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Secondary school extracurricular involvement and academic achievement: a fixed effects approach

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Abstract

Recent economic research has investigated the extent to which involvement in school-sponsored clubs and sports constitutes human capital investment. Through instrumental variables, the existing literature focuses on identifying long-term impacts in terms of educational attainment and wages. Instead, I use a fixed effects strategy to test whether activity participation provides an immediate return to student learning. Independent of individual ability, I find that athletic participation is associated with a 2 percent increase in math and science test scores. Club participation is associated with a 1 percent increase in math test scores. Finally, involvement in either type of activity is associated with a 5 percent increase in Bachelor's degree attainment expectations.

JEL classification: I20; I21; J24

Keywords: Human capital; Educational economics

1. Introduction

For many students, extracurricular clubs and sports play a central role in their secondary school years. We associate these activities with developing several important skills that are valued in the workplace but not regularly evaluated in the classroom. Involvement is viewed as an indicator of teamwork ability, self-confidence, and the ability to succeed in competitive situations (National Federation of State High School Associations, 2005). This paper investigates the extent to which participation in extracurricular clubs and sports impacts student outcomes such as secondary school test scores and Bachelor's degree attainment expectations. These variables are important in wage regressions and extracurricular involvement may affect them.

The direction of participation effects is theoretically uncertain (Anderson, 2001; Eide & Ronan, 2001; Stevenson, 2006). Activities may improve academic performance through many plausible channels. Alternatively, they may sacrifice time previously focused on human capital acquisition and thereby negatively affect student outcomes. We need to understand this relationship before drawing conclusions about how schools should allocate their resources and how students should allocate their time.

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Numerous sociological studies correlate extracurricular involvement with academic achievement.[1] These studies treat participation as exogenous conditional on observed background characteristics. Because involvement is a choice, these estimates are likely to be biased upward due to unobserved ability measures.

Economists have recently examined how activity involvement influences long run labor market outcomes like educational attainment and wages. Kuhn and Weinberger (2005) use experience as a high school team captain or club president to identify leadership activity in three national longitudinal surveys. Students with leadership experience earn significantly higher adult wages and are more likely to become managers. Lozano (2004) concludes that high school leadership activity increases college degree attainment among Hispanics whose first language is not English. Barron, Ewing, and Waddell (2000) find that athletic participation increases the number of years of education after high school. Similarly, Stevenson (2006) concludes that it increases college attendance and labor force participation among women. Anderson (2001) finds positive educational impacts for white students only. In contrast, Eide and Ronan (2001) conclude that participation affects educational outcomes positively for white females and black males but negatively for white males. They also show that black men earn significantly higher wages due to extracurricular involvement. With the exception of Kuhn and Weinberger (2005), each uses instrumental variables in part. While together these studies indicate long-term benefits of participation, results depend on the validity of the instruments.

This paper differs from previous research in two important ways. First, my concern is whether participation influences labor market variables through a different track: its effect on learning. Because high school performance is strongly related to educational attainment and future wages, short-run benefits of extracurricular involvement understate the total effect. Second, I use a fixed effects estimation strategy on a sample from the *National Education Longitudinal Study*. This approach isolates important self-selection factors such as ability, background, and general motivation that may bias estimates. The source of identification comes from respondents who join or quit clubs or sports in a given year. This allows me to analyze the change in academic performance that is associated with an additional year of activity participation.

The results indicate that extracurricular involvement benefits student learning in secondary school. Athletic participation is associated with a 2 percent increase in math and science test scores. Club participation is associated with a 1 percent increase in math scores. In addition, both types of activities are associated with a 5 percent increase in Bachelor's degree attainment expectations.

Despite isolating all time-invariant sources of endogeneity, the estimates may still be inconsistent if unobserved changes in factors like motivation are correlated with changes in participation status. To address this concern, I include a rich set of controls aimed at capturing changes in family structure, location, socioeconomic status, self-esteem, and time devoted to other tasks. Key to my analysis is that expanded models do little to attenuate the estimates and they retain their statistical significance in all cases.

In the next section, I describe the data and present descriptive statistics. Section 3 outlines the empirical methodology. Section 4 presents the results. Finally, Section 5 concludes.

2. Data and descriptive analysis

The empirical analysis uses data from the base year through the second follow-up of the *National Education Longitudinal Study of 1988*. Organizers interviewed a nationally representative cross section of eighth graders in 1988 and subsequently re-interviewed them in 1990 and 1992.[2] Each survey year, respondents answered detailed questions about their involvement in school-sponsored clubs and sports over the previous twelve months.

My sample consists of a balanced panel of observations on the 16,449 NELS participants in 1988, 1990, and 1992. I drop individuals with missing club, sport, or test-score information in all three years. These exclusions leave me with a base sample of 16,305 students. Actual sample sizes are smaller and differ by specification, as some variables are not available for all respondents in all years. Additionally, I use the appropriate NELS weights to ensure that my results are representative of the population of eighth graders in 1988. Because

[1] See Camp (1990); Eccles and Barber (1999); Holland and Andre (1987); Marsh (1993); and Spreitzer (1994).

[2] Additional follow-ups in 1994 and 2000 measure post-secondary school and labor market outcomes.

Table 1
Sport and club participation sample means and standard deviations, by gender and race

Variable	Male	Female	*t*-statistic	White	Nonwhite	*t*-statistic
Panel A: Sports						
8th grade	0.68	0.61	8.42	0.66	0.62	3.67
	(0.47)	(0.49)		(0.48)	(0.48)	
10th grade	0.56	0.42	17.43	0.51	0.45	6.34
	(0.50)	(0.49)		(0.50)	(0.50)	
12th grade	0.50	0.35	18.08	0.44	0.41	2.90
	(0.50)	(0.48)		(0.50)	(0.49)	
Panel B: Clubs						
8th grade	0.67	0.80	−17.89	0.75	0.71	4.44
	(0.47)	(0.40)		(0.44)	(0.45)	
10th grade	0.55	0.69	−18.89	0.63	0.59	5.33
	(0.50)	(0.46)		(0.48)	(0.49)	
12th grade	0.61	0.76	−19.98	0.70	0.64	7.61
	(0.49)	(0.43)		(0.46)	(0.48)	

Note: Summary statistics are weighted to make them nationally representative. The *t*-statistics reject the null hypothesis that the mean difference in participation rates between men and women (whites and nonwhites) equals zero in each grade.

NELS is a stratified sample, ordinary standard error estimates are likely to be too small. Instead, I report standard errors that are clustered by the sampling strata.

I represent sport and club participation with indicator variables denoting involvement during the twelve months prior to each survey date.[3] Table 1 reports participation rates in sports and clubs by grade, gender, and race. The popularity of these activities underscores our need to understand their potential role in human capital acquisition and labor market success. Men are more likely to participate in athletics and women are more likely to participate in clubs. The participation rate for white students is greater for each activity in all years. In each case, the mean difference between males and females (whites and non-whites) is statistically different from zero.

Sport participation decreases as the cohort ages. This is most likely due to increases in the level of play. In contrast, club participation rates drop between eighth and tenth grade but then rise between tenth and twelfth grade. A possible explanation for this upturn is that students are trying to bolster their college applications. In the empirical analysis, I examine this in more detail.

The key outcome variables are math and science test scores, and student-reported educational expectations. Using the NELS math and science tests, I assign a population-weighted percentile ranking to each student by year.[4,5] I define educational expectations in the following way. Each survey year respondents were asked, "As things stand now, how far in school do you think you will get?" Respondents chose between six possible options ranging from not finishing high school to completing graduate degrees. I construct an indicator variable that takes the value one if respondents believe they will earn at least a B.A. or equivalent degree.

Table 2 reports summary statistics for the variables used in the analysis. In most specifications, I include an extensive set of controls that may be related to both the outcome variable and extracurricular involvement. For example, traumatic

[3]This date fell between January and June. Sports include baseball/softball, basketball, football, soccer, swim team, hockey, volleyball, cross-country, gymnastics, golf, tennis, track, wrestling, cheerleading, and drill team. Clubs include activities such as band, theater, student government, honors societies, school publications, as well as service, academic, hobby, and vocational clubs.

[4]The math test contained 40 questions in 30 min. According to the NELS *Second Follow-Up: Student Component Data File User's Manual* (1992), questions measure a student's ability to solve "word problems, graphs, equations, quantitative comparisons, and geometric [problems]." The science test contained 25 questions in 20 minutes. It stressed broad concepts rather than scientific details.

[5]Respondents also took reading and history tests. Preliminary results indicated that extracurricular involvement did not significantly influence performance on either of these tests holding ability constant.

Table 2
Sample means and standard deviations

Variable	Mean	St. dev.	Variable	Mean	St. dev.
Percentile test scores	50.60	28.80	SES	0.00	1.00
B.A.-degree expectations			Occ. cuts class		
8th grade	66.03	47.36	8th grade	0.07	0.25
10th grade	56.97	49.51	10th grade	0.11	0.31
12th grade	68.36	46.51	12th grade	0.18	0.38
Parents divorced			Freq. cuts class		
8th grade	0.11	0.32	8th grade	0.02	0.15
10th grade	0.17	0.37	10th grade	0.05	0.21
12th grade	0.20	0.40	12th grade	0.07	0.26
Death of a parent			Hmwk h/week		
8th grade	0.04	0.19	8th grade	5.56	5.37
10th grade	0.05	0.25	10th grade	7.04	6.07
12th grade	0.07	0.30	12th grade	13.64	9.72
Urban community			TV h/weekday		
8th grade	0.26	0.44	8th grade	2.77	1.47
10th grade	0.29	0.45	10th grade	2.37	1.48
12th grade	0.28	0.45	12th grade	2.28	1.46
Private school			Work h/week		
8th grade	0.12	0.33	8th grade	4.87	6.12
10th grade	0.10	0.30	10th grade	10.56	12.48
12th grade	0.09	0.29	12th grade	12.26	11.57
Enrollment $\leqslant 600$			Esteem composite	0.00	1.00
8th grade	0.49	0.50			
10th grade	0.23	0.42			
12th grade	0.23	0.42			
$600 <$ Enrollment $\leqslant 1200$					
8th grade	0.43	0.50			
10th grade	0.37	0.48			
12th grade	0.38	0.48			

Note: The summary statistics are weighted to make them nationally representative. Math and science test scores have the same distribution in all years.

family events may adversely affect the level of academic performance and social involvement. As a result, I control for whether a respondent's parents have divorced or if one or more is deceased. I also use a continuous variable constructed by NELS survey designers to measure socioeconomic status. I account for changes in school characteristics by including controls for urban community schools, private schools, and enrollment.[6]

I control for truancy and a self-esteem index to capture changes in motivation. I measure truancy each year by two indicator variables: *occasionally cuts class* and *frequently cuts class*. Students cut class *occasionally* if they do so three to nine times per semester. I define *frequently* as ten times or more.[7] Each survey year, NELS respondents answered thirteen questions related to how they view themselves.[8] Each question has a distinct positive or negative connotation. To measure self-esteem, I create an index from negative thirteen to thirteen and assign the value one or negative one to strong feelings and zero to weak feelings or non-responses.

Finally, NELS includes information about the intensity of each individual's involvement in other tasks. I include weekly homework hours, hours of

[6]NELS does not record total school enrollment for 1992. However, only 6 percent of students changed schools between 1990 and 1992. I coded enrollment as missing for these people in 1992. Consequently, all changes in school enrollment occur between 1988 and 1990.

[7]The question wording in the base-year differs from the two follow-ups. The base-year question measures times per week rather than times per semester. The *NELS Second Follow-Up: Student Component Data File User's Manual* (1992) lists these questions as comparable across survey years.

[8]Examples include, "[I am] able to do things as well as most others" and "I feel I do not have much to be proud of." Respondents were asked whether they strongly agreed, agreed, disagreed, or strongly disagreed.

television per weekday, and the intensity of job commitments. Since other time commitments may influence extracurricular involvement, I use these variables as regressors in some specifications. In the empirical analysis, I standardize these variables, the self-esteem index, and the socioeconomic status variable within each grade.

3. Estimation strategy

Cross-sectional OLS may not adequately address important selection factors influencing both participation and learning.[9] Instead, researchers have utilized instrumental variables to control for these factors directly. Anderson (2001) uses gender-specific school-level participation rates in sports and part-time jobs as well as the availability of other school activities. Barron et al. (2000) use school size, library books per student, and the teacher–student ratio, among other variables. Eide and Ronan (2001) use a student's height at age sixteen. Despite typically strong first-stage results, readily available data may not provide variables that are truly excludable from the main equation. For instance, school activities may exist at a school because students want to participate in them. High-ability students may have greater access to better schools. Height may affect outcomes through its affect on unobserved measures of confidence.

The best instrumental variables approach is Stevenson (2006). That paper uses state-level variation in the high school athletic participation rate among boys before the landmark Title IX legislation passed in 1972 to instrument for the subsequent increase in girls' participation rates. Stevenson (2006) concludes that increasing opportunities to participate in sports increased female college attendance and labor force participation. These are important results although they are generalizable only to women. Among these studies, none considers club participation.

My approach uses a fixed effects model to estimate how participation affects learning independent of time-constant factors that may influence both participation and the outcome variable. Therefore, I estimate an equation of the form

$$Y_{it} = \beta_0 + \beta_1 S_{it} + \beta_2 C_{it} + w_t\gamma + c_i + \varepsilon_{it}, \qquad (1)$$

where Y_{it} is either individual i's percentile test score at time t or an indicator for whether i believes he will earn a four-year degree. S_{it} and C_{it} are indicators for sport and club participation. w_t is a vector of year indicators. The error term consists of a time-invariant component c_i and a classical component ε_{it}. I use a linear model because Greene (2002) shows that fixed effects in nonlinear models is inconsistent in finite samples with a bias that increases the smaller the time dimension.

The estimation strategy identifies participation effects through *changes* in an individual's participation status. Since these changes are not exogenous, isolating important time-constant factors such as individual ability, general motivation level, and background may not fully account for why some students participate in some years and not in others. For example, parental divorce or unobserved changes in socioeconomic status may be related to changes in both educational outcomes and participation status. To explore this possibility, I also estimate the following specification

$$Y_{it} = \beta_0 + \beta_1 S_{it} + \beta_2 C_{it} + X_{it}\beta + w_t\gamma + c_i + \varepsilon_{it}, \qquad (2)$$

where X_{it} is a vector of time-varying determinants of the dependent variable believed to be correlated with changes in participation.

In the analysis, X controls for shocks to family structure and socioeconomic status, as well as changes in attitudes, surroundings, and time allocated among tasks. Several of these factors are clearly endogenous. Time spent completing homework or watching television is a function of time spent participating in extracurricular activities. Still, by including these factors that change over time and by observing the change in the coefficient estimates, we can evaluate the temporal self-selection fear. If the coefficient estimates in (1) are unaffected by the additional regressors in (2), we will be more confident that the estimation strategy has removed most of the selection effect.

4. Empirical results

Because identification comes from the population whose participation status changes during the survey period, results are generalizable to this group. Since I observe extracurricular involvement three times, respondents follow one of eight possible participation profiles. For example, a student may participate in each survey year, in some years and not in others, or not at all. Table 3 examines the prevalence of each of these profiles for individuals

[9] Cross-sectional estimates are available from the author at http://www.econ.ucsb.edu/~lipscomb.

Table 3
Variation in sport and club participation

	Sports		Clubs	
	Frequency	Percentage	Frequency	Percentage
8th, 10th, 12th (AP)	4315	34.18	6007	47.37
8th, 10th, not 12th	1419	11.24	975	7.69
8th, 12th, not 10th	542	4.29	1429	11.27
10th, 12th, not 8th	716	5.67	1058	8.34
8th only	2315	18.34	1252	9.87
10th only	493	3.91	366	2.89
12th only	309	2.45	649	5.12
Never (NP)	2515	19.92	946	7.46
Observations	12,624	100.00	12,682	100.00
Not (AP) or (NP)	5794	45.90	5729	45.17

Note: Summary statistics based on unweighted data. The sample is restricted to individuals with non–missing participation data in all three survey years.

Table 4
Average math-test score changes by participation profile, by sports and clubs

	Both 8th & 12^{th} grade	8th grade only	12th grade only	Neither 8th nor 12th grade
Panel A: Sports				
8th grade	57.3	49.6	51.0	43.9
12th grade	58.6	48.0	52.7	43.7
Average change	1.3	−1.6	1.7	−0.2
t-statistic[a]	5.2	−5.8	3.2	−0.7
Observations	4,214	3,533	1,157	3,312
Panel B: Clubs				
8th grade	58.5	43.5	47.1	37.1
12th grade	59.2	41.2	48.2	36.8
Average change	0.7	−2.3	1.1	−0.3
t-statistic[a]	3.6	−6.6	2.8	−0.7
Observations	6,441	2,251	1,914	1,610

Note: The summary statistics are weighted to make them nationally representative. The sample is restricted to participants with non-missing math test scores in 8th and 12th grade only. For this reason, the sample differs slightly from the sample in Table 3.
[a]The *t*-statistic is from a test that the average score change equals zero.

with nonmissing sport or club participation in all years. As expected, a large fraction of respondents always participate (AP) or never participate (NP). The AP group is particularly strong for clubs. Significantly, almost half of the more than 12,600 respondents in Table 3 switched into or out of extracurricular activities at some stage.[10]

The panel analysis relates changes in extracurricular involvement to changes in achievement. Table 4 explores this descriptively and provides a preview of what to expect in the regression analysis. Column headings represent participation profiles as determined by eighth and twelfth grade status.[11] I divide the table into two sections to study sport and club participation separately. By column, I list the mean percentile math score in eighth and twelfth grade based on a distribution of scores from individuals with nonmissing participation data in both years.[12] The key rows show the average change

[10]I exclude individuals with one or two years of missing sport or club data from Table 3 because it is unclear what profile they follow. In the regression analysis, individuals are excluded entirely only if they have missing sport and club information in all three years.

[11]Table 4 does not consider tenth-grade participation. I do this for illustrative purposes as well as to maximize the sample size in each category.

[12]I report mean scores from this distribution because dropouts truncate the low end of the ability distribution in twelfth grade. Otherwise, average-ability students tend to score below average on the twelfth grade test.

Table 5
Fixed effects estimates of the impact of participation on standardized test scores

	Math percentile score			Science percentile score		
	(1)	(2)	(3)	(4)	(5)	(6)
Sport participation	*1.18*	*1.20*	*1.15*	*1.14*	*1.11*	*1.08*
	(0.26)	(0.22)	(0.22)	(0.40)	(0.40)	(0.39)
Club participation	*0.82*	*0.82*	*0.73*	0.24	0.23	0.14
	(0.26)	(0.26)	(0.26)	(0.35)	(0.35)	(0.35)
Socioeconomic status		0.82	−2.05		−7.36	−9.88
		(22.58)	(22.07)		(21.85)	(21.76)
Parental divorce		*−1.27*	−1.22		−1.62	−1.56
		(0.61)	(0.62)		(1.31)	(1.32)
Parental death		*−1.99*	*−1.93*		-0.90	-0.85
		(0.73)	(0.74)		(1.13)	(1.08)
Urban community		0.95	0.97		-0.01	0.01
		(1.25)	(1.26)		(1.37)	(1.37)
Private school		−1.25	−1.48		(0.44)	−0.64
		(0.98)	(1.01)		(1.95)	(1.96)
Enrollment ⩽600		0.04	−0.05		0.75	0.58
		(0.94)	(0.97)		(0.82)	(0.83)
600< Enrollment ⩽1200		−0.41	−0.46		0.08	−0.04
		(0.81)	(0.83)		(0.63)	(0.65)
Self esteem (std)			0.13			0.29
			(0.13)			(0.22)
Occasionally cuts class			*−1.28*			*−1.73*
			(0.45)			(0.58)
Frequently cuts class			*−2.08*			*−1.89*
			(0.63)			(0.78)
Homework h/week (std)			*0.58*			*0.34*
			(0.15)			(0.11)
TV h/weekday (std)			−0.21			−0.02
			(0.15)			(0.30)
Work h/week (std)			−0.10			−0.23
			(0.15)			(0.20)
Observations	41,255	41,255	41,255	41,096	41,096	41,096
R-squared (adj.)	0.88	0.88	0.88	0.76	0.76	0.76

Note: Italics indicates significance at the 5 percent level. Robust standard errors are reported in parentheses. Observation are weighted to make them nationally representative. Specifications include indicator variables for missing values of the controls, grade indicators, and a constant. Standard errors are clustered by sampling stratum.

from eighth to twelfth grade. On average, students participating in activities in twelfth grade improve their test performance. In contrast, students who do not participate earn lower scores. For the middle two groups, comprised of students who changed their participation status between eighth and twelfth grade, the average changes are statistically different from zero.[13] This table also demonstrates the strong relationship between levels of achievement and involvement in activities. The AP group scores between 14 and 22 percentiles higher than the NP group. The other two groups score almost exactly in between.

Fixed effects results for math and science achievement are reported in Table 5. Columns 1 and 4 list estimates from a baseline model that only includes indicators for sport and club participation, as well as grade indicators and a constant. Sport participation is associated with a 1.1 percentile increase in test scores. This converts to a 2.2 percent increase. Club involvement has a smaller impact and is only significant in the math equation.

Fixed effects estimation does not isolate the impact of unobserved time-varying selection factors, a potentially important source of endogeneity. To explore this more fully, columns 2 and 4 add controls for changes in socioeconomic status, parental divorce and death, and school-level

[13]Results are similar for science scores.

characteristics. In both equations, these factors leave the coefficients of interest virtually unchanged. The parental divorce and death variables have significant negative signs in the math equation. Surprisingly, however, neither is a significant determinant of changes in science-test scores.

Columns 3 and 6 further expand the model by including the self-esteem index and a series of variables measuring the intensity of other time commitments. In addition, I control for truancy patterns to measure changes in academic motivation. As these variables are clearly endogenous, they are included only to gauge the extent to which they attenuate the coefficients of interest. This provides a sense about how much of the benefit attributed to participation is due to these factors.

These additional controls do little to attenuate the participation coefficients. This is surprising considering several are strong predictors of test performance. Sport participation is still associated with a 2 percent increase in math and science test scores. The club participation coefficient, reduced by 11 percent in the math equation, is more sensitive to additional controls. Despite this, the estimate remains strongly significant and implies a 1.5 percent increase in math test performance.

Table 6 reports the same analysis on Bachelor's degree attainment expectations. Looking across columns 1 through 3, both forms of participation are associated with a 3.0 to 3.5 percentage point increase in degree attainment expectations. Dividing by the mean value of the dependent variable, this implies a 4.4 to 5.1 percent impact. As before, adding additional controls in columns 2 and 3 do not substantially attenuate the coefficients of interest. Similar to Table 5, the greatest reduction is for club participation.

Column 4 also controls for percentile math and science test scores. Extracurricular involvement may influence degree attainment expectations through its effect on test scores. By explicitly controlling for these measures in column 4, I remove the indirect impact. The sport and club estimates remain significant with magnitudes of 3.1 and 2.9, respectively.

In this analysis, identification comes from the population that participates in some years and not in others. If performance is increasing in the intensity of participation as indicated in Table 4, this group may include those on the margin of pursuing post-secondary education. The magnitude of the estimates in Table 6 underscores the economic significance of these activities. Students involved in both activity types increase their expectations of earning a college degree by almost 10 *percent*.

Previous studies sub-sample data by gender and race. A priori, it is unclear that coefficients should differ along these lines. In unreported results, I directly test whether there are differential impacts by gender and race in Tables 5 and 6 by separately including *(white × sport)* and *(white × club)* indica-

Table 6
Fixed effects estimates of the impact of participation on B.A. attainment expectations

	(1)	(2)	(3)	(4)
Sport participation	*3.55*	*3.51*	*3.34*	*3.13*
	(1.02)	(1.09)	(1.09)	(1.08)
Club participation	*3.45*	*3.28*	*3.01*	*2.90*
	(0.89)	(0.92)	(0.90)	(0.90)
Socioeconomic status		7.54	0.80	1.20
		(65.85)	(69.29)	(68.04)
Parental divorce		−1.99	−1.55	-1.33
		(2.54)	(2.56)	(2.61)
Parental death		−1.38	−1.14	-0.89
		(1.84)	(1.80)	(1.78)
Urban community		4.36	4.50	4.35
		(3.51)	(3.54)	(3.51)
Private school		−3.57	−4.48	(4.24)
		(3.47)	(3.43)	(3.37)
Enrollment ⩽ 600		*4.71*	*4.49*	*4.51*
		(1.34)	(1.30)	(1.27)
600 < Enrollment ⩽1200		*3.06*	*2.97*	*3.07*
		(0.95)	(0.85)	(0.81)
Self-esteem (std)			*2.92*	*2.88*
			(0.43)	(0.41)
Occasionally cuts class			*−2.54*	−2.27
			(1.16)	(1.19)
Frequently cuts class			*−6.69*	*−6.32*
			(2.36)	(2.35)
Homework h/week (std)			*1.14*	*1.05*
			(0.40)	(0.39)
TV h/weekday (std)			0.54	0.57
			(0.46)	(0.44)
Work h/week (std)			−0.19	−0.16
			(0.47)	(0.46)
Percentile math score				*0.13*
				(0.05)
Percentile science score				0.05
				(0.03)
Observations	40,101	40,101	40,101	40,101
R-squared (adj.)	0.53	0.53	0.53	0.53

Note: Italics indicates significance at the 5 percent level. Robust standard errors are reported in parentheses. Observation are weighted to make them nationally representative. Specifications include indicator variables for missing values of the controls, grade indicators, and a constant. Standard errors are clustered by sampling stratum. Coefficients multiplied by 100.

Table 7
Specifications using 8th and 10th grade data only and differentiating across club types

	Math (1)	Science (2)	B.A. (3)	B.A. (4)	B.A. (5)
Sport participation	*0.98*	1.08	2.86	2.74	*3.05*
	(0.43)	(0.67)	(1.62)	(1.64)	(1.09)
Club participation	0.34	0.06	*4.10*		
	(0.50)	(0.54)	(1.58)		
Clubs with highest scoring members[a]				*3.00*	*2.55*
				(1.39)	(0.74)
Other clubs[b]				1.23	0.46
				(1.19)	(0.89)
Sample	8th & 10th only	8th & 10th only	8th & 10th only	8th & 10th only	8th, 10th, 12th
Observations	29,466	29,337	29,195	29,195	40,101
R-squared (adj.)	0.88	0.88	0.88	0.52	0.53

Note: Italic indicates significance at the 5 percent level. Robust standard errors are reported in parentheses. Observation are weighted to make them nationally representative. Control variables are the same as column 6 of Table 5 and column 4 of Table 6. Standard errors are clustered by sampling stratum.

[a]Includes student government, academic honor societies, school yearbook, school newspaper, literary magazines, service clubs, and academic clubs.

[b]Includes band, orchestra, chorus, choir and other musical groups, school plays and musicals, hobby clubs, and vocational clubs.

tors or *(female × sport)* and *(female × club)* indicators. In all cases except for science, I failed to reject that sport or club participation affects men and women or whites and nonwhites the same. In that equation, sports participation benefits women more greatly than men.[14]

A potentially important source of endogeneity unexamined so far concerns participation in activities as a way to bolster college applications. That club participation increases between tenth and twelfth grade provides evidence of this behavior. There may be large implications for the estimates, particularly in the degree attainment expectations equation. To address this, in columns 1 to 3 of Table 7, I report estimates from the fullest specification of each dependent variable using only the eighth and tenth-grade data. Estimates are generally similar in magnitude, although the smaller sample size does increase the standard errors. The estimates in columns 1 to 3 show that this type of endogeneity does not seem to affect my results. The exception is the coefficient on club participation in the math equation. This coefficient is reduced by half and is insignificant. Since it varies more with changes in specification and sample size, we should interpret it with greater caution.

Finally, participation in certain sports and clubs may increase learning while participation in others may not. The NELS data contains rich information about participation in many different clubs.[15] I separated the clubs into two groups based on the average math score among club members. In columns 4 and 5 of Table 7, I report estimates with indicators for participation in each of these two club groups in place of the club participation variable in column 3. Participating in clubs with higher achieving members is associated with increased degree attainment expectations. In contrast, joining clubs where members do not score as highly does not appear to help student learning. These results are consistent with several recent studies measuring peer effects.[16] The participation literature would benefit from further attempts to differentiate across sport and club types. Through additional research, we may gain a better understanding of the mechanism through which participation affects learning.

5. Conclusion

Recently, economists have become interested in understanding the extent to which extracurricular involvement increases human capital. Research has mainly used instrumental variables. Although an excellent approach, readily available data may not provide exogenous sources of variation.

[14]Results are available from the author upon request.

[15]Unfortunately, I cannot subdivide the sports variable in the base year.

[16]See Angrist and Lang (2004), Katz Kling and Liebman (2001), and Sacerdote (2001).

This paper differs from the existing literature in several important ways. First, I address the question using a different estimation strategy. With a fixed-effects model and recent longitudinal data, I calculate participation impacts net of time-constant ability measures that bias OLS estimates. Second, I focus on how participating affects learning. Third, unlike most of the literature, I include clubs as well as sports. My results indicate that participating is associated with a 1.5 to 2 percent improvement in test scores and a 5 percent improvement in Bachelor's degree attainment expectations. Estimates are robust to including a rich set of time-varying controls. Omitting the twelfth-grade data does not typically change the magnitude of the estimates. Finally, I present evidence that participating in clubs with higher achieving members is more beneficial.

Eide and Ronan (2001) point out that participation can be both consumption and an investment. This paper presents evidence that this is indeed the case. Extracurricular involvement provides short-run investment returns on outcomes that are positively correlated with labor market success. Given their perennial popularity, society ought to have a better understanding of the benefits these activities afford.

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