

# Reconciling the Small Effect of Rankings on University Performance with the Transformational Cost of Conformity

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## Abstract

University rankings and metrics have become an increasingly prominent basis of student decisions, generalized university reputation, and the resources they attract. We review the history of metrics in higher education and scholarship about the influence of ranking on the position and strategic behavior of universities and students. Most quantitative analyses on this topic estimate the influence of change in university rank on performance. These studies consistently identify a small, short-lived influence of rank shift on selectivity (e.g., 1 rank position corresponds to  $\leq 1\%$  more student applicants), comparable to ranking effects documented in other domains. This understates the larger system-level impact of metrification on universities, students and the professions that surround them. We explore one system-level transformation likely influenced by the rise of rankings. Recent years have witnessed the rise of enrollment management and independent educational consultation. We illustrate a plausible pathway from ranking to this transformation: In an effort to improve rankings, universities solicit more applications from students to reduce their acceptance rate. Lower acceptance rates lead to more uncertainty for students about acceptance, leading them to apply to more schools, which decreases the probability that accepted students will attend. This leads to greater uncertainty about enrollment for students and universities and generates demand for new services to manage it. Because these and other system-level transformations are not as cleanly measured as rank position and performance, they have not received the same treatment or modeling attention in higher education scholarship, despite their importance for understanding and influencing education policy.

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# 1 Introduction

University rankings, based on metrics intended to identify quality, have become a critical tool for students and their families to make decisions about where to attend college and graduate school. They also constitute the basis for generalized university reputation and bragging rights, which, in turn, have direct consequences for the sponsorship and research resources a university can attract. A growing literature in sociology and economics has considered the influence of these rankings on the system of higher education. Much quantitative work in this area has focused on the United States and identifies a statistically significant influence of shifts in these rankings on university-level performance, including number of student applications, yield rates, test scores, and financial aid. This *ranking effect*, however, is consistently *very* small and short-lived (Gnolek et al. 2014). An increase in one rank position generates less than one percent increase in applicants for most schools (Bowman & Bastedo 2009). In this paper, we review the *ranking effect* as estimated across several recent studies, in higher education and other domains, all within the United States. Then we seek to reconcile the small size of the estimated effect with the massive attention university rankings have achieved from university administrators, students, policy-makers and scholars of higher education (Elsbach & Kramer 1996, Ehrenberg 1999, Sauder & Lancaster 2006, Espeland & Sauder 2007, Grewal et al. 2012, Luca & Smith 2013). Research focused on the university-level ranking effect cannot identify ranking’s system-level consequences. We explore the range of ranking’s influence by exploring a system-level transformation in higher education: the rise of the professions of enrollment management and independent education consultation. We document this historically, then use formal analysis and simulation to identify a plausible influence pathway from the increased importance of rankings to growth in the demand for these two professions. To inflate their ranking, universities now routinely solicit more applications in order to reject more students and appear more selective. This decreases the probability that a student will be accepted into any one school. Applicants respond by applying to more schools, but this increases the odds they will receive competing

offers, leading to a lower likelihood that any given student will accept any particular offer of admission . We demonstrate that this process leads to greater uncertainty about enrollment for both students and universities, and is a possible mechanism to explain growth in demand for the third party consultants who mitigate it.. We believe that these and other consequences resulting from conformity to the criteria underlying rankings , although much less intensively studied than the ranking effect on university performance, justify the attention paid to ranking in higher education. Insofar as these consequences decrease the value proposition of higher education for students, we outline relevant policy considerations and suggest advances in research to rigorously investigate them.

What is the basis of modern university ranking schemes? Education is a multi-sided market in which both schools and students compete for affiliation with one another. Over the past two decades, increasing tuition costs in the US and increased competition on the entry-level labor market have led to more uncertainty about the financial return from a college degree. In this environment of increased uncertainty about the future, positional comparisons have become more salient. Publications that rank universities (e.g., *U.S. News & World Report*) construct a prism through which students can make peer comparisons, and attention to these has led to positional competition on observed criteria. While there is little evidence to suggest a substantial influence of school choice on educational or career outcomes at the undergraduate level (Dale & Krueger 1999, Pascarella et al. 2005), rankings have been met with high demand from status-conscious high school students and their parents. Furthermore, year to year changes in rank are shown to have only a small effect on application and matriculation decisions, but they are salient for administrators, leading to transformations in how resources are allocated within universities. The history of measuring and ranking universities, however, goes back much further.

## 2 A Brief (Pre)History of University Metrics and Rankings

The origin of metrics in higher education may be dated to the rise of bibliometric indicators and their use in assessing scientific institutions. Every written legal system, from ancient Rome to Late Medieval Britain had laws and cases that intensively referenced one another. These citations are most critical in systems of common law where precedence and “exemplar” cases shaped and constrained subsequent judgements. The first commercial “database” of linkages, however, was created at the end of the 19th Century with Shephard’s citation index (1873). References moved from initial “Adhesive Annotations” stuck with gum on pages of case law, to bound books of citations indexed by different jurisdictions, to sets of CD ROMs, to a single web-accessible database. Citation analysis spilled beyond legal scholarship at the end of the 19th Century. Early American psychologist James McKeen Catell, editor of *Science* magazine for nearly 50 years (1895-1944), was first to champion and create a systematic collection of statistics on quantity (“productivity”) and quality (“reputation”) of scientists by nation and field. His effort focused on tracking and boosting the research reputation of the United States and psychology as a science (Godin, 2006). Citation metrics on the system of science and scholarship emerged later with the pioneering work of physicist-turned-historian, Derek de Solla Price. Using publication and citation data, de Solla Price traced the historical exponential growth of science (1963), measured the half-life of reference age in the scientific literature (1965), identified the long-tailed distribution of scientific contributions or “Price’s Law” that a few contribute a lot, and most contribute very little, and demonstrated the existence of a popularity or preferential attachment process in citations (1976), whereby articles receive new citations proportional to their prior citations.

In the course of his work on scientific citation, de Solla Price consulted with Eugene Garfield, who created the Institute for Scientific Information (ISI) and constructed the first databases of scholarly citations, the Science Citation Index. Later, ISI generated compan-

ion products, the Social Science and Arts and Humanities Citation Indices. Garfield and the architecture of these indices drew inspiration from Vannevar Bush’s famous *Atlantic Monthly* article, “As We May Think”, about building information machines to facilitate the logging and tuning of a scientist’s cognitive research and reasoning paths (1945). “As We May Think” inspired the architecture of the World Wide Web, and Garfield’s scholarly information resources and the citation metrics built upon them, served as inspiration for the HITS and Pagerank algorithms that have defined the ranking schemes of modern search engines (Gugliotta, 2009).<sup>1</sup> Garfield’s resources also facilitated scholarly research, especially in the social sciences and humanities where scholarship itself is a legitimate research object. ISI later produced Journal Citation Reports atop their other information resources and designed the associated Impact Factor metric in 1975, which became the primary basis of ranking scholarly journals. These journal rankings, in turn, have come to form the basis of productivity and reputation metrics for individual scholars, departments and universities.

Soon afterwards, in 1983, *U.S. News & World Report* published its first “America’s Best Colleges” report, which they produced annually from 1988. This has become extremely influential (e.g., 10 million hits within the first week of online publication). Although citation and journal metrics do not enter these rankings directly, they rely on a fixed evaluation methodology: an annual survey sent to each school, the school’s website, and opinion surveys of university faculty and administrators at competing schools. Bibliometric measures of productivity and impact are central to the U.S. National Academy of Sciences doctoral program rankings, as well as the influential Academic Ranking of World Universities (ARWU) compiled by the Shanghai Jiao Tong University (the “Shanghai Rankings”) to rank universities globally and provide the Chinese government with a “global benchmark” against universities in China so they “could assess their progress” and “catch up” on “hard scientific research” (Marszal, 2012). Other global university rankings (e.g., from the *Times*) have followed. Rankings, bibliometrics, and surveys have also become central to some countries’ research

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<sup>1</sup>In the same way that articles were deemed important if highly cited, webpages came to be deemed important if highly hyperlinked.

funding allocation process, like Great Britain’s research assessment exercise.

### 3 Standardized metrics in contemporary markets

Intermediaries that provide standardized metrics on quality are increasingly prevalent in many contemporary markets beyond higher education. These metrics are used as heuristics, or reduced-form information about quality that substitutes for more costly primary research. Two factors that strongly influence the use of standardized metrics include (1) the population of institutions in question (i.e. the consideration set), and (2) the stakes associated with the decision. An increase in the size of the consideration set makes it more costly for an individual to collect a representative sample of the quality distribution in a given field. Small institutional fields, in which all participants are known to one another, demonstrate little demand for intermediaries. An increase in the economic, political or moral stakes of a decision make it more important for an individual to minimize the margin of error regarding their sample, or tighten their “confidence interval”. When both factors are present, the context is ripe for the entrance of specialized intermediaries that can perform research on the consideration set and provide guidance in the form of a recommendation or ranking to prospective consumers.

Both large market size and high stakes characterize the field of higher education in post-war United States. For example, the rise of information intermediaries in academic libraries—the shift from small, departmental libraries managed by the faculty to massive, centralized research libraries presided over by professional librarians and information scientists—tracks a global explosion in the number of researchers, research articles and books published in all fields (Abbott 2011). The increase in global research activity increased the burden of gaining adequate coverage of research in any area, and coincided with the emergence of professional librarians who managed the organization of complex research outputs. Similarly, growth in the number and increasing diversity of students from different international, ethnic and social

class backgrounds has increased the demand for intermediating metrics to rank universities. These metrics and rankings facilitate a “view from Shanghai”—by anyone from anywhere—in the global field of higher education. As a result, students now consider a larger set of schools, less constrained by geographic location (Hoxby 2009).

The stakes of research and education in the field of higher education have also grown. Larger government budgets associated with global research during and following World War II necessarily led to greater oversight than that which was afforded by basic accreditation and reputation alone. Sponsors likely wanted to fund the best work, which required the creation of intermediaries and metrics to provide higher resolution assessments of quality. A culture of civilian accountability for nonmilitary research investments also likely pushed a more defensible assessment of researcher quality. Similarly, for the student consumers of higher education, tuition costs have risen nearly three times the rate of inflation since 1978 (7.74% per annum vs. 2.67%)—outpacing even health care costs. These changes set the stage for the entrance of specialized intermediaries such as *US News & World Report* in the early 1980s.

The following sections will (a) discuss the empirical findings on the effect of rankings on student application and matriculation decisions, (b) compare the impact of rankings to other factors known to influence student decisions, and (c) compare the impact of college rankings to other mediated markets when standardized metrics are prominent.

### **3.1 Effect of College Rankings on Student Preferences**

The transformative impact of intermediaries and ranking in higher education has been frequently noted (Ehrenberg 2000, Brewer et al. 2004, p. 61), but most empirical studies show very modest effect sizes for change in rank on decision making at the individual level. This section will survey what we know about standardized metrics and rankings in higher education and their effect on stakeholder decisions. Depending on the context and identification strategy, a one position change in rank can lead to a .2–2% increase in applications for a



given school in the next academic year. This effect only holds for the top twenty-five national universities, however, for which prospective student demand is particularly elastic to status (Bowman & Bastedo 2009). The perceived difference between the first and tenth schools is larger than that between the fortieth and fiftieth.

Here we focus on the effect of ranking for the performance of U.S. schools in the market for students, but we also compare effect sizes of rating and ranking across a range of contexts to provide a sense of their relative magnitude in higher education. While rigorous inferences cannot be made across studies due to a lack of standardization, there is suggestive evidence that students' educational choices respond to university ranks with a magnitude similar to that of consumer choices in other domains. Across contexts, there appears to be a consistently positive and statistically significant, but *very* modest effect of mediated ratings on institutional performance. Some of the most recent findings suggest that even the small positive effect of elevated status may be overestimated (Azoulay, Stuart & Wang 2013), and can even result in penalties under certain circumstances (Kovacs & Sharkey 2014).

Together, the body of empirical evidence calls into question the vast resources poured into rating improvements by large institutions. More comparative research is needed to generate robust inference on the effect of ratings in different contexts, and to expand knowledge beyond simple institution-level effects in order to empirically capture the size and mechanism by which intermediation effects the social system as a whole. It seems clear, however, that the vast majority of recent studies about ratings and rankings on institutional performance do not capture the experienced influence of imposed ratings and rankings on the system of higher education, where universities have conformed to measured criteria in order to advance in them.

A number of studies have estimated the impact of rankings on student application and matriculation decisions. In law schools, Sauder & Lancaster (2006) estimate that a one place change in rank corresponds to a modest increase of 19 applications and only a 0.18% increase in matriculants the following year. To arrive at this finding, they use a conservative

Prais-Winsten cross-sectional time-series regression technique with an autoregressive term for prior rank and fixed effects for school and year. By adding prior rank to their model, which controls for rank trajectory, this only allows identification of an *accelerating* change in rank, and so the effect is particularly small, but accumulates over time.

We know from other studies (Bowman & Bastedo 2009) that top schools are particularly sensitive to changes in rank, so a stratified sample might show a larger effect for schools above a particular threshold. For top 25 national universities at the undergraduate level, Bowman & Bastedo (2009) show a 1% effect of a single place change in ranking on new applications in the subsequent admissions cycle. This effect does not hold for schools ranked 25-50, or for liberal arts colleges, however. Bowman & Bastedo also used fixed effects for school and year, but not an autoregressive term. Bowman & Bastedo show a much larger effect for movements between the first and second page of the *USNWR* rankings. Schools that move into the top 25 (and thus onto the first page of the rankings) experience a 9.6% increase in applications the following year. Although moving to the first page seems to be particularly salient, the schools that experienced this change is very small in number.

Lastly, Luca (2013) finds that when *US News* changed the presentation format of schools ranked 25-50 from alphabetical to ranked order, a one place increase in rank corresponded to a 0.55-0.71% increase in applications the following year. While the information comprising the ranking was available in both formats, the salience of the ordinal presentation was required for the effect. As expected, the effect was smaller than for top 25 schools. Collectively this research shows a relatively minor effect of ranking improvements on the admissions selectivity of students. It also shows that prospective students may not be the most sophisticated information consumers and may be more influenced by salience of the presentation than the quality of information it conveys.

## 3.2 Effect of Other Factors on Student Preferences

The previously mentioned studies hold constant school-specific factors that also influence student application decisions, some of which have been shown to be more influential than ranking. Pope & Pope (2009) show that an appearance in the NCAA basketball tournament has roughly the same effect on applications as a one place increase in rank. Appearance in the NCAA basketball tournament leads to a 1% increase in applications, continuing to the ‘sweet sixteen’ yields a 3% increase, making it to the ‘final four’ a 4-5% increase, and winning the tournament a 7-8% bump in applications the following cycle. Smaller private schools are even more sensitive to this effect. In football, finishing in the top 20 yields a 2.5% increase in applications, the top 10 a 3% increase, and winning the championship yields a 7-8% rise. Like Bowman & Bastedo (2009), Pope & Pope use school and year fixed-effects to control for unobserved heterogeneity. Schools outside the top 25 in *USNWR* would therefore receive a significantly larger bump from sports success than they would from marginally improving their position in the *US News* rankings.

Lifschitz, Sauder & Stevens (2014) argue that much literature on status in higher education has focuses solely on academic factors at the expense of non-academic activities, which alumni and other external constituents find salient. In particular, they analyze how the football conference affiliations interact with a university’s academic prestige. Schools tend to sort into conferences based on similar levels of academic prestige (with the Ivy league being the most prominent example). By affiliating and competing with schools of similar academic profile, games are made more salient for fans, such that something is at stake in winning or losing to a similarly ranked peer. In this way, athletic conferences constitute a space in which status dynamics are negotiated between schools. Lifschitz et al. also find that athletic affiliation feeds back into academic prestige, such that schools in the same conference converge on measures of academic status. This suggests that school status is a complex, multidimensional quality, contested across sectors with varying constituents.

Hoxby (2009) notes that decreasing travel and information costs led to a more integrated

market for higher education in the second half of the twentieth century. As such, student decisions are now less elastic with respect to location and more responsive to a school's resources and peer group. This has led to a stronger status sorting regime between schools. Providing evidence for this trend, Hoxby (1997) finds that the dispersion of student ability within schools has declined, while the dispersion of ability between schools has increased. School responses to this dynamic have been to increase prices as well as subsidies in order to compete for higher ability students. While lower status schools became less selective over this period, they also raised expenditures and subsidies for students.

Frank (1999) and Winston (2000) have argued that this empirical pattern can be described as an expenditure cascade. Expenditure cascades involve arms-race style competition for positional goods. In certain market contexts, excessive expenditures by high-status actors produce negative consequences for those further down the status hierarchy. In order to keep up, lower status institutions must adopt the same policies, and spend lavishly on other observables in order to signal resource-richness. While schools now compete on expenditures, they have not yet competed on price. This has led to student subsidies outpacing even the dramatic increase in tuition. While it is individually rational for each school to increase its student subsidy once the competitive dynamic is underway, all schools would be better off (from an institutional perspective) if they collectively agreed to regulate or tax extraneous expenditures on luxury goods.

We do not yet have reliable empirical estimates on the impact of status signals such as new dorms, athletic facilities, dining halls, and other amenities on student preferences, but colleges' increased competition in these areas suggest that they likely weigh significantly for student choice. While resources are captured by most rankings, subsidies—signaled by lavish facilities or the marketing of other amenities (laundry services, haute cuisine)—are more observable on student visits and may have a significant effect on student college selections. To our knowledge, researchers have yet to estimate the relative impact of amenities and tangible wealth signals as compared to formal rankings on student decisions.

### 3.3 Effect of Metrics in Other Institutional Domains

Comparing the effect of metrics in different domains is particularly helpful for putting the effect of college rankings in perspective. Pope (2009) found that a one place increase in national rank corresponded to a 1% increase in non-emergency Medicare patient volume the following year. Hospitals are especially sensitive to within-state jumps in ranking. A one position increase in rank within a hospital's state corresponded to a 7% increase in Medicare patient volume. Since national rankings move 5 places on average each year, Pope concludes that the *US News* rankings are responsible for about 5% of year to year change in patient volume. It appears that rankings have had a modestly greater effect in hospital settings compared with the college matriculation decision. While the top 25 national universities showed a similar effect size for ranking, the effect was smaller for schools outside of that category, and non-significant for some populations (liberal arts colleges). For hospitals, the aggregate effect was significant over all sub-populations. Furthermore, Pope's sample included 442 hospitals, much larger than the previously discussed studies, which typically restrict themselves to the "top 50." Moreover, from our analysis, university rankings vary much less year to year. Dating back to the inaugural 1983 *US News* issue, schools in the top 25 (and later the top 50 when rankings were expanded), move 1.92 places per year on average. The reason for this difference has yet to be explained, but could be attributed to either the higher stakes of the medical decision, or differences in the social organization and characteristics of the demographic groups.

In food service, Jin & Leslie (2003) analyze the impact of posted restaurant hygiene grades on the restaurant industry across municipalities in Los Angeles county. The public provision of hygiene grades leads to a small change in consumer behavior—restaurants moving from B to an A hygiene grade receive a 5% increase in revenue. The policy has larger effects on producer than consumer behavior, however, with average hygiene grades increasing from 75 to 90% over the two year period of the study. This resulted in a 20% decrease in airborne illnesses in areas with the new policy in place. This empirical asymmetry, whereby the effect

of a metric occurs more through supply-side anticipation than demand-side response, also appears to be the case in higher education's response to college rankings, though perhaps through a different pathway. This study also suggests that while ongoing rating/ranking changes may have little influence on school performance, their imposition as a whole may effect a much more dramatic influence on the standardization of universities and student applicants. Unlike Jin & Leslie (2003), most empirical studies estimate the impact of ratings or rankings on only one side of the market and therefore fail to identify second-order effects, or allude to them as implications in spite of relatively weak effect sizes.

In finance, researchers have found that investors respond rapidly to changes in ratings from securities analysts and bond rating agencies. For securities analysts, a categorical downgrade in recommendation (e.g. from buy to hold) yields an excess return of -2% for that share between the day preceding the announcement and the day following. Likewise, a categorical upgrade leads to a +.75% excess return over the same period (Francis & Soffer 1997). Hand, Holthausen & Leftwich (1986) find that a Moody's or S&P bond downgrade across classes corresponded on average to a -1.27% excess return in the given bond on the day of and the day following the announcement. The median effect of the downgrade was -0.45%, indicating that it is partially driven by outliers. Likewise, firms' share prices is similarly affected by a bond downgrade (to the effect of -1.52% on average, -.75% median). The larger impact on share price may be due to the fact that bondholders have priority over shareholders in bankruptcy proceedings. Nevertheless, downgrades do not have a monolithic effect and 40% of companies experience positive excess returns following the announcement. Notably, the financial market has a rather decentralized structure with competing intermediaries, although moreso in the securities than the bond market.

Two other relevant studies in consumer services are worth noting. First, in the Chinese hotel industry, Ye et al. (2011) find that 10% higher ratings on an online review site corresponds to a 5% rise in online bookings, though their analysis is not causal. Lastly, Luca (2010) contends that a one star increase in Yelp score corresponds to an 8% increase in

revenue for Seattle area restaurants.

While making cross-domain inferences is impossible without standardized study designs and comparable units, it is clear that standardized metrics vary in their effects. Most appear in the anticipated direction to a greater or lesser degree. The higher education market does not appear to be the most responsive to standardized metrics. The lack of a more general framework for cross-context comparisons makes it difficult to make predictions about where these metrics should be more or less effective, much less to systematically and empirically test those predictions, though this is a promising avenue for future research.

To summarize effect sizes from the studies described above, we generated a graph (Figure 1) that plots the coefficient and standard error of a one position increase in rank on the dependent variable in question. Here, an effect size of 1 indicates that a 1 place increase in the metric corresponds to a 1% increase in the performance metric, controlling for all other factors used in the model.

The central square is the point estimate of a one place movement in rank, rating, grade, etc. on the dependent variable in question from each study. The encompassing line represents the 95% confidence interval for that point estimate, as presented in the findings. In findings where the effect size was statistically significant, the confidence interval does not intersect with the dotted vertical line, which represents a 0 point estimate.

### **[INSERT FIGURE 1 ABOUT HERE]**

The average effect size appears to be 1.45 with a standard error of .223. Noticeably, no studies produced a negative point estimate, or post a discount for rising up in the relevant metric. More recent studies, however, have discovered special cases where such a discount might occur (Kovacs & Sharkey 2014). In another study, Azoulay et al. (2012) use a difference-in-difference estimator and show that the effect of academic prizes such as the Howard Hughes Medical Investigator awards are quite small and short-lived. Given these new findings, it is not clear that all intermediary-generated status boosts will produce a favorable result, or that the result will persist over time.

Figure 1 does not standardize the effect size based on resolution of the explanatory variable. For instance, if a school moves up one place in the *USNWR* rankings, it passes one comparable peer. If a school moves from the second to first page of the rankings in years before schools 25-50 were ordinally ranked, it potentially moves past a set of 25 comparable peers. Likewise, a company whose bond is upgraded moves past potentially hundreds of comparable peers. In order to make for more informative cross-context comparisons, one would need to standardize the effect size, scaling it by the number of comparative peers one would pass by moving up a unit in the metric.<sup>2</sup>

## 4 Increasing reliance on metrics by institutions of higher education

Like Jin & Leslie’s finding for restaurants, there is an extensive body of qualitative evidence that producers are more responsive to metrification than consumers, and this responsiveness has produced substantial changes in how universities organize themselves and allocate their resources. Quantitative evidence on these broader, second-order shifts in resource allocation, however, has been scarce due to challenges of data access and an emphasis on causal identification of theoretically compelling variables. So far, the effects of intermediation through metrics has not been modeled at a systemic level, a topic we discuss in the following section.

This section will review what we know about how institutions of higher education have re-

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In lieu of standardized coefficients, we attempted to generate weights of the effect size and variance based on our estimate of the comparable ‘peers’ one would pass by advancing one place in the relevant metric. Since detailed descriptive statistics of the various ‘bins’ were not published in a majority of the studies, the authors had to use their discretion in coming up with these estimates, so we do not include them here. As an exploratory exercise, however, it seemed to produce a more informative plot than the raw estimates. The scaling factor was computed as the natural log of the comparable peers one would expect to pass in the metric plus one (in order to rescale those metrics which are purely ordinal around one, i.e. one place corresponds to one peer). This procedure allowed for better cross-case comparisons of the salience for a given rating. This analysis suggested that more centralized tournament-style competition leads to larger standardized effects, especially at the top end of the distribution. In fields where there are multiple intermediaries and large ‘bins’ (stocks and bonds, for instance), the standardized effect size is smaller.



sponded to metrification, and how different intermediary structure produces distinct results at the field level.

What standardized metrics tie together in kind, they also disperse in a one dimensional metric space. The result is a focal point for peer comparison that has the potential to induce tournament-style competition between institutions. We know from the literature on reactivity (Espeland and Sauder 2007), and multitasking agency theory (Dewatripont et al. 1999) that agents respond to observation by reallocating resources towards more observable activities.

Espeland and Sauder (2007) discuss effects of the ranking such as increased expenditures on marketing to boost the number applications a school would receive to indirectly improve its selectivity score. Schools also spent more resources on career services to ensure that their students would count as being ‘employed’ either at graduation, or nine months thereafter. Law school administrators also game the rankings, recently going so far as to sometimes falsify test-score data. Following the decline of the legal market in 2008, some schools established short-term internship programs funded by the law schools themselves, which served the latent function of counting their students as employed.

With the rise of rankings, law schools have dramatically shifted their admissions criteria towards factors of the ranking rather than taking a more holistic approach (Johnson 2006). Prior to the *USNWR* law school rankings, soft factors such as work and life experience were sometimes taken into consideration in the admissions process. Following their introduction, however, admissions have tilted much more towards a student’s GPA and LSAT score. This shift in policy at top law schools is well-documented, Espeland & Sauder may overstate the ranking’s self-fulfilling impact on external audiences, according to alternative studies. The subjective experience of rankings by law school administrators may be exaggerated relative to their empirical effect on student choice, considering the small effect of ranking on performance produced by Sauder & Lancaster (2006).

In an earlier study, Espeland & Sauder (2006) suggested that having multiple metrics

or intermediaries may serve to protect against administrative cooptation by rankings. They compare law and business schools to demonstrate the effect of competition between ranking systems on the strategic response of administrators. Whereas law schools have a monolithic ranking system with no competition (*US News*), there have been multiple, prominent rankings of business school since the late 1980s (*Businessweek* and *US News*). More recent years have seen a number of additional periodicals add rankings to their portfolio as well (*Financial Times*, the *Economist*, etc.). The result is that: 1) multiple rankings produce ambiguity for readers, which forces them to arbitrate and reflect on the relative importance of factors related to quality, 2) weakens the effect of small differences between schools because of disagreement between rankings, 3) increases reputational control and flexibility by allowing administrators to play to multiple methodologies and emphasize distinct rankings in promotional materials, and 4) undermines the authority of rankings in general, safeguarding against the oversimplification of ‘quality.’ Together, these studies indicate that the publication of standardized metrics by an independent third party has had profound impacts on the allocation of resources by administrators in higher education, and that the structure and competition of intermediaries moderates the level of impact on institutional policies.

The best documented example of the introduction of a state-run rating system comes from the U.K.’s Research Assessment Exercise (RAE, which was replaced by the Research Excellence Framework in 2014). While there is an extensive body of literature on the impact of the RAE, we limit ourselves here to a few illustrative examples. Though he did not address them empirically, Elton (2000) considers a number of unintended consequences that could be attributed to the rating system. As one example, Elton suggests that the RAE methodology might cause researchers to overvalue publications in journals that ‘made the list’ and therefore count towards faculty productivity scores. Because journals deemed to be of quality were tilted towards domestic publications, this might have favored parochial research programs that would appeal to an audience of domestic reviewers. While this could have favorable public consequences for the use of research funds by focusing research on

domestic issues, it does little to enhance the quality of research beyond crudely measurable outcomes. Another unintended consequence of the RAE was that a rating system designed to produce stratification and efficiencies could have led to more equality in funding between schools. Funding was allocated in large part based on faculty productivity and this rating was initially assigned on a linear scale, with lower rated schools positively assessed relative to a non-standardized or informal approach.

Other potential unintended consequences included the punishment of long-term research projects due to a four year review cycle. There could also be a penalty for interdisciplinary research in areas where field journals did not count towards faculty productivity scores, or in research requiring cooperation between peer institutions. This could induce less risk taking in novel or emerging research areas. Another possible consequence was the devaluation of teaching or the communication of research findings. While faculties might produce more research, they would spend less time passing that knowledge on to their students and the public. Importantly, the system could also increase competition between schools for faculty stars, and lead to bidding wars in which schools vie against each other for a faculty member's publications in the current period to attain public research funding in the next.

Elton also notes that the centralized system could potentially lead to more efficient management of research funds, as the return on investment for lower and middle status researchers with substitutable skills might outperform the higher investments required by high status researchers. Furthermore, departmental improvements in research productivity were observed at all levels. This resulted in RAE incentives having their intended consequence as less waste or 'dead wood' remained in the faculty ranks. Nevertheless, it is not clear if more tacit dimensions of research quality have been benefited by centralized review.

Rolfe (2003) describes the strategic administrative responses to the RAE. The system has led schools to leverage alternative forms of revenue to compete in the transfer market for research stars. In particular, they expanded part time programs, increased tuition and fees, and increased expenses on marketing and branding their universities to attract more

students and attention. This has allowed them to compete more effectively for productive researchers in order to garner public research funds.

In general, it seems as though university responses to metrification have exceeded their effect on student preferences. This reciprocal effect, however, has not been formally modeled or measured due to its high dimensional and complex nature. Many have qualitatively documented that students and universities show increased attention and conformity to the criteria underlying ranking and scoring. We suggest that ranking and scoring likely influence system-level transformation even further afield. Recent years have witnessed the rapid growth of two new industries in the higher education sector: enrollment management and admissions consulting. Here we document the rise of these fields, then argue and formally demonstrate how attention to rankings could drive large demand for these services and the transformation in higher education they portend. Due to the recent emergence of enrollment management and admissions consulting, very little has been written on them in the academic literature, and so our account is preliminary and leaves room for further research.

## **4.1 Enrollment Management**

Strategic enrollment management emerged as a specialized function within admissions offices in the mid-1970s, as the tidal wave of baby-boomer enrollments waned and tuition dollars became more scarce (Coomes 2000). This section will discuss recent work documenting the rise of the enrollment management profession, and its impact on the field of higher education.

While enrollment management has a more than 30 year history within universities following ebbing undergraduate enrollments in the early 1980s, it is clear that consulting firms play a larger role today in diffusing knowledge and competitive practices among universities. Historical work on universities reveals that increased competition over enrollments predates the introduction of rankings. Nevertheless, ranking amplified the competitive environment and applied greater pressure on admissions departments to inflate selectivity figures, leading to a greater need for specialized expertise in services like 'application cultivation.' Hossler

(2011) suggests that while 'most enrollment managers are not fond of rankings' they can 'ill afford to ignore them' (p.77).

Today enrollment management services are increasingly provided by third party consulting firms such as Ruffalo Noel Levitz, TargetX, and the Lawler Group. Of the 50 institutions interviewed by Schulz and Lucido (2011), 47 mentioned hiring or seeking "ideas from consultants, with most institutions having current or recent contracts with one or more external consultants" (p. 7). Over half of the enrollment professionals in their study used consultants to enhance their marketing efforts to more effectively influence student behavior, and over one third used consultants for student search and targeting (p. 9). Market size estimates are difficult to document, but Ruffalo Noel Levitz (formerly Ruffalo Cody), one of the largest specialized enrollment management consulting firms, has appeared on the Inc. 5000 fastest growing companies list for the past eight years, last year reporting a staff of 5,265 employees and revenue of \$92 million. In a 2013 Business Corridor article, the firm claimed over 900 clients in higher education, with an annual growth rate of 15-20% and plans to pursue aggressive acquisition and international growth strategies.

Historically, the role of admissions was performed by faculty and senior administrators. Growing enrollments in the early 20th century, however, created the need for a more specialized administrative function to coordinate student trajectories through the school. Following this period, a variety of tasks associated with student matriculation, retention and records were handled by the university registrar (Coomes 2000). When enrollments began to surge following WWII with matriculation of the baby boom generation, the registrar's functions required further division, giving rise to specialized admissions departments. Enrollment management came into being following the ebbing of enrollments that occurred in the wake of baby-boomer graduations. Due to the expansion of higher education and student aid, schools became increasingly reliant on tuition revenue. As such, it became a matter of financial importance that schools meet enrollment targets in order to sustain operational spending levels (Coomes 2000).

Hossler (2011) has noted that historically the work of admissions offices varied greatly across schools depending on their position in the status hierarchy. At higher status schools, admissions officers traditionally served more as “gatekeepers;” whereas at lower status schools, admissions officers serve as “salespeople” for the university to generate demand (pp. 64-65). Still, these two functions overlap to at all schools, vary in their importance across historical periods, and represent a general tension in the profession. Beginning in the 1970s, universities began to adopt for-profit business techniques to deal with budgetary pressures stemming from declining high school student populations. In order to assist with strategic planning, admissions offices became tasked with developing and executing sophisticated marketing campaigns, which differentiated a school from its competitors (p. 68).<sup>3</sup> Later, in the 1990s, admissions departments coordinated with other university units and contracted with consulting agencies to develop optimal financial aid packages that selectively encouraged students to matriculate. Enrollment management grew to maturity in this era, developing models for predicting student application, matriculation, and completion. Enrollment management grew as a ‘systematic institutional response to issues related to student enrollment’ (p. 70), which coordinated between various institutional units and managed a variety of objectives across the university. Increasingly, admissions offices are located within enrollment management divisions, and Henderson (2001) claims that enrollment management is “on the brink of a profession”. While the task of enrollment managers is much broader and more complex than positioning the school in national rankings, they take ranking criteria into account as they prioritize their efforts (p. 89). Despite academic criticisms, this has led to spiraling competition to enroll students that rate highly on *USNWR* inputs via marketing efforts and tuition discounting (p. 89).

Kraatz, Ventresca & Deng (2010) found that over 50% of “moderately selective,” or

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Marketing practices, however, predated admissions departments. Mass mailings were used as early as 1893, when “one state university had sufficient funds and political clout to send out brochures to every school superintendent in the state” and levy a \$50 fine if they were not posted (Thelin 1982, cited in Hossler 2011, p. 66).

middle-status, liberal arts colleges had adopted the enrollment management organizational structure, whereas none of the nine most selective schools had adopted it. They find that tuition dependence, competitor and field-level adoption, organizational propensity for professionalization, and prior implementation at another school by a sitting President play important roles in the adoption process. On the other hand, factors associated with academic purity and professional power, such as faculty salary, tenure-track faculty, and presidential tenure were negatively correlated with adoption. This shift towards enrollment management structures appears to have slowed towards the end of the observation period. Kraatz et al. argue that strategic enrollment management poses a threat to the historically expressed value systems of higher education institutions through 'its negative effect on equal access to higher education and its tendency to divert resources away from core educational purposes' (p. 1538). This process occurs as enrollment management constructs 'mundane administrative arrangements' that allow 'market values to unobtrusively penetrate a college and provides these values and their advocates with a structural and political foothold inside the organization' (p. 1523).

Kraatz et al.'s (2010) estimate of the impact of enrollment management on admissions practice are likely conservative. Their measure (the creation of a Vice President of Enrollment Management position) does not capture the impact of consulting firms on the practices of admissions departments, nor can it account for the informal influence of subordinate enrollment managers that work within established admissions departments. The American Association of College Registrars and Admissions Officers, founded in 1910, now claims itself as a 'a nonprofit, voluntary, professional association encouraging best practices in such areas as enrollment management, information technology, instructional management, and student services. This mandate suggests the widespread effect that enrollment management practices now exert on higher education.

Schulz & Lucido (2011) also discuss the reasons university officials gave for hiring consultants, which include expertise (and cost savings), political expediency, a capacity for

monitoring competitors and professional histories/personal relationships. The authors suggest that it is important for enrollment and admissions professionals within universities to reflect on the extent to which their institution's values align with those being promoted by consulting firms. Consulting firms are shown to import techniques from the business world, and draw inspiration from industries that more closely approximate the ideal of perfect competition than higher education.

While positional competition has likely enhanced demand for their services, many enrollment managers are critical of vertical competition on ranking criteria (Kalsbeek 2009, Gnolek et al. 2014). The segmentation methods imported from corporate marketing are designed to deal with horizontal differentiation, or finding a good fit between student and school in the variegated higher education marketplace. For this reason, enrollment management as a field can ameliorate the effects of vertical competition amongst universities primarily through intensive marketing. Nevertheless, in a market with universally recognized quality standards, segmentation and direct marketing has limited influence, suggesting an uncertain and potentially changing role demand for enrollment management services in the future.

## **4.2 Independent Educational Consultants**

Another profession that has risen in prominence and impact are Independent Educational Consultants (IECs). The admissions consulting industry can be understood to contain a variety of services for students to improve their chances of acceptance. These services include: standardized test preparation, admissions coaching and essay editing. While a number of transactional services are individually available to students (e.g. test preparation, essay editing) and often offered by admissions offices (direct mailings, CRM software for targeted emails, etc.), here we focus on full-service consultants. Given their smaller profile, and relatively recent rise, IECs have not received the same amount of scholarly attention as enrollment managers, but there is a growing body of literature identifying increased demand for their services, and their impact on the admissions landscape.



McDonough (1994) has called attention to 'major changes in the field of college admissions from increased competition, higher admissions standards, and the phenomenal growth of non school-based admissions management services' (p. 443). In particular, she draws attention to the then new practice of admissions coaching, provided by Independent Educational Counselors (IECs), who help generally upper-middle class families to mitigate the uncertainty associated with the college admissions process. Smith (2014) has recently provided a detailed look at the business activities of IECs and the motivation of their clients. She describes how 'IECs and parents spoke about how the admissions game has become more competitive due to demographic changes, marketing by schools, and media hype—especially the U.S. News and World Reports rankings' (p. 56).

As of 1989, independent educational consultants were small in number and generally treated with disdain by both school guidance counselors and admissions professionals (Sklarow 2012, p. 69). Now, IECs have achieved a greater deal of legitimacy and are more tightly integrated into admissions institutions. Many admissions offices assign staff member as point of contact for consultants and invite IECs for campus tours or special events (ibid). Furthermore, many IECs participate in the professional body for admissions officers and vice-versa (Smith pp. 39-40).

Demand for IECs grew exponentially over the past 25 years. In 1997, only 2.7% of college freshmen had worked with an IEC. More recent estimates put that figure closer to 22% (Smith 2014, p. 41). In 2009, Lipman Hearne estimated that 26% of 'high-achieving' high school seniors, defined as those scoring above the 70th percentile on the SAT or ACT and receiving acceptances at three or more schools, were working with an Independent Educational Consultant (IEC) to help guide them through the admissions process.<sup>4</sup> In 2012, the IECA estimated domestic spending on IECs at around \$400 million (Smith 2014, p. 38)

The first national survey of IECs was carried out by McDonough et al. (1997), and found that they charged an average of \$87 per hour and had a caseload of 41 students per year.

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<sup>4</sup>Lipman Hearne, a marketing agency specializing on non-profits, and National Research Center for College and University Admissions conducted the study

The overwhelming majority are white (98%), female (76%), highly educated (78% with a Master's or Doctoral degree), and located near large metropolitan areas. IECs reported that admissions management constitutes about three fourths of their work. McDonough et al. conclude that 'under the privatization of college access, trusted public servants (high school guidance counselors) are replaced by private entrepreneurs (independent educational consultants) who are driven by bottom-line financial considerations.'

Stevens (2009) later noted a 'growing market of private consultants,' and described the approach of a former admissions officer, turned private consultant, who was able to charge families \$7k to help students represent themselves in a way that 'make(s) sense to admissions officers' (p. 214). Students at affluent private high schools were also known to have access to a cadre of guidance counselors 'whose jobs revolve around getting kids into college' (p. 216).

Together with enrollment management services, admissions consulting appears to resolve increased uncertainty faced by students and universities. We will argue, and formally demonstrate in the following section, how increasingly slavish attention to rankings can explain the rise of this uncertainty. These effects cannot be captured by school-level year to year changes in performance, but rather accumulate and involve feedback between the behaviors of both sides of the higher education market.

## 5 The Double Bind of Prestige-Seeking

Our earlier review of the current literature indicates that year to year changes in university rank have a small but statistically significant effect on admissions outcomes at the school level, but these models understate the cumulative importance of rankings in reorienting resource allocation decisions of students and administrators. They cannot identify the conditions of transformation that give rise to new, uncertainty mitigating professions. While status order in higher education has been more or less conserved over time (Grewal et

al. 2012), this has been accomplished at extraordinary expense via positional competition among schools and students, which saw the emergence of large outflows of capital to new consulting professions that resolve uncertainty for their respective counterparties.

Gnolek, Falciano & Kuncl (2014) show that most changes in university rank are attributable to small year-to-year changes in reporting or admissions policies, and positional gains erode as other schools adopt strategic policies. Gnolek et al. estimate that it would take an additional \$112 million in annual expenditures for a school ranked in the mid-30s to raise its level of faculty compensation and financial resources per student (two sub-factors) to the level of schools ranked in the top 20.

Table 1, below, shows the summary statistics of cumulative change in rank from 1996-2010 for national universities ranked within the top 50 in *USNWR*'s 1996 edition.

Table 1: Summary Statistics of Cumulative Change in USNWR Rank from 1996-2010 for National Universities Ranked in the Top 50 in 1996

Change in Rank	Mean	Median	Standard Deviation	Range
Absolute Value	3.46	2.5	3.37	0, 17
Raw Value	0.14	0	4.85	-15, 17 <sup>5</sup>

Over the 15 year window, schools ranked in the top 50 changed, on average, about 3.5 places. Because one school's gain comes at another's loss, the average change of the raw ranking is centered around zero. Figure 3, below, traces a histogram of the raw change in *USNWR* rank from 1996-2010 for schools ranked in the top 50 in 1996. Gnolek et al. (2014) suggest that changes of two places should be interpreted as noise rather than signal for top 40 universities, and changes of up to four places can be interpreted as random variation for lower ranked schools. Only a few universities had larger confidence intervals that could be traced to institutional practices that "resulted in supplying notably different inputs to *U.S. News*" (p. 767).

**[INSERT FIGURE 2 ABOUT HERE]**

In this section, we use an analytical approach to examine a stylized fact: the concurrent

declines in both average acceptance rates and average yield rates at undergraduate universities. Yield rate is defined as the number of students that enroll, given an offer of admission. The National Association for College Admission Counseling's (NACAC) 2012 report indicates a drop in average acceptance rates from 69.6% to 63.8% from 2002-2011 (p. 16). The same report also shows a drop from 48.7% to 38% in the average yield rate for schools.

This dynamic creates additional uncertainty for both sides of the market. For students, especially those at the top end of the status hierarchy, observing declines in acceptance rates creates uncertainty over their likelihood of admission into any one school. Consulting industries such as standardized test preparation, admissions coaches, and essay editors have flourished in this new environment. Figure 4 depicts a Facebook advertisement from *Princeton Review* targeting parents of high-schoolers that highlights decreasing acceptance rates as a reason for using their services.

### [INSERT FIGURE 3 ABOUT HERE]

For schools, declines in yield rates mean more unpredictability regarding enrollment numbers. The 2012 NACAC report shows that the percent of students submitting seven or more applications more than tripled, from 9% to 29%, between 1990 and 2011, while the number of students submitting more than three applications rose from 61% to 79% (p. 16). the report argues that this has made “the admission office’s task of predicting yield rates and obtaining target enrollment numbers...more complex” (p. 17). We show that this relationship is a formal one, resulting from an unstable equilibrium in which both sides of the market participate in behaviors that amplify their own uncertainty.

Evidence from recent years has pointed to changes in admissions policies to increase the number of applications a school receives so that it can reject more students and improve selectivity scores in *USNWR* rankings. Toor (2000, cited in Avery et al. 2004), writes that:

“The job of admissions officers is to recruit, to boost application numbers. The more applications, the lower the admit rate, the higher the institutional ranking. Increasing application numbers is usually the No. 1 mandate of the recruiting

season. Partly, that means trying to get the very best students to apply. But it also means trying to persuade those regular, old Bright Well-Rounded Kids (B.W.R.K.'s, in admissionese) to apply—so that the college can reject them and bolster its selectivity rating."

In another account, Stevens (2009) describes a secondhand description of an admissions officer who:

"bragged ... about his school's exceptionally large numbers of applications from international students. The kids from abroad apparently were encouraged to apply online, for free. "And then you reject 'em all. But you have their applications," (p. 50)

Schools have pursued a number of strategies to boost applications numbers in order to either improve selectivity or simply hit target enrollment numbers. These include application subsidies, direct mailings, television commercials, and generous financial aid policies. Schools began accepting the Common Application in larger numbers from the mid-1990s onward to reduce the time cost of application. Liu, Ehrenberg & Mrdjenovic (2007) showed that adoption of the common application led to a one-time adoption shock that resulted in a 5.7-7% increase in applications and a 2.8-3.9% decrease in yield rate. These changes have persisted in the years after adoption. By rejecting more students and improving perceived selectivity at rates higher than peers, a school not only maintains its position in the ranking, but also enhances the signaling value of its degree. At the same time, it lowers its own and other schools' yield, making enrollment rates less predictable for all universities.

To illustrate this effect, we provide a simple formal analysis of this dynamic. Given some simplifying assumptions, the admissions system can be modeled as follows: Consider a fixed number of schools  $m$ , and a fixed number of students,  $n$ . Applicants submit  $b$  number of applications per student. All schools accept a total of  $a$  students in hopes of filling a class. Our first simulation of this system assumes that students apply to and enroll in schools at random, conditional on acceptance. It also assumes that schools randomly accept students that apply.

The average acceptance rate for schools can therefore be expressed as the number of schools times the number of students accepted per school, divided by the number of students times the number of applications submitted per student:

$$\text{Average Acceptance Rate} = \frac{ma}{nb} \quad (1)$$

Since applications per student lies in the denominator of this formula, average acceptance rate is inversely proportional to the number of applications per student. The ranking criteria incentivizes admissions offices to seek more applications in order to reject more students and improve perceived selectivity. Students, observing these trends, therefore have an incentive to diversify their application portfolio by applying to more schools. This leads to a feedback effect between increasing applications and decreasing acceptances.

Schools face a similar dilemma. In a system with a fixed number of students, an increase in applications per student will lead to more students receiving offers at competing schools. This results in a lower probability that any one student will accept an offer of admission into a given school. In particular, the probability that student  $i$  enrolls in school  $j$  can be expressed as:

$$P_{ij} = (App_{ij})(Acc_{ij})(C_{ij}) \quad (2)$$

where  $App_{ij}$  is the probability that student  $i$  applies to school  $j$ ,  $Acc_{ij}$  is the probability that student  $i$  is accepted to school  $j$ , and  $C_{ij}$  is the sum of conditional probabilities that student  $i$  chooses school  $j$ , given offers of admission from competing schools. Given our simplifying assumption of random application choices by students,  $App_{ij}$  can be expressed as the number of applications per student divided by the number of schools:

$$App_{ij} = \frac{b}{m} \quad (3)$$

Similarly, since schools are assumed to randomly select students,  $Acc_{ij}$ , or the probability that any given student receives an offer of admission, can be expressed as the average acceptance rate (from formula 1).

$$Acc_{ij} = \frac{ma}{nb} \quad (4)$$

$C_{ij}$  is the sum of conditional probabilities that student  $i$  chooses school  $j$ , given offers of admission from competing schools. In this formula,  $y$  indexes the number of schools that student  $i$  is accepted into. This can be expressed as the sum of binomial probabilities of a student receiving  $y$  acceptances divided by  $y$ .

$$C_{ij} = \sum_{y \in \{1, \dots, b\}} \frac{1}{y} P(i \text{ accepted at } y-1 \text{ other } js) P(i \text{ rejected at } b-y \text{ other } js) \binom{b-1}{y-1} \quad (5)$$

Finally, in formula 6, we get the joint probability of all three of these terms:

$$P_{ij} = \frac{b}{m} \times \frac{ma}{nb} \times C_{ij} \quad (6)$$

Because  $b$  and  $m$  in the first two terms cancel out, this reduces to formula 7:

$$P_{ij} = \frac{a}{n} \sum_{y \in \{1, \dots, b\}} \frac{1}{y} P(i \text{ accepted at } y-1 \text{ other } js) P(i \text{ rejected at } b-y \text{ other } js) \binom{b-1}{y-1} \quad (7)$$

Given formula 7, the expected enrollment of school  $j$  can be expressed as the number of students,  $n$ , times the formula for  $P_{ij}$  (from 7):

$$Enrollment_j = \sum_{i \in N} P_{ij} = n \frac{a}{n} (C_{ij}) = aC_{ij} \quad (8)$$

The total enrollment for all schools in the system can then be expressed as  $Enrollment_j$  (from 8) multiplied by the number of schools

$$Total \ Enrollment = \sum_{j \in M} Enrollment_j = m(Enrollment_j) = maC_{ij} \quad (9)$$

From formula 9, we get the average yield rate (or, the proportion of students that accept an offer of admission) for all schools in the system by dividing the total enrollment for schools in the system by the number of schools multiplied by the number of acceptances. This reduces to formula 5, or the sum of conditional probabilities that student  $i$  chooses school  $j$ , given competing offers of admission.

$$Average Yield = \frac{maC_{ij}}{ma} = C_{ij} \quad (10)$$

Because  $b$  (number of applications) appears in the denominator of all formulas, we can say that school's expected yield is inversely proportional to the number of applications submitted per student. As such, expected enrollment and average yield rates decline with an increase in the number of applications per student if  $a$  (number of acceptances) remains constant. Thus, schools face a conflict between encouraging more students to apply to improve selectivity, and resolving uncertainty about which students are more likely to attend, leading to policies such as early action/decision programs, enhanced student subsidies, and interviews, essays, and visits to screen for applicant interest.

Consider an arbitrary system with 100,000 students and 20 schools. Assume that each school accepts 10,000 students at random in hopes of enrolling a class of 4800 students. Lastly, assume each student applies to only 3 schools. Plugging these constants into the above formulas, we get the following values for the average acceptance and yield rates at the 20 schools contained in the system. From formula 1, we get the average acceptance rate of schools in the system:

$$Average Acceptance Rate = \frac{20 \times 10,000}{100,000 \times 3} = \frac{2}{3} = .6667 \quad (11)$$

and from formulas 10 and 5, we get the average yield rate:

$$Average Yield = \frac{1}{1} \frac{2^0 1^2}{3} \binom{2}{0} + \frac{1}{2} \frac{2^1 1^1}{3} \binom{2}{1} + \frac{1}{3} \frac{2^2 1^0}{3} \binom{2}{2} = \frac{1}{9} + \frac{2}{9} + \frac{4}{27} = \frac{13}{27} = .481 \quad (12)$$

Below are charts depicting the average acceptance and yield rates of schools conditional on the number of applications per student.

**[INSERT FIGURE 4 ABOUT HERE]**

**[INSERT FIGURE 5 ABOUT HERE]**

As students apply to more schools, yield and acceptance rates both drop, such that schools have a harder time fielding a class due to more cross-admits. Students have a lower probability of being accepted into the schools to which they apply, but this is counterbalanced



by the fact that they have more chances of getting in. Likewise, because competing schools are more selective, universities can expect a lower bound on declines in yield rates, as the students they select are less likely to get into other schools.

What if we were to remove the assumption of random application and admission choices by students and schools? If student and school preferences concerning the other side of the market became correlated, this would greatly exacerbate uncertainty for those at the lower end of the status hierarchy on both sides of the market. Because schools and students both wish to find a match, however, we would expect admissions behavior to be strongly correlated not only with others' opinions, but expectations for reciprocity (Gould 2001) and student-school fit. The result of this dynamic is an unstable equilibrium, where schools seek more applications and students submit more applications, further exacerbating uncertainty about admission and enrollment. This dynamic has greatly increased the problems that these professions seek to resolve, and so created enormous demand for their services.

There are a number of other forces that have also played a role in increasing demand for enrollment management and independent educational consultation over the past two decades. These include a more professionalized managerial orientation among administrators, improvements in technology and related expertise, and budgetary pressures on state universities, which have necessitated more accurate measurement of revenues and costs associated with enrollment.. Here we have detailed one plausible, but important mechanism through which rankings have likely contributed to this growth.

## 6 Discussion

Despite its meager influence on university performance, ranking and rating in higher education have had a profound effect on the experience of universities and applicants. The higher-order effects we demonstrate are one plausible mechanism contributing to rising demand for the Enrollment Management and Independent Education Consultation professions,

who use specialized knowledge to mitigate uncertainty for each side of the market. Moreover, it appears that metrification resulted in a reduction of diversity or complexity among “elite” universities and students as they conform to and compete on measured criteria.

Nevertheless, this case does not exhaust the full range of system-level consequences from rankings on the system of higher education, and suggests a number of ‘open questions’ that future research should explore. For example, what leads metrification to lead to more inequality in some contexts, but less in others? The RAE had unintended consequences, leading to greater parity between institutions in the allotment of research funds. This is attributed to the linear scale imposed on quality. Yet, the ordinal nature of *USNWR* rankings seems to be the most salient feature for universities, and leads to greater inequality. What are other factors that lead to this contingent effect? Moreover, what leads metrification to have a more enduring effect in some contexts than others?

By suggesting the system-level costs that ranking and metrification have imposed on universities and students, without producing compensating benefits for those engaged in the transaction, our investigation also suggests the importance of considering implications for higher education policy that might ameliorate these effects. More specifically, if current investments in selectivity, facilities, amenities, sports, or other activities prove to be socially wasteful, what are policy interventions that could curb them?<sup>6</sup>

Schelling (1973) and Frank (2012) have noted that the competitive dynamics of zero-sum games can lead rational individual strategies to produce suboptimal social results. Frank suggests that status contests and the pursuit of positional goods leads to negative externalities for other members of the status hierarchy, which leads to an expenditure cascade for all involved. Under such circumstances, individual strategies of excessive expenditures are rational, but everyone would be better off if some agency, within or beyond the higher education system, would impose some sort of regulation prohibiting or punishing the behavior. Schelling’s classic example involves hockey players wearing helmets. If one player opted to

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<sup>6</sup>The factors contributing to cost increases in higher education, and potential solutions have been discussed in more detail in Ehrenberg 2000 and Clotfelter 2014.

not wear a helmet, they would have more mobility and vision on the ice, thus conferring them an advantage. If this occurs, it could make sense for all other players to adopt a similar strategy, because they would be in a disadvantageous position if they did not, despite the safety hazard it imposes. The players are therefore all better off in a regulatory regime which mandates that all players wear a helmet. Multiple solutions exist for such a problem—a strict regulation, as is the case for hockey players, or a more relaxed one such as a consumption tax levied on non-cooperating parties. In the higher education context, this could take the form of a luxury tax for institutions that excessively spend on peripheral activities. While these forms of regulation may be possible in centralized states, where universities are universally supported with public funds (e.g., Great Britain, France), they are more difficult to imagine in the disaggregated context of the United States, with its separate private and public universities. As a result, we expect that market corrections in higher education will play the largest role in the United States, even though such corrections could be disruptive for both universities and students if they resulted in a discount of the perceived value that students receive from expensive higher education.

Other approaches involve the design of market mechanisms that produce efficient matches between both sides of the market (Roth 2002). Medical schools and some public school systems use this approach on a much smaller scale. It is unclear whether a modified version of these institutions could be implemented for such a heterogeneous environment as American higher education. It is important for policy makers, however, to consider the alignment between the goals of higher education and the efficiency of the admissions system in producing strong matches between schools and students.

## 7 Conclusion

In our review of scholarship regarding the influence of ranking/scoring on the position and the strategic behavior of universities, schools and departments, we find that the estimated influ-

ence of rank on university performance is remarkably small (e.g., 1 rank position corresponds to 1% more applicants/students), considering the amount of attention that ranking has received in the popular and academic press. In our analysis, we found that it is comparable to the same effect in many other institutional domains, although slightly smaller than some, like medicine, where the stakes may be higher. We show from suggestive research in other domains, however, that this estimation exercise understates the larger effect of metrification on the experience of university administrators, as well as the the institutional structure, strategy, behavior and quality of teaching and research outputs associated with science and scholarship in higher education. Because these high-dimensional, complex aspects are not as as cleanly measured as one-dimensional rank position, they have not received the same treatment or modeling attention in education scholarship, despite their clear importance for understanding and influencing higher education. This is ironic as rankings appear to have performed their magic on the producers of higher education data just as they did on the consumers of that data. By making one thing measurable and salient, ratings and rankings make it difficult for higher education researchers to estimate and publish about anything else just as they make it more difficult for consumers to consider other, unmeasured factors.

We hope that this paper inspires researchers to consider the limits of the current approach to the estimation of ranking effects, and to look beyond the most easily available metrics to assess the broader systemic influence of metrics on higher education. Research focused on university-level ranking effects simply cannot identify system-level consequences revealed in qualitative studies. In our analysis, we have used a formal example, simulation, and historical detail to identify a critical system-level consequence of increased focus on ranking and the framing of higher education as a positional good. To increase their rankings, universities now compete on selectivity by driving greater competition among applicants. Applicants respond by applying to more schools, which leads to greater uncertainty about enrollment for both students and universities. This feedback loop provides a plausible mechanism fueling the rise of enrollment management and independent education consultation professions. We believe

that this process has strongly contributed to the conformity of both universities and students to ranking criteria, and so justifies the perceived importance and increased focus on rankings as substantial and consequential for higher education, far beyond the small size of estimated ranking effects. Insofar as the feedback sparked by ranking increases the costs without producing offsetting benefits for students and universities, we urgently encourage research on novel policy approaches to improve the efficiency of matching and resource allocation in higher education and increase the value of higher education for science and society.

## References

- Abbott, A. (2011). Library research infrastructure for humanistic and social scientific scholarship in the twentieth century. *Social knowledge in the making*, pages 43–87.
- Azoulay, P., Stuart, T., and Wang, Y. (2014). Matthew: Effect or Fable? *Management Science*, 60(August):92–109.
- Bowman, N. a. and Bastedo, M. N. (2009). Getting on the Front Page: Organizational Reputation, Status Signals, and the Impact of U.S. News and World Report on Student Decisions. *Research in Higher Education*, 50(5):415–436.
- Brewer, D. J., Gates, S. M., and Goldman, C. (2004). *In pursuit of prestige: Strategy and competition in US higher education*. Transaction Publishers.
- Bush, V. (1945). As we may think. *The atlantic monthly*, 176(1):101–108.
- Chambliss, D. F. and Takacs, C. G. (2014). *How college works*. Harvard University Press.
- Clotfelter, C. T. (2014). *Buying the best: Cost escalation in elite higher education*. Princeton University Press.
- Coomes, M. D. (2000). The historical roots of enrollment management. *New directions for student services*, 2000(89):5–18.
- Dale, S. B. and Krueger, A. B. (1999). Estimating the payoff to attending a more selective college: An application of selection on observables and unobservables. Technical report, National Bureau of Economic Research.
- de Solla Price, D. J. (1976). A general theory of bibliometric and other cumulative advantage processes. *Journal of the American society for Information science*, page 293.
- de Solla Price, D. J., de Solla Price, D. J., de Solla Price, D. J., and de Solla Price, D. J. (1986). *Little science, big science... and beyond*. Columbia University Press New York.
- Dewatripont, M. and Jewitt, I. (1999). The economics of career concerns, part ii: Application to missions and accountability of government agencies. *Review of Economic Studies*, 66(1):199–217.
- Ehrenberg, R. G. (2000). *Tuition rising*. Harvard University Press.
- Elsbach, K. D. and Kramer, R. M. (1996). Members’ Responses to Organizational Identity Threats: Encountering and Countering the Business Week Rankings. *Administrative Science Quarterly*, 41(3):442–476.
- Elton, L. (2000). The uk research assessment exercise: unintended consequences. *Higher Education Quarterly*, 54(3):274–283.
- Espeland, W. and Sauder, M. (2007). Rankings and Reactivity: How Public Measures Recreate Social Worlds. *American Journal of Sociology*, 113(1):1–40.

- Francis, J. and Soffer, L. (1997). The relative informativeness of analysts' stock recommendations and earnings forecast revisions. *Journal of Accounting Research*, 35(2):193–211.
- Frank, R. (1999). Higher Education : The Ultimate Winner-Take-All Market?
- Gnolek, S. L., Falciano, V. T., and Kuncl, R. W. (2014). Modeling change and variation in u.s. news and world report college rankings: What would it really take to be in the top 20? *Research in Higher Education*, pages 761–779.
- Godin, B. (2006a). On the Origins of Bibliometrics. *Scientometrics*, (33).
- Godin, B. (2006b). On the origins of bibliometrics. *Scientometrics*, 68(1):109–133.
- Grewal, R., Dearden, J. A., and Lillian, G. L. (2012). The university rankings game. *The American Statistician*.
- Gugliotta, G. (2009). The genius index: One scientists crusade to rewrite reputation rules. *Wired Magazine*, 17(6):92–5.
- Hand, J., Holthausen, R., and Leftwich, R. (1992). The effect of bond rating agency announcements on bond and stock prices. *The Journal of Finance*, 47(2):733–752.
- Hawkins, D. A. and Lautz, J. (2013). State of college admission. *National Association for College Admission Counseling*.
- Hearne, L. (2009). Five great colleges want her. how will she decide? Technical report, Lipman Hearne.
- Henderson, S. (2001). On the brink of a profession: A history of enrollment management in higher education. *Black, J.(Ed.). The strategic enrollment management revolution, 3–36. Washington, DC: American Association of Collegiate Registrars and Admissions Officers*.
- Hossler, D. (2011). From admissions to enrollment management. *Student affairs practice in higher education*, pages 63–95.
- Hoxby, C. (2009). The changing selectivity of American colleges. *NBER Working Paper 15446*.
- Hoxby, C. M. (1997). How the changing market structure of us higher education explains college tuition. Technical report, National Bureau of Economic Research.
- Jin, G. and Leslie, P. (2003). The Effect of Information on Product Quality : Evidence from Restaurant Hygiene Grade Cards. *The Quarterly Journal of Economics*, 118(2):409–451.
- Johnson, A. M. (2006). The destruction of the holistic approach to admissions: The pernicious effects of rankings. *Indiana Law Journal*, 81.
- Kalsbeek, D. H. (2009). Enrollment management: A market-centered perspective. *College and University*, 84(3):2.

- Kovacs, B. and Sharkey, A. J. (2014). The paradox of publicity how awards can negatively affect the evaluation of quality. *Administrative Science Quarterly*, 59(1):1–33.
- Lifschitz, A., Sauder, M., and Stevens, M. L. (2014). Football as a status system in us higher education. *Sociology of Education*, page 0038040714533353.
- Luca, M. (2011). Reviews, reputation, and revenue: The case of yelp. com. *Com (September 16, 2011). Harvard Business School NOM Unit Working Paper*, (12-016).
- Luca, M. and Smith, J. (2013). Salience in Quality Disclosure: Evidence from the US News College Rankings. *Journal of Economics & Management Strategy*, 22(1):58–77.
- Mazloumian, A., Eom, Y.-H., Helbing, D., Lozano, S., and Fortunato, S. (2011). How citation boosts promote scientific paradigm shifts and nobel prizes. *PloS one*, 6(5):e18975.
- McDonough, P. M. (1994). Buying and selling higher education: The social construction of the college applicant. *The Journal of Higher Education*, pages 427–446.
- McDonough, P. M., Yamasaki, E., and Korn, J. S. (1997). Access, equity, and the privatization of college counseling. *The Review of Higher Education*, 20(3):297–317.
- Merton, R. (1968). The Matthew effect in science. *Science*.
- Pascarella, E. T., Terenzini, P. T., and Feldman, K. A. (2005). *How college affects students*, volume 2. Jossey-Bass San Francisco, CA.
- Pope, D. and Pope, J. (2009). The Impact of College Sports Success on the Quantity and Quality of Student Applications. *Southern Economic Journal*, (215).
- Pope, D. G. (2009). Reacting to rankings: evidence from "America's Best Hospitals". *Journal of health economics*, 28(6):1154–65.
- Rolfe, H. (2003). University strategy in an age of uncertainty: the effect of higher education funding on old and new universities. *Higher Education Quarterly*, 57(1):24–47.
- Roth, A. (2002). The economist as engineer: Game theory, experimentation, and computation as tools for design economics. *Econometrica*, 70(4):1341–1378.
- Sauder, M. and Espeland, W. (2006). Strength in numbers? The advantages of multiple rankings. *Indiana Law Journal*, 81(1).
- Sauder, M. and Espeland, W. N. (2009). The Discipline of Rankings: Tight Coupling and Organizational Change. *American Sociological Review*, 74(1):63–82.
- Sauder, M. and Lancaster, R. (2006). Do rankings matter? The effects of US News & World Report rankings on the admissions process of law schools. *Law & society review*, 40(1):105–134.
- Sauder, M., Lynn, F., and Podolny, J. M. (2012). Status: Insights from Organizational Sociology. *Annual Review of Sociology*, 38(1):267–283.



- Schelling, T. C. (1973). Hockey helmets, concealed weapons, and daylight saving: A study of binary choices with externalities. *Journal of Conflict Resolution*, pages 381–428.
- Schulz, S. A. and Lucido, J. A. (2011). Enrollment management, inc.: External influences on our practice. *Center for Enrollment Research, Policy, and Practice*.
- Sklaro, M. H. (2012). Educational consulting: Justification to partnership. *Journal of College Admission*, (214):69.
- Smith, J. M. (2014). *The Role of Independent Educational Consultants in the College Application Process*. PhD thesis, Brandeis University.
- Stevens, M. L. (2009). *Creating a class: College admissions and the education of elites*. Harvard University Press.
- Winston, G. C. (2000). The positional arms race in higher education. Technical report, WPEHE discussion paper series/Williams College, Williams Project on the Economics of Higher Education.
- Ye, Q., Law, R., and Gu, B. (2009). The impact of online user reviews on hotel room sales. *International Journal of Hospitality Management*, 28(1):180–182.

Figure 1: Forest Plot of Effect Sizes by Study and Context

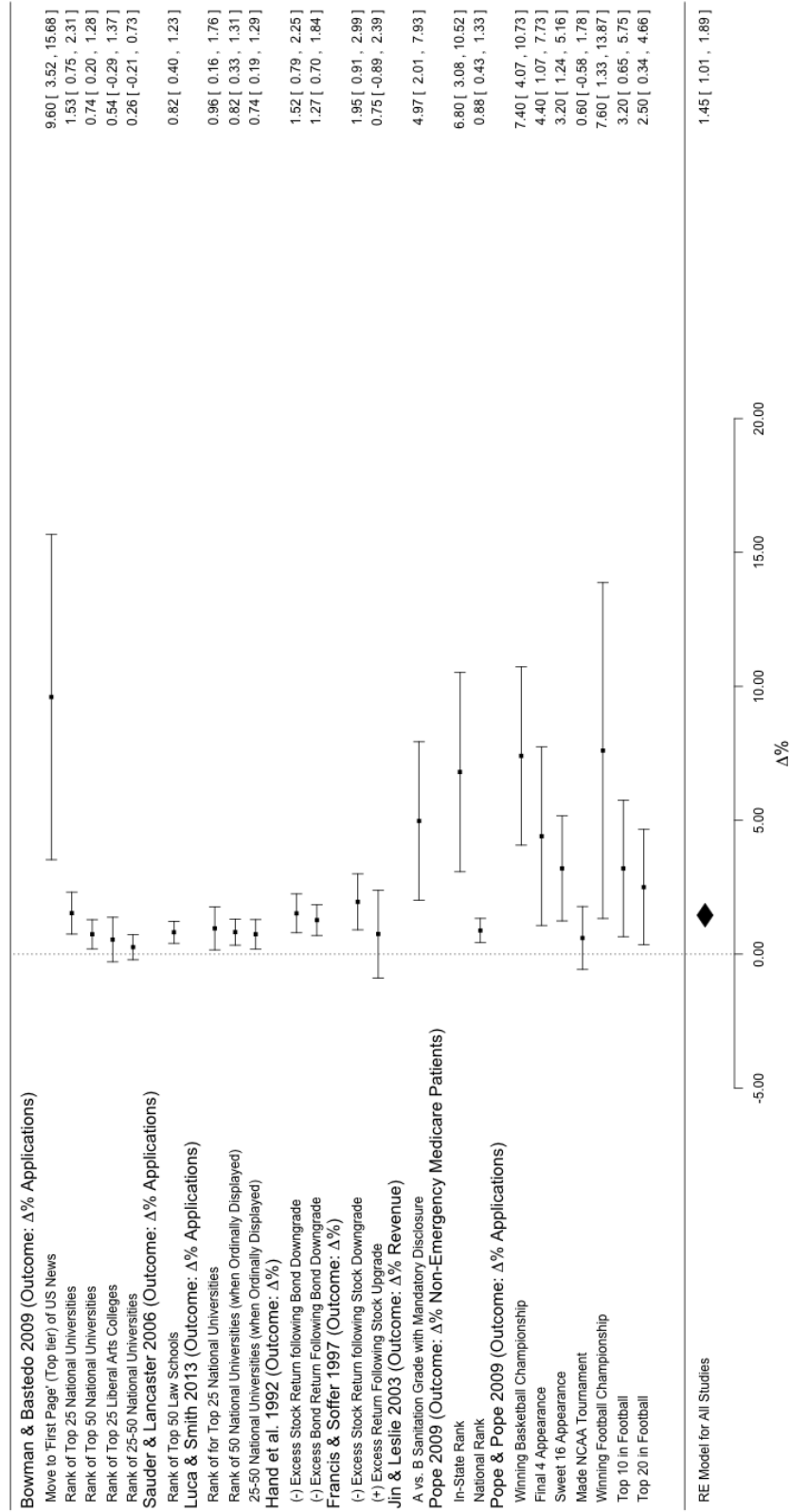


Figure 2: Cumulative Change in *USNWR* Rank from 1996-2010 for Top 50 National Universities in 1996

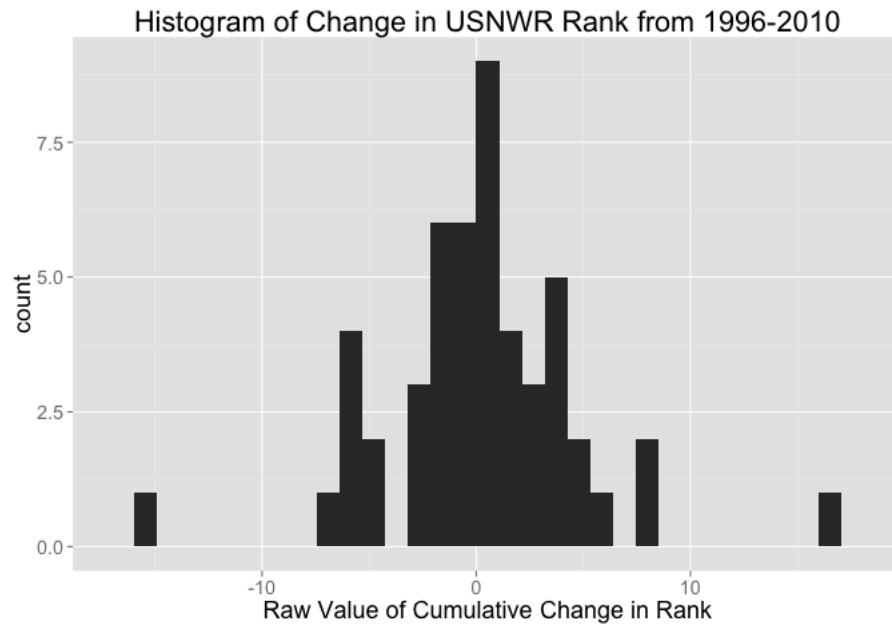


Figure 3: Facebook Advertisement for Test Preparation Emphasizes Decreasing Acceptance Rates at Elite Universities



Figure 4: Average Acceptance Rate by Number of Applications per Student

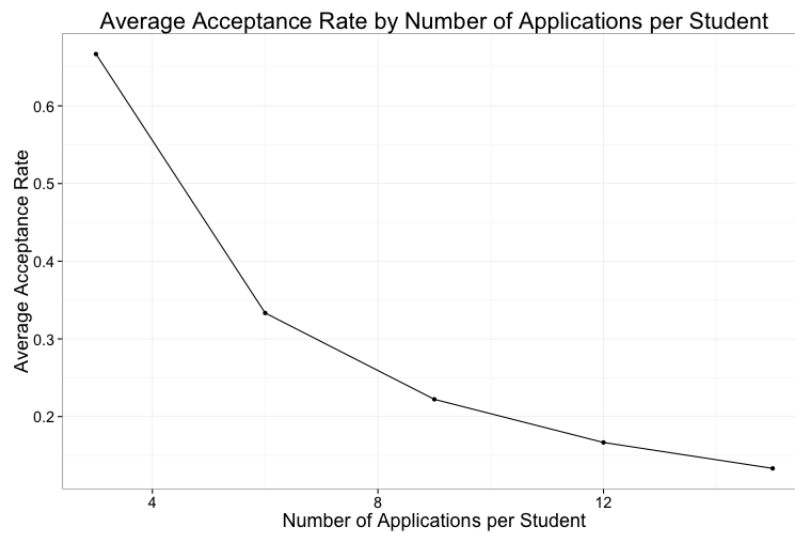


Figure 5: Average Yield Rate by Number of Applications per Student

