Understanding College Choice Decisions: How Sports Success Garners Attention and Provides Information*

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Abstract

Deciding where to apply to college among the thousands of four-year schools in the U.S. is a daunting task for most teenagers. High school students are typically not aware of all of the benefits that each school might offer. In fact, observation suggests that many students may be more familiar with a school's recent sports record than its academic quality. We develop a simple model of school choice that incorporates the limited awareness that high school students may have regarding the utility of attending different colleges. Our model predicts that college sports success may increase a school's future applications both by making students more aware of that college and by increasing the utility associated with attending that school. Using an administrative dataset that records where high school students sent their SAT scores, we analyze the effect of sports success on sent test scores for all 332 schools that participate in NCAA Division I basketball or football. It is shown that sent test scores act as a reasonable proxy for sent applications. Our results indicate that sports success in a given year can increase the total number of students that send their test scores the following year by up to 10%. We also show that certain demographic groups (males, blacks, and students that played sports in high school) are significantly more influenced by sports success and that schools can expect changes in sent test scores by up to 15-20% after a good sports year for these groups. Using a regression discontinuity design, we conclude that the increase in sent test scores stems from both the increased exposure/awareness that schools receive because of sports and the increased utility that students associate with attending a school with a strong sports program.

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Choosing where to apply to college is an important and complex decision. The decision requires narrowing the set of possible options, each with a multitude of attributes to consider, to a manageable set of schools from which application decisions and college choice can be made. Other decisions that people make in life involve similar complexities. These include car buying, choosing a profession, deciding where to go on vacation, and household location decisions. Information and cognitive limitations likely make it difficult to be aware of and fully consider *all* possible options when making these types of complex choices (see for examples Simon (1955), Conlisk (1996), and Payne et al. (1993)). The purpose of this study is to better understand how individuals make complex choices by analyzing how college sports success affects college application decisions.

There is little doubt that the media exposure generated by high profile sports such as football and basketball can act as a powerful advertising tool for institutions of higher education.[1] In fact, one might expect that future college applicants are much more likely to know about a particular college or university because of the school's appearance in the "sweet sixteen" rather than the recent hiring of a world-renowned economist. In this study we attempt to further understand the informational content associated with exposure generated by athletic success. More specifically, we wish to understand if this exposure merely focuses attention on the existence of a school, or if it provides meaningful information on the future utility that might be derived from attending the school.

[1] The University of North Carolina apparently recognized the potential to leverage the media exposure generated by their 2005 NCAA basketball championship by placing an advertisement in the Washington Post the following day indicating that they create champions on the court and in the classroom.

There has been some work on how college sports success affects application decisions. Until recently, however, evidence that sports success increases student applications was based more on anecdote than empirical research.[2] In one of the first papers on the topic, McCormick and Tinsley (1987) hypothesized that schools with athletic success may receive more applications, thereby allowing the school to be more selective in the quality of students they admit. They used data on average SAT scores and in-conference football winning percentages for 44 schools for the years 1981-1984, and found some evidence that football success can increase average incoming student quality. Several follow up studies have been conducted and have produced either small or no effects of sports on the number of applications and the quality of incoming students (Bremmer and Kesselring (1993), Tucker and Amato (1993), Murphy and Trandel (1994), and Mixon (1995)). The mixed results in these studies may be due in part to data limitations.[3]

In this study we develop a model of college choice that explicitly assumes that students have limited awareness and do not consider all possible options. Our model yields two possible mechanisms in which college sports success can affect the number of applications that a school receives. First, students may assign a higher utility to attending a school that has recently performed well in sports. Second, schools that have had recent sports success may be more likely to be in a student's consideration set due to the exposure the sports success generated.

[2] A leading example of the anecdotal evidence has been dubbed "the Flutie effect", named after the Boston College quarterback Doug Flutie whose exciting football play and subsequent winning of the Heisman Trophy in 1984 allegedly increased applications at Boston College by 30% the following year.
[3] Many of the studies that have looked at the effect of sports success on applications and student quality have only performed a cross sectional analysis or have performed a panel analysis with a small subset of NCAA Division I schools. Also, school reported application data are often unreliable.

Empirical tests of the predictions of our model are performed using an administrative dataset that records where students sent their SAT scores. The data include the number and type of students who sent their SAT scores to each of the 332 schools that participated in NCAA Division I basketball or Division I-A football between 1994 and 2001. We find significant increases in the number of students who sent their SAT scores to schools that performed well in recent men's basketball or football events. We also find that these effects are strongest among males, blacks, and students who played sports in high school. There is no evidence of an increase in the number of SAT-senders whose women's basketball team performed well. We also estimate the effect of sports success on school reported application data to verify that increases in SAT score-sending is a good proxy for increases in actual applications received.

To better understand the informational content of sports success, we exploit the single elimination NCAA men's basketball tournament to compare the application rates of teams that barely win and thus move on to the next round of play to teams that barely lose. The results suggest that teams that barely won performed no better the following year compared to teams that barely lost. However, the colleges that barely won experienced a greater increase in the number of SAT scores that were sent to them the following year relative to the colleges that barely lost. We also compare the change in the number of SAT scores sent by students located in the same state of a school that has sports success to students from other states. We find that while the effect is smaller, in-state students are still affected by sports success.

These results are consistent with the predictions of our model. They suggest that college sports success is a source of information about the utility enhancing benefits of attending a college with high profile sports success. Furthermore the results suggest that college sports success, in addition to providing information, directs student attention to colleges that may not have been included in their original consideration set. These results may have important policy implications for higher education and for complex decision modeling.

The paper proceeds as follows. Section I develops a model of college choice. Section II describes the data used in our analysis. Section III outlines our empirical strategy. Section IV presents the results. Section V discusses implications and concludes.

I. Model

This section outlines a simple model of how students decide where to apply and attend college. Previous models have typically assumed that an individual makes college application decisions by comparing the benefits and costs of all possible alternatives. Application decisions (and eventually an enrollment decision) occur by selecting the alternatives that maximize utility subject to a budget constraint. Our model departs from more canonical college-choice models (see for examples Willis and Rosen (1979), Fuller et al. (1982) Card and Krueger (2004)) by explicitly assuming that students do not consider all possible colleges as potential options.

The literature on college choice has typically modeled the choice process in three general stages: (1) *Predisposition*: deciding whether to continue formal education beyond secondary education; (2) *Search*: understanding and searching for college attributes that will affect their choice; and (3) *Choice*: constructing a set of schools to apply to and then choosing a school to attend.[4] Previous models were essentially reduced-form approximations of the predisposition and choice stages. In fact, a substantial amount of work has been done by researchers in the field of higher education on these two stages.[5] Much less has been done on understanding the search stage of the college choice process. By acknowledging that search costs and limited awareness make it unlikely that high school students consider all possible colleges when making their decisions about where to apply, our model essentially includes elements of the search stage as well.

Let U_{ij} represent the utility that student j assigns to attending school i. The level of U_{ij} may depend on factors such as the quality of the school, cost of tuition, location, perceptions of the student body, quality of the school's sports programs, and the importance that student j places on these factors. The student also assigns a probability p_{ij} to be the likelihood of being admitted to school i. Let U_{0j} be the utility of not attending college for student j. We also assume that there is a cost d_j of applying to each school (this includes the cost of writing essays, filling out the application, application fee, etc.).

We assume that a student must have a certain amount of exposure to a school i before assigning a U_{ij} and a p_{ij}. Let $\theta_{ij} \in [0,1)$ be a parameter that represents the amount of attention/exposure (good or bad) that school i has generated in the life of student j. A θ_{ij} very close to 1 signifies that j is intimately familiar with school i. $\theta_{ij} = 0$ means that the student has never heard of school i before. Exposure can come in the form of reading

[4] See Hossler and Gallagher (1987) for a more detailed description of these three stages in the college choice process.

about the school, knowing someone who attended the school, the school being nearby the student's home, sports events, etc. Let $\overline{\theta}_j$ represent an attention threshold that a school must attain for student j to actually consider attending that school. Thus, a student makes an evaluation of U_{ij} and p_{ij} for all schools for which $\theta_{ij} \geq \overline{\theta}_j$. We can now describe student j's consideration set C_j of potential schools from which to apply as:

$$C_j = \{i \mid \theta_{ij} \geq \overline{\theta_j} \ \& U_{ij} \geq U_{0j} \ \& \ p_{ij} > 0\}.$$

For any subset $\hat{C}_j \subset C_j$ that student j applies to, the probability π_{kj} that school k ends up being j's best option is:

$$\pi_{kj} = p_{kj} \times \prod_{\{i \mid U_{ij} > U_{kj}\}} (1 - p_{ij})$$

Thus, for any subset $\hat{C}_j \subset C_j$, student j's expected utility from applying to that subset is:

$$E(U) = \sum_{i \in \hat{C}_j} (\pi_{ij} U_{ij}(d_j)) + \prod_{i \in \hat{C}_j} (1 - p_{ij}) U_{0j}$$

The student will apply to the subset of schools in C_j that maximizes this expression and then attend the school with the highest U_{ij} to which they are admitted.[6] Two conclusions can be drawn from this simple model:

Conclusion 1: Holding p_{ij} constant, the probability that student j applies to and attends school i is increasing in U_{ij}.

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[5] See Hossler et al. (1989) for a dated but nonetheless useful review of the literature.

[6] Note that $\dfrac{\partial U_{ij}}{\partial d_j} \leq 0$ for all $i \neq 0$, or in words, as the cost of applying to a school increases it decreases the utility of applying to that school. However, application cost does not directly affect the option of not going to college.

Conclusion 2: Assuming that no new utility enhancing information is being transmitted (U_{ij} does not change), the probability that j applies to and attends school i is non-decreasing in θ_{ij}.

B. Predictions of the Model

Each of these two conclusions can explain why college sports success can increase the number of applications that a school receives. We assume that increasing college sports success weakly increases the utility that a high school student assigns to attending that school.[7] Thus, sports success can increase student applications via the mechanism of Conclusion 1 (utility driven). Furthermore, sports success weakly increases the exposure that a student has to a given college which can increase student applications via the mechanism of Conclusion 2 (attention driven).

Our model provides several testable predictions regarding sports success:

- The better the sports team performs the more applications the college will receive (making it to the final 4 is better than only making it to the final 64).
- Demographic groups that on average care the most about sports (e.g. males, people that played sports in high school, etc.) will be affected the most.
- Lower profile sports will have a smaller effect on application rates than higher profile sports (e.g. women's basketball success should have less of an impact than men's basketball success).

[7] It is possible that some people would prefer to attend a school that does poorly in sports, but we think the number of people in this category is small.

All of these predictions can be utility or attention driven. For example, after school i has a good sports season, both U_{ij} and θ_{ij} may be more likely to increase if j is a male than if j is a female. We would like to know if the mechanism through which sports success increases college applications is utility, attention, or a combination of the two. While difficult, it may be possible to parse out these effects under certain conditions. The difficulty in doing this is that usually when an event happens that draws attention (affects θ_{ij}), the event also gives utility enhancing information (changes U_{ij}). We would like a situation where in a given sports year, two teams signal equal sports competence but one team receives more exposure than the other (only conclusion 2 has an impact). We suggest that the single elimination NCAA basketball tournament provides just such a situation. We use a regression discontinuity approach to look at teams that barely won and moved on in the NCAA basketball tournament to teams who barely lost and thus did not receive the attention generated by future games. Assuming that the winners and losers of close games are comparable *ex ante,* a higher increase in applications for those teams that barely moved on in the tournament would appear to be attention driven.[8]

We can also implement a test in which only conclusion 1 can impact the change in applications. Let's assume that high school students have had substantial exposure to major colleges located in their own state. In particular assume that any college i that is big enough to potentially have NCAA Division I sports success (as we will later define) has already garnered enough attention from in-state students such that $\theta_{ij} \geq \bar{\theta}_j$ for all j from the state in which i is located. Given this assumption, when a college sport's team

[8] Even if this ex ante assumption holds, the results from a regression discontinuity design may still be utility driven if a student's subjective probabilities that a school will have athletic success in the future is

does well, only out-of-state applications should increase if conclusion 2 is the only driving factor (attention driven). If there is an effect of college sports success on in-state applications, we assume that it is utility driven rather than attention driven.

II. Data

The dataset that we use is derived from the College Board's Test Takers Database (referred to as SAT database in the remainder of the paper).[9] It includes individual level data for a 25% random sample of all SAT test-takers nationwide with high school graduation cohorts between 1994 and 2001. It also includes a 100% sample of SAT test-takers that are Californians, Texans, African American, or Hispanic.[10] Since students can take the SAT several times, the College Board divided the data into cohorts according to the year in which the students are expected to graduate. For example, the 1994 cohort group contains students that took the SAT who are expected to graduate in the spring of 1994 and apply to begin college the following fall.[11] The SAT database provides demographic and other background information in the Student Descriptive Questionnaire component of the SAT. The dataset identifies the first 20 schools to which a student has requested his scores be sent.[12] The median number of schools to which a student requested his scores be sent was 5 across all years in our sample. We restrict the dataset

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linked to winning a close game in the tournament. In this case a Bayesian learning model like that employed by Viscusi and O'Connor (1984) could also explain the results.

[9] We thank David Card, Alan Krueger, the Andrew Mellon Foundation, & the College Board for help in gaining access to this dataset.

[10] The reason for the over-sampling of two states and races is because the dataset was originally acquired to analyze the impact of changes in the affirmative action program in Texas and California.

[11] The data reports the SAT score and background characteristics of the most recent test and survey taken. For most students, this is at the beginning of their senior year in high school.

[12] Less than 1% of students sent their scores to more than 14 schools.

to students who sent their scores to at least one of the 332 schools that played NCAA Division I basketball or Division I-A football. We also weight the observations so that the data are representative of all SAT-taking, potential college applicants to each of these 332 schools.[13]

Table 1 presents summary statistics for our SAT dataset. It can be seen that schools that participate in Division I sports receive on average 7,801 SAT scores each year. Schools that have done well in sports (those in the top ten in football or top eight in basketball during the time frame of our dataset) are typically larger schools and receive more applications – 13,779 on average. These numbers will be useful when interpreting the size of the results we find later in the paper.

The advantage to using the SAT-takers administrative dataset is twofold. First, the data are likely to be more accurate than self-reported college application data that can be found elsewhere. Second, the SAT-takers data set includes rich demographic detail for each applicant which is unavailable for most schools when using actual application data.

For our analysis we would like to treat the process of sending an SAT score as comparable to applying to a school. Of course we recognize that a student sending her SAT score to a school is not the same as applying to that school. The central question to consider is whether it is a good proxy. More specifically, in our analysis can we interpret changes in total SAT scores sent to an institution as a proxy for changes in total applications sent to that same institution? The measurement error caused by differences between the proxy of applications and actual applications can potentially cause

[13] The weight is 1 for observations from students who are included in the sample with probability 1 and four for those who are included in the sample with probability .25.

attenuation bias in our estimates. Card and Krueger (2004) (using this same SAT test-takers dataset) tested the validity of using sent SAT scores as a proxy for applications. They compared the number of SAT scores that students of different ethnicities sent with admissions records from California and Texas, to administrative data on the number of applications received by ethnicity. They conclude that "trends in the number of applicants to a particular campus are closely mirrored by trends in the number of students who send their SAT scores to that campus, and that use of the probability of sending SAT scores to a particular institution as a measure of the probability of applying to that institution would lead to relatively little attenuation bias."

To further verify the relationship between the number of SAT scores and the number of applications sent to an institution, we use college-level application data that is available in a licensed dataset received from the Thompson Corporation. The Thompson Corporation is the company that publishes the well known "Peterson's Guide to Four Year Colleges". When non-missing, these data contain the number of applications received annually between 1983 and 2002 for the 332 NCAA Division I basketball or Division I-A football schools. We show that the results of regressing actual applications on indicators of sports success are very similar to the results obtained by using SAT scores sent as a proxy for applications.[14] These results provide further evidence that changes in SAT score-sending rates can be used as a proxy for changes in application rates. Furthermore, these results suggest that our analysis is indicative of the effect of

[14] Note that the timing of when students send their applications is somewhat different than the timing of sending SAT scores. Therefore the lagged sports success indicators are suggestive, but not perfectly comparable. Furthermore, the results suggest that changes in SAT scores are likely slightly higher than changes in actual applications.

sports success on not only SAT-accepting schools between 1994 and 2001, but on all sports schools (including ACT-accepting schools) since 1980.

We gathered sports data on NCAA basketball and football success for all 332 schools that participate in NCAA Division I basketball or Division I-A Football. We use the Associated Press's college football poll as our indicator of football success. This poll ranks NCAA division I-A football teams based upon game performances throughout the year. We collected the end of season rankings for all teams finishing in the top twenty between the years of 1991 and 2001.[15]

Although this indicator does not incorporate all measures of success (for example, big wins against key rivals, exciting individual player on a team, etc.) it probably proxies these indicators for the top 20 teams each year. For basketball success, we gather data on team performance in the NCAA men's college basketball tournament. It is widely agreed that this tournament provides the greatest media exposure and indicator of success for a college basketball team (particularly on a national level) each year. "March Madness" as it is often called takes place at the end of the college basketball season in March and the beginning of April. It is a single elimination tournament that determines who wins the college basketball championship. Since 1985, 64 teams have been invited to play each year.[16] We collected information on all college basketball teams that were invited to the tournament between 1991 and 2001.[17] From this data we created dummy variables that

[15] This data can be obtained at www.infoplease.com.
[16] Currently, 65 are actually invited, but 2 teams are required to win an additional game before entering the round of 64.
[17] We also collected the basketball data from www.infoplease.com

indicate the furthest round in which a team played. In our analysis we use the rounds of 64, 16, 4, and champion.[18]

III Empirical Strategy

A. Specification

Many school characteristics cannot be observed by the econometrician, yet these unobservables are likely correlated with both indicators of sports success and the number of applications received by a school. The unobservable component is likely to include information about scholastic tradition, geographic advantages and other information on the quality of the school. Without adequately controlling for these unobservables, they would likely confound the ability to detect the impact of athletic success on the quantity and quality of incoming students.

The nature of the data we have compiled allows us to plausibly control for the unobservables associated with each school. The econometric specification that we employ takes advantage of the panel design of the data. We use a fixed effects model where the fixed effects control for year specific and school specific unobserved heterogeneity. We also include a linear trend for each school to try to capture heterogeneous trend rates. We include several additional variables on the right hand side of the equation to further control for quality characteristics of the schools. The econometric specification we use is the following,

$$(1) \quad Y^{j}_{i,t} = \alpha_{i,t} + t\lambda_i + S_{i,t}\beta + S_{i,t-1}\delta + S_{i,t-2}\gamma + S_{i,t-3}\theta + X_{i,t}\phi + \varepsilon_{i,t}$$

[18] These rounds are typically considered "special" rounds and advancing to these rounds results in special recognition to a team.

where $Y^j{}_{i,t}$ represents the log number of applications received by school i in year t *from the j^th^ population group*. The key covariate $S_{i,t}$ is a vector of dummy variables indicating the level of sports success that school *i* had during year *t*. We include up to three lags for each sports variable in our model in order to examine persistence in the effects of a winning season on applications. $X_{i,t}$ is a set of four control variables commonly used in the literature to control for the quality of the school – log total cost to attend school, log average professor salary (lagged one year), log average real income in the state in which the school is located, and the number of public high school diplomas awarded in the state in which the school is located during year *t.*[19]

B. Lag Structure

Understanding when prospective students apply to college in relation to the football and basketball seasons is crucial in determining which lags of our athletic success variables should affect the left-hand side of equation (1). Fall admission application deadlines vary by school. They can occur any time between November and August before the expected fall enrollment period. Furthermore, students often have to send letters of recommendation and SAT scores to the school well before the actual deadlines. Figure 1 illustrates the distribution of application deadlines for our sample of schools in 2003.[20] The label "continuous" in Figure 1 refers to those schools that have a rolling application period rather than a specific deadline. The NCAA Division I-A football season finishes at the beginning of January. The NCAA basketball tournament

[19] The data for these control variables was gathered from the Integrated Post Secondary Education Survey conducted by the National Center of Education and from the Bureau of Labor Statistics' website.

finishes at the end of March or beginning of April. Therefore, since Figure 1 illustrates that about half of the schools in our sample have application deadlines after April, we might expect some effect on the current year variables. This means that a successful football team that finishes in January or a successful basketball team that finishes in March may still affect application decisions for students enrolling that upcoming fall. However, given the timing of when applications are likely prepared and submitted, one would expect athletic success to have its largest impact when lagged one period (especially for basketball which is three months after football). The second and third lags should provide an indication of the persistence of the effect that athletic success has on application rates.

C. Regression-Discontinuity Design

We implement a regression-discontinuity design to analyze the effect of two teams that in a given season show equal sports competence, but receive different levels of attention. It is plausible that teams that just win a NCAA basketball tournament game have similar capabilities to those that just lose. Thistlethwaite and Campbell (1960) first proposed using an observed discontinuity to estimate causal effects. Nonetheless, the presence of an observed discontinuity does not guarantee a causal effect. The identifying assumption in our case is that all observable and unobservable pre-event characteristics between the winning and losing teams are not systematically different. For example, it is possible that better teams can "step it up a notch" at the end of games and that even very close games are usually won by the better team. If this is the case, it is not possible to

[20] The data used to create Figure 1 came from a licensed data set from Peterson's (a part of the Thompson Corporation).

achieve causal effects using this discontinuity. Ultimately, it is necessary to look at the observable data to generate a convincing argument that the winners and losers are equivalent *ex ante*.

To make this *ex ante* comparability argument, we use a logit model to look at the probability of a team making it to a specific round in next year's tournament given the team's level of success in this year's tournament. We examine whether or not teams that won or lost the game by 2 points or less (one basket) have different levels of success the following season. We then run our baseline regression and compare the increase in number of SAT-senders for teams that barely won and teams that barely lost.

III. Results

The coefficient values and robust standard error bars of the impact of sports success on the log number of SAT scores sent are presented in Figures 2 and 3 (the regression estimates can be seen in table format in Appendix A). The open circles indicate the coefficient estimates of the effect of current year sports success on the log number of SAT scores sent while the closed circles, diamonds, and squares indicate the effects of sports success lagged by one, two, and three years, respectively. The top panel in Figure 2 indicates the coefficient values for making it into the NCAA basketball tournament (round of 64). The other panels in Figure 2 and Figure 3 present the coefficient values for achieving the different levels of sports success that we have discussed. Column 1 presents the effect of sports success on the log number of total SAT senders. Subsequent columns present the effect of sports success on the log number of SAT senders in different subgroups.

Looking down column 1 of Figures 2 and 3 we find that being one of the 64 teams in the NCAA tournament yields approximately a 2% increase in the total number of SAT score senders the following year (the closed circle), making it to the "sweet sixteen" yields a 5% increase, making it to the "final four" a 6% increase, and being the champion a 11% increase. For football, the results suggest that ending the season ranked in the top 20 results in a 2% increase in score senders the following year, ending in the top 10 yields a 6% increase, and ending as the football champion yields a 12% increase in score senders the following year. As was expected, there appears to be some effect on the current football sports variables (the football season ends three months before the basketball season) but little effect on the current basketball sports variables. The effects are large and significant on the first and second lags, while by the third lag the effects are usually diminished to a small magnitude and are insignificant. Almost all coefficients on the first and second lag variables are significant at the one percent level. These results are in line with our model's prediction that the better the sports team performs the more applications a college will receive.

Looking across the columns in Figures 2 and 3, we find very distinct responses to athletic success from different groups as our model predicted. Blacks are roughly twice as responsive to basketball success as any other race. For example, making it into the final four yields a 14% increase in black SAT scores sent (s.e. = 2.6) compared to a 7% increase (s.e. = 1.2) for the overall population. The basketball champion in a given year receives on average 20% more black SAT scores sent for each of the next two years.

Hispanics and blacks are the two races most likely to be affected by football success. Asians are the least likely to be affected by either sport. The results indicate that males respond more to sports success than females. Similarly, the coefficients on the students who played basketball or football in high school are generally at least twice those of students who did not play sports. Both out-of-state and in-state students are affected by sports success. If we assume that major colleges within the state of a given applicant are always in the student's consideration set, this positive effect of sports success on in-state student applications suggests that at least part of the explanation of why sports success affects student application rates is due to the "utility enhancing" effect of sports success.

Appendix B reports in table format the effect of sports success on the log number of actual applications received by schools between 1983 and 2002. While in most instances the coefficients are slightly smaller than the coefficients obtained using SAT scores sent, the results are statistically significant and closely mimic the results expressed in Figures 2 and 3.[21]

Because women's basketball does not appear to be as popular as men's basketball, our model predicts that women's basketball success will not have the same impact on applications as men's basketball success. To test this prediction, we gathered final four and champion data for women's basketball. In Table 2, we present the results of our equation (1) specification using women's basketball sports variables. Column (1) uses the log number of SAT scores sent as the dependent variable. Column (2) uses the log number of SAT scores sent by females as the dependent variable. The results indicate

[21] It is possible that some individuals choose to send their SAT score to a school because of a recent sports victory, but then end up not sending an actual application. The slightly smaller coefficients in Appendix B indicate that while some of this is probably happening, the majority of the extra students that are sending their SAT scores to the winning schools are also actually applying.

that women's basketball does not have any impact on the total number of SAT scores sent or on the number of SAT score sent from women that a school receives.

Table 3 provides the first set of results for our regression discontinuity method. In order for the regression discontinuity design to be valid, teams that barely win and thus move on in the NCAA tournament need to be similar to teams that barely lose. To look at this, we run logistic regressions on the probability of winning next year given the success that you had this year. The first column in Table 3 indicates that teams that win their round of 64 game this year are significantly more likely to make it to and win the round of 64 game next year. Column 1 also shows that teams that win their round of 64 game this year are more likely to make it to, and win the rounds of 32 and 16 next year. However, column 2 indicates that when we limit the sample to teams that barely won or lost (by two points or less) their entry round game, teams that barely won are no more likely to win in different tournament rounds the following year than teams that barely lost. Similarly, columns 3-6 show that when looking at all schools, teams that win in certain rounds in the current year appear to perform better the following year than teams that lose. Again however, when we limit the sample to teams that barely win in certain rounds in the current year, we find that they do not perform any better the next year relative to teams that barely lose. These results lend credibility to the regression discontinuity design that we employ.

Table 4 presents the effect of barely winning and barely losing in rounds 64, 32, and 16 on next year's applications. We look at the first lag results of barely winning or losing because the previous regressions suggested that the largest effect of sports success comes on the first lag. We use the normal set of institutional control variables, fixed effects, and current, second, and third lag sports variables as controls. The results indicate that colleges that barely win and thus move on in the tournament receive an increase in SAT scores sent that is at least two or three times higher than that of schools that barely lose. This suggests that at least part of the explanation of why sports success affects student application rates is due to the attention generated by sports success.

IV. Implications and Conclusion

Our findings provide evidence for the predictions of our model. It appears that success in Division I college football and basketball has a significant impact on where high school students send their SAT scores. The better the sports team performs the more applications the college is likely to receive. Our results also suggest that sports success affects demographic groups differently. Males, blacks, and students that played sports in high school are more influenced by sports success than their peers. We find that success in women's basketball, which is a lower profile sport than men's football and basketball, has very little impact on where students send their SAT scores. Finally, we also provide evidence using a regression discontinuity design and information on in-state and out-of-state students that the increase in the number of SAT scores being sent to a college that recently did well in sports is due to both the attention that is generated and because of the increased utility of attending that college.

We think these findings are likely to be of interest to both higher education administrators and economists in general. These results imply that sports success affects not only the quality of the higher education experience for enrolled students participating in sporting events, but also the demographic composition of future student applicant pools. Thus athletics may change the demographic composition of a student body over time. Increased demographic diversity is often thought to increase the quality of the college experience. In the absence of programs such as affirmative action, there is the intriguing possibility that athletics could be used as an instrument by administrators to change student body demographic composition.

Of more general interest, the distinction we have made in this paper between “attention” and “utility” effects may be important in a variety of other complex decision making arenas like car buying, choosing a profession, deciding where to go on vacation, and household location decisions. Changes in application rates after a recent sports victory that is due to a change in perceived utility of attending a university can be considered a rational decision. If students expect to gain additional utility from attending a school with a successful sports program and sharing the identity that comes with a winning team, then they *should* be more willing to apply to schools that show excellence in sports. If this is the case, there are no obvious policy implications that could increase social welfare. However, if students are applying to schools that do well in sports because sports performance is the only channel in which they become familiar with what schools are available, then important policy implications do exist.

Our findings suggest that the current avenues that are being used to inform high school students about different universities, such as school counselors and college days, may not be as effective at engaging students as one would hope. As a result many students choose to send their scores to schools that "catch their eye" through the exposure generated by athletic success rather than applying to schools that "catch their eye" because of academic advances. An important question is whether or not this is the result of inexperienced economic agents between the ages of seventeen and eighteen or if this is found in a variety of other institutional settings. Hopefully further research can continue to understand complex decision making processes by delineating the difference between events that focus attention on existence and events that provide meaningful information about utility.

References

Bremmer, D. and R. Kesselring. 1993 “The Advertising Effect of University Athletic Success—A Reappraisal of the Evidence,” *Quarterly Review of Economics and Finance* 33(4), 409-421.

Card, D. and A. Krueger. 2004 "Would the Elimination of Affirmative Action Affect Highly Qualified Minority Applicants? Evidence from California and Texas," NBER Working Paper # 10366.

Conlisk, John. 1996 “Why bounded rationality?” *Journal of Economic Literature* 34, 669-700.

Fuller, W., C. Manski and D. Wise. 1982 “New Evidence on the Economic Determinants of Postsecondary Schooling Choices,” *Journal of Human Resources* 17, 477-498.

Hossler, D. and Gallagher, L. 1987 "Studying college choice: A three-phase model and the implication for policy makers," *College and University* 2: 207–221.

Hossler, D., J. Braxton and G. Coopersmith. 1989 "Understanding Student College Choice," in John C. Smart (Ed.) *Higher Education: Handbook of Theory and Research* 5 231-288.

McCormick, R., and M. Tinsley. 1987 “Athletics versus Academics? Evidence from SAT Scores,” *Journal of Political Economy* 95, 1103-1116.

Mixon, F. 1995 “Athletics versus Academics? Rejoining the Evidence from SAT Scores,” *Education Economics* 3, 277-283.

Murphy, R. and G. Trandel. 1994 “The Relation between a University’s Football Record and the Size of Its Applicant Pool,” *Economics of Education Review* 13, 265-270.

Payne, J., Bettman, J., and E. Johnson. 1993 “The Adaptive Decision Maker, 1993, Cambridge: Cambridge University Press.

Pope, D. and J. Pope. 2005 “The Athletic and Academic Objectives of Higher Education: Substitutes or Compliments?,” mimeo.

Roberts, J. and J. Lattin. 1997 “Consideration: Review of Research and Prospects for Future Insights” *Journal of Marketing Research* 34, 406-410.

Simon, H. 1955 “A behavioral model of rational choice,” *Quarterly Journal of Economics* 69, 665-690.

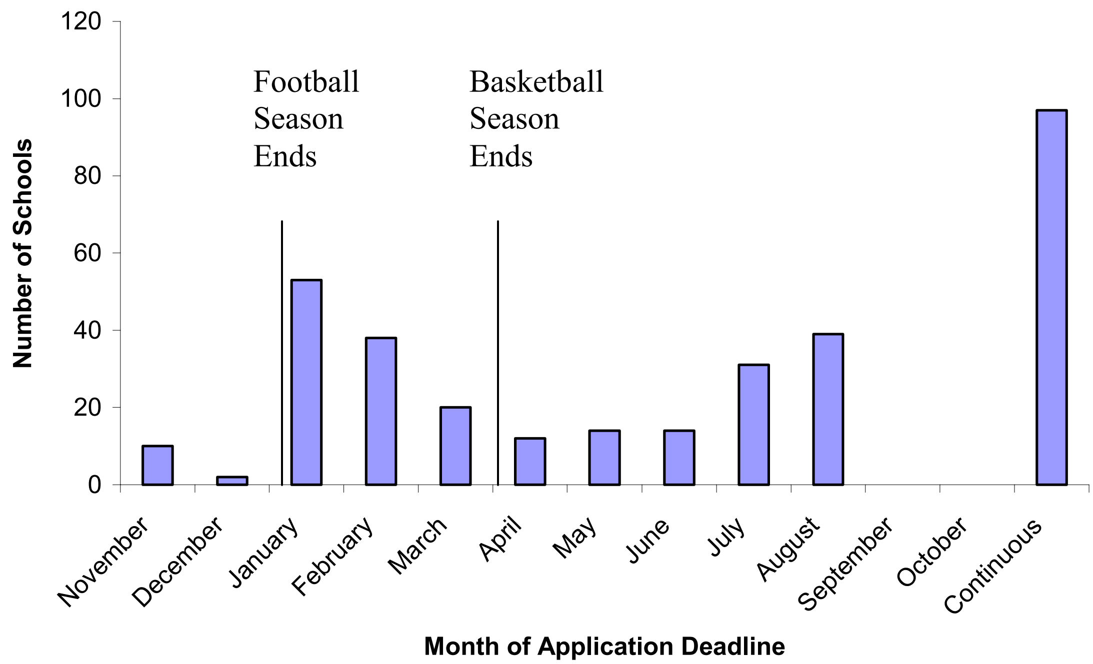
Thistlethwaite, D., and D. Campbell. 1960 "Regression discontinuity analysis: an alternative to the ex post facto experiment," *Journal of Educational Psychology*, 51, 309-317.

Tucker, I. and L. Amato. 1993 "Does Big-Time Success in Football or Basketball Affect SAT Scores?," *Economics of Education Review* 12, 177-181.

Viscusi, W. and C. O'Conner. 1984 "Adaptive Responses to Chemical Labeling: Are Workers Bayesian Decision Makers?," *American Economic Review* 74, 942-956.

Willis, R. and S Rosen. 1979 "Education and Self-Selection" *Journal of Political Economy* 87, 7-36.

Figure 1: Application Deadlines



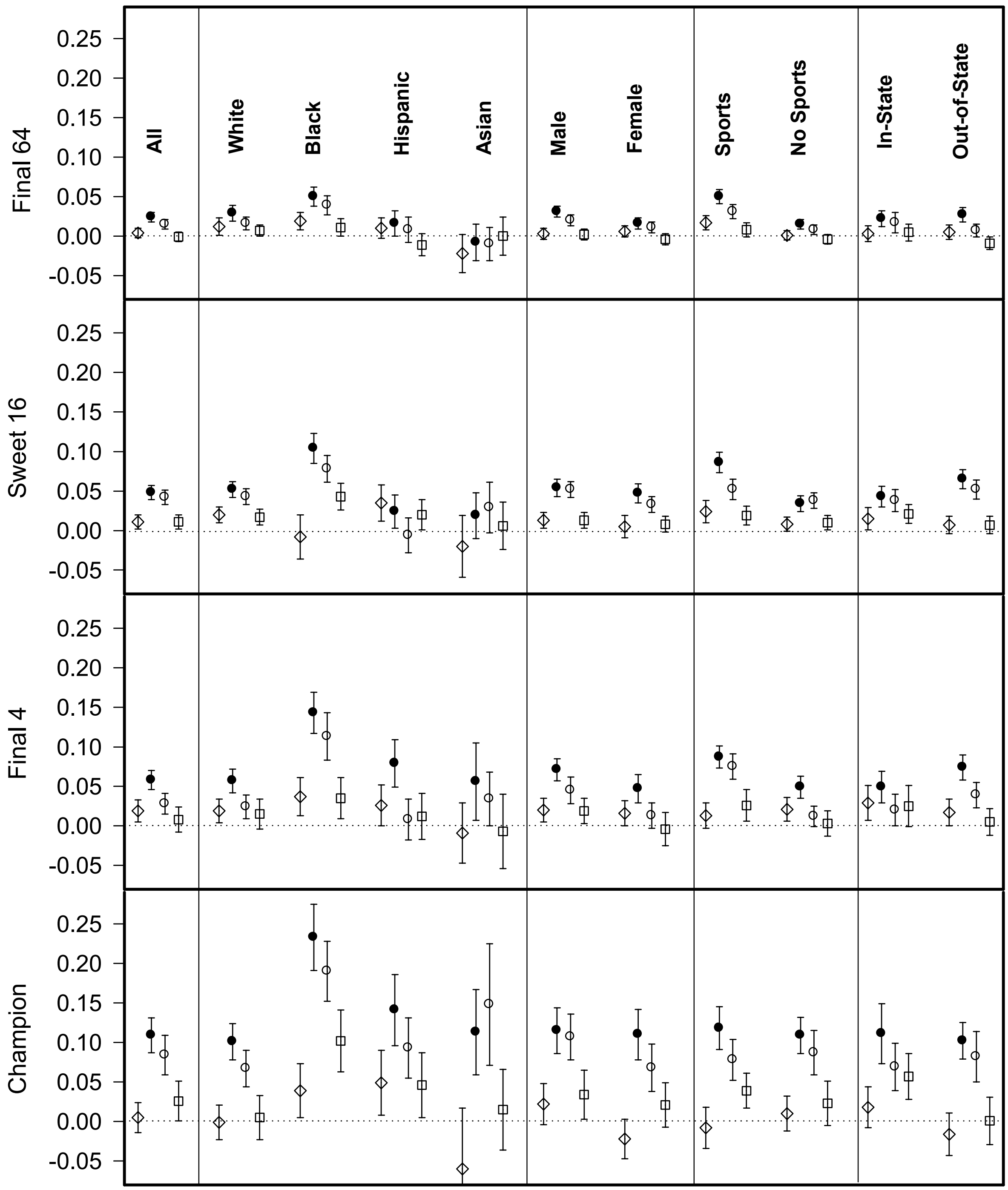


Figure 2. Regression coefficients (and SE bars) for basketball success compared across levels of success; across race, sex, high school sports participation, and in-versus out-of-state categories; and for different lags (open diamond denotes concurrent year; closed circle, one-year lag; open circle, two-year lag; open square, three-year lag).

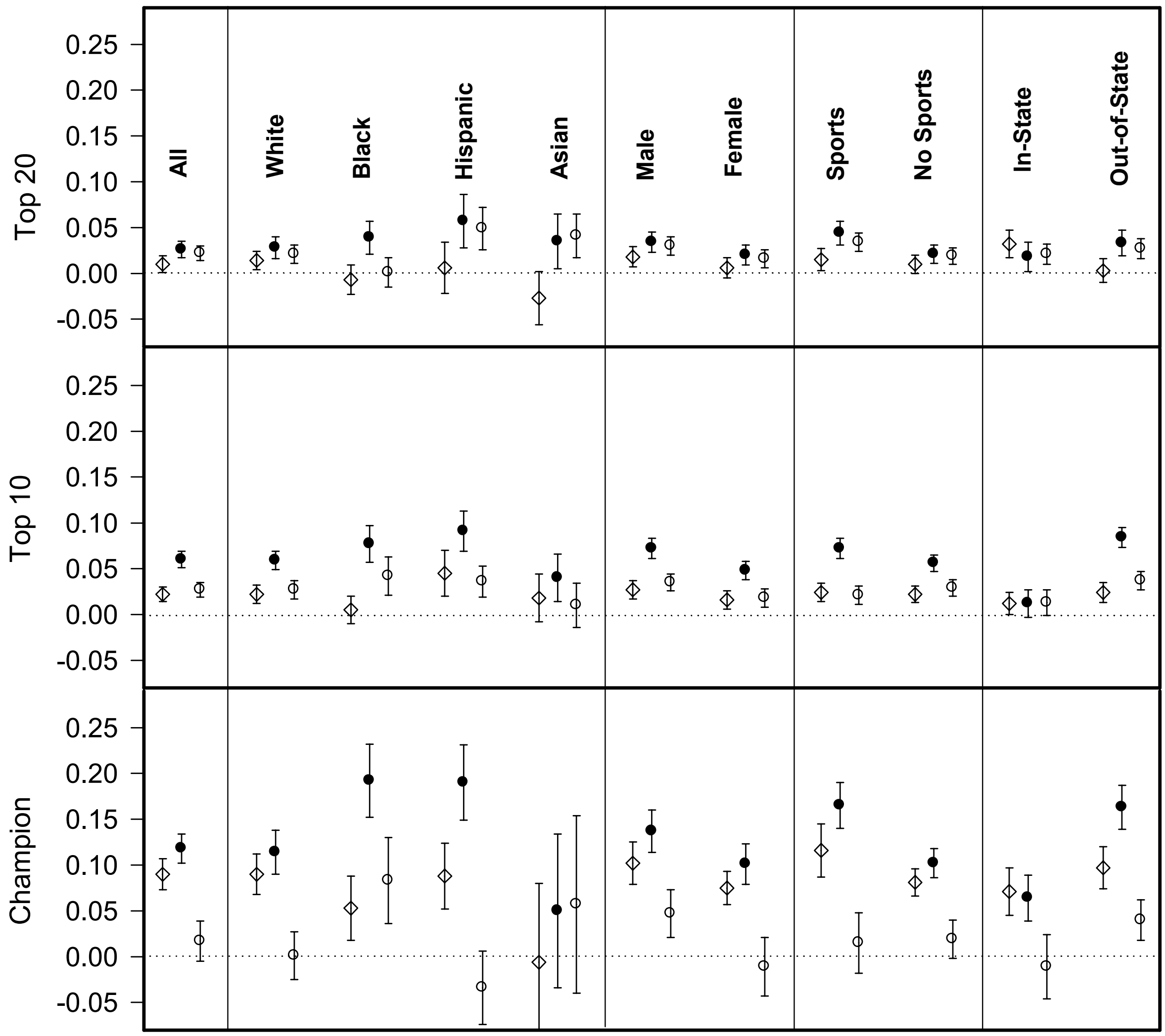


Figure 3. Regression coefficients (and SE bars) for football success compared across levels of success; across race, sex, high school sports participation, and in-versus out-of-state categories; and for different lags (open diamond denotes concurrent year; closed circle, one-year lag; open circle, two-year lag).

Table 1. Summary Statistics

Average total number of students submitting SAT scores each year	762,273
Average number of scores submitted per year to each of the 332 schools in Division IA sports	7,801
Average number of scores submitted per year to each school that had a top sports program	13,779
Percent of Score Senders	
White	63.9
Black	10.8
Hispanic	8.2
Asian	8.7
Male	45.9
Female	54.1
Played Sports in HS	21.1
Didn't Play Sports in HS	78.9

Notes: Data spans from the graduating cohort class of 1994 to the class of 2001. "Top sports programs" are considered to be those that placed in the top 10 in football or the top 8 in basketball at one point during our sample. "Played sports in High school" are students that indicated that they either played basketball or football in high school.

Table 2. Impact of Success in Women's Basketball on the number of SAT-Senders

	Log(# SATs)	Log(# Female SATs)
Basketball		
Final_4	0.004	-0.002
	[0.016]	[0.020]
Final_4_lg1	-0.004	-0.007
	[0.017]	[0.018]
Final_4_lg2	0.002	0
	[0.016]	[0.018]
Final_4_lg3	0.003	-0.004
	[0.017]	[0.019]
Champ	-0.023	-0.027
	[0.018]	[0.026]
Champ_lg1	0.007	0.007
	[0.024]	[0.030]
Champ_lg2	-0.012	-0.001
	[0.025]	[0.034]
Champ_lg3	-0.013	-0.003
	[0.022]	[0.028]
Controls & F.E.s	X	X
Observations	N = 2431	N = 2430
R^2	0.997	0.997

Notes: Robust standard errors are presented in brackets. Control variables that are included are school and year fixed effects, school*year (linear trends), number of high school diplomas given out that year in the school's state, log average professor salary, log average real income in the school's state, and log tuition cost.
* significant at 5%, ** significant at 1%

Table 3. Predicting future Basketball Success with Success in the Current Season

	Win 64 (t)		Win 32 (t)		Win 16 (t)	
	All Games	Margin<=2	All Games	Margin<=2	All Games	Margin<=2
Dep. Vars.						
Win 64 (t+1)	0.659	0.054	0.357	-0.642	0.168	0
	[.205]**	[.423]	[.282]	[.572]	[.360]	[.636]
Win 32 (t+1)	0.846	0.043	0.086	0	0.285	-0.442
	[.236]**	[.613]	[.293]	[.701]	[.506]	[.668]
Win 16 (t+1)	0.844	-0.936	0	0	-0.168	-0.636
	[.294]**	[.860]	[.340]	[.866]	[.629]	[.812]
N	N = 394	N = 106	N = 204	N = 54	N = 148	N = 40

Notes: Logistic regressions of winning certain rounds in year t+1 on winning certain rounds in year t. Standard errors are presented in brackets.
* significant at 5%, ** significant at 1%

Table 4. Regression Discontinuity Results

	Dep. Var. = Log Number of SAT Scores Sent		
Outcome in Previous Season	**(1)**	**(2)**	**(3)**
Win 64 by <=2 points	0.02		
	[.016]		
Lose 64 by <=2 points	0.005		
	[.011]		
Win 32 by <=2 points		0.041	
		[.014]**	
Lose 32 by <=2 points		0.011	
		[.021]	
Win 16 by <=2 points			0.029
			[.020]
Lose 16 by <=2 points			0.016
			[.020]
School & Year F.E.	X	X	X
Control Variables	X	X	X
Other Sport Controls	X	X	X
N	N = 2431	N = 2431	N = 2431
R2	0.997	0.997	0.997

Notes: Robust standard errors are presented in brackets. Control variables that are included are school and year fixed effects, school*year (linear trends), number of high school diplomas given out that year in the school's state, log average professor salary, log average real income in the school's state, and log tuition cost, all football variables and lags, all current year basketball variables with second and third lags (without first lags).
* significant at 5%, ** significant at 1%

Appendix A

Appendix A: Sports Success on SAT Scores Sent

Dependent Variable: Log Number of SAT Scores Sent by Subgroup											
	Everyone	White	Black	Hispanic	Asian	Males	Females	Sports	No Sports	In-State	Out-of-State
Basketball											
Final_64	0.004	0.012	0.019	0.01	-0.022	0.003	0.006	0.017	0.001	0.003	0.005
	[0.006]	[0.011]	[0.011]	[0.013]	[0.024]	[0.007]	[0.007]	[0.009]	[0.006]	[0.010]	[0.009]
Final_64_lg1	0.024	0.029	0.05	0.016	-0.008	0.031	0.016	0.05	0.015	0.022	0.027
	[0.006]**	[0.010]**	[0.012]**	[0.016]	[0.023]	[0.007]**	[0.007]*	[0.009]**	[0.006]*	[0.010]*	[0.009]**
Final_64_lg2	0.015	0.016	0.039	0.008	-0.01	0.02	0.011	0.031	0.008	0.017	0.007
	[0.006]*	[0.008]*	[0.012]**	[0.016]	[0.021]	[0.007]**	[0.007]	[0.009]**	[0.006]	[0.013]	[0.008]
Final_64_lg3	-0.001	0.007	0.011	-0.011	0	0.002	-0.004	0.008	-0.004	0.005	-0.009
	[0.006]	[0.007]	[0.011]	[0.014]	[0.024]	[0.007]	[0.007]	[0.009]	[0.006]	[0.011]	[0.008]
Final_16	0.011	0.02	-0.008	0.035	-0.02	0.013	0.005	0.024	0.008	0.015	0.007
	[0.009]	[0.010]*	[0.028]	[0.023]	[0.039]	[0.010]	[0.014]	[0.014]	[0.009]	[0.014]	[0.011]
Final_16_lg1	0.048	0.052	0.104	0.024	0.019	0.054	0.047	0.086	0.034	0.043	0.065
	[0.009]**	[0.010]**	[0.019]**	[0.021]	[0.029]	[0.011]**	[0.012]**	[0.013]**	[0.010]**	[0.013]**	[0.012]**
Final_16_lg2	0.042	0.043	0.078	-0.006	0.029	0.052	0.033	0.052	0.038	0.038	0.052
	[0.009]**	[0.010]**	[0.017]**	[0.022]	[0.032]	[0.010]**	[0.010]**	[0.013]**	[0.010]**	[0.014]**	[0.012]**
Final_16_lg3	0.011	0.017	0.043	0.02	0.006	0.013	0.008	0.019	0.01	0.021	0.007
	[0.009]	[0.010]	[0.017]*	[0.019]	[0.030]	[0.010]	[0.010]	[0.012]	[0.009]	[0.012]	[0.011]
Final_4	0.019	0.019	0.037	0.026	-0.009	0.02	0.016	0.013	0.021	0.029	0.017
	[0.014]	[0.015]	[0.024]	[0.026]	[0.038]	[0.015]	[0.016]	[0.016]	[0.015]	[0.022]	[0.017]
Final_4_lg1	0.058	0.057	0.143	0.079	0.056	0.071	0.047	0.087	0.049	0.049	0.074
	[0.012]**	[0.015]**	[0.026]**	[0.030]**	[0.049]	[0.014]**	[0.018]**	[0.014]**	[0.014]**	[0.020]*	[0.016]**
Final_4_lg2	0.028	0.024	0.113	0.008	0.034	0.045	0.013	0.075	0.012	0.02	0.039
	[0.013]*	[0.015]	[0.030]**	[0.026]	[0.034]	[0.017]**	[0.016]	[0.016]**	[0.013]	[0.020]	[0.016]*
Final_4_lg3	0.008	0.015	0.035	0.012	-0.007	0.019	-0.004	0.026	0.003	0.025	0.005
	[0.016]	[0.019]	[0.026]	[0.029]	[0.047]	[0.016]	[0.021]	[0.020]	[0.016]	[0.026]	[0.017]
Champ	0.005	-0.001	0.039	0.049	-0.06	0.022	-0.022	-0.008	0.01	0.018	-0.016
	[0.019]	[0.022]	[0.034]	[0.041]	[0.077]	[0.026]	[0.025]	[0.026]	[0.022]	[0.026]	[0.027]
Champ_lg1	0.109	0.101	0.233	0.141	0.113	0.115	0.11	0.118	0.109	0.111	0.102
	[0.022]**	[0.023]**	[0.042]**	[0.045]**	[0.054]*	[0.029]**	[0.032]**	[0.027]**	[0.023]**	[0.038]**	[0.023]**
Champ_lg2	0.084	0.067	0.19	0.093	0.148	0.107	0.068	0.078	0.087	0.069	0.082
	[0.025]**	[0.023]**	[0.038]**	[0.038]*	[0.077]	[0.029]**	[0.030]*	[0.026]**	[0.028]**	[0.030]*	[0.032]**
Champ_lg3	0.026	0.005	0.102	0.046	0.015	0.034	0.021	0.039	0.023	0.057	0.001
	[0.025]	[0.028]	[0.039]**	[0.041]	[0.051]	[0.031]	[0.028]	[0.022]	[0.028]	[0.029]	[0.030]
Football											
Top_20	0.01	0.014	-0.007	0.006	-0.027	0.018	0.006	0.015	0.01	0.032	0.003
	[0.009]	[0.010]	[0.016]	[0.028]	[0.029]	[0.011]	[0.011]	[0.012]	[0.010]	[0.015]*	[0.013]
Top_20_lg1	0.026	0.028	0.039	0.057	0.035	0.034	0.02	0.044	0.021	0.018	0.033
	[0.009]**	[0.012]*	[0.018]*	[0.029]	[0.030]	[0.011]**	[0.011]	[0.013]**	[0.010]*	[0.016]	[0.014]*
Top_20_lg2	0.022	0.021	0.001	0.049	0.041	0.03	0.016	0.034	0.019	0.021	0.027
	[0.008]**	[0.010]*	[0.016]	[0.023]*	[0.024]	[0.010]**	[0.010]	[0.011]**	[0.009]*	[0.011]	[0.011]*
Top_10	0.022	0.022	0.005	0.045	0.018	0.027	0.016	0.024	0.022	0.012	0.024
	[0.008]**	[0.010]*	[0.015]	[0.025]	[0.026]	[0.010]**	[0.010]	[0.010]*	[0.009]*	[0.012]	[0.011]*
Top_10_lg1	0.06	0.059	0.077	0.091	0.04	0.072	0.048	0.072	0.056	0.012	0.084
	[0.009]**	[0.010]**	[0.020]**	[0.022]**	[0.026]	[0.011]**	[0.010]**	[0.011]**	[0.009]**	[0.015]	[0.011]**
Top_10_lg2	0.027	0.027	0.042	0.036	0.01	0.035	0.018	0.021	0.029	0.013	0.037
	[0.008]**	[0.010]**	[0.021]	[0.017]*	[0.024]	[0.009]**	[0.010]	[0.010]*	[0.009]**	[0.014]	[0.010]**
Champ	0.09	0.09	0.053	0.088	-0.006	0.102	0.075	0.116	0.081	0.071	0.097
	[0.017]**	[0.022]**	[0.035]	[0.036]*	[0.086]	[0.023]**	[0.018]**	[0.029]**	[0.015]**	[0.026]**	[0.023]**
Champ_lg1	0.118	0.114	0.192	0.19	0.05	0.137	0.101	0.165	0.102	0.064	0.163
	[0.016]**	[0.024]**	[0.040]**	[0.041]**	[0.084]	[0.023]**	[0.022]**	[0.025]**	[0.016]**	[0.025]*	[0.024]**
Champ_lg2	0.017	0.001	0.083	-0.034	0.057	0.047	-0.011	0.015	0.019	-0.011	0.04
	[0.022]	[0.026]	[0.047]	[0.040]	[0.097]	[0.026]	[0.032]	[0.033]	[0.021]	[0.035]	[0.022]
Controls & F.E.s	X	X	X	X	X	X	X	X	X	X	X
N	N = 2431	N = 2427	N = 2429	N = 2426	N = 2411	N = 2430	N = 2429	N = 2428	N = 2431	N = 2419	2430
R2	0.997	0.995	0.994	0.993	0.981	0.996	0.997	0.994	0.997	0.995	0.996

Notes: Robust standard errors are presented in brackets. Control variables that are included are school and year fixed effects, school*year (linear trends), number of high school diplomas given out that year in the school's state, log average professor salary, log average real income in the school's state, and log tuition cost.

* significant at 5%, ** significant at 1%

Appendix B

Appendix B: Sports Success on Applications

Dependent Variable: Log Number of Applications Received	
Basketball	
Final_64	-0.004
	[0.006]
Final_64_lg1	0.007
	[0.006]
Final_64_lg2	0.011
	[0.007]
Final_64_lg3	0.005
	[0.007]
Final_16	0.026
	[0.010]**
Final_16_lg1	0.029
	[0.010]**
Final_16_lg2	0.03
	[0.010]**
Final_16_lg3	0.012
	[0.011]
Final_4	0.032
	[0.017]
Final_4_lg1	0.04
	[0.017]*
Final_4_lg2	0.035
	[0.016]*
Final_4_lg3	0.023
	[0.020]
Champ	0.044
	[0.032]
Champ_lg1	0.073
	[0.018]**
Champ_lg2	0.078
	[0.025]**
Champ_lg3	0.046
	[0.021]*
Football	
Top_20	0.025
	[0.010]*
Top_20_lg1	0.012
	[0.011]
Top_20_lg2	0.001
	[0.010]
Top_10	0.034
	[0.013]**
Top_10_lg1	0.019
	[0.013]
Top_10_lg2	-0.007
	[0.012]
Champ	0.083
	[0.031]**
Champ_lg1	-0.008
	[0.048]
Champ_lg2	-0.032
	[0.031]
Controls & F.E.s	X
N	N = 5335
R2	0.969

Notes: Robust standard errors are presented in brackets. Control variables that are included are school and year fixed effects, school*year (linear trends), number of high school diplomas given out that year in the school's state, log average professor salary, log average real income in the school's state, and log tuition cost.

* significant at 5%, ** significant at 1%