Beyond the Classroom: Using Title IX to Measure the Return to High School Sports

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Abstract

Cross-sectional evidence suggests that high school athletes experience better outcomes than non-athletes, including higher educational attainment, more employment, and higher wages. Students self-select into athletics, however, so these may be selection effects rather than causal effects. This paper uses credibly exogenous variation in athletic participation caused by Title IX, federal legislation that led to dramatic increases in the number of American girls participating in high school sports. Between 1972 and 1978 U.S. high schools rapidly increased their female athletic participation rates (to approximately the same level as their male athletic participation rates) in order to comply with Title IX. This paper uses variation in the level of boys' athletic participation across states before Title IX as an instrument for the change in girls' athletic participation over the 1970s. Analyzing 25-34 year olds in the 1980 & 2000 censuses, I find that a 10-percentage point rise in the opportunity to play sports at the state-level generates an increase of 1 to 2 percentage points in college attendance and a 1 to 2 percentage point rise in female labor force participation. Furthermore, greater opportunities to play sports leads to greater female participation in previously male-dominated occupations, particularly for high-skill occupations.

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1. Introduction

The role of athletics in US high schools has been debated for decades. James Coleman threw down the gauntlet in 1961, arguing in *The Adolescent Society* that athletics were consuming an unwarranted amount of resources and were shifting the focus away from the main mission of the schools. In the ensuing years researchers have tried to resolve the controversy over the costs and benefits of high school athletics. Many studies have found a positive relationship between participation in high school athletics and educational aspirations, educational attainment, and wages later in life.[1]

What remains elusive is whether such benefits are treatment effects (*caused* by participation) or merely selection effects (associated with the type of student who chooses to participate in athletics). Much of the existing research has focused on sorting out the possible mediating mechanisms instead of dealing with the fact that students are not randomly assigned to participation in sports. Athletes tend to be more extroverted, aggressive, and achievement oriented. Are these traits they bring to athletics or are these traits athletics brings to them? Are they learning valuable skills? Or are the high skilled simply more likely to participate in sports?

To measure the causal benefits of participating in high school sports, one would want to randomly assign students to participation, or randomly assign different levels of athletic opportunities to different schools. Neither of these policy experiments exists, but there does exist a natural experiment that mimics the second policy experiment, at least for girls. In 1972 Congress enacted Title IX of the Educational Amendments, legislation that banned gender discrimination in federally-funded educational institutions. Compliance with Title IX can be characterized as requiring a school to raise its female athletic participation rate to near equality with its male athletic participation rate.[2] As a result, the proportion of female high school girls participating in athletics rose from 1 in 27 females in 1972 to 1 in 4 by 1978. In contrast, male participation remained relatively constant at 1 in 2. Although Title IX applied to every state, at the time of its passage there was considerable variation in male sports participation rates across states. Female sports

[1] Rehberg and Schafer (1968); Spreitzer and Pugh (1973); Picou (1978); Hanks (1979); Long and Caudill (1991); Barron, Ewing, and Waddell (2000).

participation rates also varied, but were low everywhere. Most of the variation in the scale of the compliance problem, therefore, came from male participation. In short, some states needed much larger increases in female sports participation than others. This paper uses the variation in states' mandated increases as a credibly exogenous source of variation in states' actual participation changes. As such, I identify credibly causal effects of athletic participation.

This paper focuses on the effects of *female* sports participation for two reasons. First, the experiment just described favors a focus on girls. Second, the benefits of sports participation are generally thought to be different for women than for men. Scholars have argued that since athletic participation is much less socially acceptable for females than it is for males, it is less important as a status-conferring mechanism.[3] While this may be true, status among one's peers is not the sole mediating mechanism by which athletic participation may confer benefits. Alternatively, women may gain interpersonal skills, confidence, work habits, or networks from sports that are useful in college and the labor market. Even if the effects of sports on individual females' traits were small, female athletic participation could improve women's outcomes by contributing to changing social norms about gender roles and perceptions about the perceived relative strengths of men and women.

The outline of the paper is as follows: In section 2 I describe the likely motivations for playing sports in order to clarify the nature of the selection problem. Section 3 then uses cross-sectional regressions to illustrate the association between participation in high school athletics and educational attainment and wages. Section 4 discusses Title IX and section 5 describes the specific instrumental variables procedure that it generates. In sections 6 and 7 I analyze data from the Census of Population to generate estimates of the effects of athletic participation on educational attainment, employment status, occupation, and wages.

2. Why Participate in Sports?

Broadly, there are two groups of potential mediating mechanisms through which athletics may

[2] Although the rules about compliance are in reality quite complicated, a reasonable approximation is that compliance requires the female participation rate to equal the male participation rate.
[3] Coakley (1978), Hanks (1979), Hanks and Eckland (1976), and Snyder and Spreitzer (1977).

influence academic and career outcomes. The first relies on the actual playing of a sport. Athletics is a highly regulated system in which social conflict is displayed in a positive light. From this, players learn how to compete. Participants also learn how to operate successfully under a formal code of rules and procedures. Furthermore, players are taught to function as a team. The development of these skills could be especially important for girls who must try to maneuver their way through traditionally male occupations later in life. Further, sports participation has direct physiological benefits that may be rewarded in the labor market.[4]

The second group of mediating mechanisms includes things that may occur because of athletic participation, but are not necessarily required by, or unique to, athletic participation. First, athletes may receive increased attention and encouragement from teachers, counselors, and other adults. Second, athletes may have larger, or more useful, social networks than non-athletes. Finally, because athletes often gain visibility amongst their peers, their self-esteem may rise and they may feel increased peer pressure to succeed.

In Becker's seminal work on human capital he acknowledged the difficulty in conceptualizing ability. Conventional measures of ability, Becker argued, "while undoubtedly relevant at times, do not reliably measure the talents required to succeed in the economic sphere."[5] In other words, ability is multi-faceted. While some intellectual and academic abilities can be measured with standard IQ tests, other abilities are less easily measured by conventional tests. These attributes include the ability to communicate, the ability to work well with others, competitiveness, assertiveness, and discipline.

Partitioning talent into these two components can help clarify how high school students choose among extra-curricular activities. Consider a high school student who has to decide how to allocate out-of-school time. Those possessed with an aptitude for academics may find reading or studying the most beneficial activity; those with strong motivation and aptitude in the interpersonal domain may find athletics most beneficial, and those with low ability in several domains may prefer activities such as watching television. Even if none of these activities generates human capital, they may generate private benefits to

[4]For evidence on the relation between physiological characteristics and earnings see Averett and Sanders (1993) or Hamermesh and Biddle (1994).
[5] Becker, 1993 p. 97.

students because they signal (otherwise unobservable) abilities to employers and colleges. Note that even if abilities *were* observable to employers and colleges (though not to econometricians), a cross-sectional correlation between extra-curricular activities and outcomes would still be observed, so long as students with particular abilities enjoyed disproportionate (consumption) benefits from participating.[6]

In sum, athletes may earn more by signaling that they are motivated and competitive. Alternatively, a cross-sectional correlation may simply reflect unobserved background variables. Or athletics may foster the development of skills that increase productivity. These productivity-enhancing effects will be observed both in cross-sectional data, and in the evolution through time of athletic participation rates and outcome measures in aggregate populations.

3. Association of Athletics with Educational and Labor Market Outcomes in Cross-Sectional Data

To better understand the association between sports participation and outcomes, it is instructive to analyze a cross-section of high school students. The National Longitudinal Survey of Youth (NLSY) is a nationally representative sample of 12,686 men and women aged 14 to 22 in 1979. In 1984, the respondents were asked retrospectively about their participation in a variety of high school extra-curricular activities, which can be grouped into three broad categories: vocational clubs, athletics, and other clubs.[7]

The relationship between sports participation and educational attainment is shown in Table 1.[8] Controlling for age, race, parent's education, and the urban status of the area in which the individual attended high school, being an athlete is associated with 0.6 of a year more schooling for girls (column 1). When controls are added for the state of residence at age 14, AFQT scores, and membership in the National Honor Society, the association is still statistically significant at the 1% level, but is reduced to approximately 0.4 of a year of schooling (column 3), still an economically meaningful effect.

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[6] Under the omitted variables interpretation, changes in the aggregate levels of athletic activity in a state yield no effect on wages within that state. The signaling model is more subtle. Conceptualizing Title IX as a reduction in the cost of playing sport for women can yield predictions of either more or less efficient sorting of people of unknown abilities across jobs.

[7] There are many clubs for which the NLSY identifies as vocational. The remaining "other clubs" include student government, newspaper, yearbook, and other, primarily hobby, clubs.

[8] The sample is restricted to those who completed at least the 10th grade, as attending some high school is necessary in order to participate in high school sports.

The association between athletic participation and educational attainment is similar for boys, with male athletes achieving 0.8 years more schooling than non-athletes (Column 5). When controls for state of residence, AFQT scores, and membership in the National Honor Society are added (column 6) the magnitude is reduced to approximately 0.4 years. Although some previous studies have found no association between females' athletic participation and their educational attainment, the NLSY data indicate that the association is similar for males and females. This may reflect the fact that most of the girls in the NLSY data attended high school after Title IX was in effect, so that their participation tendencies were more like those of boys, whereas previous studies have largely looked at pre-Title IX sports participation.[9]

Previous literature has emphasized the effects of *athletic* participation on outcomes, assuming that athletics are more influential than other extracurricular activities in high school. Adding an indicator variable for an individual having participated in any non-athletic club does not change the magnitude of the coefficient on athletics much, but the coefficient on the indicator variable itself is similar in magnitude to that on the indicator for athletic participation (columns 3 and 7). This is equally true for boys and girls.

When the category of non-athletic clubs is divided into vocational and non-vocational clubs, I find that the coefficient on vocational clubs is negative and statistically significant while the coefficient on non-vocational clubs is positive, statistically significant, and similar to the coefficient on athletics (columns 4 and 8). It is not surprising that the coefficient on vocational clubs is negative, if participating in such clubs indicates a desire to pursue a vocation rather than further schooling. This appears to be a clear case of sorting.

In short, the cross-sectional association between sports participation and educational attainment (which combines treatment and selection effects) appears to be large and similar for girls and boys. Furthermore, participation in non-athletic clubs has a similar association with educational attainment. Apparently, students who are actively engaged while in high school are more likely to get further education.

[9] Long and Caudill (1991) analyzed the effects of college sports participation using data from the entering college freshman class in 1971, finding an increase in annual incomes of 4 percent for men. Although the estimated coefficient for women is economically comparable, the large standard errors (stemming from the small number of female sports participants in their sample) indicate that they simply lack sufficient statistical resolution to be able to distinguish effects of sports participation on wages for women.

Those who are nearing the end of their educational careers are less involved in high school activities. It is difficult to know whether any of this association is causal.

The association between high school activities and wages (approximately 9 years after high school, among those who work) is examined in Table 2.[10] Without controlling for education, playing a high school sport is associated with more than 10 percent higher wages for both men and women (column 1 and 6). When controls for education, AFQT scores, membership in the National Honor Society, and state fixed effects are added, the wage premium is reduced to around 7 percent for women and 6 percent for men, both of which are statistically significant (columns 3 and 8). When controls are added for participation in other clubs, we see that *only* high school sports participation consistently has a statistically significant association with wages (columns 4-5 and 9-10). The effect of athletics on women's wages is as large as that for men.

The fact that athletic participation (and only athletic participation among all extra-curricular activities) is associated with higher wages suggests that sports have an especially strong correlation with a type of ability that is both an important determinant of wages and is not measured by other observable variables. Thus far, I have discussed only *associations,* because sports participation is not randomly assigned in the NLSY, and it is unclear whether the coefficients recorded reflect causal effects or selection. I now turn to a natural experiment that relies on a credibly exogenous shock to female sports participation.

4. History of Title IX

On June 23, 1972 President Nixon signed into law Title IX of the Education Amendments to the 1964 Civil Rights Act.[11] Title IX stated that "No person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any educational program or activity receiving financial assistance."[12] The two areas in which many schools still had explicitly discriminatory policies were sports and the enrollment of pregnant girls. Title IX banned such

[10] Wages are hourly wages measured in 1988 when the average respondent was 27 years old.
[11] The legislative history of Title IX is shown in Appendix B.
[12] Historically single sex schools were exempt from Title IX, as were military institutions, and religious institutions where Title IX was a violation of their religious beliefs.

explicit discrimination against female athletes and pregnant students.[13] Thus, while Title IX formally applies to all areas of education, its most far-reaching implications have been to increase access to sports.[14]

A large, and discontinuous, jump in national female high school sports participation occurred in the early 1970s (Figure 1).[15] This increase in female participation appears to start with the passage of Title IX in 1972 and continues through to 1978, by which time the legislation required schools to be in compliance. Furthermore, the little evidence available in the earlier years indicates that girls throughout the United States had been virtually shut out of athletics prior to Title IX.

As is evident from Figure 1, schools immediately increased athletic opportunities for female students, despite the fact that schools were given until July 1978 to comply with the Title IX regulation. Although the regulation stipulating the procedures for the implementation of Title IX was not released until June 1975, most high school principals probably realized at the time the legislation passed that their schools would need to move toward roughly equal athletic participation rates among males and females.[16] Further, a school that had a high rate of male participation needed to achieve particularly large gains in female participation, unless it eliminated male sports teams.

Figure 2 shows that overall male high school athletic participation was stable through this period. National male participation rates remain around 50 percent. Figure 3 shows girls' participation as a share of all athletes. This fraction increased from 1971 when approximately 1 in 13 athletes were female to 1997 when 2 in 5 athletes were female. Note that the most dramatic changes occurred from 1972-1978, corresponding with Title IX's timing.

In sum, the equality of opportunity and equality of provision mandates in Title IX induced schools to allow and/or encourage girls to pursue an interest in sports. Although enforcement of the law was (and still

[13] The potential for Title IX to impact sports participation was so great that the NCAA was behind an aggressive lobbying effort against its passage.

[14] Although Title IX applied to most activities of schools, other forms of explicit discrimination had been removed prior to Title IX. For instance, most of the male-only colleges and universities had become coeducational prior to Title IX. Further, the rapid increase in women attending professional schools had also begun prior to Title IX (Goldin and Katz 2000).

[15] High school participation is measured as the total number of varsity players in all teams. If a person plays on two teams, they are counted as two participants.

is) far from perfect, many schools made discrete and significant changes in the accessibility and attractiveness of high school sports for girls. Furthermore, scholars have argued that Title IX created a new norm about female athletics, which generated part of the dramatic increase in female athletic participation.[17]

5. Empirical Strategy

Title IX legislation provides an exogenous shock to female sports participation nationally. Moreover, the national shock can be combined with variation across states in *male* sports participation rates, prior to Title IX, to generate a useful identification strategy for estimating the effects of female high school sports participation.

Data on sports participation come from the National High School Athletic Participation Survey conducted by the National Federation of State High School Associations (NFSH). Each state, plus the District of Columbia, has its own high school association, which is responsible for gathering information from individual schools.[18] The state associations record the number of athletes in each sport, by gender, and they report this information to the National Federation.[19]

The sports participation data provide the total number of team members in each state. To get sports participation *rates*, the raw numbers need to be divided by total high school enrollment by gender, for each state, for each year. However, high school enrollment by state and sex is not collected. Instead I collect state level high school enrollment data from administrative sources and impute a gender division using graduation rates from the 5% Public Use Micro Sample (PUMS) of the 1990 Census of Population.[20]

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[16] Title IX played a role in changing attitudes regarding the appropriateness of female sports participation – changes that were necessary for the increase to occur. In other words, even if schools expanded the *opportunities* overnight we would still expect a gradual increase in *participation* as social norms changed.
[17] Cahn 1994, Birrell & Cole 1994.
[18] Iowa appears to significantly under-report athletic participation through the 1970s.
[19] Annual data exists for the number of participants for each gender, in each sport, and by state, for the academic years 1970-71, 1972-73, 1973-74, 1975-6, 1977-78 and every academic year thereafter.
[20] While this estimate has many problems, including the fact that state of birth is used to identify the state of high school and that people with GED degrees are counted as having graduated high school, this estimate should help control for any bias that may result from a change over time in female enrollment rates caused by the increasing athletic opportunities in high school. An alternative is to impute that half of all students are female. All results have been checked and found to be robust to using this alternative imputation procedure.

Prior to Title IX's passage, individual states varied dramatically in terms of the athletic participation rate of boys (Figure 4).[21] States with higher levels of male participation needed a higher level of female participation by 1978 in order to be in compliance with Title IX. Female participation rates also varied by state prior to Title IX, but the variation in girls' participation is much smaller than that in boys' participation (Figure 5). The difference between the maximum and minimum rates of girls' participation is less than one-sixth of the difference between the maximum and minimum rates of boys' participation. The participation rates in 1977-78 illustrate that while there were some changes in male participation rates, the overwhelming change was the increase in female participation rates (Figures 6 and 7).

As a first stage equation, it might seem natural to regress a state's change in the girls' participation rates on the initial (1971) gap between the boys' and girls' participation rates:

$$Girls'\ participation^{1978}_s - Girls'\ participation^{1971}_s = \alpha + \beta(Boys'\ participation^{1971}_s - Girls'\ participation^{1971}_s) + \varepsilon_s \quad \textbf{(1)}$$

However, there are two reasons why this specification is not the most desirable one. First, female sports participation rates in 1971 appear to be measured with a great deal of error (perhaps because female athletics were not considered to be important). Putting a variable that contains substantial measurement error on both sides of an equation produces biased coefficients. Second, the *initial level* of girls' participation is likely to be correlated with state norms regarding female education, female labor force participation, and women generally. The level of boys' sports participation prior to Title IX is far less likely to reflect such norms. Since most of the variation in states' compliance problems is generated by boys' participation and since this variation is more credibly exogenous to the outcomes of interest, better first stage equations are:

$$Girls'\ participation^{1971}_s = \alpha + \beta\, Boys'\ participation^{1971}_s + \varepsilon_s \quad \textbf{(2)}$$

or

$$Girls'\ participation^{1978}_s - Girls'\ participation^{1971}_s = \alpha + \beta\,(Boys'\ participation^{1971}_s) + \varepsilon_s \quad \textbf{(3)}$$

Table 3 shows the results of estimating these two first stage equations. Columns 1 and 2 show the estimated coefficients from equations 2 and 3, respectively. The R-squared statistics indicate that the initial level of boys' participation is a strong instrument for either the level of girls' participation in 1978 or the change in girls' participation between 1971 and 1978. The coefficients indicate that a state that inherited a

[21] Since participation counts all team members and many athletes play on more than one team, this number can be

10 percentage point higher rate of male sports participation increased female participation rates by 3 to 4 percentage points by 1978. The similarity of these specifications reflects the fact that female sports participation rates were close to zero in most states. Figure 8 shows that the rise in female sports participation rates from 1971 to 1978 is closely related to the pre-existing (1971) levels of participation.

To test that the relationships just described are not merely a coincidence, the third column shows the results of estimating an analogous "placebo" regression; boys' participation in 1981 is used to predict the change from 1981 to 1988 in girls' participation. As expected, boys' participation in 1981 does not have a statistically significant effect on the subsequent change in female athletic participation. In fact, the adjusted R-squared statistic is -.001.

Title IX was passed in 1972 and took full effect in the summer of 1978. Girls who graduated from high school in 1972 would have been unaffected by Title IX, while those who started high school in the fall of 1978 would have been fully exposed to the regulations mandated by Title IX. Given approximate high school starting and finishing ages of 14 and 18 respectively, those born before 1954 would have had no exposure to Title IX, while those born after 1964 would have had complete exposure.[22] The cohort born between 1954 and 1964 had intermediate and increasing exposure to Title IX. Thus, three cohorts can be identified: a non-treated cohort consisting of women born prior to 1954, a partially treated cohort comprised of individuals born between 1954 and 1964, and a treatment cohort consisting of those born after 1964.

In sum, the *combination* of pre-law variation in male sports participation rates and the timing of the Title IX legislation interact to generate a natural experiment in girls' sports participation. The instrumental variable yields plausibly exogenous variation in girls' participation unless there is an omitted variable that changes in a way that is correlated with states' 1971 *levels* of *boys'* participation.

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greater than one.

[22] Title IX likely also affected sports participation at younger ages both because junior high schools were under the same legal requirement as high schools to give the same athletic opportunities to girls that they are giving to boys and because Title IX provide a strong incentive for girls to "invest" in sports in their early years (e.g. the prospect of playing varsity sports in high school).

There remain two necessary clarifications about the identification strategy.[23] First, because Title IX increased athletic opportunities for women at college, the instrument may also pick up a rise in college athletic scholarships and athletic participation. This effect may provide an alternative explanation for any observed positive association between high school sports and educational attainment. However, much smaller shares of both male and female students participate in college athletics than in high school athletics, so this is unlikely to constitute a large share of any observed impact of athletic opportunities on educational attainment. Even so, the reduced form results reflect the differential impact of Title IX across states.

The second clarification is to discuss the driving factors behind the state variation in male high school athletic participation rates. About a quarter of the variation can be explained by average high school size. States with larger high schools in 1971 had a smaller percentage of students as athletic participants. Additionally state weather patterns, both monthly average temperatures and precipitation as well as their standard deviations explain about an additional 50% of the variation. Finally, states with more people under 20 had lower participation rates in 1971. From this it appears as if much, although not all, of what drives differences in male high school sports participation in 1971 reflects time-invariant state characteristics.

6. The Effects of Athletic Participation on Education

I use data on 25-34 year olds from the 5% Public Use Micro Sample (PUMS) of the 1980 and 2000 Censuses of Population to look at educational attainment.[24] The 25-34 year olds from the 1980 PUMS would have attended high school entirely before Title IX enactment; the 25-34 year olds from the 2000 PUMS went to high school entirely after Title IX went into effect.[25] I regress each individual's educational attainment on the level of athletic participation that was characteristic of their cohort in their state:[26]

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[23] While Title IX did affect pregnant teens' enrollment in school, there is no reason to believe that this aspect of Title IX would have changed opportunities and incentives for girls in a way that is correlated with pre-Title IX male athletic participation.

[24] Data are for 49 states and the District of Columbia. Iowa was dropped from the sample due to reporting problems with the girls' sports participation. All results are robust to including Iowa in the sample.

[25] With the 25-34 year olds it is possible that they may have had some exposure to Title IX if they were in school beyond the standard age of high school students. Mistakenly treating those who attend high school at an older age as untreated may lead to attenuation bias.

[26] State of birth is used as an indicator of the state in which an individual attended high school. This is likely to attenuate the estimated effects of Title IX. Investigating those high school ages in the 1980, 1990, and 2000 Censuses

$$Years\ of\ Education_{i,s,t} = \alpha + \beta\ Athletic\ Participation_{s,t} + \sum_s \eta_s State_s + \sum_t \lambda_t Year_t + X_{i,s,t}\delta + \varepsilon_{i,s,t} \quad \textbf{(4)}$$

where *i*=individual, *s*=state, and *t*=year of census.

The instrument for athletic participation is the pre-Title IX (1971) level of boys' participation for 2000 cohort observations and is zero for 1980 cohort observations (because the states' compliance problem was "zero" for this cohort). The standard errors are clustered by state-year cells.[27]

Table 4 shows the instrumental variables estimates of the effects of female athletic participation on educational attainment. The first row in the first column of Table 4 suggests that a 10 percentage point increase in the female athletic participation rate in a state generates an increase in the average educational attainment among women of 0.046 years. An alternative way to interpret the estimate is to say that if *every* woman had been to induced to participate in athletics (and if none had been participating 1971) then educational attainment among women would be 0.46 years higher. (This latter interpretation is less natural, given the source of variation in the data, as it requires one to extrapolate beyond the variation in the data.) This baseline estimate includes a saturated set of controls for age and state and time fixed effects. The second row reports the reduced form estimate of the relationship between Title IX compliance problems and educational attainment. The third row gives the estimate from the first stage (equation 3).[28]

The estimates in the next three columns examine whether the instrumental variables estimate is robust to changes in the specification. Column 2 shows that the estimated coefficients are largely unchanged by adding controls for race and ethnicity. Recall that, in order for an omitted variable to be driving the results, it would have to be changing over time in a way that is correlated with the initial level of boys' sports participation. For example, if there were relatively smaller or larger increase in educational attainment in the south during this period we might be concerned about regional trends. Indeed Figure 4 shows that southern states had boys' participation rates in 1971 that were below the median. In column 3 of Table 4, controls are

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shows no relationship between changes in the probability of still living in your state of birth and the 1971 level of boys' athletic participation. While mobility changes may themselves be an outcome of increased sports opportunities, there is no preexisting pattern.

[27] Alternatively, the regressions can be run by aggregating to the state-level. All of my results are robust to such a specification. Results are available from the author upon request.

added for regional changes (year-times-region-of-birth indicator variables) and column 4 controls for economic conditions around the time these women were making their education decisions.[29] In sum, while adding regional trends magnifies the coefficient slightly, there appears to be a robust relationship between educational attainment and the opportunity to play sports.

Table 5 further analyzes the relationship between sports participation and post-secondary educational attainment. The first two columns in Table 5 regress sports participation on whether or not an individual received at least 1 year of education beyond high school. The first column shows that a 10 percentage point increase in girls' sports participation generates an increase of 1.3 percentage points in the probability of getting some post-secondary education. As in Table 4, I test the sensitivity of the specification to the inclusion of regional changes and economic conditions in the state of birth. Adding these controls has little impact on the reduced form estimate, but the IV estimate falls a little.

I next look at the probability of attending at least four years of college. The first column shows that a 10 percentage point increase in girls' sports participation generates an increase of 0.8 percentage points in the probability of getting at least a college degree. Adding controls for regional changes and state of birth economic conditions has little impact on the estimates.

To look further at post-secondary educational attainment I generated a variable indicating whether or not an individual has received more than 4 years of post-secondary schooling. With a saturated set of controls for age, race, ethnicity, and state and year fixed effects, a 10 percentage point increase in girls' sports participation generates an increase of .14 percentage points in the probability post-college education. However, this effect is not statistically significant. Adding regional changes and state of birth economic conditions, the estimated coefficient rises and becomes statistically significant.

In sum, it appears as if sports participation induced by Title IX had a large and statistically significant effect on female educational attainment. The reduced form results also indicate that states with bigger compliance problems (and thus bigger predicted increases in female sports participation) had bigger

[28] The estimated coefficient here will differ from that in Table 3 both because of added controls and because these regression reflect census weights.
[29] Region is a saturated set of dummies for the nine U.S. regions, identified for an individual's state of birth.

increases in educational attainment for women. The IV results suggest that a 10 percentage point rise in sports participation raises average years of education in a state by .04 to .06 years. Overall female sports participation rose by around 30% suggesting that this might account for a rise in female educational attainment of .12 to .18 years. This rise appears evident across all education levels.

7. The Effect of Athletic Participation on Employment, Occupational Choice, and Wages

If participating in athletics gives women skills that are particularly useful in the workforce, then we may expect to find that women who participated in athletics are more likely to be part of the employed labor force.[30] To test this I regress whether or not a woman reports being employed at the time of the census on the level of athletic participation that was characteristic of her cohort in her state:

$$Employed_{i,s,t} = \alpha + \beta\ Athletic\ Participation_{s,t} + \mathbf{X_{i,s,t}}\boldsymbol{\delta} + \sum_{s} \eta_s State_s + \sum_{t} \lambda_t Year_t + \varepsilon_{i,s,t} \quad \textbf{(5)}$$

Following the previous section, I instrument for athletic participation with the interaction of boys' participation in 1971 and a post-Title IX dummy variable.

Regressions in Tables 6a and 6b also include controls for age and state and year fixed effects. Column 1 of Table 6a shows that a 10-percentage point increase in girls' sports participation generates an increase of 1.9 percentage points in the probability of being employed. This result is robust to controlling for race and ethnicity (column 2). Adding controls for regional changes raises the standard error and suggests a slightly smaller effect. Controlling for a lagged set of economic conditions in the state of birth has little effect on the reduced form estimate, but lowers the standard error and the magnitude on the coefficient from the IV regression.

To further test this specification, regressions were run defining a woman as employed only if she reported having been employed for at least 46 weeks of the previous year. The estimated coefficients are similar to those estimated using employment status at the time of the census survey (columns 5-8 of Table 6a). To analyze employment patterns further, Table 6b examines women who report working full-time (a

typical work-week of 35+ hours). Controlling for age, race, ethnicity, and state and year fixed effects, a 10-percentage point increase in girls' sports participation generates an increase of 1.9 percentage points in the probability of working full-time (column 1).

The last four columns turn to a different measure, analyzing the probability that a woman is employed full-time conditional on being employed. The baseline specification indicates that among the employed, women born in states with a 10-percentage point higher increase in athletic opportunities were .3 to .6 percentage points more likely to work full-time.

Sports participation might have an effect on the type of career chosen. The natural starting point is to examine whether women in states with more opportunities to play sports are subsequently more likely to be employed in a sports-related occupation. Using time-consistent occupational codes in the IPUMS, 0.034% of all women were employed in sports-related occupations in 1980 and that number tripled to 0.089% in 2000. Results in Table 7 (columns 1 & 2) shows that a 10-percentage point rise in the opportunities to play high school sports offered to girls increased the probability of being in employed in a sports related position by .02 percentage points, which represents one-third of the growth in employment in sports-related occupations between 1980 and 2000. Since Title IX led to an average female high sports participation rate of about 30%, the sports opportunities offered by Title IX can explain *all* of the growth in employment of women in sports-related occupations between 1980 and 2000.

Additionally, one might want to ask if girls who play sports are more likely to choose an occupation that has been traditionally male in the past. Male occupations are defined as those occupations in which at least two-thirds of the workers under the age of 50 in 1970 were male. Similarly female occupations are those in which two-thirds of the workers under the age of 10 in 1970 were female. "Mixed" occupations represent the remaining occupations. In 1980, 12.9% of women were employed in male occupations, 22.7% in female occupations, and 25.2% in mixed occupations. In 2000 those numbers had risen to 22.5% and 29% in male-dominated and mixed occupations respectively, while the percent of women employed in female occupations had fallen to 20.2%. Table 7 shows that relative to the 1980 baseline, growth in male and mixed

[30] For instance, using the NLSY-79 women who played sports in high school were 5 percent more likely to be working

occupations were higher than that in female occupations. A 10-percentage point rise in athletic opportunities led to a 0.45 percentage point rise in the probability of being employed in a male occupation, a 0.36 percentage point rise in the probability of being in a female occupation, and a 1.1 percentage point rise in the probability of being in a "mixed" occupation. Thus the rise in female employment documented in Table 6 was concentrated in occupations that are not traditionally female.

Table 8 examines occupational selection by previous gender ratios and the skill-requirement of the occupations. "High education" occupations are those in which the average worker had 12.5 years of education or higher in 1970, while "low education" occupations are ones in which the average worker had less than 12.5 years of education. The first 6-columns examine the likelihood that an individual is employed in a high-education occupation that is traditionally male, female, or mixed gender. The pattern of coefficients shows that higher rates of athletic participation led a rise in employment of women in high-education male-occupations in both specifications. For mixed-gender occupations higher rates of athletic participation are associated with a greater probability of employment in such occupations, however this result is not robust to the inclusion of region-by-time trends and state of birth economic conditions. Both specifications show no relationship between sports opportunities and employment in high-education female occupations.

For low education occupations the pattern of coefficients shows a relationship between greater sports opportunities and an increased female employment in mixed occupations. For low-skill male occupations there is a small and in most cases statistically insignificant negative relationship with athletic opportunities, while there is a positive relationship for low-skill female occupations that reverses with the inclusion of region-by-time and state of birth economic conditions.

In sum, it appears as if higher sports opportunities led to greater employment in traditionally male and mixed gender occupations, compared with traditionally female occupations. This relationship is driven by women entering high education occupations.

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10 years later.

Finally, I look at the relationship between athletic opportunities generated by Title IX and the subsequent wages received by women. This relationship is particularly difficult to examine because the results in the previous section illustrate that Title IX generated a large labor supply shock which may mitigate against any human capital gain that might be increasing wages. Indeed the baseline specification shown in column 1 of Table 9 shows a large and statistically significant negative relationship between athletic opportunities and female wages. This relationship is positive, albeit imprecisely estimated, when controls for region-by-time trends and state of birth economic conditions are added. Columns 3 and 4 add a control for years of education and show a similar pattern to that seen in columns 1 and 2.

8. Conclusion

Despite the controversial nature of applying Title IX to athletics, there has been surprisingly little research done on the effects of Title IX on sports participation, and even less on the effects of female sports participation on later outcomes for women. Previous research, in both the economics and sociology literature, has found that participating in athletics, both at the high school and college level, translates into improved outcomes for men. While some of this research has attempted to look at women, the small number of women participating in athletics prior to 1972 made it near impossible to find significant effects. Furthermore, the existing literature has been hampered by a severe methodological problem in that sports participation is not randomly determined. As such, selection issues may swamp the previous findings of positive relationships between sports participation and outcome measures.

Title IX of the Education Amendments to the 1964 Civil Rights Act required schools to provide athletic opportunities for girls equal to those provided to boys. Before Title IX was enacted, states differed in the levels of athletic opportunities offered to boys, while negligible opportunities were offered to girls everywhere. Hence compliance required a larger increase in girls' sports participation in those states with historically strong sports programs for boys. Thus, the *interaction* of the Title IX legislation with pre-existing levels of boys' sports participation provides a credibly exogenous instrument for the change in girls' athletic participation over the 1972-78 period. Reduced form estimates suggest that this interaction is

significantly related to changes in female educational attainment and employment status. Further, first stage regressions show that the instrument does indeed explain much of the variation through time in state-level measures of athletic participation. Thus, I conclude that athletic participation has important causal effects on women's educational and labor market outcomes. While alternative interpretations may point to the impact of Title IX on other things going on in the education system, these interpretations need to rely on the change in outcomes being correlated with the initial level of sports participation of boys.

My central estimates suggest that if a state's female sports participation rate rises 10-percentage points, then average levels of schooling in the state will rise by around .04-.06 years, and employment rates will rise by 1-to-2 percentage points. Thus, while selection may explain some of the positive correlates of athletic participation found in cross-sectional analysis, this research provides evidence of important treatment effects as well.

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Figure 1
Female High School Sports Participation
(As a Percentage of Female High School Enrollment)

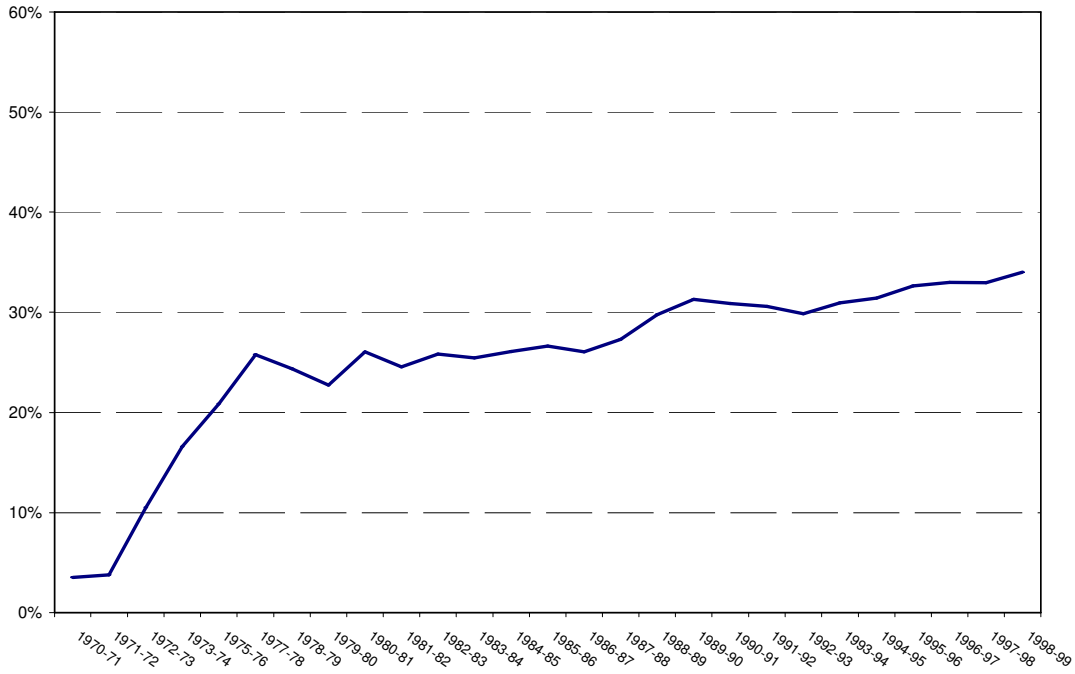
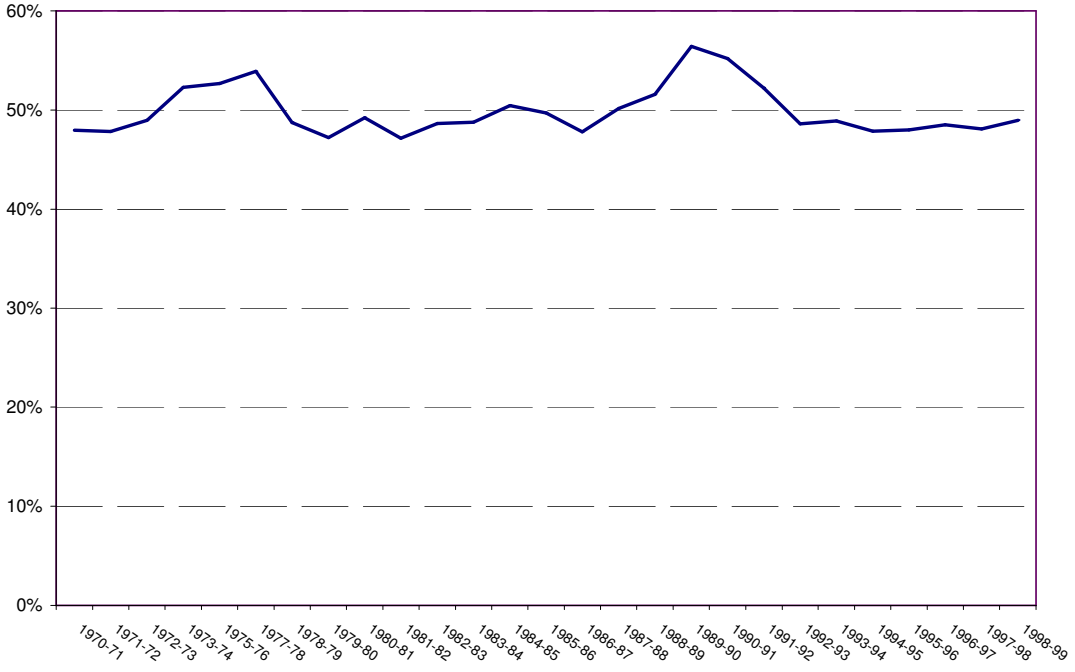
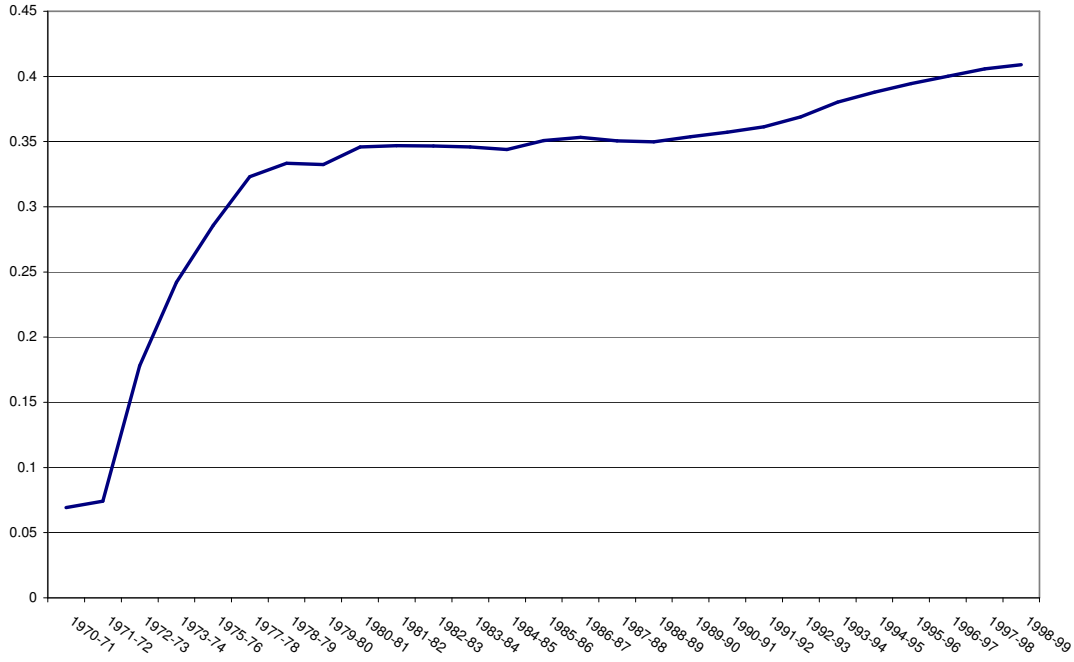


Figure 2
Male High School Sports Participation
(As a Percentage of Male High School Enrollment)



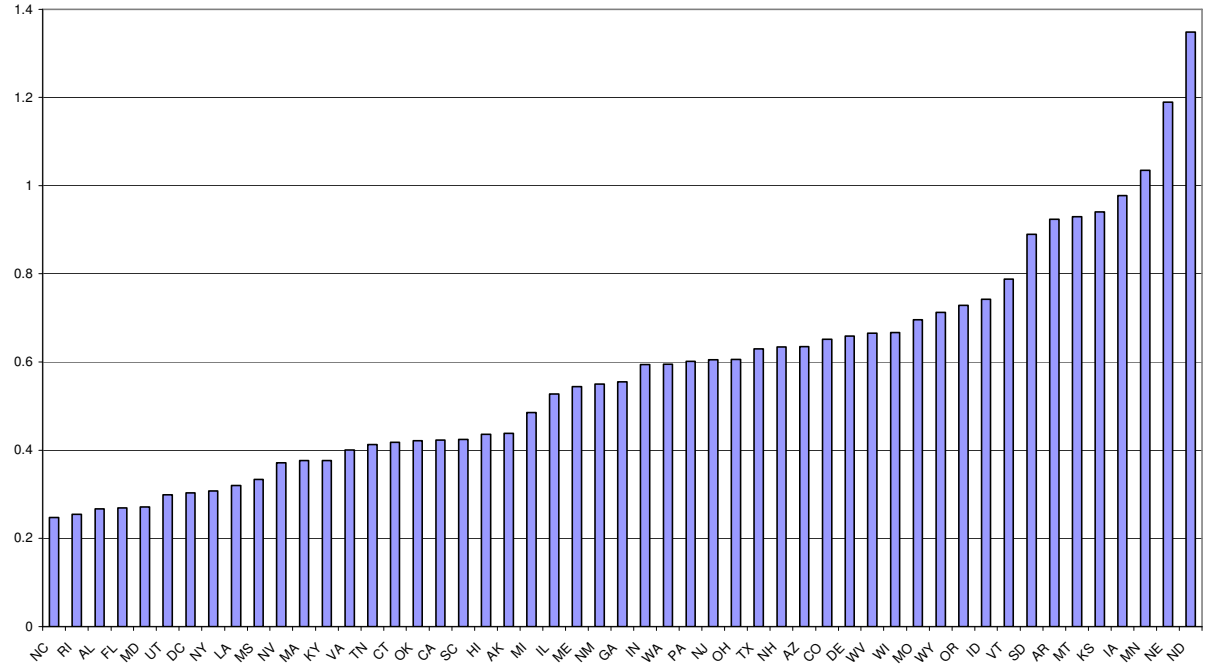
Source: Participation numbers are from the National Athletic Participation Survey (conducted by the National Federation of High Schools). A participant is a varsity sport team member. (Individual students may be counted more than once if they play on multiple teams.) The participation rate is the sum of total team memberships in a year, divided by total high school enrollment given by the National Center for Education Statistics.

Figure 3
Female High School Sports Participants
(As a Fraction of all Sports Participants)



Source: Participation numbers are given by the National Federation of High Schools (Athletic Participation Survey). A participant is a varsity sport team member. (Individual students may be counted more than once if they play on multiple teams.) The participation rate is the sum of total team memberships in a year, divided by total high school enrollment given by the National Center for Education Statistics.

Figure 4
Male Sports Participation Rate in 1971



Source: State numbers for 1971 are calculated by the author from state-level participation numbers by sport (provided by the National Federation of High Schools Athletic Participation Survey). The participation numbers are divided by an estimate of the state's high school population. These are estimated using state-level high school enrollment data from the National Center for Education Statistics (NCES), with a gender split imputed using graduation rates by state of birth from the 5% Public Use Micro Sample (PUMS) of the 1990 Census of Population.

Figure 5
Female Sports Participation Rate in 1971

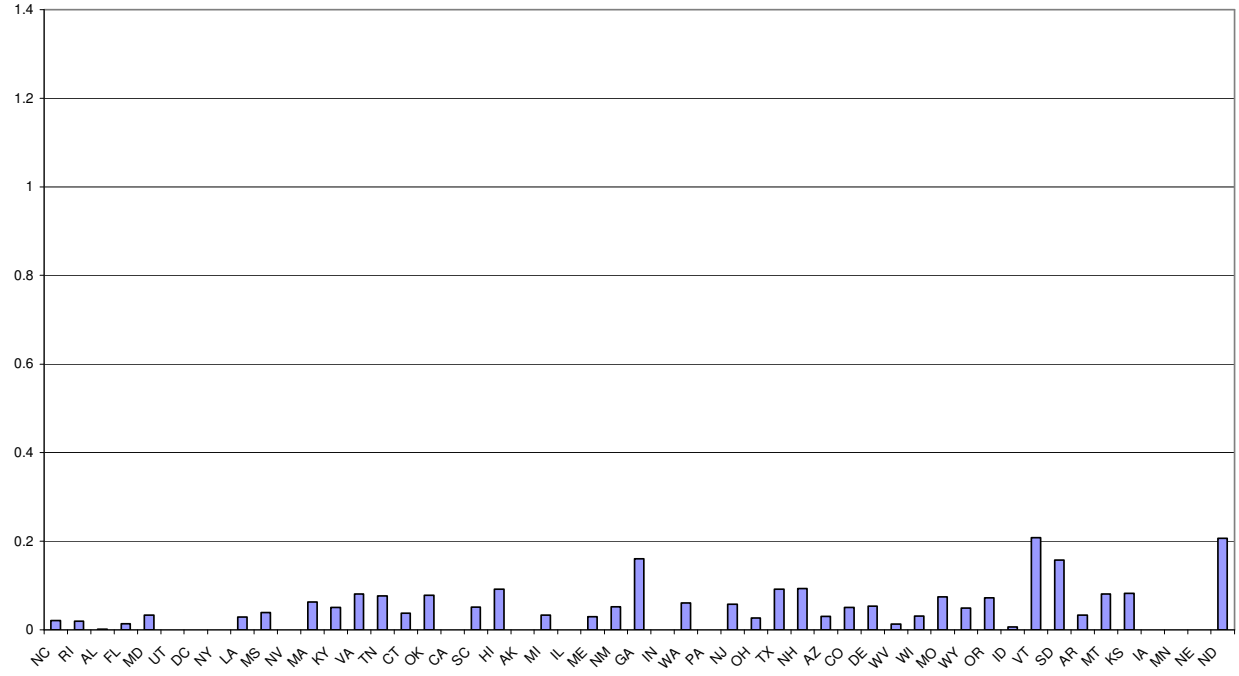
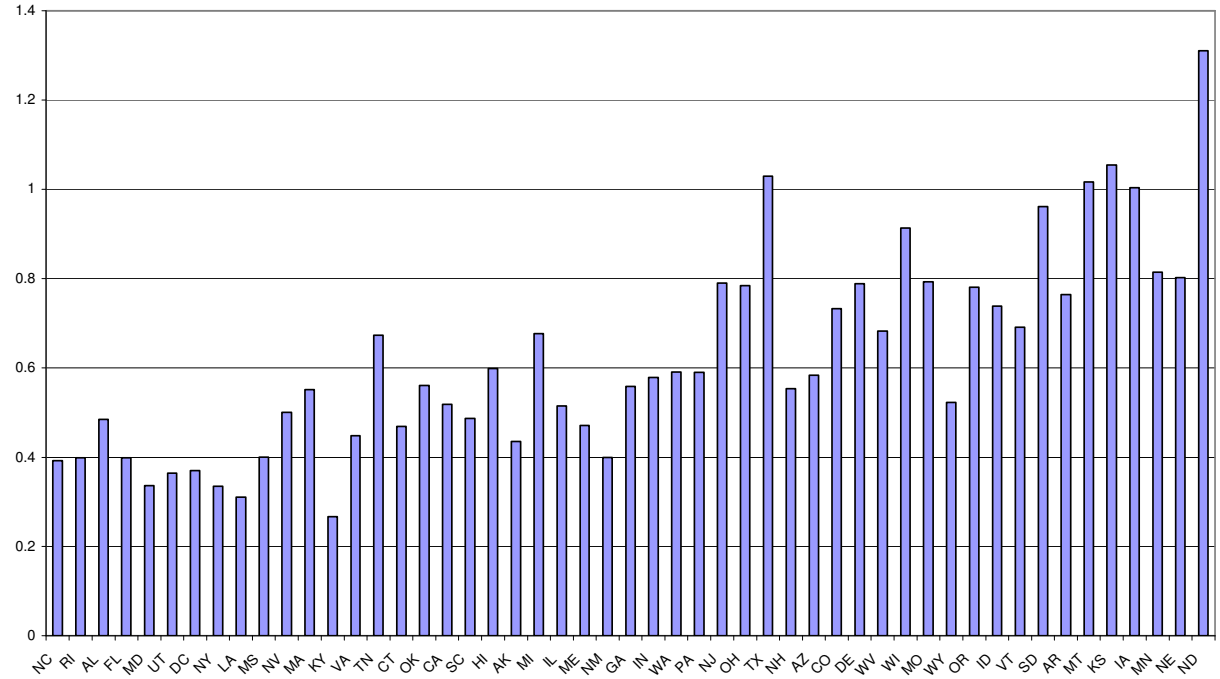


Figure 6
Boys Participation 1977



Source: State numbers for 1971 are calculated by the author from state-level participation numbers by sport (provided by the National Federation of High Schools Athletic Participation Survey). The participation numbers are divided by an estimate of the state's high school population. These are estimated using state-level high school enrollment data from the National Center for Education Statistics (NCES), with a gender split imputed using graduation rates by state of birth from the 5% Public Use Micro Sample (PUMS) of the 1990 Census of Population. The states are sorted in order of increasing level of boys' sports participation in 1971 (see Figure 4).

Figure 7
Girls Participation 1977

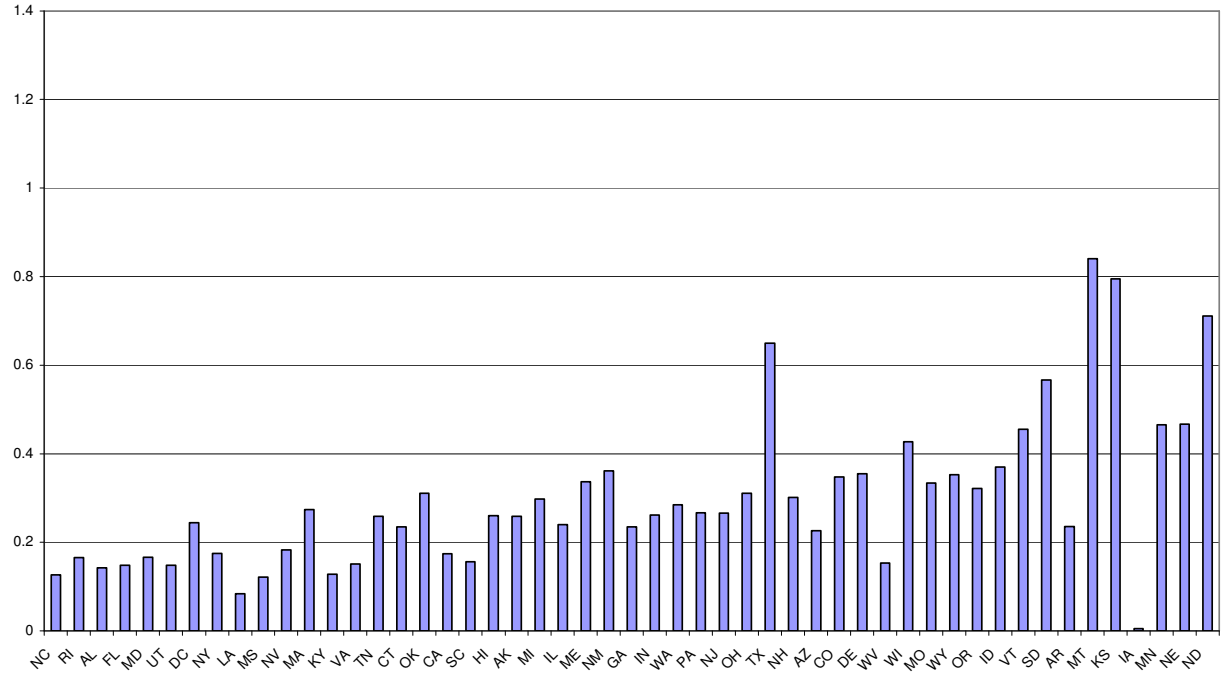
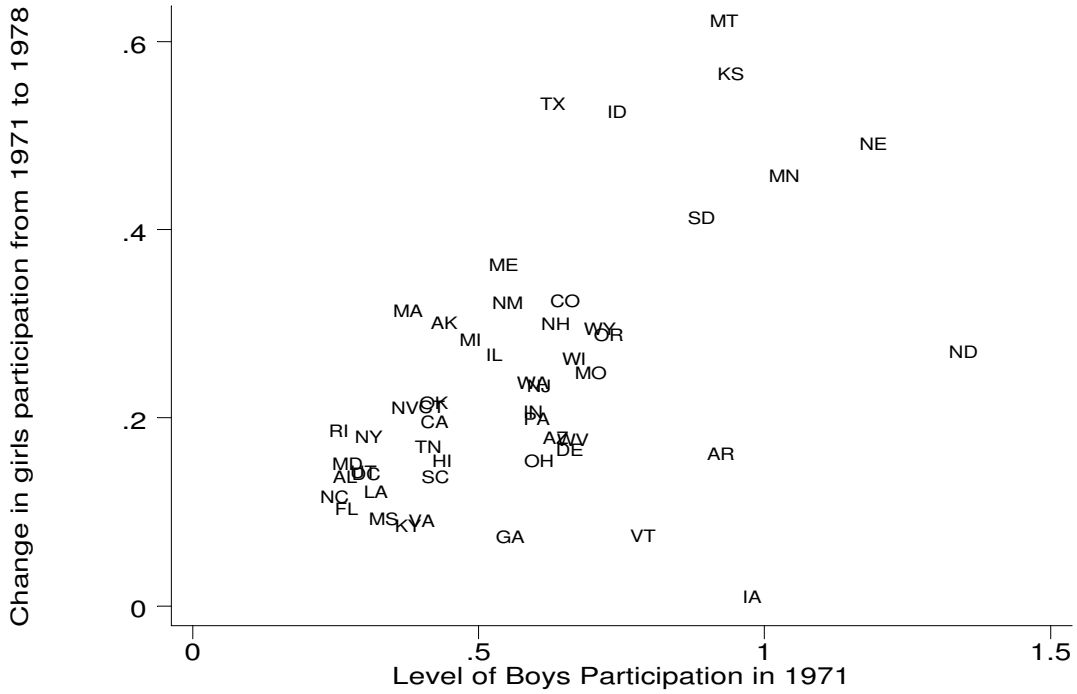


Figure 8



Source: State numbers for 1971 are calculated by the author from state-level participation numbers by sport (provided by the National Federation of High Schools Athletic Participation Survey). The participation numbers are divided by an estimate of the state's high school population. These are estimated using state-level high school enrollment data from the National Center for Education Statistics (NCES), with a gender split imputed using graduation rates by state of birth from the 5% Public Use Micro Sample (PUMS) of the 1990 Census of Population. The states in Figure 7 are sorted in order of increasing level of boys' sports participation in 1971 (see Figure 4).

Table 1
Effects of High School Participation in Extra Curricular Activities on Educational Attainment

	Dependent Variable: Years of Education[a] (OLS)							
Independent Variable	**Female**				**Male**			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Athletics[b]	.653	.371	.323	.276	.804	.417	.399	.387
	(.055)	(.049)	(.050)	(.050)	(.056)	(.048)	(.048)	(.048)
All Non-Athletic Clubs[b]			.287				.210	
			(.052)				(.048)	
Vocational Clubs[b]				-.096				-.277
				(.049)				(.056)
Non-vocational Clubs[b]				.384				.427
				(.050)				(.050)
Controls[c]								
Race	✓	✓	✓	✓	✓	✓	✓	✓
Parents' Education[d]	✓	✓	✓	✓	✓	✓	✓	✓
Urban/Rural status	✓	✓	✓	✓	✓	✓	✓	✓
Age	✓	✓	✓	✓	✓	✓	✓	✓
State at age 14	✓	✓	✓	✓	✓	✓	✓	✓
AFQT Score		✓	✓	✓		✓	✓	✓
National Honor Society		✓	✓	✓		✓	✓	✓
Number of Observations	5148	5148	5148	5148	4932	4932	4932	4932
Adjusted R-squared	.22	.40	.41	.40	.24	.47	.47	.48

Source: Author's calculations based on data from National Longitudinal Survey of Youth, 1979 (NLSY79).
(Standard errors in parentheses.)
[a] Educational attainment is that achieved by 1996. Sample is restricted to those who completed at least 10th grade.
[b] Participation in extra-curricular activities was asked in 1984. *Athletics* is an indicator variable for an individual having participated in high school sports. *Non-athletic clubs* include vocational clubs, student government, newspaper, yearbook, and other, primarily hobby, clubs. This variable is then further divided into two collectively exhaustive and mutually exclusive categories: *vocational* and *non-vocational* clubs.
[c] All control variables are included as a saturated set of dummy variables.
[d] *Parent's education* reflects the highest grade completed by either parent.

Table 2
Effects of High School Participation in Extra Curricular Activities on Educational Attainment on Log Hourly Wage

	Dependent Variable: Log Hourly Wages[a] (OLS)									
Independent Variable	**Female**					**Male**				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Athletics[b]	.126***	.078***	.067***	.067***	.068***	.105***	.069***	.055***	.057***	.058***
	(.019)	(.019)	(.019)	(.019)	(.019)	(.021)	(.021)	(.022)	(.022)	(.022)
All Non-Athletic Clubs[b]				.001					-.036*	
				(.021)					(.021)	
Vocational Clubs[b]					-.019					-.038
					(.020)					(.025)
Non-vocational Clubs[b]					.002					-.023
					(.019)					(.023)
Controls[c]										
Race	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Parents' Education[d]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Urban/Rural status	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Age	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
State at age 14		✓	✓	✓	✓		✓	✓	✓	✓
Educational attainment		✓	✓	✓	✓		✓	✓	✓	✓
AFQT Score			✓	✓	✓			✓	✓	✓
National Honor Society			✓	✓	✓			✓	✓	✓
Number of Observations	3724	3724	3724	3724	3724	3712	3712	3712	3712	3712
Adjusted R-squared	.13	.18	.21	.21	.21	.09	.11	.13	.13	.13

Source: Author's calculations based on data from National Longitudinal Survey of Youth, 1979 (NLSY79).
(Standard errors in parentheses.) ***, ** and * indicate statistically discernible from zero at the 1%, 5% and 10% levels, respectively.
[a] Log hourly wages are as reported in 1988 when the average respondent is 28 years old. Sample is restricted to those who completed at least 10th grade, are employed, and have a valid hourly wage observation.
[b] Participation in extra-curricular activities was asked in 1984. *Athletics* is an indicator variable for an individual having participated in high school sports. *Non-athletic clubs* include vocational clubs, student government, newspaper, yearbook, and other, primarily hobby, clubs. This variable is then further divided into two collectively exhaustive and mutually exclusive categories: *vocational* and *non-vocational* clubs.
[c] All control variables are included as a saturated set of dummy variables.
[d] Parent's education reflects the highest grade completed by either parent.

Table 3
The Relationship Between the Change in Girls Sports Participation and the Pre-existing Level of Boys Sports Participation

Independent Variable	Change in Girls' participation Rate: 1971-1978 (1)	Girls' participation Rate in 1978 (2)	PLACEBO Change in Girls' participation Rate: 1981-1988 (3)
Boys' participation in 1971	.280***	.353***	
	(.067)	(.068)	
Boys' participation in 1981			.080
			(.083)
Adjusted R^2	.25	.34	-.001
Number of Observations	51	51	51

***, **, and * indicate statistically discernible from zero at the 1%, 5% and 10% levels, respectively.

Source: Participation rates are calculated by the author using total participation numbers from High School Athletics Participation Survey (conducted by the National Federation of High Schools). A participant is a varsity sport team member. (Individual students may be counted more than once if they play on multiple teams.) The participation rate is the sum of total team memberships in a state in a year, divided by an estimate of the state's high school population. These are estimated using state-level high school enrollment data from the National Center for Education Statistics (NCES), with a gender division is imputed using graduation rates by state of birth from the 5% Public Use Micro Sample (PUMS) of the 1990 Census of Population.

Table 4
Instrumental Variables Estimates of the Effects of Female Athletic Participation on Educational Attainment

	(1)	(2)	(3)	(4)
Wald Estimator (IV)	.456**	.392**	.665***	.392***
Causal Effect of Sports Participation[a]	(.222)	(.180)	(.254)	(.160)
Reduced Form Results:	.195**	.168***	.235***	.222***
Differential Effects of Title IX on Years of Education, by State[b]	(.081)	(.066)	(.053)	(.079)
First-Stage Results:	.428	.429	.354	.567
Changes in Female Sports Participation Generated by Title IX[c]	(.059)	(.059)	(.075)	(.079)
<u>Controls</u> (all regressions include state of birth and year of census fixed effects and a saturated set of dummies for age)				
Race, ethnicity	No	Yes	Yes	Yes
Year*Region of Birth Fixed Effects	No	No	Yes	Yes
Economic conditions in state of birth	No	No	No	Yes
Observations (standard errors are clustered at the level of 100 state-year cells)	1,544,870	1,544,870	1,544,870	1,544,870

Standard errors (shown in parentheses) are clustered by state of birth and year of census. ***, **, and * indicate statistically significant at the 1%, 5% and 10% levels.
<u>Source:</u> 1980 and 2000 Censuses of Population, IPUMS, 5% sample (Ruggles and Sobek 1997). Data are for 49 states plus the District of Columbia. Iowa is excluded because it does not report girls' sports participation in 1978. Data are for women aged 25-34 conditional on having completed 10th grade.
<u>Specifications:</u>

[a]IV estimates of causal effects of rising state female sports participation rates:

$$Years\ of\ Schooling_{i,s,t} = \alpha + \beta\ Female\ Athletic\ Participation_{s,t}^{IV} + \sum_s \eta_s State_s + \sum_t \chi_t Year_t + \mathbf{X}_{i,s,t}\lambda + \varepsilon_{i,s,t}$$

[b] Reduced Form Results: Relationship between changing girls' educational outcomes, and the pre-existing levels of boys sports participation:

$$Years\ of\ Schooling_{i,s,t} = \alpha + \beta(Post\ Title\ IX\ Cohort_t * Boys\ Athletic\ Participation_s^{1971}) + \sum_s \eta_s State_s + \sum_t \chi_t Year_t + \mathbf{X_{i.s.t}}\boldsymbol{\lambda} + \varepsilon_{i,s,t}$$

[c] 1st Stage Regression: Changes in girls sports participation by state generated by the interaction of Title IX and pre-existing levels of boys sports participation:

$$Female\ Athletic\ Participation_{i,s,t} = \alpha + \beta(Post\ Title\ IX\ Cohort_{t^{\wedge}} * Boys\ Athletic\ Participation_s^{1971}) + \sum_s \eta_s State_s + \sum_t \chi_t Year_t + \mathbf{X_{i.s.t}}\boldsymbol{\lambda} + \varepsilon_{i,s,t}$$

All regressions include as controls a saturated set of dummy variables for state of birth, year of sample, and age. Race is included as a set of 4 dummies indicating black, Asian, Native American, and other. Ethnicity is a dummy variable indicating the respondent is Hispanic. Economic conditions in the state of birth include a three-year lag of the log of per capita nominal GSP, a 10-year lag of the log of per capita personal income, a 5-year lag of the housing price index, and an 8-year lag of unemployment rate.

Table 5
Instrumental Variables Estimates of the Effects of Female Athletic Participation on the Probability of Attending College

	Attended at least 1 year of college		Attended at least four years of college		Post-college education	
	(1)	(2)	(3)	(4)	(5)	(6)
Wald Estimator (IV)	.133***	.079**	.076**	.061**	.013	.029*
Causal Effect of Sports Participation [a]	(.046)	(.033)	(.038)	(.030)	(.014)	(.016)
Reduced Form Results: Differential Effects of Title IX on	.057***	.045***	.032**	.035**	.006	.017**
College-going propensities, by State [b]	(.015)	(.017)	(.015)	(.016)	(.006)	(.007)
First-Stage Results: Changes in Female Sports	.429	.567	.429	.567	.429	.567
Participation Generated by Title IX [c]	(.059)	(.079)	(.059)	(.079)	(.059)	(.079)
Controls (all regressions include state of birth and year of census fixed effects and a saturated set of dummies for age)						
Race, ethnicity	Yes	Yes	Yes	Yes	Yes	Yes
Year*Region of Birth Fixed Effects	No	Yes	No	Yes	No	Yes
Economic conditions in state of birth	No	Yes	No	Yes	No	Yes
Observations (standard errors are clustered at the level of 100 state-year cells)	1,544,870	1,544,870	1,544,870	1,544,870	1,544,870	1,544,870

Standard errors (shown in parentheses) are clustered by state of birth and year of census. ***, **, and * indicate statistically significant at the 1%, 5% and 10% levels.
Source: 1980 and 2000 Censuses of Population (IPUMS) 5% sample (Ruggles and Sobek 1997). Data are for 49 states plus the District of Columbia. Iowa is excluded because it does not report girls sports participation in 1978. Data are for women aged 25-34 conditional on having completed 10th grade.
Specifications: (Linear probability model)

[a] IV estimates of causal effects of rising state female sports participation rates:

$$Attended\ college_{i,s,t} = \alpha + \beta\ Female\ Athletic\ Participation_{s,t}^{IV} + \sum_s \eta_s State_s + \sum_t \chi_t Year_t + \mathbf{X}_{i,s,t}\lambda + \varepsilon_{i,s,t}$$

[b] Reduced Form Results: Relationship between changing girls' educational outcomes, and the pre-existing levels of boys sports participation:

$$Attended\ college_{i,s,t} = \alpha + \beta\ (Post\ Title\ IX_t\ *\ Boys\ Athletic\ Participation_s^{1971}) + \sum_s \eta_s State_s + \sum_t \chi_t Year_t + \mathbf{X_{i.s.t}}\boldsymbol{\lambda} + \varepsilon_{i,s,t}$$

[c] 1st Stage Regression: Changes in girls sports participation by state generated by the interaction of Title IX and pre-existing levels of boys sports participation:

$$Female\ Athletic\ Participation_{i,s,t} = \alpha + \beta\ (Post\ Title\ IX_t\ *\ Boys\ Athletic\ Participation_s^{1971}) + \sum_s \eta_s State_s + \sum_t \chi_t Year_t + \mathbf{X_{i.s.t}}\boldsymbol{\lambda} + \varepsilon_{i,s,t}$$

All regressions include as controls a saturated set of dummy variables for state of birth, year of sample, and age. Race is included as a set of 4 dummies indicating black, Asian, Native American, and other. Ethnicity is a dummy variable indicating the respondent is Hispanic. Economic conditions in the state of birth include a three-year lag of the log of per capita nominal GSP, a 10-year lag of the log of per capita personal income, a 5-year lag of the housing price index, and an 8-year lag of unemployment rate.

Table 6a
Instrumental Variables Estimates of the Effects of Female Athletic Participation on Employment Status

	Employed at time of the survey 1=Working, 0=Not Working				**Employed full-year last year** Employed at least 46 weeks in past year			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Wald Estimator (IV)	.189***	.187***	.151**	.103***	.187***	.186***	.170***	.094***
Causal Effect of Sports Participation [a]	(.055)	(.054)	(.067)	(.041)	(.050)	(.049)	(.065)	(.036)
Reduced Form Results: Differential Effects of Title IX on Employment, by State [b]	.081***	.080***	.053***	.058***	.080***	.080***	.060***	.053***
	(.017)	(.018)	(.017)	(.018)	(.015)	(.014)	(.014)	(.016)
First-Stage Results: Changes in Female Sports Participation Generated by Title IX [c]	.428	.429	.354	.567	.428	.429	.348	.567
	(.059)	(.059)	(.075)	(.079)	(.059)	(.059)	(.073)	(.079)
Controls								
Race, ethnicity	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Year*Region of Birth Fixed Effects	No	No	Yes	Yes	No	No	Yes	Yes
Economic conditions in state of birth	No	No	No	Yes	No	No	No	Yes
Observations (standard errors are clustered at the level of 100 state-year cells)	1,544,870	1,544,870	1,544,870	1,544,870	1,544,870	1,544,870	1,544,870	1,544,870

Standard errors (shown in parentheses) are clustered at the level of 100 state-year cells. ***, **, and * indicate statistically significant at the 1%, 5% and 10% levels.
Source: 1980 and 2000 Censuses of Population (IPUMS) 5% sample (Ruggles and Sobek 1997). Data are for 49 states plus the District of Columbia. Iowa is excluded because it does not report girls sports participation in 1978. Data are for women aged 25-34 conditional on having completed 10th grade.
Specifications: (Linear probability model)

[a] IV estimates of causal effects of rising state female sports participation rates:

$$Employed_{i,s,t} = \alpha + \beta\ Female\ Athletic\ Participation_{s,t}^{IV} + \sum_s \eta_s State_s + \sum_t \chi_t Year_t + \mathbf{X}_{i,s,t}\lambda + \varepsilon_{i,s,t}$$

[b] Reduced Form Results: Relationship between changing women's labor market outcomes, and the pre-existing levels of boys sports participation:

$$Employed_{i,s,t} = \alpha + \beta\ (Post\ Title\ IX_t\ *\ Boys\ Athletic\ Participation_s^{1971}) + \sum_s \eta_s State_s + \sum_t \chi_t Year_t + \mathbf{X_{i.s.t}}\lambda + \varepsilon_{i,s,t}$$

[c] 1st Stage Regression: Changes in girls sports participation by state generated by the interaction of Title IX and pre-existing levels of boys sports participation:

$$Female\ Athletic\ Participation_{i,s,t} = \alpha + \beta\ (Post\ Title\ IX_t\ *\ Boys\ Athletic\ Participation_s^{1971}) + \sum_s \eta_s State_s + \sum_t \chi_t Year_t + \mathbf{X_{i.s.t}}\lambda + \varepsilon_{i,s,t}$$

All regressions include as controls a saturated set of dummy variables for state of birth, year of sample, and age. Race is included as a set of 4 dummies indicating black, Asian, Native American, and other. Ethnicity is a dummy variable indicating the respondent is Hispanic. Economic conditions in the state of birth include a three-year lag of the log of per capita nominal GSP, a 10-year lag of the log of per capita personal income, a 5-year lag of the housing price index, and an 8-year lag of unemployment rate.

Table 6b
Instrumental Variables Estimates of the Effects of Female Athletic Participation on Employment Status

	Full-time Worker Usually work at least 35 hours per week				Full-time worker conditional on being employed			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Wald Estimator (IV) **Causal Effect of Sports Participation** [a]	.190***	.190***	.136**	.101**	.068**	.069**	.024	.033
	(.059)	(.058)	(.061)	(.047)	(.030)	(.028)	(.029)	(.034)
Reduced Form Results: Differential Effects of Title IX on Employment, by State [b]	.081***	.081***	.048***	.057***	.029***	.030***	.008	.018
	(.020)	(.019)	(.016)	(.021)	(.017)	(.011)	(.010)	(.018)
First-Stage Results: Changes in Female Sports Participation Generated by Title IX [c]	.428	.429	.354	.567	.427	.427	.348	.567
	(.059)	(.059)	(.075)	(.079)	(.057)	(.057)	(.073)	(.079)
Controls								
Race, ethnicity	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Year*Region of Birth Fixed Effects	No	No	Yes	Yes	No	No	Yes	Yes
State of birth characteristics	No	No	No	Yes	No	No	No	Yes
Observations (standard errors are clustered at the level of 100 state-year cells)	1,544,870	1,544,870	1,544,870	1,544,870	1,047,810	1,047,810	1,047,810	1,047,810

Standard errors (shown in parentheses) are clustered at the level of 100 state-year cells. ***, **, and * indicate statistically significant at the 1%, 5% and 10% levels.
Source: 1980 and 2000 Censuses of Population (IPUMS) 5% sample (Ruggles and Sobek 1997). Data are for 49 states plus the District of Columbia. Iowa is excluded because it does not report girls sports participation in 1978. Data are for women aged 25-34 conditional on having completed 10th grade.
Specifications: (Linear probability model)

[a] IV estimates of causal effects of rising state female sports participation rates:

$$Employed_{i,s,t} = \alpha + \beta\ Female\ Athletic\ Participation^{IV}_{s,t} + \sum_s \eta_s State_s + \sum_t \chi_t Year_t + \mathbf{X}_{i,s,t}\lambda + \varepsilon_{i,s,t}$$

[b] Reduced Form Results: Relationship between changing women's labor market outcomes, and the pre-existing levels of boys sports participation:

$$Employed_{i,s,t} = \alpha + \beta\ (Post\ Title\ IX_t\ *\ Boys\ Athletic\ Participation^{1971}_s) + \sum_s \eta_s State_s + \sum_t \chi_t Year_t + \mathbf{X_{i.s.t}}\boldsymbol{\lambda} + \varepsilon_{i,s,t}$$

[c] 1st Stage Regression: Changes in girls sports participation by state generated by the interaction of Title IX and pre-existing levels of boys sports participation:

$$Female\ Athletic\ Participation_{i,s,t} = \alpha + \beta\ (Post\ Title\ IX_t\ *\ Boys\ Athletic\ Participation^{1971}_s) + \sum_s \eta_s State_s + \sum_t \chi_t Year_t + \mathbf{X_{i.s.t}}\boldsymbol{\lambda} + \varepsilon_{i,s,t}$$

All regressions include as controls a saturated set of dummy variables for state of birth, year of sample, and age. Race is included as a set of 4 dummies indicating black, Asian, Native American, and other. Ethnicity is a dummy variable indicating the respondent is Hispanic. Economic conditions in the state of birth include a three-year lag of the log of per capita nominal GSP, a 10-year lag of the log of per capita personal income, a 5-year lag of the housing price index, and an 8-year lag of unemployment rate.

Table 7
Instrumental Variables Estimates of the Effects of Female Athletic Participation on Occupational Choice

	"Sports Worker" (Multiplied by 100)		"Male" Occupation		"Female" Occupation		"Mixed" Occupation	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Wald Estimator (IV) Causal Effect of Sports Participation [a]	.215*** (.045)	.247*** (.050)	.045* (.027)	.069*** (.021)	.036* (.020)	-.017 (.027)	.114*** (.032)	.056*** (.021)
Reduced Form Results: Differential Effects of Title IX on Employment, by State [b]	.092*** (.016)	.140*** (.028)	.019* (.011)	.039*** (.007)	.015** (.008)	-.010 (.015)	.049*** (.012)	.032*** (.011)
First-Stage Results: Changes in Female Sports Participation Generated by Title IX [c]	.429 (.059)	.567 (.079)	.429 (.059)	.567 (.079)	.429 (.059)	.567 (.079)	.429 (.059)	.567 (.079)
Controls								
Race, ethnicity	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year*Region of Birth Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes
Economic conditions in state of birth	No	Yes	No	Yes	No	Yes	No	Yes
Observations (standard errors are clustered at the level of 100 state-year cells)	1,544,870	1,544,870	1,544,870	1,544,870	1,544,870	1,544,870	1,544,870	1,544,870

Standard errors (shown in parentheses) are clustered at the level of 100 state-year cells. ***, **, and * indicate statistically significant at the 1%, 5% and 10% levels.
Source: 1980 and 2000 Censuses of Population (IPUMS) 5% sample (Ruggles and Sobek 1997). Data are for 49 states plus the District of Columbia. Iowa is excluded because it does not report girls sports participation in 1978. Data are for women aged 25-34 conditional on having completed 10th grade.
Specifications: (Linear probability model)

[a] IV estimates of causal effects of rising state female sports participation rates:

$$Employed\ in\ occupation_{i,s,t} = \alpha + \beta\ Female\ Athletic\ Participation^{IV}_{s,t} + \sum_s \eta_s State_s + \sum_t \chi_t Year_t + \mathbf{X}_{i,s,t}\lambda + \varepsilon_{i,s,t}$$

[b] Reduced Form Results: Relationship between changing women's labor market outcomes, and the pre-existing levels of boys sports participation:

$$Employed\ in\ occupation_{i,s,t} = \alpha + \beta\ (Post\ Title\ IX_t\ *\ Boys\ Athletic\ Participation^{1971}_s) + \sum_s \eta_s State_s + \sum_t \chi_t Year_t + \mathbf{X_{i.s.t}}\lambda + \varepsilon_{i,s,t}$$

[c] 1st Stage Regression: Changes in girls sports participation by state generated by the interaction of Title IX and pre-existing levels of boys sports participation:

$$Female\ Athletic\ Participation_{i,s,t} = \alpha + \beta\ (Post\ Title\ IX_t\ *\ Boys\ Athletic\ Participation^{1971}_s) + \sum_s \eta_s State_s + \sum_t \chi_t Year_t + \mathbf{X_{i.s.t}}\lambda + \varepsilon_{i,s,t}$$

All regressions include as controls a saturated set of dummy variables for state of birth, year of sample, and age. Race is included as a set of 4 dummies indicating black, Asian, Native American, and other. Ethnicity is a dummy variable indicating the respondent is Hispanic. Economic conditions in the state of birth include a three-year lag of the log of per capita nominal GSP, a 10-year lag of the log of per capita personal income, a 5-year lag of the housing price index, and an 8-year lag of unemployment rate.

Table 8
Instrumental Variables Estimates of the Effects of Female Athletic Participation on Entering a High- Education Occupations*

	High Education Occupations						Low Education Occupations					
	"Male" Occupation		"Female" Occupation		"Mixed" Occupation		"Male" Occupation		"Female" Occupation		"Mixed" Occupation	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Wald Estimator (IV)	.040*	.069***	.015	-.012	.035**	.004	-.009*	-.005	.020**	-.005	.078**	.052***
Causal Effect of Sports Participation [a]	(.023)	(.021)	(.013)	(.014)	(.015)	(.016)	(.005)	(.005)	(.009)	(.016)	(.023)	(.019)
Reduced Form Results: Differential Effects	.017*	.039***	.007	-.007	.015***	.003	-.004	-.003	.009**	-.003	.034***	.029***
of Title IX on Employment, by State [b]	(.010)	(.009)	(.005)	(.009)	(.006)	(.009)	(.003)	(.003)	(.004)	(.009)	(.008)	(.009)
First-Stage Results: Changes in Female	.429	.567	.429	.567	.429	.567	.429	.567	.429	.567	.429	.567
Sports Participation Generated by Title IX[c]	(.059)	(.079)	(.059)	(.079)	(.059)	(.079)	(.059)	(.079)	(.059)	(.079)	(.059)	(.079)
Controls												
Race, ethnicity	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year*Region of Birth Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Economic conditions in state of birth	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations (standard errors are clustered at the level of 100 state-year cells)	1,544,870	1,544,870	1,544,870	1,544,870	1,544,870	1,544,870	1,544,870	1,544,870	1,544,870	1,544,870	1,544,870	1,544,870

Standard errors (shown in parentheses) are clustered at the level of 100 state-year cells. ***, **, and * indicate statistically significant at the 1%, 5% and 10% levels.
Source: 1980 and 2000 Censuses of Population (IPUMS) 5% sample (Ruggles and Sobek 1997). Data are for 49 states plus the District of Columbia. Iowa is excluded because it does not report girls sports participation in 1978. Data are for women aged 25-34 conditional on having completed 10th grade.
*High-education occupations are defined as occupations in which the mean educational attainment of men in 1970 was 12.5 years of education or more.
Specifications: (Linear probability model)

[a] IV estimates of causal effects of rising state female sports participation rates:

$$Employed_{i,s,t} = \alpha + \beta\ Female\ Athletic\ Participation_{s,t}^{IV} + \sum_s \eta_s State_s + \sum_t \chi_t Year_t + \mathbf{X}_{i,s,t}\lambda + \varepsilon_{i,s,t}$$

[b] Reduced Form Results: Relationship between changing women's labor market outcomes, and the pre-existing levels of boys sports participation:

$$Employed_{i,s,t} = \alpha + \beta\ (Post\ Title\ IX_t\ *\ Boys\ Athletic\ Participation_s^{1971}) + \sum_s \eta_s State_s + \sum_t \chi_t Year_t + \mathbf{X_{i.s.t}}\boldsymbol{\lambda} + \varepsilon_{i,s,t}$$

[c] 1st Stage Regression: Changes in girls sports participation by state generated by the interaction of Title IX and pre-existing levels of boys sports participation:

$$Female\ Athletic\ Participation_{i,s,t} = \alpha + \beta\ (Post\ Title\ IX_t\ *\ Boys\ Athletic\ Participation_s^{1971}) + \sum_s \eta_s State_s + \sum_t \chi_t Year_t + \mathbf{X_{i.s.t}}\boldsymbol{\lambda} + \varepsilon_{i,s,t}$$

All regressions include as controls a saturated set of dummy variables for state of birth, year of sample, and age. Race is included as a set of 4 dummies indicating black, Asian, Native American, and other. Ethnicity is a dummy variable indicating the respondent is Hispanic. Economic conditions in the state of birth include a three-year lag of the log of per capita nominal GSP, a 10-year lag of the log of per capita personal income, a 5-year lag of the housing price index, and an 8-year lag of unemployment rate.

Table 9
INSTRUMENTAL VARIABLES ESTIMATES OF THE EFFECTS OF FEMALE ATHLETIC PARTICIPATION ON LOG HOURLY WAGES

	Log hourly wages			
	(1)	(2)	(3)	(4)
Wald Estimator (IV) **Causal Effect of Sports Participation** [a]	-.088* (.048)	.067 (.053)	-.111** (.047)	.025 (.050)
Reduced Form Results: Differential Effects of Title IX on Employment, by State [b]	-.038* (.020)	.035 (.029)	-.047*** (.018)	.014 (.028)
First-Stage Results: Changes in Female Sports Participation Generated by Title IX [c]	.429 (.059)	.567 (.079)	.429 (.059)	.567 (.079)
Controls				
Race, ethnicity	Yes	Yes	Yes	Yes
Year*Region of Birth Fixed Effects	No	Yes	No	Yes
State of birth characteristics	No	Yes	No	Yes
Years of education	No	No	Yes	Yes
Observations (standard errors are clustered at the level of 100 state-year cells)	770333	770333	770333	770333

Standard errors (shown in parentheses) are clustered at the level of 100 state-year cells. ***, **, and * indicate statistically significant at the 1%, 5% and 10% levels.
Source: 1980 and 2000 Censuses of Population (IPUMS) 5% sample (Ruggles and Sobek 1997). Data are for 49 states plus the District of Columbia. Iowa is excluded because it does not report girls sports participation in 1978. Data are for women aged 25-34 conditional on having completed 10th grade.
Specifications: (Linear probability model conditional on full-year employment)

[a] IV estimates of causal effects of rising state female sports participation rates:

$$Log\ wage_{i,s,t} = \alpha + \beta\ Female\ Athletic\ Participation_{s,t}^{IV} + \sum_s \eta_s State_s + \sum_t \chi_t Year_t + \mathbf{X}_{i,s,t}\lambda + \varepsilon_{i,s,t}$$

[b] Reduced Form Results: Relationship between changing women's log wages, and the pre-existing levels of boys sports participation:

$$Log\ wage_{i,s,t} = \alpha + \beta\ (Post\ Title\ IX_t\ *\ Boys\ Athletic\ Participation_s^{1971}) + \sum_s \eta_s State_s + \sum_t \chi_t Year_t + \mathbf{X_{i.s.t}}\lambda + \varepsilon_{i,s,t}$$

[c] 1st Stage Regression: Changes in girls sports participation by state generated by the interaction of Title IX and pre-existing levels of boys sports participation:

$$Female\ Athletic\ Participation_{i,s,t} = \alpha + \beta\ (Post\ Title\ IX_t\ *\ Boys\ Athletic\ Participation_s^{1971}) + \sum_s \eta_s State_s + \sum_t \chi_t Year_t + \mathbf{X_{i.s.t}}\lambda + \varepsilon_{i,s,t}$$

All regressions include as controls a saturated set of dummy variables for state of birth, year of sample, and age. Race is included as a set of 4 dummies indicating black, Asian, Native American, and other. Ethnicity is a dummy variable indicating the respondent is Hispanic. Economic conditions in the state of birth include a three-year lag of the log of per capita nominal GSP, a 10-year lag of the log of per capita personal income, a 5-year lag of the housing price index, and an 8-year lag of unemployment rate.

Appendix A
SUMMARY STATISTICS

	Mean	SD
Boys' Athletic Participation 1971	.570	.247
Girls' Athletic Participation 1971	.048	.050
Boys' Athletic Participation 1978	.551	.180
Girls' Athletic Participation 1978	.286	.145
	Means	
	1980	**2000**
Years of Schooling	13.0	13.7
Attended at least 1-3 years of college	43%	65%
Attended at least 4 years of college	20%	30%
Attended school beyond college	10%	7%
Percent Employed (At time of Census Interview)	62%	72%
Percent Employed Full-Year last year (Worked at least 46 weeks in the past year)	42%	59%
Percent Employed Full-Time (Usual hours of at least 35 per week)	47%	57%
Percent of employed working full-time		
Percent "sports workers"	.034%	.089%
Percent employed in "male" occupations	12.9%	22.5%
Percent employed in "female" occupations	22.7%	20.2%
Percent employed in "mixed" occupations	25.2%	29.0%
Percent employed in high-education "male" occupations	10.8%	20.9%
Percent employed in high-education "female" occupations	14.7%	9.9%
Percent employed in high-education "mixed" occupations	18.8%	23.8%
Percent employed in low-education "male" occupations	5.6%	6.5%
Percent employed in low-education "female" occupations	8.0%	10.3%
Percent employed in low-education "mixed" occupations	6.4%	5.2%

Source: 1980 and 2000 Censuses of Population (IPUMS) 5% sample (Ruggles and Sobek 1997). Data are for 49 states plus the District of Columbia. Iowa is excluded from the sample because it does not report girls sports participation in 1978.

Notes: Data are for women aged 25-34 conditional on having completed 10th grade.

Appendix B
History of Title IX Legislation, Regulation and Policy Interpretation[1]

"No person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity receiving Federal financial assistance."

1972	Congress enacts Title IX of the Educational Amendments of 1972, prohibiting sex discrimination in any education program or activity, within any institution receiving any type of Federal financial assistance. Historically single-sex, religious, and military schools are exempt from Title IX. *(Title 20 U.S.C. Sections 1681-1688)* Signed into law on June 23, 1972 by President Nixon.
1974	On May 20, 1974, Senator Tower introduced an amendment to exempt revenue-producing sports from any measure of Title IX compliance. The amendment was rejected.
1974	In lieu of the proposed Tower Amendment, Senator Javits introduced, in July 1974, a proposal stating that HEW must issue Title IX regulation including "with respect to intercollegiate athletic activities, reasonable provisions considering the nature of particular sports."
1975	HEW issues final Title IX regulation, which includes compliance measures and provisions prohibiting sex discrimination in athletics.
1975	On June 4, 1975 the present Title IX compliance regulation was transmitted to Congress. The next day (June 5, 1975) Senator Helms introduced a resolution in the Senate disapproving of the entire Title IX legislation. On June 17, 1975, Rep. Martin introduced two resolutions in the House. The first was similar to Senator Helms resolution and the second attempted to exclude intercollegiate athletics from Title IX. On July 16, 1975, Senators Laxalt, Curtis & Fannin introduce resolutions in the attempting to exclude intercollegiate athletics from Title IX. None of the attempts to curtail Title IX were adopted.
1975 & 1977	Two bills attempt to exclude revenue-producing sports from full-compliance with Title IX; both die in committees before reaching the House or Senate floors. Senator Helms introduces a bill in an attempt to prohibit the application of Title IX regulations to athletics where participation in those athletic activities are not a required part of the educational institution's curriculum. Senator Helms reintroduces the bill again in 1977.
1978	HEW issues proposed policy, in this policy the compliance is defined as substantially equal average per capita expenditures for men and women athletes and the potential for future expansion of opportunity and participation for women.
1979	Final policy interpretation is used by HEW. The policy focuses on institution's obligation to provide equal opportunity, rather than relying exclusively on a single compliance standard.
1980	Department of Education is established and given oversight of Title IX through the Office for Civil Rights (OCR).
1981	U.S. Department of Education releases a memo stating that Title IX prohibits sexual harassment. As such, any institution covered by Title IX must set up procedures for sexual harassment claims.

[1] Information provided by *http://bailiwick.lib.uiowa.edu/ge/historyRE.html*

1984	The Supreme Court ruled in *Grove City vs. Bell* that institutions that discriminated on the basis of sex, race, age, national origin, or disability could continue to receive federal funding as long as the discrimination occurred only within non-federally funded programs. This decision removed the applicability of Title IX to many athletics programs.
1988	Congress reverses *Grove City vs. Bell* with the *Civil Rights Restoration Ac*t, which becomes law on 3/22/88 (after overriding a Presidential veto by President Ronald Reagan). With this legislation Congress clarified its intent that Title IX should apply to all educational institutions which receive any type of Federal financial assistance, whether it be direct or indirect..
1990	Title IX Investigation Manual is published by the U.S. Dept. of Education through the Office for Civil Rights.
1992	On February 2, 1992 the Supreme Court ruled unanimously in *Franklin vs. Gwinnett County Public Schools* that plaintiffs filing Title IX lawsuist may receive punitive damages in cases where intentional action to avoid Title IX compliance is shown.
1994	Senator Mosley-Braun (S. 1468) and Rep. Collins (H.R. 921) sponsor the *Equity in Athletics Disclosure Act (EADA),* stating that any co-educational institution of higher education participating in any Federal student financial aid program must make public information their regarding intercollegiate athletics program by publishing an annual report. The legislation passes and the first EADA disclosure report is due no later than October 1, 1996.
1996	OCR issues clarifications of three-part "Effective Accommodation Test"
1996	The first EADA report is due. As such, all institutions must have publicly available information on their intercollegiate athletics department.