.018)	(0.018)	(0.029)	(0.033)	(0.040)	(0.033)	(0.032)

Panel (B): Differences-in-differences analysis: % expenditure

	% Instruction	% Academic support	% Student services	% Research	% Institutional support	% Noneducational services
Ranked	0.009**	−0.004	−0.003*	−0.001	0.001	−0.000
	(0.004)	(0.003)	(0.001)	(0.003)	(0.002)	(0.005)

Panel (C): Differences-in-differences analysis: reputation scores

	Reputation score
Ranked	−0.017
	(0.014)

All specifications include school fixed effects and private-by-year fixed effects. Robust standard errors clustered by school in parentheses

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$

total expenditure), I found that instruction (0.9%) received relatively more funding while student services observed a very small decrease (0.3%) at National Universities (Table 3, Panel B). For Liberal Arts Colleges, the relative expenditure allocated to each category did not change significantly, except for spending on institutional support (1.2%) (Table 4, Panel B). Second, peer reputation is one of the critical measurements for an institution's ranking, as the indicator weighs 22.5% of the total evaluation. Also, an institution's ranking status impacts its future peer assessment of reputation (Bastedo and Bowman 2010). The feedback loop between the measure and rankings might encourage institutions to increase spending. Estimating the changes in peer reputation when a college observed a change in its ranking status (i.e. being ranked) lends credence to a hypothesis that money begets a reputation. Using the DD model, I analyzed how a ranked institution's reputation score[13] changes in the following years. Inclusion in the numerical ranking did not change reputation scores among National Universities, while the reputation score was increased by 0.07 points (almost a one-unit (0.1-point) change) among National Liberal Arts Colleges.

Table 4 Robustness check and additional analysis: Liberal Arts Colleges

Panel (A): Differences-in-differences analysis by analytic periods

Analytic Periods	(1) Total Education and General	(2) Instruction	(3) Academic support	(4) Student services	(5) Research	(6) Institutional support	(7) Noneducational services
1980–1994							
Ranked: 1987	0.027	0.092***	0.079*	0.007	0.176	0.111***	0.122***
	(0.024)	(0.027)	(0.048)	(0.043)	(0.194)	(0.041)	(0.030)
1987–2002							
Ranked: 1995	0.026	0.035	0.108**	0.078*	0.018	0.073*	0.007
	(0.023)	(0.023)	(0.050)	(0.043)	(0.234)	(0.042)	(0.045)
1995–2011							
Ranked: 2003	0.051**	0.036	0.023	0.041	0.016	0.096***	0.014
	(0.021)	(0.025)	(0.034)	(0.030)	(0.231)	(0.036)	(0.033)

Panel (B): Differences-in-differences analysis: % expenditure

	% Instruction	% Academic support	% Student services	% Research	% Institutional support	% Noneducational services
Ranked	0.004	0.000	−0.003	0.000	0.012***	−0.000
	(0.005)	(0.003)	(0.003)	(0.003)	(0.004)	(0.005)

Panel (C): Differences-in-differences analysis: reputation scores

	Reputation score
Ranked	0.070***
	(0.017)

All specifications include school fixed effects and private-by-year fixed effects. Robust standard errors clustered by school in parentheses

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$

Effect of Arbitrary Groupings on Institutional Expenditures

Table 5 reports the differential effect of rankings on resource allocation at National Universities. In particular, the coefficients report changes in the expenditures that are related to indirect intrinsic measures and extrinsic measures by an institution's location in the ranking, measured through the relative distance from the ranking group cutoffs. 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 might have developed different ranking strategies. Specifically, National Universities at the lower margin of the cutoff, particularly within a 4-point interval,[14] observed a significant increase (8%) in the amount spent on instruction. On average, this increase is equivalent to $987 per FTE per year at these universities. No differential effect on noneducational and institutional support expenditures was found.

Ranking positions of National Liberal Arts Colleges were associated with instructional expenses on average (Table 6). 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 cutoff points (a 4.7% increase) (Column 2). The increase in expenditure suggests that schools at the margin (+0–4) spend an extra $580 per student compared with the rest of the ranked schools. Meanwhile, Column 4 suggests some evidence that the expenditure on noneducational services was significantly higher for the institutions near the cutoff point, particularly at the lower margin. Compared to other ranked National Liberal Arts Colleges, schools ranked at the lower margin of each ranking group cutoff increased noneducational services expenses by 10.6%. This means an annual increase of about $627 per FTE at the respective National Liberal Arts Colleges.

Discussion and Conclusions

College rankings have become a powerful influence in higher education. Yet, the growing popularity in college rankings has intensified concerns in the higher education community about institutional aspirations for a higher ranking (O'Meara 2007). Previous research has found that higher ranking positions bring benefits in admissions and financial and human resource attainment, as well as reputation (Bastedo and Bowman 2010, 2011; Bowman and Bastedo 2009, 2011; Griffith and Rask 2007; Luca and Smith 2013; Meredith 2004; Monks and Ehrenberg 1999; Sauder and Lancaster 2006). Thus, researchers have argued that colleges and universities are vulnerable to rankings and cannot buffer themselves from the influence of rankings (Bastedo and Bowman 2011; Sauder and Espeland 2009). It has been hypothesized that universities may alter resource allocation behaviors to improve ranking positions, which might result in significant increase in costs (Ehrenberg 2003) and drifts of resources from teaching and learning to peripheral activities (Brewer et al. 2002; Morphew

[13] Reputation was reported as a rank order until 1996. From 1997, reputation scores (maximum 5 points) are reported for all National Universities and National Liberal Arts Colleges. The analysis reported here employed reputation scores, and therefore included only years 1997–2010.

[14] For a robustness check, I also employed other intervals—5–7 points from the cutoffs, respectively. The results were consistent with those from the ±4-point model, and the sign, magnitude, and significance were similar across different definition of margins. See Appendix Tables 9 and 10.

Table 5 Heterogeneous effect of rankings on expenditures: National Universities

Dependent variables	(1) Total education and general	(2) Instruction	(3) Academic support	(4) Student services	(5) Research	(6) Institutional support	(7) Noneducational services
Explanatory variable: Ranked*_Margin_							
Ranked	0.030	0.051*	−0.029	−0.008	−0.134***	0.027	0.052
	(0.027)	(0.028)	(0.046)	(0.040)	(0.049)	(0.044)	(0.042)
Margin: upper	0.012	0.009	0.023	0.002	0.039	−0.041	−0.018
	(0.028)	(0.032)	(0.050)	(0.051)	(0.056)	(0.064)	(0.053)
Margin: lower	0.054	0.080**	0.151	0.067	0.058	0.044	−0.039
	(0.034)	(0.039)	(0.148)	(0.073)	(0.062)	(0.081)	(0.073)
Observations	6164	6163	6158	6143	6095	5965	6115
Number of institutions	199	199	199	199	198	199	199

All specifications include school fixed effects and private-by-year fixed effects. Robust standard errors clustered by school in parentheses

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$

Table 6 Heterogeneous effect of rankings on expenditures: National Liberal Arts Colleges

Dependent variables	(1) Total education and general	(2) Instruction	(3) Academic support	(4) Student services	(5) Research	(6) Institutional support	(7) Noneducational services
Explanatory variable: Ranked*_Margin_							
Ranked	0.060***	0.050**	0.052	0.059*	0.225	0.085**	0.035
	(0.019)	(0.025)	(0.039)	(0.035)	(0.167)	(0.037)	(0.031)
Margin: upper	0.012	0.047*	0.073	−0.052	−0.196	−0.041	−0.054
	(0.027)	(0.028)	(0.063)	(0.059)	(0.239)	(0.055)	(0.059)
Margin: lower	−0.009	0.025	0.037	0.041	−0.309	0.072	0.106**
	(0.024)	(0.027)	(0.060)	(0.054)	(0.194)	(0.057)	(0.045)
Observations	4154	4154	4136	4150	2753	4018	4121
Number of institutions	134	134	134	134	111	134	134

All specifications include school fixed effects and year fixed effects. Robust standard errors clustered by school in parentheses

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$

and Baker 2004; Winston 1999; Zemsky and Massy 1990). While there is no empirical test for this hypothesis, the current study contributes to the understanding of effect of rankings on institutional behavior based on the quantitative analysis of expenditures. The findings from this study provide important implications in considering the function and dysfunction of the ranking system in U.S. higher education.

Using the *U.S. News* rankings, this study found that the system of rankings, through its measurements as well as presentation of the results, makes institutions alter their resource allocation behaviors. Overall, changes in expenditure reflect the ranking system's measurement schemes. As the rankings are determined in part based on expenditure size, the overall educational expenditure expanded immediately when an institution's status was defined as a particular number, and the increase continued over time. Instruction expenditure was the major area that institutions altered in response to the features of ranking systems, including numerical rankings and arbitrary groupings. As rankings include measures of class size, as well as faculty salary (which is captured by instructional expenditure), institutions are likely to increase relative spending on instructional activities. Meanwhile, the escalation of student and academic services expenditures, as well as the long-term increase in spending on noneducational activities such as residential halls, food services, student health services, intercollegiate athletics, college unions, and stores, might reflect institutions' consideration of other measures such as retention and graduation rates and admissions outcomes, respectively. Finally, the increased institutional support expenditure might indicate the expansion of the management of evaluation systems through administrative services, fiscal operations, and public relations development. These patterns were manifested differently at National Universities and National Liberal Arts Colleges. While National Universities responded to rankings by increasing instructional expenditure, Liberal Arts Colleges increased not only instructional expenditure but also expenditure on other support services and noneducational expenditures.

The conformity to rankings shows that rankings reinforce the resource-centered view of prestige (Brooks 2005) through the measurements and the way results are presented that dictate the image of prestigious, legitimate universities. Also, institutional responses to arbitrary groupings suggest that institutions internalize ranking behaviors and cannot decouple themselves from rankings, and are under pressure for higher ranking positions and competition with other universities (Corley and Gioia 2000; Sauder and Espeland 2009). Increased spending on educational activities may be encouraged because this expenditure is one of the direct measurements employed by *U.S. News* ("financial resources") that can be manipulated by institutions. Also, changes in this measure are accomplishable, as educational needs are often prioritized in resource allocation (Lasher and Greene 2001).

The emphasis on resources and increasing institutional expenditures in 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 and Bowman 2011; Grunig 1997; Jin and Whalley 2007; Meredith 2004). Yet movement in rankings requires enormous investment. Gnolek et al. (2014) simulated the average increase in financial resources per student required for a 1-point movement as $7400 per year for a National University ranked in the mid-30s. This amount is significantly larger than the average change I observed from this study for both National Universities and National Liberal Arts Colleges. 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.

The conformity to rankings might involve indirect costs in the core activities at campuses. As Leeuw (2000) and Smith (1995) depict, the increased expenditure on student and academic services, noneducational services, and institutional support by rankings (particularly at National Liberal Arts Colleges) might indicate the dysfunction of rankings. The expansion of spending in the peripheral areas can cause conflict in campus management. For example, faculty might be concerned that financial and human resources are moved from teaching to "lazy rivers" or administrative functions that are not directly related to academic activities. Faculty and staff might observe more student demands for support services and external features, which take time and resources from serving the core mission of higher education, including access and learning experiences. Yet, the conclusion is still open due to the limited availability of data on how institutions use these increased expenditures for specific activities. For example, increased spending in instruction was mostly driven by faculty compensation (Kim 2017). The significant increases in educational and related activities expenditures may include the administrative lattice (Zemsky and Massy 1990), which explains the increasing administrative costs for providing various student supports (Morphew and Baker 2004). In addition, whether more resources would translate into better quality in core practices is an open question. While schools that are highly ranked in *U.S. News* do not necessarily have high retention and graduation rates relative to their student, faculty, and financial resources (Breu and Raab 1994), some studies found significant relationships between the levels of expenditures on educational activities and institutional grant retention and graduation outcomes (Gansemer-Topf and Schuh 2006; Webber and Ehrenberg 2009). Future investigations are needed to address how the institutional response to rankings impacts core activities of higher education institutions, particularly teaching and research.

This study also provides meaningful implications to theorizing institutional behavior responding to institutional influence—ranking systems. I argue that universities employ strategic behaviors in response to the rankings not only by complying with rankings (acquiescing), but also by balancing tactics to improve rankings with different contingencies (compromising) (Oliver 1991). The different responses of National Universities and National Liberal Arts Colleges might indicate that institutions consider their own distinctive mission, size, control, and expectation of constituencies in their responses to rankings (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 et al. 2004). The constituencies for liberal arts colleges, particularly prospective students and parents, might have a unique demand or expectation for college experience (Bowman and Bastedo 2009). Thus, it is possible that investment in amenities, student services, and academic services is more important for liberal arts colleges (Fugate 2012; Hartley and Morphew 2008). The small size and private status might make liberal arts colleges more susceptible to striving behavior. One of the criticisms of *U.S. News* 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 raises 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 ranking and subranking, and how schools interpret the rankings in relation to their core activities. Rankings have been a powerful influence on higher education, measuring and publicizing the quality of colleges and universities mostly based on resources, including educational expenditures. In addition, the presentation of the results—numerical order and arbitrary groupings reinforce institutional responses to rankings. As the function of rankings brings the higher ranked institutions benefits through resource attainment and encourages schools to improve their key practices, rankings also involve dysfunction by encouraging institutions to increase spending, particularly in the indirect measures of intrinsic characteristics and extrinsic features. These *tunnel vision* and *measure fixation* dysfunctions are due to the *performance paradox*—weak correlations between the ranking indicators and institutions' performances (Van Thiel and Leeuw 2002). From these concerns, some researchers have argued that the definition of prestige should be expanded to reflect institutional support and responses to students or student experiences and educational outcomes (Chun 2002). Some recent rankings (e.g., *Washington Monthly*'s rankings) have introduced criteria such as social mobility (recruiting low-income students) and service (encouraging students to give something back to their country). When it comes to specific measurements employed to evaluate institutional practices and outcomes in these dimensions, it is still the resource-related measurements (e.g., net price that students pay or number of courses and staff that are allocated for the service activities) or predicted measures defined by the ranking producers (e.g., differences in predicted and actual graduation rates given student composition and other conditions) that are employed by the rankings. 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.

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Appendix

See Fig. 4 and Tables 7, 8, 9, 10.

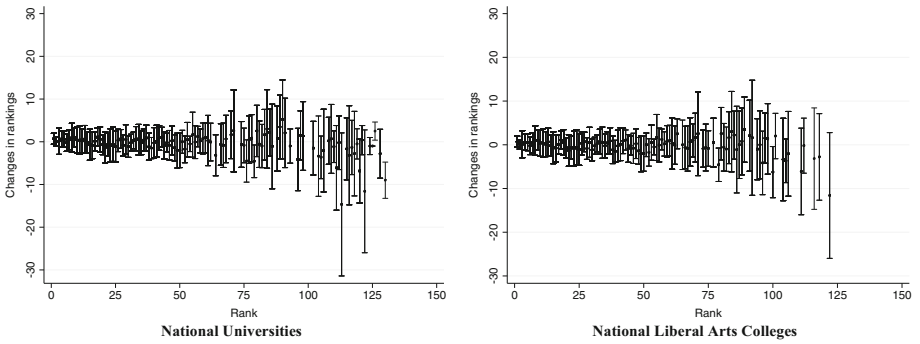

Fig. 4 Average changes in positions by rank

Table 7 Descriptive statistics

	Other 4-year universities/colleges	National Universities		National Liberal Arts Colleges	
		Ranked	Tiered	Ranked	Tiered
Independent and control variables					
No. of institutions (%)	1304	126 (63.32)	73 (36.68)	107 (79.85)	27 (20.15)
Year first numerically ranked					
1987–1994 No. (%)		32 (25.40)		35 (32.71)	
1995–2002 No. (%)		24 (19.05)		21 (19.63)	
2003– No. (%)		70 (55.66)		51 (47.66)	
No. (%) private	815 (62.50)	60 (47.62)	12 (16.44)	105 (98.13)	26 (96.30)
Total number of FTE (*SD*)	4665.17 (6477.99)	16,412.66 (11,125.94)	11,355.75 (6209.12)	1662.99 (729.02)	1029.35 (511.62)
Dependent variables (per FTE)					
Total education and general (*SD*)	27,182.45 (78,553.84)	49,442.29 (39,316.24)	26,665.80 (13,119.72)	36,932.06 (14,570.09)	27,059.89 (9739.40)
Instruction (*SD*)	9463.75 (18,106.12)	17,514.64 (14,586.26)	10,447.33 (4909.02)	12,171.2 (4936.37)	8130.52 (2791.94)
Academic support (*SD*)	2341.93 (8896.26)	4290.52 (3935.41)	2534.26 (1897.80)	3059.39 (1709.68)	1885.75 (1115.13)
Student services (*SD*)	2563.41 (20,471.45)	2161.33 (1911.73)	1413.66 (809.99)	4167.40 (2053.82)	3629.17 (1628.06)
Research (*SD*)	2934.50 (17,979.29)	10,783.68 (14,239.25)	3701.61 (4026.37)	747.99 (1067.79)	186.90 (321.70)
Institutional support (*SD*)	2668.74 (7584.16)	3386.08 (4360.13)	1848.48 (1663.26)	4282.15 (3364.59)	3283.51 (2472.06)
Noneducational services (*SD*)	3892.85 (7026.03)	5842.19 (3896.07)	3401.88 (1780.81)	6818.33 (2672.99)	4834.85 (1810.76)
Observations	40,424	3906	2263	3317	837
Total (N)	1304	199		134	

FTE full-time equivalent students

Table 8 Definition of dependent variables: expenditure categories

Category	Definition
Total education and general expenditure	Sum of total expenses on instruction, research, public service, academic support, institutional support, and student services
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
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
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
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
Institutional support	Sum of all operating expenses associated with the day-to-day operational support of the institution. Includes expenditures for general administrative services, executive direction and planning, legal and fiscal operations, and public relations and development. Excludes expenditures for physical plan operations
Noneducational 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)

All variables include data from 1980 to 2011

Definitions follow HEGIS and IPEDS data dictionaries

Table 9 Robustness check analysis: heterogeneous effect of rankings on expenditures—National Universities

	(1) Total education and general	(2) Instruction	(3) Academic support	(4) Student services	(5) Research	(6) Institutional support	(7) Noneducational services
Panel (A): Margins: ±5 points from the cutoff points							
Ranked	0.027	0.039*	−0.063	0.035	−0.036	0.019	−0.003
	(0.022)	(0.022)	(0.040)	(0.038)	(0.043)	(0.032)	(0.036)
Margin: upper	0.030	0.043*	0.076	−0.032	−0.021	0.044	−0.011
	(0.021)	(0.024)	(0.047)	(0.047)	(0.047)	(0.046)	(0.039)
Margin: lower	0.036	0.061*	0.153	0.012	−0.003	0.082	−0.032
	(0.029)	(0.035)	(0.115)	(0.067)	(0.061)	(0.057)	(0.063)
Panel (B): Margins: ±6 points from the cutoff points							
Ranked	0.031	0.041*	−0.049	0.037	−0.029	0.022	−0.006
	(0.021)	(0.021)	(0.039)	(0.040)	(0.042)	(0.033)	(0.036)
Margin: upper	0.024	0.033	0.053	−0.035	−0.029	0.037	−0.006
	(0.022)	(0.024)	(0.046)	(0.048)	(0.048)	(0.046)	(0.040)
Margin: lower	0.026	0.064*	0.111	0.011	−0.021	0.074	−0.025
	(0.031)	(0.036)	(0.114)	(0.068)	(0.064)	(0.058)	(0.064)
Panel (C): Margins: ±7 points from the cutoff points							
Ranked	0.030	0.039*	−0.041	0.052	−0.021	0.013	0.008
	(0.022)	(0.022)	(0.039)	(0.043)	(0.044)	(0.035)	(0.038)
Margin: upper	0.024	0.034	0.042	−0.051	−0.031	0.054	−0.027
	(0.024)	(0.027)	(0.048)	(0.050)	(0.052)	(0.049)	(0.043)
Margin: lower	0.022	0.058	0.076	−0.022	−0.043	0.065	−0.045
	(0.033)	(0.038)	(0.107)	(0.065)	(0.066)	(0.058)	(0.061)
Observations	6164	6163	6158	6143	6095	5965	6115
Number of institutions	199	199	199	199	198	199	199

Table 10 Robustness check analysis: Heterogeneous effect of rankings on expenditures—Liberal Arts Colleges

	(1) Total education and general	(2) Instruction	(3) Academic support	(4) Student services	(5) Research	(6) Institutional support	(7) Noneducational services
Panel (A): Margins: ±5 points from the cutoff points							
Ranked	0.052***	0.041*	0.055	0.038	0.245	0.069*	0.015
	(0.018)	(0.025)	(0.034)	(0.037)	(0.202)	(0.041)	(0.027)
Margin: upper	0.032	0.069**	0.094*	−0.007	−0.005	−0.003	0.006
	(0.026)	(0.029)	(0.054)	(0.051)	(0.267)	(0.058)	(0.046)
Margin: lower	−0.002	0.044	−0.004	0.040	−0.287	0.088	0.095***
	(0.026)	(0.031)	(0.060)	(0.048)	(0.240)	(0.059)	(0.035)
Panel (B): Margins: ±6 points from the cutoff points							
Ranked	0.054**	0.031	0.050	0.041	0.214	0.078*	0.007
	(0.021)	(0.028)	(0.036)	(0.036)	(0.203)	(0.042)	(0.028)
Margin: upper	0.020	0.073**	0.092*	−0.022	0.041	0.002	0.017
	(0.030)	(0.033)	(0.052)	(0.051)	(0.275)	(0.061)	(0.043)
Margin: lower	−0.002	0.052	−0.002	0.039	−0.202	0.050	0.096***
	(0.027)	(0.034)	(0.059)	(0.049)	(0.260)	(0.064)	(0.036)
Panel (C): Margins: ±7 points from the cutoff points							
Ranked	0.051**	0.029	0.051	0.053	0.122	0.085*	0.009
	(0.022)	(0.030)	(0.038)	(0.039)	(0.207)	(0.045)	(0.029)
Margin: upper	0.023	0.077**	0.087	−0.035	0.136	−0.005	0.018
	(0.030)	(0.034)	(0.054)	(0.053)	(0.286)	(0.063)	(0.044)
Margin: lower	0.002	0.050	−0.003	0.018	−0.042	0.033	0.086**
	(0.028)	(0.034)	(0.057)	(0.050)	(0.281)	(0.066)	(0.036)
Observations	4154	4154	4136	4150	2753	4018	4121
Number of institutions	134	134	134	134	111	134	134

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