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Are Big-Time Sports a Threat to Student Achievement?†

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We consider the relationship between collegiate football success and non-athlete student performance. We find that the team's success significantly reduces male grades relative to female grades, and only in fall quarters, which coincides with the football season. Using survey data, we find that males are more likely than females to increase alcohol consumption, decrease studying, and increase partying in response to the success of the team. Yet, females also report that their behavior is affected by athletic success, suggesting that their performance is likely impaired but that this effect is masked by the practice of grade curving. (*JEL* I21, L83)

> *"Tailgaiting rituals, painted faces, and screaming fans are part of American higher education as surely as physics labs and seminars on Milton... Big-time athletics is too important to be relegated entirely to the sports pages... At issue is whether the university entertainment enterprise is a threat to American higher education or instead is one of its reasons for success."*
>
> —*Charles T. Clotfelter*, Big-Time Sports in American Universities

In the midst of record-setting revenues, escalating costs, and the launching of conference-specific television networks, collegiate sports have never been bigger. Moreover, they have grown to be quite important from a public finance perspective. In 2010, 211 out of 218 Division I athletics departments at universities subject to open records laws received a subsidy from their student body or general fund.[1] These subsidies are substantial and rapidly growing. From 2006 to 2010, the average subsidy increased 25 percent, to $9 million. Given the large amount of taxpayer and tuition dollars that are being channeled toward college sports programs, and

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[1] There are a total of 346 Division I schools, 128 of which are not subject to open records laws. Division I is the highest level of intercollegiate athletics. Statistics are based on the analysis of documents gathered by *USA Today* and Indiana University's National Sports Journalism Center. These data were available on October 10, 2011 at www.usatoday.com/sports/college/2011-06-23-2011-athletic-department-subsidy-table_n.htm.

concerns that these programs might be detrimental to the academic missions of universities, the merits of this spending has been the subject of intense debate.

However, almost nothing is known about their effects on human capital acquisition.[2] The research that has been conducted on big-time college sports has focused primarily on its advertising effects, considering impacts on student applications, student enrollment, and alumni giving.[3] To our knowledge, Clotfelter (2011) is the only prior study to plausibly identify a causal effect of college sports on learning and research, which are clearly the most important objectives of postsecondary institutions. It is important to note that it is not clear ex ante what effect to anticipate, as some have argued that college sports are a distraction that diverts time and attention away from academic pursuits, whereas others have argued that it could enhance productivity by promoting social capital. To address the question empirically, Clotfelter (2011) examines the number of JSTOR articles viewed (as a measure of work done by students and faculty) at 78 research libraries around the time of the NCAA basketball tournament. He finds that having a team in the tournament reduces the number of article views and, further, that unexpected wins have especially large effects.

In this paper, we build on this earlier work by considering how academic performance at a large public university varies with the prominence of university football on campus, as measured by the team's winning percentage in a given year. One of the advantages of our approach that focuses on student GPAs is that it provides a relatively long-run measure of student performance, whereas Clotfelter may be identifying the intertemporal substitution of study time that might not affect levels of learning. In addition, we can exploit the gender asymmetry in how closely students follow college sports in order to speak to the extent to which the effects might be driven by professor behavior rather than student behavior.

Our paper also contributes to the large literature on gender differences in higher education, where some have argued that there is a "boy crisis." This concern is often motivated by the fact that males have fallen further and further behind females in college attendance and completion over the past 30 years (Goldin, Katz, and Kuziemko 2006). The 2008 American Community Survey shows that 24 to 29 year-old females are 17 percent more likely to have attended college and 29 percent more likely to have completed a baccalaureate degree than similarly aged males.

Of additional concern is the fact that males tend to be less responsive than females to educational interventions, which suggests that we may need to look beyond traditional educational policies to better understand the determinants of male performance.[4] In this area, research focusing on the ability level of peers also

[2] In describing the close to 20 years he convened the NBER working group on higher education, Clotfelter (2011) reports: "In the 30 meetings of that group that occurred over this period, scholars presented 176 papers on topics ranging from financial aid, rising costs, and preferential admissions to faculty retirement, doctoral training, and sponsored research. But only one paper during this entire period had to do with big-time college sports."

[3] See Pope and Pope (2011) for further discussion.

[4] For example, males have been found to be less responsive, if responsive at all, to achievement awards (Angrist and Lavy 2009; Angrist, Lang, Oreopoulos 2009), tuition reductions (Dynarski 2008), and offers of academic advising (Angrist, Lang, Oreopoulos 2009). Lindo, Sanders, and Oreopoulos (2010) find that being placed on academic probation improves the grades of returning females more than returning males, but that it causes males to drop out and has no such impact on females. Babcock and Marks (2011) document that female students study more than their male counterparts.

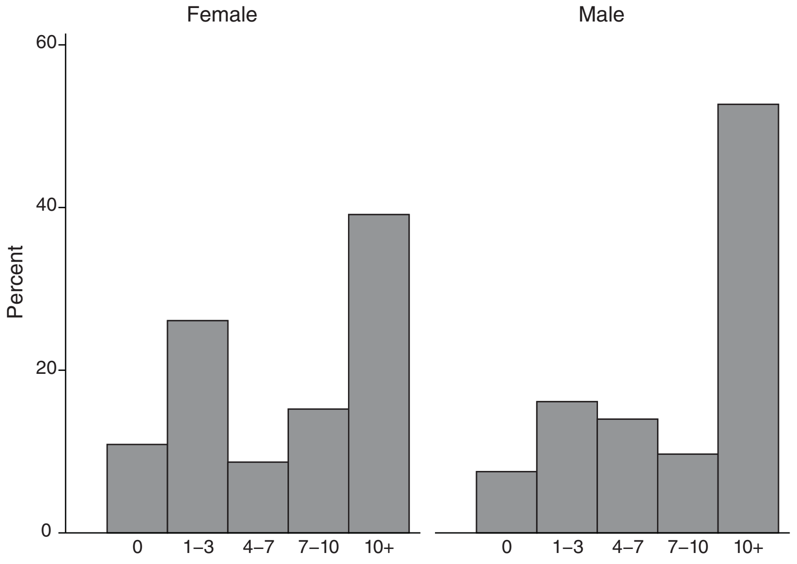

Figure 1. Responses to the Question: "Of the 12 Regular-Season University of Oregon Football Games in the 2010 Season, How Many Did You Watch on tv or in Person?"

Note: The sample has been limited to non-first-year students.

tends to find greater effects for females than males, whereas studies that explore alcohol consumption and its associated activities find mixed results.[5] Collectively, this research suggests that one would be hard-pressed to reliably identify an important factor that would have a greater influence on males' academic performance than females' academic performance. While instructor gender might appear to be a likely candidate, even the research in this area is mixed.[6] As such, it is informative to consider a prominent component of college culture that our priors suggest would exhibit a pronounced influence on the male population—the hype and interest associated with the success of the university football team.

The public university we consider, the University of Oregon, being largely representative of other four-year public institutions and having substantial variation in football success, provides an ideal setting to explore the effects of big-time college sports. Highlighting the significance of the football team, Figure 1 summarizes survey evidence on the number of football games students watched during the 2010

[5] In particular, Stinebrickner and Stinebrickner (2006); Han and Li (2009); and Carrell, Hoekstra, and West (2011b) find greater peer effects among females. Foster (2006) finds larger effects for males but concludes that there is "little evidence of robust residential peer effects on undergraduate performance." Kremer and Levy (2008) finds that being assigned a heavily drinking roommate affects males more than females. Carrell, Hoekstra, and West (2011a) finds that the effect of legal access to alcohol is similar for males and females; and Lindo, Swensen, and Waddell (2011) finds that legal access affects females but not males.

[6] At the postsecondary level, Hoffmann and Oreopoulos (2009) finds small effects overall but report that these effects are "driven more by males performing worse when assigned to a female instructor, with females performing about the same." In contrast, Carrell, Page, and West (2010) reports that "professor gender has little impact on male students, [but] has a powerful effect on female students' performance in math and science classes, their likelihood of taking future math and science courses, and their likelihood of graduating with a STEM degree." See Hoffmann and Oreopoulos (2009) for an in-depth review of the larger literature that focuses on the primary and secondary levels.

season. Only 10 percent of females and an even smaller share of males report watching 0 games. Some 40 percent of females watched 10 or more games out of 12, while over 50 percent of males watched 10 or more games.

Our main results are based on student fixed effects models to ensure that the estimates are not driven by systematic changes in the composition of students that may be correlated with the success of the football team. This analysis reveals that GPAs vary systematically with the prominence of university football on campus, as measured by the team's winning percentage in a given year.[7] Our estimates suggest that 3 fewer wins in a season would be expected to reduce the gender gap by 9 percent. In order to speak to the mechanisms at work, we provide evidence that students' time use and study behaviors respond differentially by gender to the football team's performance.[8] Given that females' time use and study behaviors are also affected by the team's success, it is likely that their performance is affected as well, but this is masked by the usual practice of grade curving. We also explore heterogeneity across race and measures of socioeconomic status. We find that the effects are most severe for nonwhites and those from disadvantaged backgrounds.

In order to consider an outcome that is more clearly linked to long-run outcomes, we supplement our analysis of GPAs with an analysis of dropout behavior. With the caveat that we cannot control for student fixed effects in this analysis, we find that the success of the football team does not significantly affect the probability that male students drop out before their next fall quarter. Given that their grades are impaired, this suggests that male dropout behavior is not sensitive to academic performance or that any effect of academic performance on dropout behavior is counterbalanced by other effects of the football team's success. In contrast, we find that the success of the football team decreases the probability that low-ability females drop out, which may be due to improved grades or to other effects of the team's success.

I. Data Used in Main Analysis

Our primary source of data is University of Oregon student transcripts, covering all undergraduate classes administered from fall quarter of 1999 through winter quarter of 2007. For our main analysis, we limit the sample to fall quarters to coincide with the collegiate football seasons. We also limit the sample to non-athlete undergraduate students as we anticipate that athletic success, if not endogeneous to athletes' academic performance, may interact differently with student-athlete grades. After making these restrictions, our main sample consists of 29,737 students, or 267,322 student-class observations across 9 fall quarters.[9]

We combine these data with readily available reports of the football team's win-loss records, which we use to form our term-specific measures of athletic

[7] Other documented behaviors associated with collegiate football include increased crime (Rees and Schnepel 2009) and heavy alcohol consumption (Neal and Fromme 2007; Glassman et al. 2007; Glassman et. al. 2010). Card and Dahl (2011) also finds increases in male on female violence associated with NFL football games.

[8] See Stinebrickner and Stinebrickner (2004) for a discussion on the relationship between time use and educational outcomes.

[9] The implied average number of classes per student is low as we do not observe all students' complete tenure at the institution. Normal patterns of attrition from the university also act to lower this ratio.

Table 1—Summary Statistics

	All students	Male	Female
Grade point average (GPA)	3.04	2.94	3.12
1st year GPA	3.00	2.90	3.07
2nd year GPA	3.01	2.92	3.08
3rd year GPA	3.08	3.00	3.15
4th year GPA	3.14	3.02	3.24
5+ year GPA	2.98	2.90	3.10
High school GPA	3.49	3.40	3.56
SAT	1121	1134	1095
White	0.80	—	—
Asian	0.08	—	—
Black	0.02	—	—
Hispanic	0.04	—	—
Winning percentage	0.70	—	—
Number of undergraduates	29,737	13,184	16,553
Observations	267,322	119,191	148,131

Notes: Sample data consist of non-athlete University of Oregon undergraduates from 1999 through 2007. Winning percentage is the ratio of the University of Oregon football team's wins to total games played in a given season.

success—the ratio of total games won to total games played.[10] Over our sample period, the winning percentage is 69.7 percent, on average, and varies from 45.5 percent to 90.9 percent.

This large public university is also representative in terms of institutional and student characteristics. While twice the size and having higher admission rates than the average public four-year institution, it is similar in terms of enrollment rates and SAT scores of incoming students. It is also similar to the average college in cost of attendance and in financial aid opportunities. Like most other institutions, the University of Oregon is over half female and predominately white, although at 75 percent it has a larger share of white students than is typical of the universe of US postsecondary institutions.[11] We report summary characteristics of our data in Table 1. Consistent with the discussion in the introduction, males have systematically lower GPAs than females. On average, they earn GPAs of 2.94, whereas the average among females is 3.12. This gap is present for first-year students and students who have been at the university for several years. In unreported analysis, we have verified that the gap cannot be explained by ability upon entry, as measured by high school GPAs and SAT scores.

[10] For 5 of the 9 seasons spanned by our data, the team played 11 regular season games. For the other 4 seasons, the team played 12 regular season games. Post-season games, which take place after the fall quarter ends, are not used to construct the winning percentage used for our analysis. Although pre- or post-season rankings could conceivably be used to proxy for the prominence of university football on campus in a similar fashion, the University of Oregon was unranked in most of the years spanned by our data.

[11] See Lindo, Swensen, Waddell (2011) for additional comparisons to other four-year public US institutions.

Table 2—Estimated Effect of Athletic Success on Male and Female Grades

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Males						
Winning percentage	−0.142***	−0.064***	−0.061***	−0.039**	−0.040**	−0.069***
	(0.023)	(0.022)	(0.021)	(0.020)	(0.019)	(0.019)
Time trend	No	Yes	Yes	Yes	Yes	No
Student controls	No	No	Yes	—	—	—
Student fixed effects	No	No	No	Yes	Yes	Yes
Subject-by-level fixed effects	No	No	No	No	Yes	Yes
Accumulated-credits fixed effects	No	No	No	No	No	Yes
Number of unique students	13,184	13,184	13,184	13,184	13,184	13,184
Observations	119,191	119,191	119,191	119,191	119,191	119,191
Panel B. Females						
Winning percentage	−0.073***	0.002	0.000	0.034**	0.026*	0.005
	(0.019)	(0.018)	(0.017)	(0.016)	(0.015)	(0.015)
Time trend	No	Yes	Yes	Yes	Yes	No
Student controls	No	No	Yes	—	—	—
Student fixed effects	No	No	No	Yes	Yes	Yes
Subject-by-level fixed effects	No	No	No	No	Yes	Yes
Accumulated-credits fixed effects	No	No	No	No	No	Yes
Number of unique students	16,553	16,553	16,553	16,553	16,553	16,553
Observations	148,131	148,131	148,131	148,131	148,131	148,131
Panel C. Pooled sample						
Winning percentage	−0.073***	0.004	0.003	0.025	0.024	−0.001
	(0.019)	(0.019)	(0.017)	(0.016)	(0.015)	(0.015)
Male × winning percentage	−0.069**	−0.072**	−0.067**	−0.052**	−0.061**	−0.062***
	(0.030)	(0.030)	(0.027)	(0.026)	(0.024)	(0.024)
Male	−0.129***	−0.128***	−0.077***			
	(0.022)	(0.022)	(0.020)			
Time trend	No	Yes	Yes	Yes	Yes	No
Student controls	No	No	Yes	—	—	—
Student fixed effects	No	No	No	Yes	Yes	Yes
Subject-by-level fixed effects	No	No	No	No	Yes	Yes
Accumulated-credits fixed effects	No	No	No	No	No	Yes
Number of unique students	29,737	29,737	29,737	29,737	29,737	29,737
Observations	267,322	267,322	267,322	267,322	267,322	267,322

Notes: Panels A and B provide the estimates for male and female students, respectively. The dependent variable is the grade points received by a student in a given class, ranging from 0 to 4.3. Student controls include math and verbal SAT scores, high school GPA, age, and indicator variables for private school attendance, black, Hispanic, and Asian. The sample has been limited to fall-term grades. Winning percentage is the ratio of the University of Oregon football team's wins to total games played in a given season. Standard errors (in parentheses) are corrected for clustering at the student level.

*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

II. Estimated Effects on GPAs

A. *Main Results*

In panel A of Table 2, we report estimates of the effect of athletic success on male GPAs. To begin, in column 1 we estimate

$$G_{ijt} = \alpha + \theta WinningPercentage_t + \epsilon_{ijt}, \tag{1}$$

where G_{ijt} is the grade of student i in class j in the fall term of year t and $WinningPercentage_t$ is the ratio of wins to total games played in year t. Standard error estimates are clustered on the student. This simple model leads to an estimated of θ of -0.142.

Of course, the extent to which the university experienced grade inflation in the years spanned by the data and the football team's performance got somewhat worse, this estimate may overstate the negative impact of the football team's success. Indeed, in column 2, where we control for a quadratic in time, the point estimate is substantially smaller (−0.064), although it remains statistically significant. This estimate is largely unchanged by the inclusion of a rich set of controls for observable student characteristics in column 3.[12]

Our preferred estimates are identified off of within-student longitudinal variation in grades as the football team's winning percentage varies, corresponding to the regression equation

$$(2) \qquad G_{ijt} = \alpha_i + \psi WinningPercentage_t + \beta X_{ijt} + e_{ijt},$$

where α_i are student fixed effects. As this approach isolates the effect of athletic success on individual student performance in fall classes across terms, we are implicitly assuming that the counterfactual for a student's performance in "high-win terms" is the student's own performance in "low-win terms," and vice versa. We prefer this approach because it controls flexibly for the changing composition of the student body from year to year, which may not be well captured by the battery of observable characteristics available in our data (or by a smooth time trend). Column 4 shows the estimated effect based on this model, still controlling for the overall time trend in order to address grade inflation. It is smaller (−0.039) but remains statistically significant.

In column 5, we address the fact that courses offered during fall quarters may differ from year to year, which could lead to a spurious relationship between the performance of the football team and student grades. We do so by controlling for subject-by-level fixed effects.[13] With the addition of these controls, the estimated effect is unchanged but is more precisely estimated.

In column 6, we take an alternative approach to controlling for time-varying factors, including fixed effects for the number of credits a student has accumulated before the quarter begins instead of the overall time trend.[14] This approach is motivated by our desire to control flexibly for the tendency for grades to increase as students make progress toward their degrees. Of course, it would be desirable to control for this tendency in addition to the long-run trend, but, with student fixed effects in the model, this would lead to near-perfect multicolinearity. With this trade-off acknowledged, we note that the estimated effect based on this model (−0.069) is larger than the estimate based on the model that instead controls for a smooth time trend.

It is important to note that the practice of grading student performance on a curve implies that the estimates in panel A are likely to understate the true effect on male performance. For example, if the success of the football team impairs all students'

[12] In particular, in this column, we add controls for math and verbal SAT scores, high school GPA, age at entry, and indicator variables for black, Hispanic, and Asian, and for having graduated from a private high school.

[13] For example, subjects correspond to economics, English, and mathematics, while levels correspond to either 100-, 200-, 300-, or 400-level classes.

[14] The fixed effects are a series of indicator variables for credits in intervals of four.

performance equally, there would be no effect on any student's GPA under strict curving. In contrast, if the success of the football team has an especially large impact on the performance of a particular group of students (males), we would clearly expect to see their GPAs fall relative to others (females). Further, one would anticipate that the one group's "response" to athletic success would appear to offset the other's, consistent with the zero-sum nature of strict grading curves.

With this in mind, in panel B, we perform the same analysis for the female-student population. The estimates based on our model with student fixed effects are positive, though they vary in their statistical significance. However, for the reasons described above, even if the estimates were strongly significant, it would not imply that athletic success improves female performance. In Section IV, we present evidence suggesting that female performance is likely impaired but, instead, may reflect that the relatively large impact on males improves females' *relative* performance, which translates into higher grades when grades are based on a curve. The fact that the magnitude of the estimated effects on females tends to be smaller than the magnitude of the estimated effect on males suggests that grade curves are not *perfectly* strict.

Additionally, it is important to note that the estimated effects on females' GPAs suggest that it is unlikely that the effects on males are driven by professor behavior. If athletic success led professors to be more generous or more harsh in assigning grades, we would anticipate observing similar effects on both male and female students.[15]

As a measure of relative performance, the gender gap in grades is not subject to the interpretative challenges discussed above. Inasmuch as grading curves are uniformly applied to male and female students, changes in the gender gap in GPAs that are systematic with football performance are clearly indicative of changes in gender-specific performance. Pooling male and female observations and adding the interaction of winning percentage and an indicator for being male to the models described above, in panel C, we estimate the effect of athletic success on the gender gap in grades. The coefficient on the interaction of the winning percentage with the indicator for being male provides the estimated effect of athletic success on the gender gap in grades. Whereas the gender-specific estimates were somewhat sensitive to the inclusion of differing control variables, the estimated impact on the gender gap is quite stable as the coefficient estimates range from −0.052 to −0.072 across the 5 columns.[16] Further, they are statistically significant and virtually identical in columns 4 and 5, which display our preferred estimates. To put the magnitude of the estimate (−0.061) into context, it suggests that a 25 percentage point increase in the football team's winning percentage will increase the gender gap in GPAs (0.18) by 8.5 percent.

[15] Although we think it is unlikely, we do note that it is possible that the success of the football team causes professors to grade male and female students differently. That said, we have verified that our main result is also evident if we focus on large classes (with at least 50 students) where this sort of professor behavior is especially unlikely. In fact, the estimated effect is even larger when the sample is restricted in this manner.

[16] We have also estimated models that include course-credits fixed effects, course-enrollment fixed effects (in bins of 10 from 0–50, bins of 25 from 50–100, and bins of 50 from 100–250), and fixed effects for the number of credits that a student is taking in the current quarter. The inclusion of these controls changes the estimated effect by less than 0.001. In addition, we have considered using GPAs normalized at the class level as an outcome variable. These results are also very similar, albeit somewhat larger in magnitude, to our main results.

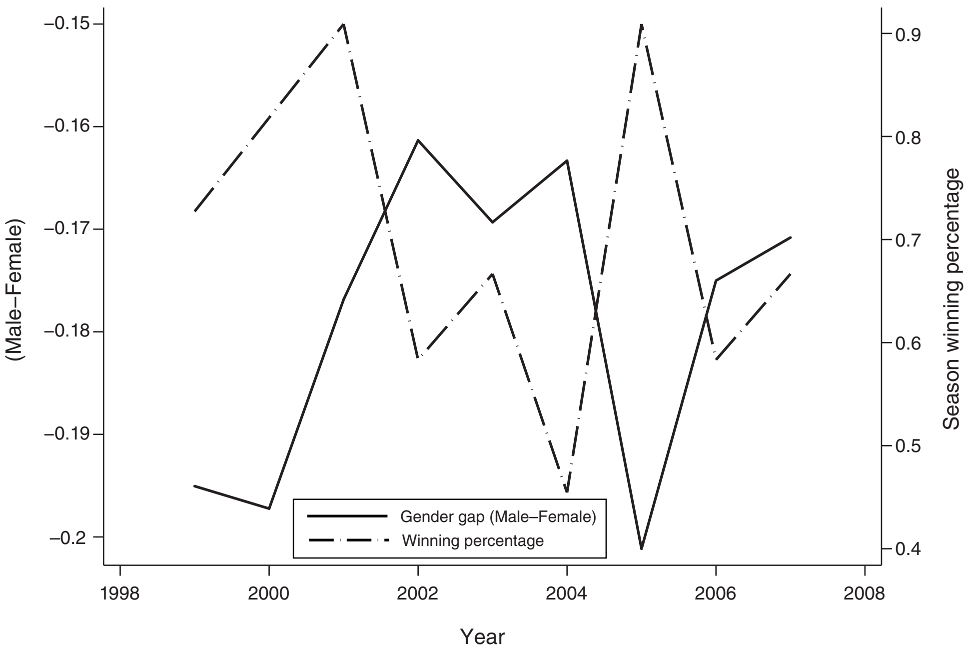

Figure 2. Does Athletic Success Affect the Gender Gap in GPAs?

Notes: The sample is limited to fall term grades. The gender gap is defined as mean male GPA less mean female GPA, at the term level. Win percentage is the ratio of the University of Oregon football team's wins to total games played in a given season. A regression of the winning percentage on the gender gap (i.e., a model with only nine observations) yields an estimated coefficient of –0.074 with a heteroskedasticity-robust standard-error estimate of 0.027.

B. *Estimated Effects Using Aggregate Data*

While we prefer the approach described above because it allows us to control for several potential confounders, the pattern we have identified is sufficiently regular that it is evident in a plot of the mean difference between male and female grades and winning percentage across years. We provide such a plot in Figure 2 for the period 1999 through 2007. The correlation coefficient between the difference in average grades (i.e., male minus female) and winning percentage is −0.736. Moreover, aggregating grades to the 9 fall term observations at which the variation in winning percentage exists, and regressing the difference between male and female GPAs on the winning percentage, yields an estimated coefficient of −0.074 and a heteroskedasticity-robust standard-error estimate of 0.027—very close to the point estimates in our preferred specification in Table 2.

C. *Estimated Effects across Letter-Grade Assignments*

In Table 3, we explore the potential for winning percentage to influence grades nonlinearly across the grade distribution. Specifically, we replace "grade point" with binary letter-grade assignments on the left-hand side. Because it offers a clearer

Table 3—Estimated Effects across Letter Grade Assignments

Outcome:	A (1)	B (2)	C (3)	Fail (4)
Panel A. Controlling for time				
Winning percentage	−0.003	0.017*	−0.009	−0.005
	(0.009)	(0.010)	(0.007)	(0.004)
Male × winning percentage	−0.008	−0.015	0.008	0.015**
	(0.013)	(0.014)	(0.011)	(0.007)
Number of unique students	29,737	29,737	29,737	29,737
Observations	267,322	267,322	267,322	267,322
Panel B. Controlling for accumulated credits				
Winning percentage	−0.007	0.013	−0.007	0.001
	(0.009)	(0.010)	(0.007)	(0.004)
Male × winning percentage	−0.010	−0.013	0.009	0.014**
	(0.013)	(0.014)	(0.011)	(0.007)
Number of unique students	29,737	29,737	29,737	29,737
Observations	267,322	267,322	267,322	267,322

Notes: All estimates control for student fixed effects and subject-by-level fixed effects. Panel A additionally controls for a quadratic in time, while panel B additionally controls for a student's accumulated credits at the beginning of the term. The dependent variables are indicator variables for letter grade assignments corresponding to each column letter. The sample has been limited to fall term grades. Winning percentage is the ratio of the University of Oregon football team's wins to total games played in a given season. Standard errors (in parentheses) are corrected for clustering at the student level.

*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

interpretation, in this subsection and the subsections that follow, we focus on the effect of athletic success on the gender gap in GPAs. We also focus on our preferred models that control for student fixed effects and subject-by-level fixed effects. However, because there is a tradeoff involved with controlling for time versus controlling for accumulated credits, in separate panels, we present estimates that take each of these two approaches.

In Table 3, we replace "grade point" with binary letter-grade assignments on the left-hand side. As such, in column 1, the coefficient on the interaction of the indicator for being male and the winning percentage is interpreted as the difference between males and females in the impact of athletic success on the probability of receiving a grade of "A" in a given class. Across columns 1–4, we observe meaningful decreases in the probabilities of receiving As and Bs and increases in the probabilities of receiving Cs or lower for males in response to the success of the team. Clearly, the largest effect on the gender gap appears to occur at the lowest end of the grade distribution—in the probability of receiving a failing grade.

D. *This Pattern Is Unique to Fall Terms*

In Table 4, we investigate whether similar effects are found in winter and spring quarters, where one would not expect the winning percentage to affect student performance. Doing so provides evidence that only in the quarter we associate with football—the fall quarter—is there movement in the gender gap in academic

TABLE 4—ESTIMATED EFFECTS ON GPAS, BY TERM

	Fall (1)	Winter (2)	Spring (3)
Panel A. Controlling for time			
Winning percentage	0.024	0.002	0.004
	(0.015)	(0.015)	(0.016)
Male × winning percentage	−0.061**	−0.023	−0.018
	(0.024)	(0.024)	(0.025)
Number of unique students	29,737	29,490	25,298
Observations	267,322	271,489	207,837
Panel B. Controlling for accumulated credits			
Winning percentage	−0.001	−0.021	−0.017
	(0.015)	(0.015)	(0.016)
Male × winning percentage	−0.062***	−0.020	−0.016
	(0.024)	(0.024)	(0.025)
Number of unique students	29,737	29,490	25,298
Observations	267,322	271,489	207,837

Notes: All estimates control for student fixed effects and subject-by-level fixed effects. Panel A additionally controls for a quadratic in time, while panel B additionally controls for a student's accumulated credits at the beginning of the term. The dependent variable is the grade points received by a student in a given class, ranging from 0 to 4.3. Placebo quarters include the winter and spring quarters during which the football team does not play any games. Winning percentage is the ratio of the University of Oregon football team's wins to total games played in a given season. Standard errors (in parentheses) are corrected for clustering at the student level.

*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

performance that varies systematically with athletic success.[17] Among the eight coefficient estimates for the winter and spring quarters, corresponding to the overall effect of the winning percentage and the differential effect on males, none are statistically significant.

E. *Heterogeneity*

In Tables 5 and 6, we explore the extent to which there are heterogeneous effects of athletic success on the gender gap. While such heterogeneity is interesting for a variety of reasons, a primary motivation for exploring heterogeneous impacts is to support the external validity of our estimates. For instance, if we see the same phenomenon across different groups at one institution, it lends credibility to the idea that similar effects might be present at institutions with different compositions of students. We first consider heterogeneity across ability and financial aid eligibility to determine whether our main results are driven by individuals more likely to struggle with coursework or those from particular economic backgrounds. We then examine the possibility for heterogeneous effects across race.

Table 5 stratifies the estimates by various measures of ability and relative socio-economic status. In columns 1–4, the estimates are stratified by ability, where "low-ability" students are defined as those with cumulative SAT scores in the lowest

[17] Over our sample time period, all bowl games that the football team participated in took place between the end of the fall quarter and the beginning of the winter quarter.

TABLE 5—ESTIMATED EFFECTS ON GPAS, BY ABILITY AND FINANCIAL NEED

	SAT				Financial need			
	All (1)	Low (2)	Med (3)	High (4)	All (5)	Low (6)	Med (7)	High (8)
Panel A. Controlling for time								
Winning percentage	0.024	0.057**	−0.018	0.030	0.035	0.010	0.039	0.054*
	(0.015)	(0.028)	(0.026)	(0.024)	(0.018)	(0.029)	(0.030)	(0.032)
Male × winning percentage	−0.061**	−0.123***	−0.053	−0.036	−0.076***	−0.043	−0.078	−0.109**
	(0.024)	(0.046)	(0.042)	(0.037)	(0.029)	(0.047)	(0.048)	(0.054)
Number of unique students	29,737	9,755	9,554	10,428	20,668	6,927	6,840	6,901
Observations	267,322	80,868	86,367	100,087	186,969	64,635	63,169	59,165
Panel B. Controlling for accumulated credits								
Winning percentage	−0.001	0.031	−0.040	0.006	0.013	−0.001	0.002	0.035
	(0.015)	(0.028)	(0.026)	(0.024)	(0.018)	(0.029)	(0.030)	(0.032)
Male × winning percentage	−0.062***	−0.130***	−0.050	−0.040	−0.077***	−0.043	−0.081*	−0.106**
	(0.024)	(0.046)	(0.042)	(0.037)	(0.028)	(0.047)	(0.048)	(0.054)
Number of unique students	29,737	9,755	9,554	10,428	20,668	6,927	6,840	6,901
Observations	267,322	80,868	86,367	100,087	186,969	64,635	63,169	59,165

Notes: All estimates control for student fixed effects and subject-by-level fixed effects. Panel A additionally controls for a quadratic in time, while panel B additionally controls for a student's accumulated credits at the beginning of the term. The dependent variable is the grade points received by a student in a given class, ranging from 0 to 4.3. The SAT groups (columns 2–4) are defined by student SAT score terciles. The financial-need groups (columns 6–8) are defined by student eligibility terciles. Standard errors (in parentheses) are corrected for clustering at the student level.

*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

tercile, and medium- and high-ability students are defined similarly.[18] These results provide strong evidence that the effect of athletic success on the gender gap is most prominent among lower-ability students. In particular, column 2 suggests that, among low-ability students, the gender gap in grades increases by 0.03 in response to a 25 percentage point increase in the winning percentage, accounting for 14 percent of the existing gender gap (0.22) among those students. The estimated effect on the gender gap has the same sign for medium- and high-ability students but is smaller in magnitude and not statistically significant.

Columns 5–8 consider the effects stratified by "financial need" for the 70 percent of students who submitted a Free Application for Federal Student Aid (FAFSA).[19] These estimates suggest that the impact on the gender gap is largest among students from more disadvantaged backgrounds. Again, the estimated effect on the gender gap is negative for all groups but is only significant for those in the highest tercile of financial need.

[18] Results are similar using high school GPAs to construct the measure of ability.

[19] To determine the level of the Pell grant, FAFSA-reported data are used to calculate two key measures: a cost of attendance (COA), which varies across both institutions and students; and an expected family contribution (EFC), which varies across students. The COA is a measure of the expected educational expenses a student will undertake. Individual institutions set the COA for a given student, based on the attributes of the institution and the student. For full-time students, their COA includes such costs as tuition and fees, books, supplies, transportation, other personal education-related expenses, and room and board. For part-time students and those enrolled in correspondence courses COA expenses are more limited. Once the COA and EFC have been calculated, the value of the Pell award is formulaic. The level of an individual student's grant in a given year is the minimum of the difference between the Federal maximum Pell Grant and the student's EFC and the difference between the institution's COA and the student's EFC.

Table 6—Estimated Effects on GPAs, by Race

	All (1)	White (2)	Nonwhite (3)	Black (4)	Hispanic (5)	Asian (6)
Panel A. Controlling for time						
Winning percentage	0.024	0.011	0.128***	0.166	0.003	0.150***
	(0.015)	(0.016)	(0.044)	(0.155)	(0.087)	(0.053)
Male × winning percentage	–0.061**	–0.047*	–0.170**	–0.348	–0.155	–0.114
	(0.024)	(0.025)	(0.069)	(0.222)	(0.143)	(0.083)
Number of unique students	29,737	25,844	3,893	482	1,034	2,383
Observations	267,322	232,469	34,853	3,968	8,801	22,124
Panel B. Controlling for accumulated credits						
Winning percentage	–0.001	–0.012	0.087**	0.093	–0.046	0.113**
	(0.015)	(0.016)	(0.044)	(0.154)	(0.086)	(0.054)
Male × winning percentage	–0.062***	–0.048*	–0.165**	–0.317	–0.152	–0.113
	(0.024)	(0.025)	(0.069)	(0.228)	(0.144)	(0.083)
Number of unique students	29,737	25,844	3,893	482	1,034	2,383
Observations	267,322	232,469	34,853	3,968	8,801	22,124

Notes: All estimates control for student fixed effects and subject-by-level fixed effects. Panel A additionally controls for a quadratic in time, while panel B additionally controls for a student's accumulated credits at the beginning of the term. The dependent variable is the grade points received by a student in a given class, ranging from 0 to 4.3. Standard errors (in parentheses) are corrected for clustering at the student level.

*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

In Table 6, we provide estimates stratified by race. After again displaying the estimate based on the full sample, columns 2 and 3, show separate estimates for whites and nonwhites. These estimates demonstrate that the winning percentage affects the gender gap among both whites and nonwhites, but that the effect is particularly strong in the minority-student population. In columns 4 and 5, we further stratify nonwhite into black, Hispanic, and Asian. Although estimates are imprecise at this level, there is suggestive evidence that the largest effects are found in the black student population.

More broadly, we note that the estimated effects on the gender gap are negative in all regressions presented in Tables 5 and 6. This suggests that the overall impact is not being driven by any one group in particular, even though there is heterogeneity in the effect on the gender gap among different groups.

III. Estimated Effects on Dropout Behavior

In this section, we consider the effect on an outcome that is more closely tied to students' long-run success—the probability of dropping out of school. Although it might seem more desirable to focus on the impact on graduation, we do not adopt this approach for two reasons. First, our panel is not long enough to be able to reliably measure graduation for many of the cohorts we observe. Second, while there is substantial variation in the team's winning percentage from year to year, there is much less variation from cohort to cohort (after averaging the team's success during their tenure) and the variation that does exist across cohorts is not as likely to be exogenous. As such, we instead focus on the probability of dropping out of the University before the next academic year, defined as an indicator variable equal to one if a student is not observed in the next fall term or any subsequent term and has not graduated. We do so with the caveat that this analysis may reflect impacts on the timing of dropout behavior in addition to impacts on the probability of graduation.

An additional caveat to this exercise is that, lacking within-student variation from year to year, we cannot include student fixed effects in our regression models. Instead, we control for student characteristics with a rich set of covariates: math and verbal SAT score, high school GPA, age at entry, race, and whether the student graduated from a private high school. In addition, we control for the year and a student's accumulated credits in the current fall term, as in our previous analyses.

Before describing the results of this analysis, it is important to note that we do not have clear predictions for the sign of the effect. On one hand, the success of the football team may directly reduce the probability that a student drops out because it leads to a more enjoyable college experience. On the other hand, the success of the football team may affect the probability that a student drops out through its impact on his or her GPA (and number of failed classes).

Column 1 of Table 7 shows the estimated effect based on the full sample.[20] The estimated coefficient on the winning percentage and its interaction with gender are both small and insignificant, suggesting that the success of the team does not affect drop-out decisions in the aggregate. However, columns 2–4 of Table 7 show that this masks substantial heterogeneity across ability. In particular, column 2 reveals that, among those with low SAT scores, a successful team reduces the probability that females drop out, while having no significant effect on males. In light of the estimated effects on GPAs shown in Table 5, this impact on females may be driven by the positive impact on their GPAs but could also be a direct effect of the team's success. The lack of a significant impact on males suggests that the negative impact on their GPAs is offset by the direct effect of the team's success. The remaining columns of Table 7 explore heterogeneity across financial need, providing suggestive evidence that the team's success reduces the probability that high-need females drop out.

Table 8 considers heterogeneity across race. Generally, these estimates are too imprecise to draw any strong conclusions. However, they do suggest that the success of the football team reduces the probability that black females drop out and perhaps increases the probability that black males drop out. These results are consistent with the point estimates in Table 6, which suggested positive effects on black females' GPAs and negative effects on black males' GPAs.

IV. Survey Evidence on Mechanisms

To shed light on the underlying mechanisms driving our main results, we surveyed undergraduate classes during three regularly scheduled class times in the 2011 spring term.[21] Of the classes surveyed, 183 students were enrolled in an introductory

[20] Estimates are very similar if seniors are not included in the analysis.

[21] Our survey design is informed by Clotfelter (2011), which reports that students at highly selective big-time sports universities spend more time exercising and participating in team sports, are more likely to report binge

Table 7—Estimated Effects on Dropping Out, by Ability and Financial Need

	SAT				Financial need			
	All (1)	Low (2)	Med (3)	High (4)	All (5)	Low (6)	Med (7)	High (8)
Winning percentage	−0.014	−0.051***	0.011	0.004	−0.015	−0.003	−0.008	−0.034*
	(0.009)	(0.018)	(0.016)	(0.015)	(0.011)	(0.018)	(0.019)	(0.020)
Male × winning percentage	0.004	0.063**	−0.023	−0.024	0.001	−0.000	0.002	0.006
	(0.013)	(0.027)	(0.022)	(0.020)	(0.016)	(0.026)	(0.026)	(0.030)
Male	−0.010	−0.047**	0.005	0.010	−0.007	−0.006	−0.013	−0.003
	(0.009)	(0.020)	(0.016)	(0.014)	(0.011)	(0.018)	(0.019)	(0.022)
Time trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Student controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Accumulated credits fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of unique students	26,802	8,702	9,171	8,929	18,627	6,208	6,209	6,210
Observations	71,372	22,384	24,476	24,512	49,537	16,643	17,005	15,889

Notes: The dependent variable is an indicator for not being observed in the next fall quarter or any subsequent quarter and not having graduated. The dependent variable is undefined for the last year of data, resulting in fewer observations than our previous analysis. Student controls include math and verbal SAT scores, high school GPA, age, and indicator variables for private school attendance, black, Hispanic, and Asian. The SAT groups (columns 1–3) are defined by student SAT score terciles. The financial need groups (columns 4–6) are defined by student eligibility terciles. Standard errors (in parentheses) are corrected for clustering at the student level.

*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

economics course and 80 were enrolled in either of two upper-division economics courses. The students enrolled in introductory economics are largely representative of the freshman and sophomore student body, as introductory economics is a general education requirement for many majors and the majority (90 percent) of students are in their first or second year of school. The students we surveyed in the upper-division economics courses were primarily (90 percent) juniors and seniors.

A. *Survey Design*

As part of the survey, we collected information on general student characteristics, interest in the university football team, and about known or anticipated behavioral changes around the outcomes of university football games. We focused on alcohol consumption, partying, studying, and class attendance, with questions worded to elicit differences in these behaviors when the football team wins relative to when the football team loses. In our reported survey results, we limit the sample to non-first-year students—53 percent of our sample. While the patterns we report are insensitive to this restriction, this ensures that the survey respondents had experienced a regular season loss.[22]

drinking, and possibly spend less time studying and doing research.

[22] Figures for the first-year sample are available on request. In our preferred models, the influence of winning percentage on fall- erm grades is independent of post-season bowl activity (i.e., subsequent to fall term grades being posted). However, while first-year students had not experienced a regular season loss at the time of our survey, they had experienced a loss in the Bowl Championship Series game in January 2011. However, one might worry that such a loss may overly influence first-year students' perceptions of how they respond to wins versus losses. Anticipating this, we also asked students to compare "big games" to other games, where big games are described as

Table 8—Estimated Effects on Dropping Out, by Race

	All (1)	White (2)	Nonwhite (3)	Black (4)	Hispanic (5)	Asian (6)
Winning percentage	−0.014	−0.011	−0.036	−0.138*	−0.046	−0.002
	(0.009)	(0.010)	(0.025)	(0.080)	(0.051)	(0.030)
Male × winning percentage	0.004	0.000	0.034	0.225*	0.008	−0.011
	(0.013)	(0.014)	(0.037)	(0.129)	(0.075)	(0.045)
Male	−0.010	−0.010	−0.009	−0.113	−0.006	0.021
	(0.009)	(0.010)	(0.026)	(0.094)	(0.054)	(0.032)
Time trend	Yes	Yes	Yes	Yes	Yes	Yes
Student controls	Yes	Yes	Yes	Yes	Yes	Yes
Accumulated credits fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of unique students	26,802	23,338	3,464	431	911	2,126
Observations	71,372	62,048	9,324	1,100	2,363	5,870

Notes: The dependent variable is an indicator for not being observed in the next fall quarter or any subsequent quarter and not having graduated. The dependent variable is undefined for the last year of data, resulting in fewer observations than our previous analysis. Student controls include math and verbal SAT scores, high school GPA, age, and indicator variables for private school attendance, black, Hispanic, and Asian. The SAT groups (columns 1–3) are defined by student SAT score terciles. Standard errors (in parentheses) are corrected for clustering at the student level.

*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

B. *Survey Results*

To broadly measure academic time use related to football success, we collected student responses to the question, "Does the success of the University of Oregon football team decrease the amount of time you study for classes?" Figure 3 summarizes student responses, where categorical responses range from "definitely not" to "definitely." While both distributions are skewed right, the male distribution shows significantly higher mass to the right, which is consistent with relatively more males reporting a decrease in study time in response to football "success." In fact, 24 percent of males report that athletic success either "definitely" or "probably" decreases their study time, compared to only 9 percent of females.

Figure 4 presents student responses to questions regarding changes in alcohol consumption, partying, studying, and class attendance—comparing behaviors when the team wins to when the team loses. In panel A, we see that roughly 28 percent of males report a tendency to increase alcohol consumption when the football team wins rather than loses, while only 20 percent of females report the same.[23] Although this difference is not statistically significant, the results indicate a large effect on males and females and remain suggestive of a more pronounced effect for males.

Panel B presents similar results for partying. Despite being unable to determine all activities encompassed by students' definitions of partying, this question allows

"a game against a rivalry team, a ranked team, a game that involves significant hype, etc." While we do not highlight these responses, similar patterns also appear in these survey responses.

[23] Conditional on reporting that one consumes alcohol, which we collected in the survey, the estimated difference increases to 12 percentage points ($p = 0.155$).

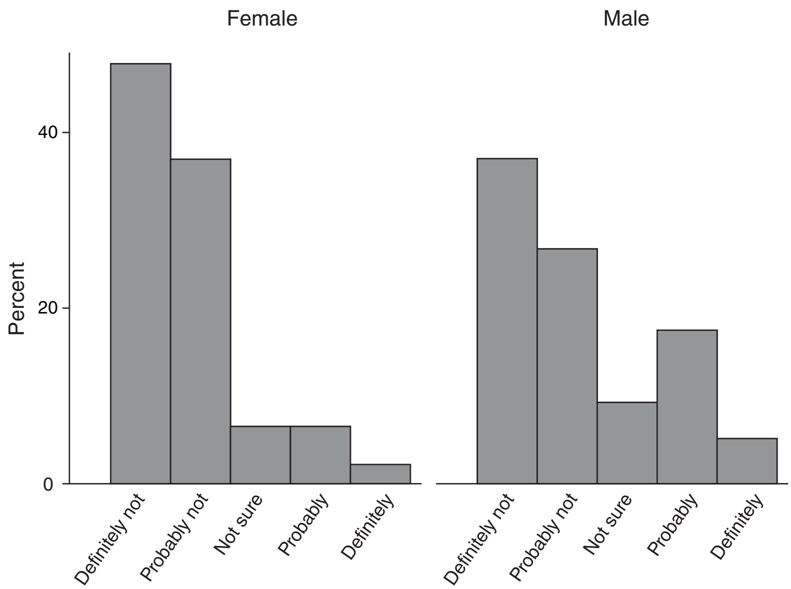

Figure 3. Responses to the Question: "Does The Success of the University of Oregon Football Team Decrease the Amount of Time You Study for Classes?"

Note: The sample has been limited to non-first-year students.

us to broadly account for additional behavioral responses beyond alcohol consumption that are associated with increased excitement following a win. We observe that 28 percent of females report increased partying when the team wins versus 47 percent of males.[24]

In terms of educational activities, panel C shows that the difference between males and females reporting that they study less when the team wins is approximately 14 percent. Panel D indicates that female students are slightly more likely to indicate an increased tendency to miss class associated with a win. However, the result is small in magnitude and not significant.

In summary, our survey results lend strong support for a differential impact of athletic success on male and female behaviors. Both in absolute terms and relative to females, athletic success decreases males' academic time investments and increases time spent in distracting or risky behaviors. That said, we also find an impact on female behaviors, including studying, alcohol consumption, and partying. While our previous empirical analysis of grades can primarily speak to relative performance, our survey results suggest that the impact of athletic success on academic performance or learning likely extends to females.

[24] This difference is statistically significant at the 5 percent level.

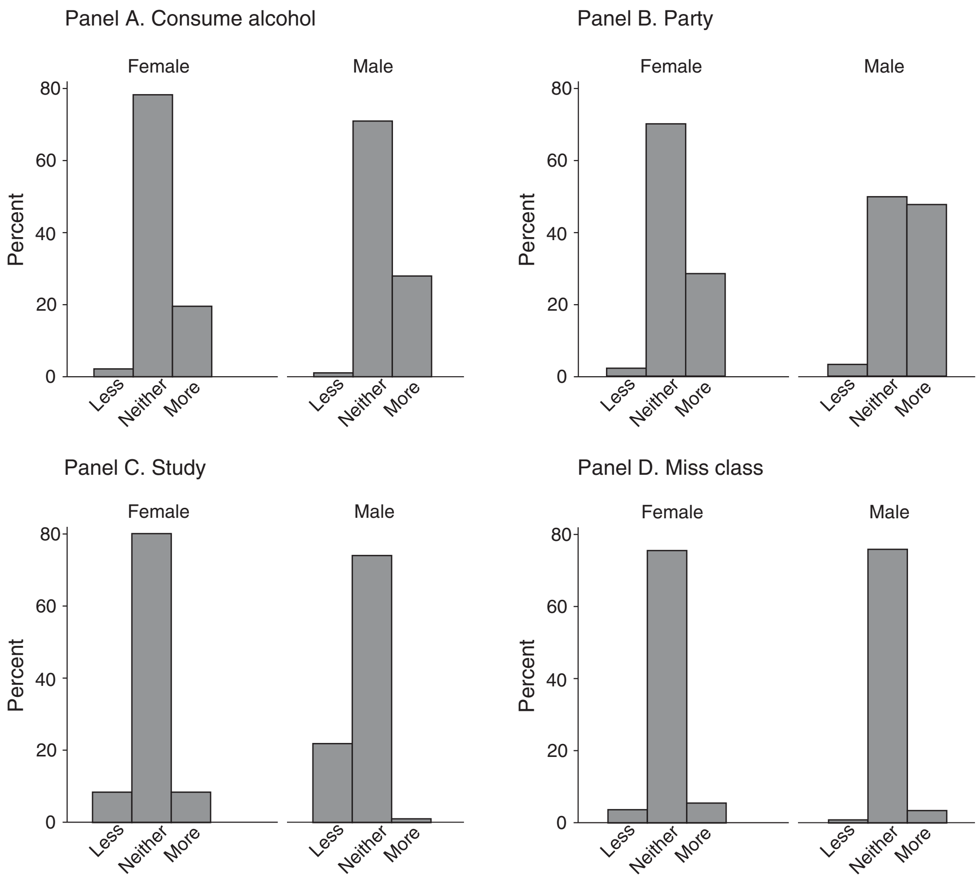

Figure 4. Responses to the Question: "Compared to a Loss, When the Football Team Wins I Tend to..."

Note: The sample has been limited to non-first-year students.

V. Discussion and Conclusion

We identify the effect of football success with student class-level data spanning nine football seasons, 1999 through 2007. Our preferred specifications include individual-student fixed effects to identify the effect off of longitudinal variation. That is, our preferred estimates are based on considering how a student's grades deviates from his or her own average grades as the winning percentage varies from its average, and then how this response varies across gender. With our analysis we show that male grades fall significantly with the success of the football team, both in absolute terms and relative to females. There is also pronounced heterogeneity among students, suggesting that the impact is largest among students from relatively disadvantaged backgrounds and those of relatively low ability.

We also find evidence that the success of the football team reduces the probability that some students drop out. In particular, the groups of females whose GPAs increase with the success of the football team (i.e., those with low ability, those with high financial need, and blacks) are less likely to drop out of school after a successful season. At the same time, we cannot determine whether this result is driven by their improved academic performance or by more direct effects of the team's success. That said, we find no evidence that the success of the football team has any impact on males' dropout behavior, which may be due to offsetting effects of impaired academic performance and greater enjoyment of the academic year.

In addition to our main analysis, we offer insight into the underlying mechanisms that may be driving the systematic patterns evident in measured academic performance. In particular, we elicit student responses to questions about behaviors around football outcomes. Beyond confirming that there is a high level of student viewership and interest in football, survey responses reveal pronounced gender differences in behavioral responses to athletic success. Relative to females, males report being more likely to increase alcohol consumption, decrease studying, and increase partying around the success of the football team. Yet, both male and female students report that their behavior is responsive to athletic success. This suggests that female performance is likely affected by the performance of the football team as well, but that this effect is masked by grade curving.

We view our research as taking one of the first steps toward documenting the nonmonetary costs associated with college athletics. Of course, whether it is desirable to be investing large amounts of public and student money in college sports requires a broad consideration of all costs, in addition to the benefits that might be generated.

Appendix

Student Survey

1) What is your gender?
   a) Male
   b) Female

2) What year of school are you in at the University of Oregon?
   a) in my first year
   b) second
   c) third
   d) fourth
   e) fifth or greater

3) Of the 12 regular-season University of Oregon football games in the 2010 season, how many did you watch on TV or in person?
   a) 0
   b) 1–3
   c) 4–7
   d) 7–10
   e) 10+

4) Of the 12 regular-season University of Oregon football games in the 2010 season, how many did you watch in person?
   a) 0
   b) 1–3
   c) 4–7
   d) 7–10
   e) 10+

5) When did you first start following the University of Oregon football team?
   a) before deciding to attend the University of Oregon.
   b) after deciding to attend the University of Oregon.
   c) I do not follow the football team.

6) For a typical University of Oregon football game, do you consume more alcohol before, during, or after the game?
   a) before
   b) during
   c) after
   d) none of the above

For questions 7 through 10: Compared to a loss, when the football team wins I tend to

7) a) drink more alcohol.
   b) drink less alcohol.
   c) neither drink more or less. My drinking behavior doesn't change based on whether or not the football team wins.

8) a) party more.
   b) party less.
   c) neither party more or less. My partying behavior doesn't change based on whether or not the football team wins.

9) a) spend more time studying for your classes.
   b) spend less time studying for your classes.
   c) neither study more or less. My studying behavior doesn't change based on whether or not the football team wins.

10) a) miss class more often.
    b) miss class less often.
    c) My attendance doesn't change based on whether or not the football team wins.

For questions 11–14 consider the following: Compared to other games, leading up to a "big game" (a big game being defined as a game against a rivalry team, a ranked team, a game that involves significant hype, etc...) I tend to

11) a) drink more alcohol.
    b) drink less alcohol.
    c) neither. My drinking behavior doesn't change leading up to a "big" game.

12) a) party more.
    b) party less.
    c) neither. My partying behavior doesn't change leading up to a "big" game.

13) a) spend more time studying for your classes.
    b) spend less time studying for your classes.
    c) neither. My studying behavior doesn't change leading up to a "big" game.

14) a) miss class more often.
    b) miss class less often.
    c) neither. My class attendance doesn't change leading up to a "big" game.

For questions 15–18: Compared to other games, after a winning a "big game" I tend to

15) a) drink more alcohol.
    b) drink less alcohol.
    c) neither. My drinking behavior doesn't change after a big win.

16) a) party more.
    b) party less.
    c) neither. My partying behavior doesn't change after a big win.

17) a) spend more time studying for your classes.
    b) spend less time studying for your classes.
    c) neither. My studying behavior doesn't change after a big win.

18) a) miss class more often.
    b) miss class less often.
    c) neither. My class attendance doesn't change after a big win.

19) Does the success of the University of Oregon football team decrease the amount of time you study for classes?

    a) definitely   d) probably not
    b) probably   e) definitely not
    c) not sure

20) Have you consumed alcohol since the beginning of fall term this year?
    a) yes   b) no

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