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WORKING PAPER # 528
PRINCETON UNIVERSITY
INDUSTRIAL RELATIONS SECTION
MAY 2008
http://www.irs.princeton.edu/pubs/pdfs/528.pdf

The Effects of Female Sports Participation On Alcohol Behavior

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*This research was supported by a Graduate Research Fellowship from the National Science Foundation as well as with resources from the Princeton University Industrial Relations Section. The author wishes to thank Henry Farber, Cecilia Rouse, and Jesse Rothstein for helpful criticisms and suggestions. Any remaining errors are the responsibility of the author.

ABSTRACT

Most existing research on the effects of girls' participation in high school sports focuses on short term outcomes without accounting for selection effects. In this research, I examine the effect of athletic participation in high school on longer term outcomes, using Title IX as a source of exogenous variation in athletic participation. I use the change in girls' sports participation between cohorts within high schools surveyed by the High School and Beyond Survey to measure the effect of participation in high school sports on women's later alcohol behavior. I find that several years after high school, women in cohorts within high schools exposed to more athletics, drink substantially more alcohol than women within the same high school exposed to less athletics. Relative to the mean alcohol behavior of the sample, these differences are both statistically significant and sizable.

JEL: I10, I20, I28

Key Words: determinants of health, high school athletics, alcohol, Title IX

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1 INTRODUCTION

Most existing research on the social and health effects of girls' participation in high school sports focuses on short term outcomes. Research on the relationship between female athletics participation and drug use consistently finds that female athletes are significantly less likely to use marijuana, cocaine or most other illicit drugs, although research on short term alcohol use is more mixed (Sabo et al., 2004, Page et al., 1998, Miller et al., 2000). Other research finds that athletes are less likely to smoke cigarettes (Melnick et al., 2001), more likely to have traits associated with eating disorders (Taub, Blinde, 1992), have lower or equivalent rates of sexual activity as nonathletes (Miller et al., 1998), and to be more likely to exceed the speed limit and to ride bicycles without helmets (Baumert et al., 1998).[1]

In general, however, the research that looks at the short term impact of high school and college sports on social and health outcomes, does not adequately account for selection effects: those students who participate in swimming, softball, and soccer are fundamentally different from the students not engaged in these activities.[2] For this reason, observed differences in short term outcomes between athletes and non-athletes may not be because of participation in athletics.[3]

[1] Within economics, however, most of the research on the impact of participation in high school athletics focuses upon wage and employment, educational attainment, as well as occupational choices. This research finds that athletes (although not all races and ethnicities of athletes) experience a wage premium several years after high school graduation, obtain more education than their non athletic peers, and make different occupational choices (see, for example, Barron et al., 2000, Eide, Ronan, 2001, and Stevenson B, Beyond the Classroom: Using Title IX to Measure the Return to High School Sports, Working Paper, July 2005).

[2] Research by Videon suggests that students of higher socioeconomic status, students that attend private schools, and students in rural rather than urban schools are more likely to participate in athletics; these results are consistent with the characteristics of the HSB sample (Videon, 2002).

[3] Prior to this study, only one economics paper had used the impact of Title IX legislation to try to identify the impact of athletics on outcomes, in that case, college attendance, labor force participation, and participation in male dominated fields (Stevenson, 2005). As this study was being developed, Kaestner and Xu released a study looking at the impact of athletics on physical activity, body mass, and body composition, using Title IX as an exogenous source of variation (2006). However, Kaestner

This research adds to the literature by first, examining the effect of athletic participation in high school on longer term outcomes, that is the relationship between girls' participation in high school sports and alcohol behavior several years after high school graduation,[4] and secondly, by using Title IX as a source of exogenous variation in athletic participation, as well as controlling for an extensive set of individual covariates likely to be correlated with athletic participation and alcohol outcomes.

In the years following the passage of Title IX, I use the change in girls' sports participation between cohorts within high schools surveyed by the High School and Beyond Survey to measure the effect of participation in high school sports on women's later alcohol behavior. Title IX, enacted by Congress in 1972, explicitly prohibited discrimination in admissions, course provision, and extracurricular activities (including athletics). According to the text of the 1975 revision of Title IX (which stated that schools had to be in compliance by 1978), "A recipient which operates or sponsors interscholastic, intercollegiate, club or intramural athletics shall provide equal athletic opportunity for members of both sexes" (Title 34 1975). Between 1972 and 2001, largely as a consequence of Title IX, participation in high school athletics by women within the United States increased from 295,000 to 2.78 million (National Women's Law Center,

and Xu rely on aggregate state level participation numbers for their identification strategy. The only other economics paper which attempts to deal with the endogeneity of sports participation on outcomes is Eide and Roman (2001) who instrument for sports participation with height. However, given that other researchers have found that there is a significant independent relationship between height and wages (Case A., Paxson C. Stature and Status: Height, Ability, and Labor Market Outcomes, NBER working paper 12466, August 2006), this does not seem to be a good instrument to investigate the impact of sports participation on labor market and education outcomes.

[4] An earlier study looked at the simple correlation between athletics and alcohol use for sophomores using the High School and Beyond survey, but did not control for covariates other than race or gender (Spreitzer, 1994). In that work, Spreitzer found no significant relationship between alcohol use and athletic participation in the sophomore or senior year in high school (Spreitzer, 1994). Subsequent work by Crosnoe, with a limited sample of only 9 high schools in California and Wisconsin, controlled for parent education, ethnicity, family structure, and friends behavior (but not high school characteristics or family income), and found that athletic status was a risk factor for girls' alcohol use, but not predictive for boys' alcohol use (Crosnoe, 2002). Another work which controlled more carefully for demographic variables, substance use by peers, family structure, stressful life events, as well as preteen substance abuse, found no significant association between alcohol use and sports participation in the overall sample, although this was not true for all racial subgroups (Eitle et al., 2003). For a review of this literature, see Feldman and Matjasko (2005).

2002).

In this research, I test whether within the same high school, women in cohorts that were exposed to more high school athletics have different outcomes, as compared to cohorts exposed to less high school athletics, where I assume that the unobserved characteristics of the students have not changed between cohorts and that differences in participation reflect differences in provision and not underlying interest. I study the overall impact of female sports participation on women within a school. Of course, the provision of athletics within a high school is not strictly exogenous: without interest from female students, no high school need offer athletic programs in order to be in compliance with Title IX. However, I assume that the differences in changes in the provision of athletics between cohorts across schools reflect technical and logistical differences in the ability of the school to provide athletics, and do not reflect differences in unobserved interest between female cohorts (which would bias later estimates of the impact of athletics).

Using data from the 1980-1986 waves of the High School and Beyond survey, I control for individual and fixed high school characteristics. I also control for changes within high schools between 1980 and 1982 which are unrelated to high school athletics participation. Unfortunately, the High School and Beyond Survey surveyed sophomores and seniors within selected high schools starting in 1980, so I am not able to capture within school changes in athletics participation immediately after the passage of Title IX. However, given that high schools did not have to be in full compliance with Title IX legislation until 1978, and full compliance included "demonstrated efforts" towards the provision of sports for girls, many schools were still expanding their athletic programs between 1980 and 1982, and national estimates suggest that during this two year period, participation by women in high school athletics increased by over 60,000 (National Federation of State High School Athletics Association, 2001).

In recent years, economists have begun to study the social and health effects of

alcohol use. Such research has attempted to identify the causal impact of drinking alcohol on other behaviors using exogenous changes in alcohol policies whether through changes in prices, minimum age restrictions, or underage drinking penalties. Among the chief findings of this literature are that price increases as well as health knowledge reduce binge drinking and drunk driving (Kenkel, 1993), that restrictions on alcohol availability, for example, from war or alcohol prohibitions, reduce cirrhosis of the liver (Cook, Moore, 2000), that excise taxes on beer seem to decrease rape and robbery (Cook, Moore, 1993a).[5]

Additional research which focus upon youth alcohol behavior finds that alcohol use lowers contraceptive use (Kaestner, Joyce, 2001), increases the probability of having sex (Sen, 2002), increases the rate of unintended pregnancy (Kaestner, Joyce, 2001), and increases gonorrhea and syphilis rates (Chesson et al., 2000), although some of these findings have been disputed.[6] Using variation in state alcohol policies to identify the impact of alcohol changes, Cook and Moore find that high school seniors who drink frequently complete less years of education (Cook, Moore, 1993b).

The medical and epidemiological literature generally finds that moderate alcohol drinking reduces heart disease, while reducing clotting, increasing the chance of stroke, and increasing hypertension, among other medical effects not detailed here (Cook, Moore, 2000). Given the broad implications of alcohol use (both positive and negative), it seems clear that understanding the relationship between athletics and alcohol is important. While there are some health benefits to alcohol, there seem to be many more negative behavioral costs associated with drinking, (and excessive drinking), making understanding the predictors of alcohol use more crucial.

Ultimately, in this work, I find that several years after high school, women in cohorts within high schools exposed to more athletics drink, on average almost one day more

[5] This material was largely drawn from the extensive overview provided by Cook and Moore (2000).

[6] For a more extensive discussion, see Grossman M., Kaestner R., Markowitz, S. An Investigation of the Effects of Alcohol Policies on Youth STDs. 2004 NBER Working Paper 10949.

per month (relative to an average number of drinks of four), drink more than 6 drinks per day about one half more days per month (relative to an average of slightly less than 1), drink three fourths more of a drink on days that they drink their maximum (where the average maximum number of drinks is slightly less than 3) and drink around one third more drinks on average per day (where the average number of drinks per day is slightly less than 1 and three quarters). Relative to the mean alcohol behavior of the sample, these differences are both statistically significant and sizable.

The remainder of this paper proceeds as follows. Section 2 reviews the data and includes descriptive statistics for individuals and schools within the High School and Beyond Survey. Section 3 describes my basic empirical model. Section 4 includes a description of the main results, linking high school athletic behavior to long term alcohol behavior. Section 5 includes various extensions and robustness checks. Section 6 concludes.

2 THE DATA

I use data from the High School and Beyond study (HSB), conducted by the Center for Educational Statistics. HSB initially surveyed 1,015 high schools in spring 1980. Within each high school, a random sample of 36 seniors (class of 1980) and 36 sophomores (class of 1982) were chosen to be interviewed. A nationally representative subset of students from both cohorts was selected and interviewed in 1982, 1984, and 1986.[7] In addition to interviewing students, HSB surveyed school administrators, teachers, parents, and high school and postsecondary administrative records.

I restrict the sample to public school students because private high schools that did not receive federal funding were not subject to Title IX requirements. Because the initial sophomore survey included students who transferred out of the school or dropped out of

[7] To account for this nonrandom selection of students for follow up, panel weights provided by HSB are used in all analysis, unless otherwise noted.

high school, in order to ensure that the sophomore cohort is directly comparable to the senior cohort (where neither of these student types are present), both of these student types are excluded from the analysis. Therefore the senior cohort, which did not include students who dropped out or transferred into other schools, is slightly larger than the sophomore cohort (HSB Manual, 1983). This leaves 19,120 total observations, 9,838 (51%) of which are of females.

I classify individuals by their response to the following question, asked in their senior year (both cohorts), "Have you participated in any of the following types of activities either in or out of school this year?" where the list of options include varsity athletic teams, other athletic teams, cheerleading, pep club, majorettes, debating or drama, band or orchestra, and various other extracurricular activities. I primarily focus upon "any" athletics, defined as participation in varsity or other athletic activity, as my measure of athletics participation. I use the school cohort participation percentage as the measure of exposure to high school athletics.

Individual characteristics available within the HSB survey and used within my regression analysis include gender, race, ethnicity, birth year, cognitive test scores, high school course grades, parental education and socioeconomic status. The following questions, asked in the 1986 Follow up 3 Survey of both seniors and sophomores were used to identify alcohol behavior: How many day s in the past month (30 days) did you drink an alcoholic beverage, that is beer, wine or hard liquor? On how many days during the last 30 days did you have six or more drinks? On the day that you had the fewest drinks, how many drinks did you have? On the day that you had the greatest number of drinks, how many drinks did you have? On days that you drank, what was the average number of drinks that you had? In cases where a range of responses was offered, the median value was chosen as the representative value.[8]

[8]Because respondents are between the ages of twenty two and twenty four, I do not emphasize earnings outcomes: around a third of the younger respondents have not completed education as of the third follow up survey. For work which looks at the impact of athletics on wages or education see, for example, Barron, Ewing, and Waddell (2000), Eide and Ronan (2001) and Stevenson (2005).

Table 1 provides weighted summary statistics for sophomore and senior cohort women.

The sophomore and senior cohorts have significantly different alcohol behaviors, on average, the sophomore cohort members appear to drink with greater frequency and intensity. Selected characteristics for high schools within the HSB survey are available in the appendix table 2A. The schools in HSB are nationally representative.

In Table 2, I show the coefficient and standard errors for the estimates of the within school change in athletics for women, using my three measures of female athletics participation.

Schools within the HSB survey experienced a positive change in female athletics measured using three different definitions of athletic participation, although these changes are not significant. In contrast, over this same time period, boys' varsity sports increased, but boys' nonvarsity sports and "any" sports participation decreased insignificantly.

The students selected for the survey are representative of the overall student body (as determined by comparing the racial characteristics of the sampled students to reported racial distribution of the school by high school administrators). Schools with more than an average change in any female sports participation between cohorts had significantly more cheerleading by sophomore and senior cohorts and were more likely to be located in the Western region, as well as to have fewer Hispanics than those with less than average change in female sports participation between cohorts. The geographical location of those schools experiencing the most change in female athletics participation 1980-1982 is consistent with Stevenson (2005) who finds that seven of the ten states experiencing the most change in female athletics 1971-1976 were in the Western United States. Other differences (type of school, drop out rate, college going rate, enrollment, and expenditures) were not significant between schools experiencing more than average changes in participation and schools experiencing less than average changes in participation.

3 EMPIRICAL MODEL

I estimate the following specification:

$$A_{ijk} = X_i\beta + Z_{jk}\delta_{jk} + Y_{jk}\theta_{jk} + \alpha_{1j} + \varepsilon_{ijk}$$

where A_{ijk} is the outcome for individual i from school j in cohort k.[9] X_i includes a vector of individual characteristics, including birth cohort, class cohort, individual indicators for race, religion, ethnicity and country of origin, attendance in college in the fall of 1986, average high school grade point average, composite test scores from 1980, student height and weight, height squared, weight squared, advanced math participation in 1980, time on homework in 1980, time watching television in 1980, number of rooms in the house in 1980, parental home ownership, an indicator for having more than 50 books in the house, natural log of family income in 1980, as well as parental education level. Z_{jk} represents a vector of school-cohort characteristics which are captured separately for each cohort, including senior year cohort size, senior year dropout rate, College Board courses available senior year, Junior ROTC available in senior year, and high school and district average expenditure in senior year. Y_{jk} represents the proportion of female students in school j, cohort k, involved in athletics, while θ_{jk} is the coefficient of interest. α_{1j} represents a school fixed effect.

I cannot control for changes such as the introduction of a new health or fitness oriented program within high schools which may be correlated with increases in athletic participation, but unrelated to Title IX, because the High School and Beyond survey does not ask school administrators about physical fitness or health requirements, or school fitness initiatives, but I argue that the included characteristics capture changes within high schools which would be related to such a program introduction, for example, through high school and district average expenditure. Athletics participation is identified from changes in athletics participation within schools.

[9] Individual alcohol behaviors (and not cohort average alcohol behaviors) are used as outcomes because individual covariates, such as race and ethnicity may be correlated with athletic participation as well as alcohol behaviors.

Two assumptions underlie this functional form. First, the effect of changes in athletic participation within cohorts is linear on the outcomes of interest, and second, the intensity of program provision (the percentage change in participation) is exogenous.

4 RESULTS

I focus upon five outcomes of interest: days drinking alcohol within the last month, fewest drinks in a day in the last month, most drinks in a day in the last month, average number of drinks per day, and number of days with more than 6 drinks in the last month, measured as of the 1986 survey. I find that women with more exposure to high school athletics (measured using average measure of "any" athletic participation) drink significantly more days per month (on average almost one day more per month), binge drink (defined as drinking more than 6 drinks per day) about one half more days per month, drink three fourths more of a drink on days that they drink their maximum and drink around one third more drinks on average per day. These results are summarized in Table 3. Coefficients for changes in other athletics participation are similar (in size as well significance), although none of the changes in varsity participation have a significant effect on alcohol behaviors as can be seen in Table 3.

For only one of the fifteen basic regressions are the results sensitive to the inclusion of covariates which might be considered codetermined with athletic participation (including household income, size, high school grade point average, time watching television, college attendance, books in house, advanced math participation, for example). In that case, fewest number of drinks in a month given a change in other athletic participation, the removal of the codetermined covariates causes the impact estimate to become significant (positive), suggesting that these covariates which might be codetermined are not strongly correlated with both alcohol behavior and sports participation.

In terms of other outcomes, changes in "any" girls athletic percentage does, however, have a positive and significant effect on sports participation in 1986, the number of

times a student saw a doctor for an accident within the last year, civic engagement (measured by a count of civic activities in the survey year), as well as a negative effect on calculated GPA (for college). The within school change in any sports participation had no significant impact on time watching TV, seeing a doctor for reasons other than an accident, registering to vote, voting in the 1984 presidential election, marriage (as of 1986), the number of children the respondent had had as of 1986, work status in February 1986, or calculated grade point average. Results for within school changes in other sports and varsity sports on all non alcohol behaviors are similar.

Some might argue that changes in athletic participation per se are not responsible for these observed effects, but instead it is changes in participation in any extracurricular activity which cause changes in later behavior. Perhaps participation or provision of extracurricular activities makes students more social and therefore more likely to drink (and binge drink). To confirm that these observed changes in outcomes can be attributed to athletics participation, rather than changes in participation in any extracurricular activity, I look at the effect of percentage changes in cheerleading, orchestra or band, and debate and drama participation on alcohol drinking behavior. Overall, between 1980 and 1982, cheerleading and debate and drama participation decreased, while band or orchestra participation increased, although none of these changes are significant. There is no evidence that a change in participation in any of these activities affected any alcohol related behavior.

These results suggest key differences between changes in varsity athletics participation, other (and any sports) participation, and participation in other extra curricular activities. Female varsity athletes are already active sports participants – and they may have already been exposed to an athletic culture of drinking (one which is not present in musical, cheerleading, or drama or debate activities) so that increasing the proportion of the class involved in varsity sports does little to change behavior; these girls may also be more serious athletes, for whom athletics acts to deter them from using alcohol because

they do not want to interfere with or jeopardize their athletic performance. Changes in nonvarsity athletes, however, seem to affect school alcohol behavior much more, perhaps because they are becoming part of the "athletic culture," a culture which may include alcohol use; they may also be less serious or dedicated athletes. This explanation would be consistent with work by previous authors which finds that "athletes are exposed to subcultures that are tolerant of, and exaggerate perceived norms of, drinking" (Sabo et al. 2004).

5 EXTENSIONS

Some have suggested that the above results which show the impact of changes in average percentage participation in athletics within cohorts may not actually avoid selection effects; Are these estimates simply reflecting the selection bias that plagued earlier estimates of the relationship between athletics and alcohol? It does seem to be the case, that for four of the five measures of alcohol behavior, (see Table 4) there is a significant relationship between individual participation in any sports and alcohol drinking frequency and intensity, although there does not seem to be any relationship between varsity athletic participation and alcohol drinking behavior and a much less clear relationship between other athletic participation and alcohol behavior. It is surprising, and reassuring, that changes in other sports, at least, are associated with significant changes in alcohol use which are not solely captured by individual effects.[10]

A more careful exploration of these results suggests that it is not only individual participation than impacts alcohol behavior, but also the size of the cohort participating that impacts alcohol drinking behavior. Looking at table 5, we see that including individual participation as well as average participation numbers causes the individual impact estimates to be insignificant, while the average participation numbers continue to

[10] In contrast, individual participants in cheerleading, band or orchestra and debate or drama have alcohol behaviors which are not significantly different from non participants, with the single exception of female debate participants who on average, drink .56 days per month more than non participants.

be significant (and close to the original estimates) for the estimate of the number of days drinking within the last month, although not for any other alcohol related behaviors. The impact of increasing average participation appears to diminish after the proportion of participants reaches a critical point. However, when the sample is restricted to only participants and non participants, a change in average "other" participation has no impact on any outcome for the non participants, but a significantly positive impact on the fewest number of drinks and average number of drinks by participants – suggesting that changes in athletic participation do not affect non participants, but only those already "involved in the program." In the analogous specification for varsity athletics, none of the coefficients of interest were significant. Results for any sport participation are reported in Appendix Table 5A.

It appears that there are important spillover affects to athletics – that is, individual participation is not enough to explain individual increases in alcohol drinking; as the proportion of athletes change in a cohort, alcohol behaviors change in a non linear way – and these changes do not simply reflect aggregated individual behaviors.

Finally, some have also suggested that Title IX negatively impacted boys by redistributing resources from boys to girls. On average, boys' participation in other sports and "any" sports decreased between 1980 and 1982, although these changes were not significant, as measured using the HSB survey data.[11] This suggests that if there were programs within a high school, introduced concurrently with athletic program changes for women, those programs were targeted towards women (or completely ineffective for men), which seems unlikely, and these programs were also distinct from cheerleading, band or orchestra, and debate (as captured above) because participation in these activities did not increase. Given that increases in female participation were correlated with negative changes in overall men's athletics, it is particularly surprising that changes in female sports participation did not appear to directly affect men's alcohol behavior.

[11] These results are consistent with those of Kaestner and Xu (2006).

Some researchers have suggested using men as a comparison group for women, since men's athletic behavior does not seem to have been substantially affected during the time period of this study by Title IX, however, the alcohol behavior of individual male athletes seems to differ substantially from that of female athletes, suggesting males are not good comparison groups for women.

To understand the direct effect of women's participation in athletics on men, within the same high school, I look at the impact of changes in girls' athletics participation on men's outcomes.[12] Changes in female athletic participation within schools have no significant effect on later male drinking behavior, while changes in male athletic participation within schools have no significant effect on later female drinking behavior.[13]

6 DISCUSSION

I find that women who attended schools with a larger change in overall athletics' participation drink significantly more days per month (on average almost three fourths of a day more), are more likely to binge drink (and do so by almost half of a day more), drink more alcohol on days when they drink their maximum (almost three fourths of a drink more), and drink more per day (almost a third of a drink), on average, than women with less exposure to high school athletics. While these effects may not be enormous, they suggest an important relationship between participation and exposure to high school athletics and later alcohol behaviors.

While it seems clear how changes in a high schools provision of athletics may influence

[12] If there is a fixed budget constraint, then seems likely that increases in women's sports should cause a decrease in men's sports, potentially affecting men's outcomes.

[13] Somewhat surprisingly, actually, particularly given other published work looking at boys participation and athletics: the only one of five alcohol outcomes for boys affected by between cohort changes in male athletic participation is number of drinks on day drinking fewest number of drinks in the last month; that is, positive changes in any, other, or varsity participation, reduce the fewest number of drinks by boys. This is in contrast to individual sports participation: boys that participated in varsity or other sports drink significantly more drinks when they drink their most number of drinks relative to those boys within their cohort and high school who did not participate within athletics. Other alcohol behaviors are not significantly different between male athletes and non athletes.

later participation in athletics (by changing cultural norms and by making athletics acceptable for all women, and not just the "varsity athletes"), I hypothesize that the observed relationship between changes in sports provision and later alcohol use may be attributable to a "culture" of drinking, which many sports participants tacitly encourage or participate in – and which may outlast participation in the actual sport itself.

From these regressions, it appears that there are important spillover affects to athletics – that is, individual participation is not enough to explain individual increases in alcohol drinking; as the proportion of athletes change in a cohort, alcohol behaviors change in a non linear way – and these changes do not simply reflect aggregated individual behaviors. The concentration of athletes within a cohort also matters.

Previous research, looking at the impact of athletics on alcohol behaviors has ignored issues of selection bias, inadequately controlled for background characteristics which predict athletics participation and alcohol usage, used a limited sample of students (from a particular geographic location), and neglected questions of spillovers and peer effects. In this work, I try to address these gaps, using Title IX as a source of variation in participation, and measuring the impact of changes in average athletic participation on alcohol behaviors, controlling for an extensive set of covariates.

Ideally, I would have liked to explore outcomes for cohorts closer to the passage of Title IX, when the most rapid changes in girls sports participation occurred. However, national estimates suggest that participation in athletics by high school girls continued to increase between 1980 and 1982, as more and more girls became interested in athletics (National Federation of State High School Athletics Association 2001).Of course, as discussed earlier, the decision to increase girls sports' programs is not strictly exogenous – the provision of sports for girls depends on student interest for such sports within high schools. To some extent, therefore, the "program" evaluated here is not strictly exogenous; and the high correlation between regression estimates from individual participation regressions and the regressions using average participation measures, coupled

with the alternate specifications, suggest that most of the increase in alcohol behavior from an increase in athletic participation comes from athletes drinking more than non athletes, not from an increasing number of athletes changing the culture of their schools, so that non athletes drink. Even with the inclusion of covariates for individual participation, the impact of changes in average "other" participation, however, is significant on number of days drinking.

There is a positive relationship between girls' high school sports provision and a variety of later alcohol behaviors, effects which appear using a variety of measures of sports participation, and which are insensitive to the removal of covariates. Thus, changes in participation in any sports by females within a school seem to be positively and significantly related to increased drinking, an unintended consequence of Title IX.

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Table 1: Descriptive Statistics (Female Students)

Senior Participation	Sophomore Cohort Mean	Senior Cohort Mean	Difference	P Value (Test of Difference)
Any Sports	.410	.393	.017	.243
Other Sports	.322	.315	.007	.595
Varsity Sports	.254	.238	.015	.215
In the Last Month:				
Days Drinking Alcohol	3.890	3.836	.055	.689
Days Greater than 6 Drinks	.928	.676	.066	.000
Fewest drinks on a Day	.989	.928	.060	.058
Most Drinks on a Day	2.969	2.665	.304	.000
Average Drinks Per Day	1.760	1.563	.197	.000

Note: All means are weighted using the High School and Beyond fourth survey panel weights (panelwt4). The total number of observations is 4,256 (sophomore cohort) and 5,582 (senior cohort.), although the number of observations may be smaller for particular calculations because of individual item non response.

Table 2: OLS Regressions of Average Female Senior Cohort Participation on Average Female Sophomore Participation within School

	(1)	(2)	(3)
Treatment:	Any Sports	Other Sports	Varsity Sports
Sophomore Cohort Indicator	0.006 (0.430)	0.003 (0.220)	0.012 (0.940)
R Squared	0.0000	0.0000	0.0000
N	1,705	1,704	1,704

* indicates significant at 5 percent level. NOTE: Robust standard errors clustered at the school level are in parentheses. Sample is restricted to public schools with survey participants in both cohorts (although there may not be respondents in both cohorts that answered questions regarding extra curricular activities). Within school participation averages are weighted with panel weights.

Table 3: Impact of Percentage Change of Female Athletes on Alcohol Behavior (OLS)

	(1)	(2)	(3)	(4)	(5)
Treatment:	Days Drinking Alcohol	Days Greater than 6 Drinks	Fewest drinks on a Day	Most Drinks on a Day	Average Drinks Per Day
Percentage Senior Female Athletes in Any Sport	0.906	0.450	0.120	0.701	0.308
	(0.351)**	(0.190)*	(0.086)	(0.231)**	(0.141)*
R Squared	0.28	0.23	0.24	0.31	0.27
N	2,716,360	2,549,087	2,551,363	2,544,802	2,549,305
Percentage Senior Female Athletes in Other Sports	0.966	0.359	0.168	0.640	0.302
	(0.365)**	(0.086)*	(0.096)	(0.242)**	(0.145)*
R Squared	0.28	0.23	0.24	0.31	0.27
N	2,715,792	2,548,519	2,550,795	2,544,234	2,548,737
Percentage Senior Female Athletes in Varsity Sports	0.386	0.257	-0.036	0.314	0.107
	(0.388)	(0.209)	(0.099)	(0.244)	(0.148)
R Squared	0.28	0.23	0.23	0.31	0.27
N	2,716,337	2,549,064	2,551,340	2,544,779	2,549,282

*indicates significant at 5 percent level. * * indicates significant at 10 percent level.
NOTE: reported coefficients are corrected for attenuation bias attributed to measurement error in the proportion of girls participating in athletics.

Table 4: Relationship between senior female individual participation in athletics and alcohol behaviors (OLS)

Treatment: In the Last Month	(1) Days Drinking Alcohol	(2) Days Greater than 6 Drinks	(3) Fewest drinks on a Day	(4) Most Drinks on a Day	(5) Average Drinks Per Day
Athlete in Any Sport	0.339	0.171	0.055	0.248	0.134
	(0.161)*	(0.080)*	(0.032)	(0.087)**	(0.054)*
R Squared	0.28	0.24	0.24	0.31	0.27
N	2,680,517	2,516,244	2,518,520	2,511,959	2,516,462
Athlete in Other Sport s	0.294	0.135	0.048	0.243	0.118
	(0.164)	(0.077)	(0.034)	(0.095)*	(0.057)*
R Squared	0.28	0.24	0.24	0.31	0.27
N	2,662,628	2,499,434	2,501,710	2,495,149	2,499,652
Athlete in Varsity Sports	0.313	0.134	0.027	0.105	0.067
	(0.178)	(0.095)	(0.035)	(0.097)	(0.061)
R Squared	0.28	0.24	0.24	0.31	0.27
N	2,676,252	2,512,199	2,514,475	2,507,914	2,512,417

* indicates significant at 5 percent level. * * indicates significant at 10 percent level. Additional covariates include school fixed effects, indicators for race, religion, ethnicity and country of origin, cohort, birth year, college enrollment status in fall of 1986, high school grade point average, composite test score 1980, height and weight in 1980, height and weight squared, parents home ownership status in 1980, advanced math participation in 1980, time on homework in 1980, time watching television in 1980, number of rooms in house in 1980, more than 50 books in household in 1980, natural log of family income 1980, parent education level, senior year cohort size, senior year drop out rate, College Board courses available senior year, Junior ROTC available in senior year, high school and district average expenditure in senior year .

Table 5: Spillovers from Athletic Participation: Alcohol Behavior (OLS)

Treatment:	(1) Days Drinking Alcohol	(2) Days Greater than 6 Drinks	(3) Fewest drinks on a Day	(4) Most Drinks on a Day	(5) Average Drinks Per Day
Senior Athlete in Other Sports	0.157	0.093	0.024	0.168	0.080
	(0.178)	(0.082)	(0.037)	(0.103)	(0.062)
Average Senior Participation in Other Sports	0.835	0.256	0.150	0.456	0.230
	(0.391)*	(0.205)	(0.106)	(0.264)	(0.159)
R Squared	0.28	0.24	0.24	0.31	0.27
N	2,662,628	2,499,434	2,501,710	2,495,149	2,499,652
Average Senior Participation in Other Sports	2.898	0.590	0.037	1.145	0.370
	(0.995)**	(0.518)	(0.282)	(0.65)	(0.402)
Average Senior Participation in Other Sports Squared	-2.426	-0.291	0.164	-0.635	-0.085
	(1.063)*	(0.523)	(0.355)	(0.718)	(0.434)
R Squared	0.28	0.23	0.24	0.31	0.27
N	2,715,792	2,548,519	2,550,795	2,544,234	2,548,737
Average Senior Participation in Other Sports (Participants)	1.276	0.529	0.489	0.585	0.59
	(0.710)	(0.330)	(0.194)*	(0.435)	(0.252)*
R Squared	0.57	0.54	0.53	0.56	0.53
N	849,743	801,381	802,523	802,976	802,876
Average Senior Participation in Other Sports (Non Participants)	0.942	0.053	0.155	0.713	0.156
	(0.576)	(0.314)	(0.147)	(0.378)	(0.237)
R Squared	0.34	0.29	0.3	0.37	0.34
N	1,812,885	1,698,053	1,699,187	1,692,173	1,696,776

* indicates significant at 5 percent level. * * indicates significant at 10 percent level. See above for additional covariates in school fixed effects regressions. Standard errors are robust, clustered at school level. NOTE: in the analogous specification for varsity sports participation, none of the coefficients in any of the four specifications were significant (available upon request from the author). Results for alternative specifications of any sport participation are reported below in appendix Table 5A.

Table 2A: Selected High School Characteristics (HSB 1980)

Variable	Mean	SD
Type of School: General	.223	.419
Type of School: Academic	.451	.498
Drop out rate (1980)	10.669	9.659
College Going Rate (1980)	44.287	18.547
Black Students (%)	15.491	24.575
Hispanic Students (%)	10.278	20.655
Enrollment (1980)	1,422.350	808.164
Ln District Average Per Capita Expenditure (1980)	7.171	.987
Ln High School Average Per Capita Expenditure	7.024	1.243

Source: Center for Education Statistics High School and Beyond Survey.
Note: Only public schools with participants in both cohorts are included (N=833). Individual means may have slightly fewer observations because of item non response.

Table 5A: Spillovers from Any Athletic Participation: Alcohol Behavior (OLS)

Treatment: In the Last Month	(1) Days Drinking Alcohol	(2) Days Greater than 6 Drinks	(3) Fewest drinks on a Day	(4) Most Drinks on a Day	(5) Average Drinks Per Day
Senior Athlete in Any Sports	0.231 (0.171)	0.118 (0.082)	0.043 (0.035)	0.167 (0.093)	0.102 (0.058)
Average Senior Participation in Any Sports	0.663 (0.366)	0.322 (0.196)	0.077 (0.093)	0.494 (0.247)*	0.196 (0.153)
R Squared	0.28	0.24	0.24	0.31	0.27
N	2,680,517	2,516,244	2,518,520	2,511,959	2,516,462
Average Senior Participation in Any Sports	2.428 (1.032)*	0.230 (0.543)	0.079 (0.268)	0.769 (.669)	0.273 (.410)
Average Senior Participation in Any Sports Squared	-1.686 (1.028)	0.240 (0.522)	0.046 (0.281)	-0.077 (0.668)	0.039 (0.398)
R Squared	0.28	0.23	0.24	0.31	0.27
N	2,716,360	2,549,087	2,551,363	2,544,802	2,549,305
Average Senior Participation in Any Sports (Participants)	0.717 (0.621)	0.880 (0.345)*	0.291 (0.148)*	0.514 (0.386)	0.355 (0.22)
R Squared	0.51	0.50	0.45	0.48	0.45
N	1,075,098	1,014,411	1,015,467	1,015,706	1,016,338
Average Senior Participation in Any Sports (Non Participants)	0.400 (0.518)	-0.190 (0.291)	0.101 (0.152)	0.564 (0.371)	0.112 (0.245)
R Squared	0.37	0.34	0.32	0.40	0.36
N	1,605,419	1,501,833	1,503,053	1,496,253	1,500,124

* indicates significant at 5 percent level. * * indicates significant at 10 percent level. See above for additional covariates in school fixed effects regressions. Standard errors are robust, clustered at school level.