

Does Drinking Impair Student Performance? Evidence from a Regression Discontinuity Approach

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Abstract

This paper examines the effect of alcohol consumption on student achievement by exploiting the discontinuity in drinking at age 21 at a college in which the minimum legal drinking age is strictly enforced. We find that drinking causes significant reductions in academic performance, particularly for the highest-performing students. This suggests that the negative consequences of alcohol consumption extend beyond the narrow segment of the population at risk of more severe, low-frequency, outcomes. Thus, our results indicate policies that combat drinking—particularly binge drinking that occurs around age 21—may well have large positive effects that are broader than previously known.

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Economists and other social science researchers have devoted significant effort toward understanding the effects of alcohol consumption. However, nearly all of this research has focused on low-frequency outcomes such as mortality and teen pregnancy (Carpenter and Dobkin, 2009; Dee, 1999; Dee 2001; Fertig and Watson, 2009; Saffer, 1997). In contrast, little is known about the effect of drinking on the majority of users. In addition, identifying the causal effect of alcohol consumption is difficult since individuals likely select into drinking based on unobserved characteristics that affect outcomes. Moreover, efforts to exploit state-level variation such as alcohol taxes or adoption of minimum legal drinking age laws have also been problematic. That is, there are concerns that the timing of the drinking age laws may be endogenous (Miron and Tetelbaum, 2007), while efforts to exploit tax differences across states have been limited by the relative weakness of taxes as an instrument (e.g., Chaloupka and Wechsler, 1996) and the corresponding imprecision of labor market outcome estimates (Dave and Kaestner, 2002).

In this paper, we examine the impact of drinking on academic performance in college. In doing so, this study contributes to the existing literature and the corresponding policy debate in several ways. First, examining the impact of drinking in a college context allows for us to gauge the impact of drinking on a wide range of students, rather than focusing on low frequency outcomes that affect relatively few individuals. In addition, understanding the impact of drinking during college is itself particularly important for public policy, since college is a critical time in the human capital formation process that can significantly impact future labor market outcomes. Indeed, concern regarding the harmful effects of drinking in college is reflected by the Amethyst Initiative, in which 135 university presidents and chancellors argue that current policy has resulted in “binge-drinking” and thus ought to be reexamined.

Another distinct advantage of our approach is that by studying the impact of drinking in a college environment in which underage drinking is strictly prohibited, we can distinguish the effect of drinking from confounding factors. To do so, we utilize a regression discontinuity design in comparing the grades of students who turned 21 just before final exams to those who turned 21 just afterward.¹ Under the plausible identifying assumption that other determinants of performance are smooth through age 21, any discontinuous changes in performance are properly interpreted as the causal impact of drinking on performance.

We use administrative data on 5,492 students at the United States Air Force Academy (USAFA) between 2000 and 2007. This educational setting offers two distinct advantages for our analysis. First, in contrast to many college campuses, the explicit ban on underage drinking at the USAFA is strictly enforced; violations can lead to expulsion.² As a result, in an anonymous survey of underage students in our sample, only 17.4 to 27.4 percent of students reported drinking *any* alcohol at all over the previous year. By comparison, the National Institute on Alcohol Abuse and Alcoholism (NIAAA) reports that 83% of college students nationwide drink, and that 41% of college students reported consuming five or more drinks on a single occasion within the past two weeks (NIAAA, 2010).³ The second advantage of using USAFA data is a consistent measurement of academic achievement. Students at USAFA are required to take a core set of approximately 30 courses in mathematics, basic sciences, social sciences, humanities, and engineering. For these core courses, students have no discretion in choosing their professors. Furthermore, exams are standardized across different sections of the

¹ This research design is similar to that used by Carpenter and Dobkin (2009) to estimate the effect of drinking on mortality.

² Per the AFCWMAN36-3501, Section 1.6.1, two incidents of underage drinking result in the expulsion of the student. Additionally, some single incidents such as driving under the influence (DUI) result in expulsion.

³ Additionally, in a self-reported sample of 10,424 college freshmen across 14 schools taken in the fall semester of 2003, roughly 55% reported drinking alcohol during a two week time period. Among those who drank, there were on average 4.35 (sd = 2.99) drinking occasions for male students and 3.35 (sd=2.32) drinking occasions for female students within that two-week period (White, Kraus, and Swartzwelder, 2006).

same course. These attributes lessen the scope for professor subjectivity and student selection into courses that might correlate with date of birth.

Results from our analysis indicate that alcohol consumption significantly reduces academic performance by nearly one tenth of a standard deviation, or approximately as much as being assigned a professor whose quality is one standard deviation below average. Strikingly, the negative effects are largest for the highest-performing students at the academy. This suggests that the negative consequences of alcohol consumption are not limited to a small fraction of users or even to those who might naturally struggle with academics. Thus, our findings suggest that policies that reduce binge drinking may well have broader positive impacts than previously anticipated.

1. Identification Strategy

In order to estimate the causal impact of drinking on student performance, we apply a regression discontinuity design⁴ to exploit the sudden increase in drinking that occurs at age 21. This approach is similar to that used to examine the impact of Head Start (Ludwig and Miller, 2007) and, more recently, the effect of alcohol consumption on mortality (Carpenter and Dobkin, 2009). The identifying assumption of the design is that while other determinants of performance such as motivation or maturity vary smoothly over age 21, access to and consumption of alcohol varies discontinuously at that point. This smoothness assumption appears to be particularly reasonable when treatment depends on age because in contrast to other outcomes such as test scores, there is little scope for individuals to change their 21st birthday by a few days or weeks. Moreover, current evidence indicates that there is a discontinuous increase in alcohol consumption at age 21; Carpenter and Dobkin (2009) report that a 21 percent increase in recent

⁴ Imbens and Lemieux (2008) offer a thorough description of regression discontinuity design.

drinking days at age 21. Similarly, although we cannot directly test how much more students in our data drink once they turn 21 than those just about to turn 21, we can report that there is significant variation on the extensive margin: In a 2004 USAFA survey of students, nearly 90 percent of students 21 years or older reported drinking in the previous year. This compares to at most only 27.4 percent of students under the age of 21.

To formally test for discontinuities in academic performance at age 21, we estimate the following equation:

$$\text{CourseScore}_{ic} = \beta_0 + \beta_1 \text{Age21}_i + \beta_2 f(\text{Age})_i + \varepsilon_{ic}$$

where CourseScore_{ic} is the final score earned in course c by student i , Age21 is an indicator variable equal to one if the student is at least 21 years old at the time of the exam, and $f(\text{Age})$ is a flexible polynomial of one's age at the time of the exam which we allow to take different forms on either side of the cutoff. Under the identifying assumption that other determinants of achievement are continuous at the age 21 cutoff, β_1 will be an unbiased estimate of the effect of the increase in drinking at age 21 on academic performance. Standard errors are clustered at the birthday level (month/day/year), which accounts for the fact that students are observed with scores in multiple courses.

In addition to the equation above, we also estimate specifications in which we additionally control for course by section fixed effects, graduating class by semester by year at USAFA fixed effects, birth year fixed effects, SAT verbal, SAT math, academic composite, algebra/trig placement score, leadership composite, fitness score, and indicator variables for Black, Hispanic, Asian, recruited athlete, and preparatory school attendance. These additional controls account for any course, teacher, classroom, or cohort-level common shocks to student performance.

While the regression discontinuity approach used in this paper offers a clean way of estimating the impact of drinking on performance, it is subject to a specific interpretation. For example, the estimates will reflect the effect of the type of drinking that occurs on and immediately after one's 21st birthday, which may be closer to binge drinking than other types of drinking.⁵ In addition, the estimates we obtain reflect only the short-term consequences of drinking and may not capture the effect once individuals adjust to their tendency to drink. Thus, our estimates may overstate the effect drinking over longer time horizons.

On the other hand, the estimates presented here may well understate the longer-term effects of drinking. For example, "treated" individuals in our study have only been drinking for a week or so, which means that drinking could not have affected cognitive learning throughout the course of the semester. Consequently, estimates here are best interpreted as the effect of drinking on performance, rather than the effect of drinking on learning.

2. Data

Our data include student-level observations for each course taken during the 2000-01 through the 2006-07 academic years. From this sample, we exclude physical education courses and observations on freshmen students and students who had attended military preparatory school.⁶ In addition, we exclude observations in which the final exam was taken more than 270 days before or after one's 21st birthday. This leaves a sample of 74,247 observations on 5,492 students. Each observation measures the final score achieved by each student in each course.

⁵ We note, however, that Carpenter and Dobkin (2009) report a sustained increase in drinking at age 21 rather than a temporary spike.

⁶ We exclude freshmen because only a small fraction of students turn 21 during their freshman year and freshman at USAFA are prohibited from drinking alcohol, regardless of age. In addition, students who attended military preparatory school can be considerably older than average college student and are the less representative of college-students more generally. We note, however that our results are not sensitive to the exclusion of these students. Appendix Table 1 shows results when relaxing our sample restrictions. Specifically, the estimated discontinuity for the full sample is 0.082, which compares to a reported estimate of 0.092 in Column 2 of Panel 2 in Table 2.

Summary statistics from our data are shown in Table 1. The average combined SAT score of students in our sample is approximately 1,300, which is similar to other undergraduate institutions such as UCLA, University of Michigan, University of Virginia, and UNC-Chapel Hill. Eighteen percent of the sample is female, 3 percent is Black, 4 percent is Hispanic, and 5 percent is Asian. The average score achieved in academic courses was 82 percent, which corresponds to a mean grade point average of 2.9.⁷

3. Results

3.1 The Discontinuity in Drinking at Age 21

Although we cannot match student-level data on drinking to our sample, there is evidence of a large increase in drinking at age 21 at the USAFA. In the anonymous USAFA Climate Survey, a small proportion of students under the age of 21 report having a drink since coming to USAFA (2003: 27.4%, 2004: 17.4%, 2005: 18.2%) while in 2004, approximately 90 percent of students 21 years or older reported having a drink in the previous year. Moreover, this difference likely understates the true increase in drinking at age 21 at the USAFA because it only represents the increase in drinking on the extensive margin. Indeed, while we do not have data on the frequency or intensity of drinking at the academy, Carpenter and Dobkin (2009) report a 21 percent increase in the proportion of days drinking at age 21. In addition, it is likely that the majority of the underage drinking that does occur by students at the USAFA is done while off-campus during holiday breaks, when students are no longer under the watchful eye of their superiors. Finally, once students at the USAFA turn 21 years of age, social drinking is quite

⁷ These statistics represent the academic achievement of students in our sample within 180 days of their 21st birthday.

accessible because a campus bar is located adjacent to the student dormitories.⁸ Thus, the evidence suggests that there is a significant increase in drinking at age 21 at the USAFA.

3.2 Tests of the Validity of the RD Design

The primary threat to identification in a RD design comes from the possibility of nonrandom sorting of students to either side of the cutoff. While the scope for such sorting seems limited, if not impossible, given both the inflexibility of age and the timing of the final exam schedule at the USAFA, we can nonetheless test the identifying assumption that other determinants of achievement are smooth through the age 21 threshold.

We first examine whether there is evidence of sorting graphically. Figure 1 shows the distribution of observations around the age 21 cutoff, which shows the density is smooth across the minimum drinking age cutoff. Graphically there is little evidence of nonrandom sorting near age 21.⁹

In addition, we also test whether a variety of predetermined characteristics vary smoothly across the age 21 cutoff, including math and verbal SAT scores, academic composite scores, math placement exam scores, leadership composite scores, and fitness scores. Results are shown in Figure 2, in which the open circles represent local averages and the line is the predicted score. Corresponding regression discontinuity estimates are shown in Table 2. Both the visual evidence and regression estimates reveal no evidence of discontinuities in predetermined characteristics at age 21. Collectively, these results are supportive of the identifying assumption that while drinking is discontinuous at age 21, other determinants of performance are continuous.

⁸ Hap's Place Lounge is located in the campus student union, called Arnold Hall, adjacent to the student dormitories. Students at the USAFA are required to reside in the dormitories. A student-made video of Hap's Place can be found at: <http://www.youtube.com/watch?v=LHWNN9-c0ho>.

⁹ To further test this result, we performed chi-squared goodness of fit tests by semester. For the first ten semesters of data, we fail to reject the null hypothesis of uniformity at a 5% level. In the final three semesters of data, the frequency of birthdates is skewed due to the absence of data from the rising class. The main results of our paper are robust to the exclusion of these final three semesters of data.

3.3 The Estimated Effect of Drinking on Academic Performance

Figure 3 provides a graphical representation of the effect of drinking on academic performance. The results indicate that students who turn 21 just prior to taking final exams score approximately one-tenth of a standard deviation lower than students who turn 21 just after finals. This drop in performance is both statistically and economically significant; it is roughly the same effect as having a professor whose quality is one standard deviation below the mean (Carrell and West, 2009).

Corresponding regression discontinuity estimates are shown in Table 3, which includes observations on all courses in which the final exam was taken within 180 days of the student's 21st birthday. Columns 1 and 2 show the estimates from specifications without and with controls, respectively, while Column 3 shows the estimate when allowing for quadratic functions of age on either side of the age 21 cutoff. All three specifications show that drinking causes a statistically significant reduction in performance on the order of approximately one-tenth of a standard deviation.

To test the robustness of these results, we estimated specifications using different bandwidths, different polynomials of age, and with and without individual controls. Results are shown in Table 4, where Panel A shows results from specifications without controls and Panel B shows results with controls. Columns 1 through 6 shows results for bandwidths of 9, 8, and 7 months, where odd-numbered columns include a linear polynomial of age and even-numbered columns include a quadratic. Columns 7 through 10 control for linear functions of age for bandwidths of 150, 120, 100, and 80 days. Columns 11 through 14 show results for bandwidths of 80, 60, 40, and 20 days. In those specifications no controls for age are included, under the

assumption that among those sufficiently close to their 21st birthday, whether one can drink is essentially random. Consistent with the visual evidence in Figure 1 as well as the results of Table 2, estimates indicate that drinking causes a statistically significant performance drop of 0.06 to 0.10 standard deviations in the course.

Next, we examine which students are most affected by drinking. Table 5 shows results when we split the sample into two groups by cumulative GPA at the end of the freshman year. Strikingly, we find that the largest negative effects of drinking are the high-ability students who were in the top 50 percent of the GPA distribution at the end of their freshman year. Point estimates in Column 2 indicate that these students experience a drop in course performance of 0.110 standard deviations, or more than the effect of being assigned a professor whose quality was one standard deviation below average. This result is shown graphically in Figure 4, which shows the discontinuous drop in performance for students whose freshmen GPAs placed them in the top half of their class.

Columns 4 and 5 of Table 5 show results for men and women, respectively. The estimate for men is negative and statistically significant while that for women is not, though we note the latter is imprecisely estimated due to the smaller number of women at the academy.

In summary, our results yield two notable findings. We find that there is a large and statistically significant discontinuous drop in college performance at age 21 that is robust across various bandwidths and functional forms. The drop in performance from the short-term increase in drinking in the weeks prior to final exams is economically significant, as it is approximately the same as the effect of being assigned to a professor whose quality is one standard deviation below the mean in quality for the entire semester. We also find that the largest negative effects of drinking are on the high-ability students and for men.

3.4 Robustness and Falsification

To test the robustness of our findings, in Table 6, Column 2, we show that our results are virtually unchanged when including freshman students and students who attended a military preparatory school prior to entering the USAFA. As a second robustness check, we restrict our observations to the required core courses taken by all students at the USAFA. These courses have the advantage of common examinations for all students taking the course in a given semester and eliminate any possible concerns of self-selection of courses during the semester in which a student turns 21 years of age. Again, our results remain virtually unchanged compared to our main specification.

Finally, an alternative interpretation of the performance decline at age 21 is that it represents the effect of birthdays generally, rather than the effect of drinking. To test this hypothesis, we perform a similar regression discontinuity analysis for students turning 20. If the performance declines estimated earlier are the result of a birthday effect rather than the increase in drinking at age 21, we would expect to observe a similar decline at ages 20. Results are shown in Figure 6, with corresponding regression discontinuity estimates presented in Table 6, Column 4. The results show a small and statistically insignificant decline in performance, with the magnitude of the effect is about one-third of that observed at age 21.

4. Conclusion

While there has been a considerable amount of research on the consequences of alcohol consumption, existing studies have faced one of two significant limitations. First, attempts to exploit state-level laws have resulted in questions regarding both the relevance and the validity

of the instruments. Second, the majority of the existing research has focused on low frequency outcomes such as out-of-wedlock childbearing and fatalities, so it is unclear whether drinking has consequences on a broader set of individuals.

This study addresses the consequences of drinking on academic performance in college, which allows us to examine a high frequency individual-level outcome. To overcome the identification problem caused by selection into drinking, we exploit the discontinuity in drinking that occurs at age 21 at a unique educational institution in which the minimum legal drinking age is strictly enforced. Results show that drinking prior to and during final exam week causes a statistically and economically meaningful reduction in academic performance. The performance drop is of approximately the same magnitude as being assigned to a professor whose quality is one standard deviation below average.

Moreover, we find that these effects are largely driven by the highest-performing students. This suggests that the negative consequences of drinking are not limited to the narrow segment of the population at risk of more severe, low-frequency outcomes. Thus, our results indicate policies that combat drinking—particularly the type of binge drinking that occurs around age 21—may well have large positive effects that are broader than previously known.

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Figure 1: Distribution of Final Exam Observations Near Age 21

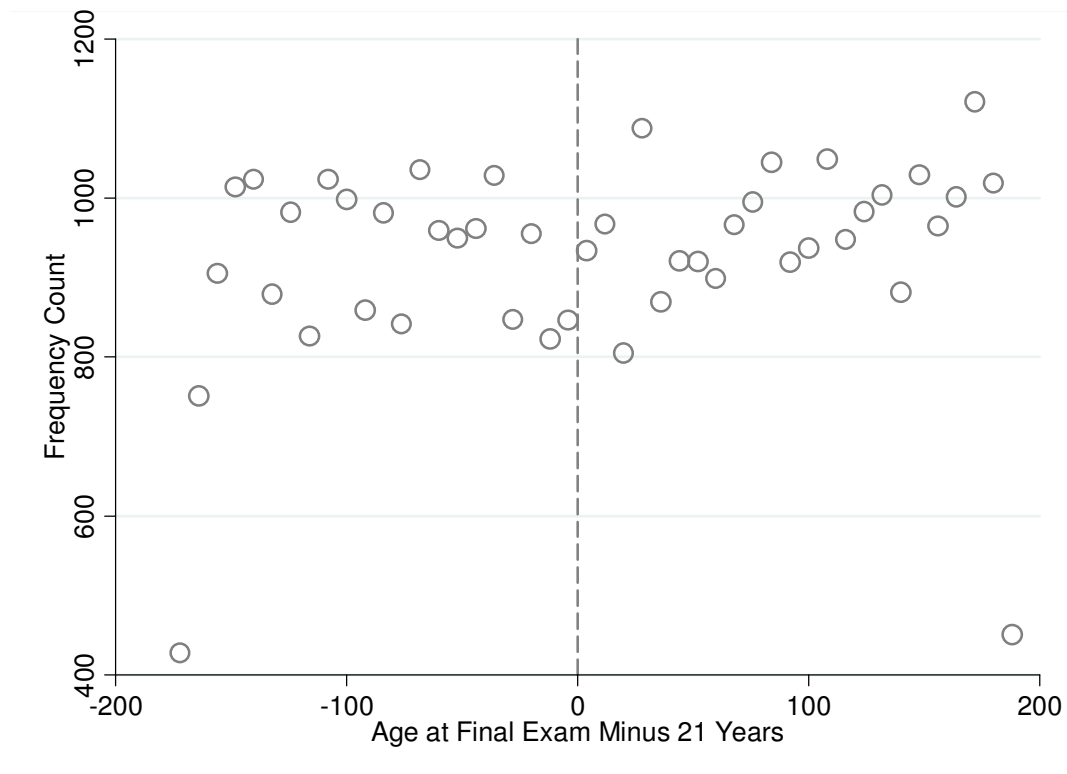


Figure 2: Tests of the Regression Discontinuity Design

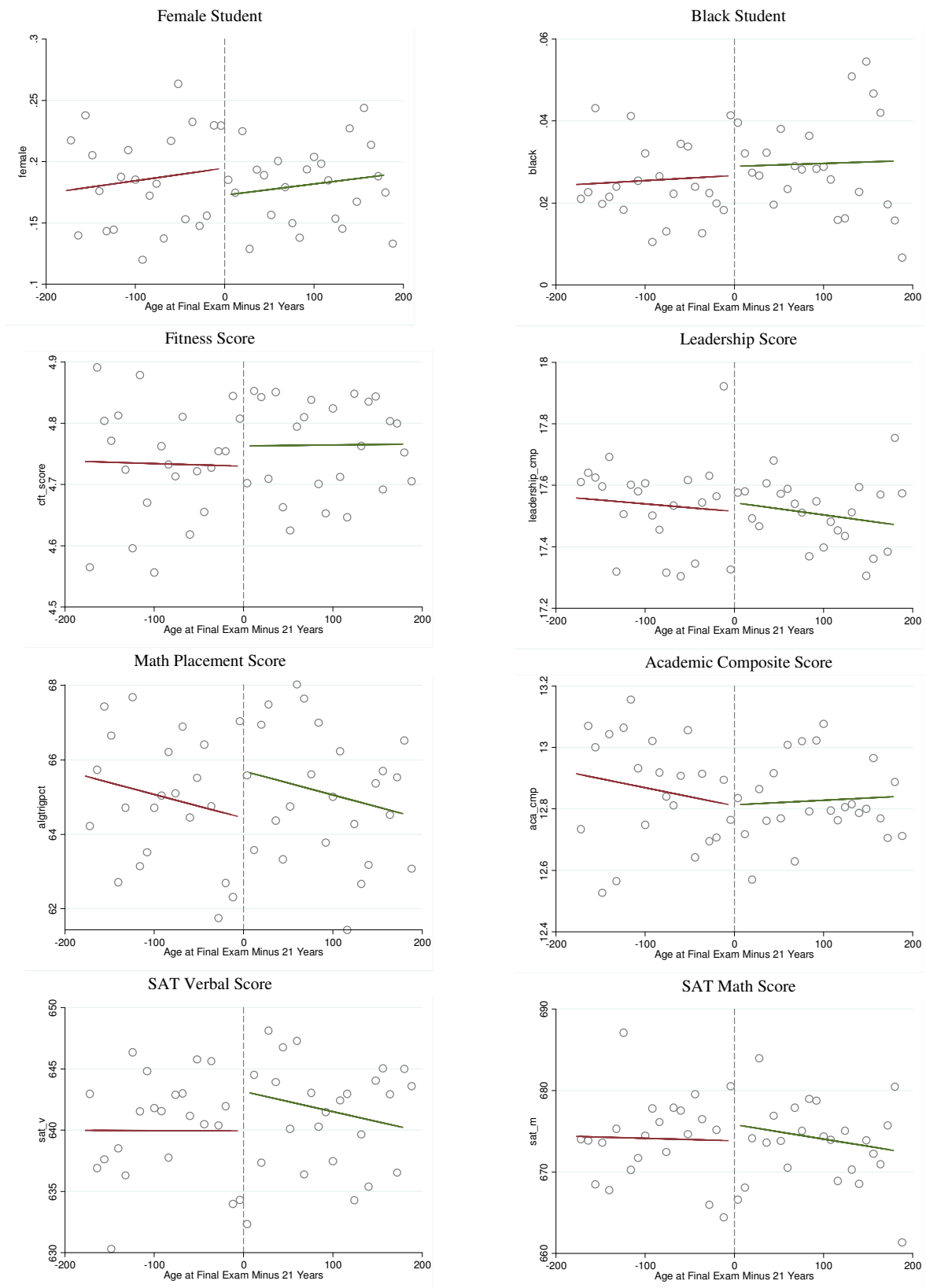


Figure 3: Regression Discontinuity Estimates of the Effect of Drinking on Achievement

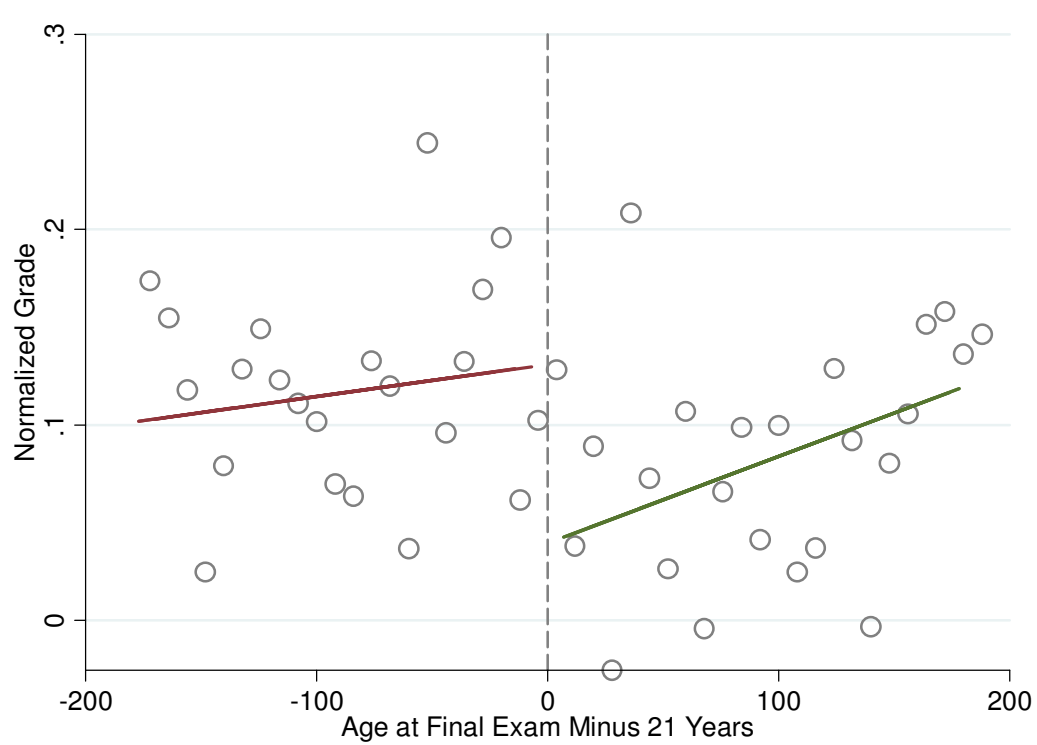
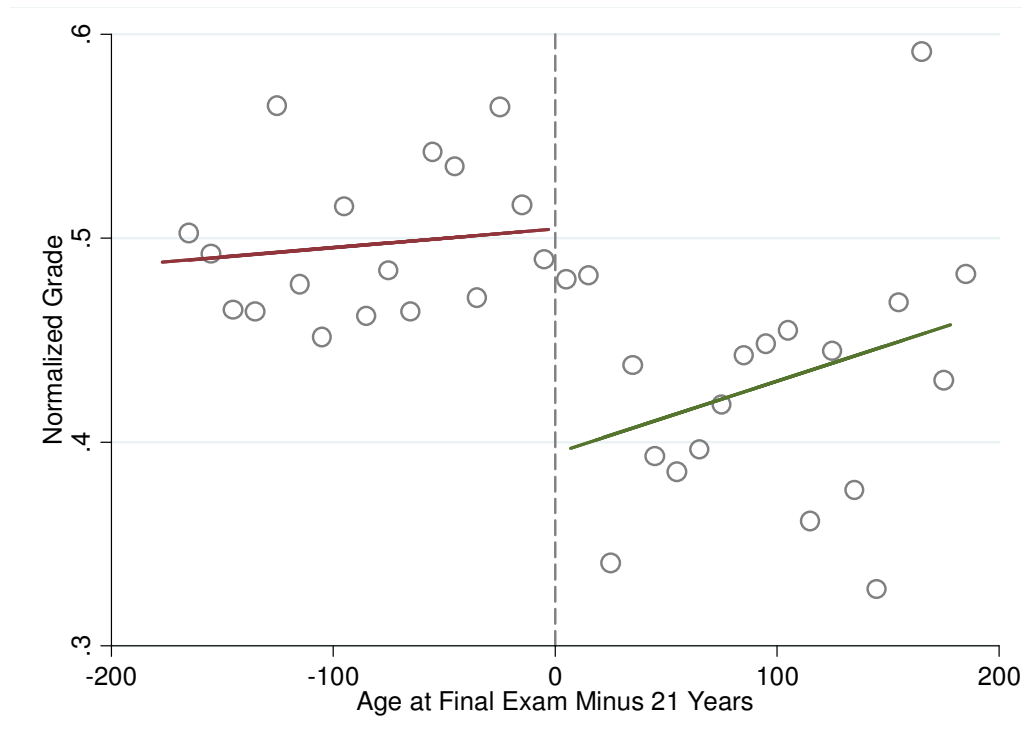


Figure 4: Regression Discontinuity Estimates for High- and Low-Ability Students

A. High Ability Students



B. Low Ability Students

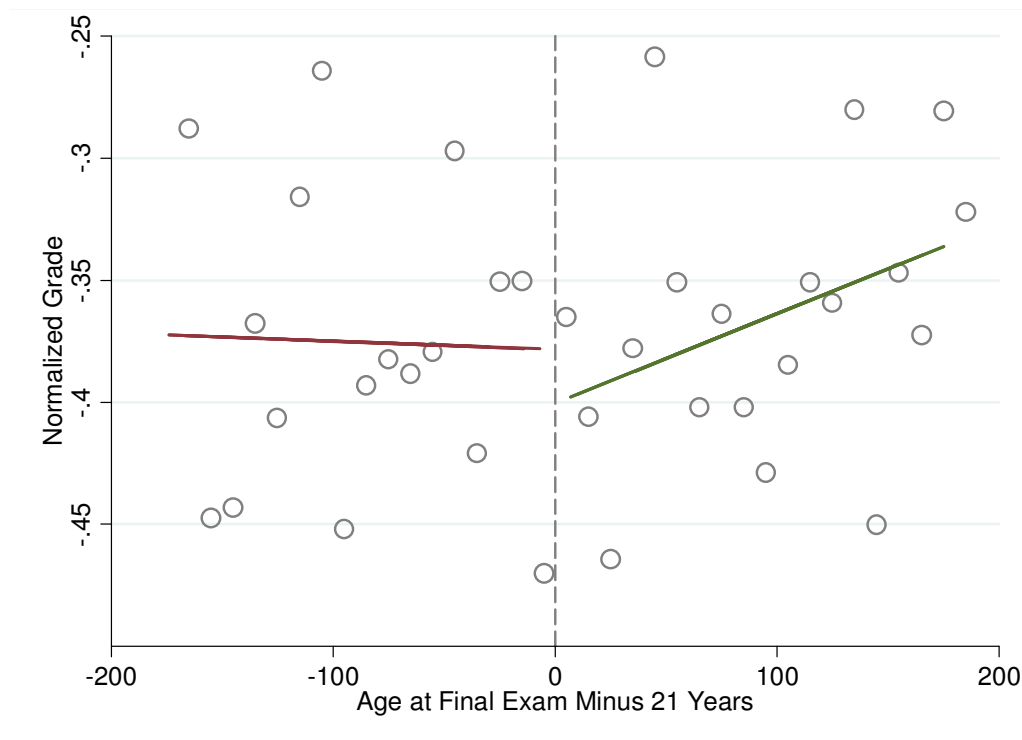


Figure 6: The Birthday Effect of Turning 20 Years Old on Academic Achievement

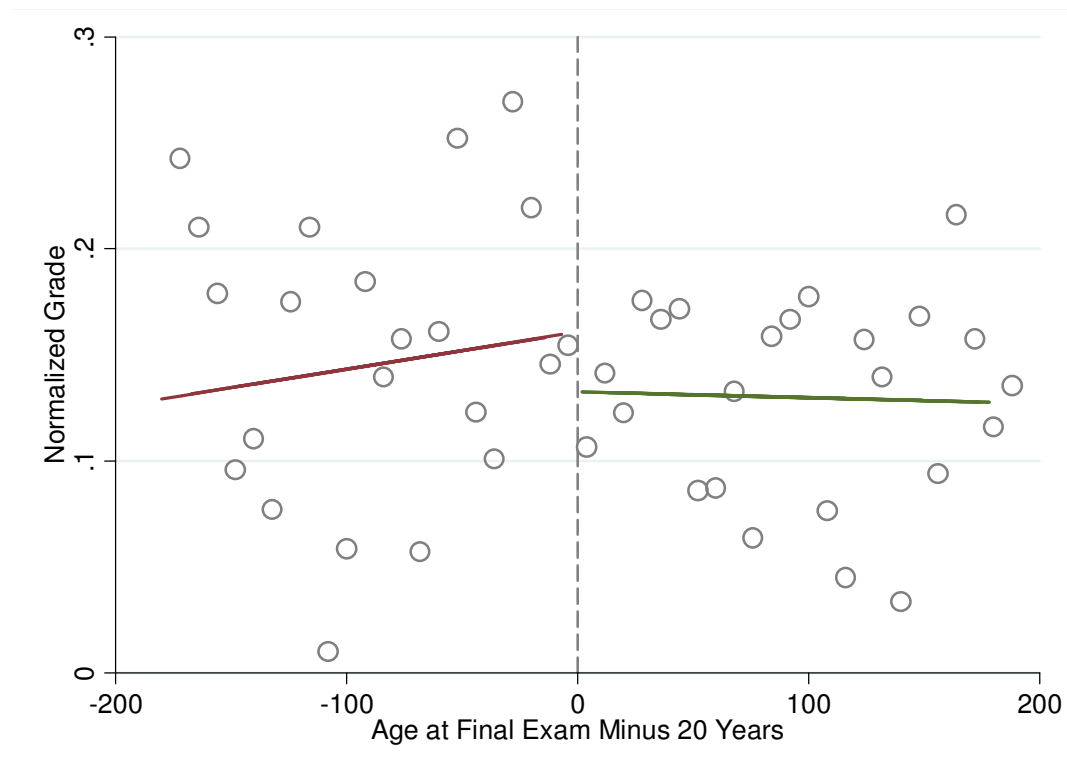


Table 1: Descriptive Statistics

Variable	Mean (std. dev)	Range
Course Score	82.43 (8.87)	0-117.73
Age (days from 21st birthday during finals week)	3.36 (103.92)	-180-179
Black	0.03 (0.17)	0-1
Hispanic	0.04 (0.20)	0-1
Asian	0.05 (0.21)	0-1
Female	0.18 (0.39)	0-1
SAT Verbal Score	639.90 (60.29)	340-800
SAT Math Score	673.02 (57.06)	420-800
High School Academic Composite Score	12.80 (2.04)	405-513
High School Leadership Score	17.54 (1.85)	-0.57-0.55
High School Fitness Score	4.77 (0.90)	623-709
Recruited Athlete	0.27 (0.44)	0-1

Notes: Figures come from 42,559 observations on 4,349 students. Excludes freshman and students who attended a military preparatory school.

Table 2: Tests of the Identifying Assumption of the RD Analysis

Outcome	SAT Math	SAT Verbal	Academic Composite	Math Placement Exam	Leadership Composite	Fitness Score
	1	2	3	4	5	6
Discontinuity at Age 21	1.988 (2.66)	3.212 (2.60)	0.003 (0.09)	1.263 (0.92)	0.028 (0.08)	0.033 (0.04)
Observations	42,623	42,623	42,623	42,623	42,623	42,623

Notes: Each cell represents results for separate regression where the dependent variable is normalized course grade and the key independent variable is an indicator for Age 21. Standard errors clustered by age are in parentheses. All specifications control for a linear function of distance from Age 21 in which the slope is allowed to vary on either side of the cutoff.

* Significant at the 0.10 level

** Significant at the 0.05 level

*** Significant at the 0.01 level

Table 3: Regression Discontinuity Estimates of the Effect of Drinking on Academic Performance

Specification	1	2	3
Discontinuity at Age 21	-0.092*** (0.03)	-0.119*** (0.02)	-0.106*** (0.03)
Observations	42,559	42,559	42,559
Age Polynomial	Linear	Linear	Quadratic
Control Variables	No	Yes	Yes

Notes: Each cell contains results for separate regression where the dependent variable is normalized course grade and the key independent variable is an indicator for age 21. Standard errors clustered by age are in parentheses. All specifications control for a flexible polynomial of age in which the slope is allowed to vary on either side of the cutoff. Data include all observations on student performance within 180 days of their 21st birthday. Controls include course by semester by year fixed effects, graduating class by semester by year at USAFA fixed effects, birth year fixed effects, SAT math and verbal scores, academic composite score, algebra/trig placement score, leadership composite score, fitness score, and indicator variables for Black, Hispanic, Asian, recruited athlete, and preparatory school attendance.

* Significant at the 0.10 level

** Significant at the 0.05 level

*** Significant at the 0.01 level

Table 4: Robustness Checks

Bandwidth	270 Days		240 Days		210 Days		150 Days	120 Days	100 Days	80 Days		60 Days	40 Days	20 Days
Panel A: No Controls	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Discontinuity at Age 21	-0.055** (0.03)	-0.090** (0.04)	-0.056** (0.03)	-0.074*** (0.02)	-0.101*** (0.04)	-0.066** (0.03)	-0.105*** (0.04)	-0.086** (0.04)	-0.093** (0.04)	-0.080* (0.04)	-0.064*** (0.02)	-0.082*** (0.03)	-0.063* (0.03)	-0.071* (0.04)
Panel B: With Controls	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Discontinuity at Age 21	-0.065*** (0.02)	-0.126*** (0.02)	-0.074*** (0.02)	-0.148*** (0.03)	-0.081*** (0.02)	-0.135*** (0.03)	-0.125*** (0.02)	-0.140*** (0.03)	-0.142*** (0.03)	-0.130*** (0.04)	-0.096*** (0.03)	-0.105** (0.04)	-0.073 (0.05)	-0.086 (0.10)
Observations	63,742	63,742	56,562	56,562	56,562	49,553	49,553	28,304	23,454	18,778	18,778	13,813	9,036	4,474
Age Polynomial	Linear	Quadratic	Linear	Quadratic	Linear	Quadratic	Linear	Linear	Linear	Linear	None	None	None	None

Notes: Each cell represents results for separate regression where the dependent variable is normalized course grade and the key independent variable is an indicator for age 21. Standard errors clustered by age are in parentheses. Controls include course by semester by year fixed effects, graduating class by semester by year at USAFA fixed effects, birth year fixed effects, SAT math and verbal scores, academic composite score, algebra/trig placement score, leadership composite score, fitness score, and indicator variables for Black, Hispanic, Asian, recruited athlete, and preparatory school attendance.

* Significant at the 0.10 level

** Significant at the 0.05 level

*** Significant at the 0.01 level

Table 5: Regression Discontinuity Estimates by Subgroup

Sample	Main Results	Top Half Freshman GPA	Bottom Half Freshman GPA	Male	Female
Panel A: No Controls	1	2	3	4	5
Discontinuity at Age 21	-0.092*** (0.03)	-0.110*** (0.04)	-0.022 (0.04)	-0.107*** (0.03)	-0.006 (0.07)
Panel B: Controls	1	2	3	4	5
Discontinuity at Age 21	-0.119*** (0.02)	-0.173*** (0.03)	0.002 (0.04)	-0.135*** (0.02)	-0.092 (0.08)
Observations	42,559	23,978	18,581	34,775	7,784

Notes: Each cell represents results for separate regression where the dependent variable is normalized course grade and the key independent variable is an indicator for Age 21. Standard errors clustered by age are in parentheses. All specifications control for a linear function of distance from Age 21 in which the slope is allowed to vary on either side of the cutoff. Controls include course by semester by year fixed effects, graduating class by semester by year at USAFA fixed effects, birth year fixed effects, SAT math and verbal scores, academic composite score, algebra/trig placement score, leadership composite score, fitness score, and indicator variables for Black, Hispanic, Asian, recruited athlete, and preparatory school attendance.

* Significant at the 0.10 level

** Significant at the 0.05 level

*** Significant at the 0.01 level

Table 6: Robustness Checks and Falsification Exercise

Sample	Main Results	With Freshman and Preparatory School Students	Mandatory Core Courses	Age 20 Birthday Effect
Panel A: No Controls	1	5	6	7
Discontinuity at Age 21	-0.092*** (0.03)	-0.082*** (0.03)	-0.089** (0.05)	-0.028 (0.04)
Panel B: Controls	1	5	6	7
Discontinuity at Age 21	-0.119*** (0.02)	-0.155*** (0.03)	-0.079** (0.04)	-0.044* (0.02)
Observations	42,559	52,194	13,217	34,235

Notes: Each cell represents results for separate regression where the dependent variable is normalized course grade and the key independent variable is an indicator for Age 21. Standard errors clustered by age are in parentheses. All specifications control for a linear function of distance from Age 21 in which the slope is allowed to vary on either side of the cutoff. Controls include course by semester by year fixed effects, graduating class by semester by year at USAFA fixed effects, birth year fixed effects, SAT math and verbal scores, academic composite score, algebra/trig placement score, leadership composite score, fitness score, and indicator variables for Black, Hispanic, Asian, recruited athlete, and preparatory school attendance.

* Significant at the 0.10 level

** Significant at the 0.05 level

*** Significant at the 0.01 level