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The Impact of Participation in Sports on Educational Attainment: New Evidence from Germany

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ABSTRACT

The Impact of Participation in Sports on Educational Attainment: New Evidence from Germany*

We analyze the impact of exercising sports during childhood and adolescence on educational attainment. The theoretical framework is based on models of allocation of time and educational productivity. Using the rich information from the German Socio-Economic Panel (GSOEP), we apply generalized ordered probit models to estimate the effect of participation in sport activities on secondary school degrees and professional degrees. Even after controlling for important variables and selection into sport, we find strong evidence that the effect of sport on educational attainment is statistically significant and positive.

JEL Classification: I21, J13, J22, J24

Keywords: allocation of time, education, human capital, sport

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I. INTRODUCTION

Economic analyses of sports have become very popular in the last decades (Sloane, 2006; Torgler et al., 2006). While the focus of most studies is on labor markets, labor-management relations, wage determination, and finance in professional sports like baseball, basketball, football, and soccer, only few research deals with the impact of non-professional sports on economic outcomes. Conversely, the economic literature about human capital mainly focuses on formal education and on-the-job training. Other forms of human capital investments like out of school activities of students (e.g., sport) are largely neglected.

Exceptions stem all from the United States, where some studies analyze the impact of high school and college athletic participation on educational and labor market success (see for example Long and Caudill, 1991; Maloney and McCormick, 1993; Anderson, 1998; Barron et al., 2000; Robst and Keil, 2000; Eide and Ronan, 2001; Libscomb, 2006; Stevenson, 2006). Overall, the studies point to a positive impact of sport activities. However, non-professional sport in the US is strongly related with high school and college attendance, whereas in other countries sport is mainly an outside school activity performed in sports clubs or public sport sites. Thus, it is unknown if results from the US can be generalized, or if they are caused by the institutional setting.

Our paper is the first in analyzing the impact of non-professional sports among adolescents outside the US. More precisely, we analyze if young Germans who participate in outside school athletic activities have better educational attainment in form of secondary school degrees and professional degrees. The paper is organized as follows: Section II covers some theoretical considerations about allocation of time and productivity effects of sport. Section III contains a brief description of the German educational and sport system. The dataset, variables, and methods are described in section IV. The econometric results are presented in section V. The paper ends with a short conclusion.

II. ALLOCATION OF TIME AND PRODUCTIVITY EFFECTS OF SPORT

In the debate about athletic participation and academic performance, it is often assumed that sport activities of adolescents are harmful to their educational outcomes. The underlying line of reasoning is oversimplified: Since the time spent on sport activities crowds out time devoted to schooling, the impact of sport is negative. However, empirical investigations find a rather positive correlation between sport and educational attainment (e.g., Long and Caudill, 1991; Barron et al., 2000). These findings are supported by two main arguments. The first extends the simple allocation of time model by introducing additional activities (Becker, 1965). The second acknowledges that leisure activities can have direct positive as well as negative effects on educational productivity.

In a simple allocation of time model with only two activities from which an adolescent can choose from, the time devoted to leisure activities like sport cannot be used for school activities like studying and class attendance (substitution effect). Though, if we extend the allocation of time model and split leisure activities in good and bad activities, where sport is an example for a good leisure activity[1], this implication can change. In this new framework, time spent on sport does not necessarily reduce the time allocated to schooling but can also reduce bad leisure activities, which might harm educational productivity. Examples for bad leisure activities are watching television, playing computer games, smoking, drinking, and going to parties. If participation in athletic activities reduces these bad activities, sport can have an indirect positive effect on educational productivity. Anderson (1998) reports that male as well as female athletes spend significantly more hours per week on homework and less on watching television than non-athletes. Conversely, Maloney and McCormick (1993) find a strong negative in-season effect of intercollegiate athletic participation in revenue sports (e.g., basketball, football), i.e., during the season the time devoted to learning shrinks, which negatively affects course grades. Whether we expect a negative time allocation effect depends on how time-consuming the sport and the studies actually are.

[1] Other possible good leisure activities might be reading, playing an instrument, or attending a theater group.

Moreover, there might be some direct positive effects of sport on educational productivity. First, the better health status of athletes could increase productivity and lead to more investments in human capital, because healthier people will probably have a longer life span and, hence, a longer amortization period. Second, sport does not only train functional skills like dexterity and balance but it also teaches soft skills like taking orders, leadership, teamwork, performing in a regulated system, and socialization. Third, sport can help to form the character of young people because it teaches behavioral habits like motivation, discipline, tenacity, competitive spirit, responsibility, perseverance, confidence, and self-esteem, which cannot always be acquired in classroom. These behavioral aspects should lead to reduced truancy, increase the willingness to succeed in school, and encourage social interaction with other students, which are associated with higher efficiency of learning because time is used more productively.

Our theoretical considerations are supported by new research findings on cognitive and noncognitive skills, which show that most cognitive skills are acquired during the early childhood, while noncognitive skills can be developed in later years, too (Heckman et al., 2006; Pfeiffer and Reuß, 2007). However, most of noncognitive skills are accumulated until an age of 20, i.e., during adolescent years. Heckman et al. (2006) demonstrate the importance of noncognitive skills. They find evidence that the probability to drop out of high school decreases and the probability to be a four-year-college graduate increases with noncognitive skills.

The rate of return to sports might be larger for women than for men because sport activities may enhance the capability of being successful in a male-dominated society. The higher competitiveness and self-esteem of female athletes can be essential to assert themselves and to compete with men in the classroom. To illustrate this, we use an example of classroom participation: Students within one course compete in signaling their effort through classroom participation in order to obtain good grades. Since women are less competitive in their behavior, female students might shy away from competition with male students. A female athlete, however, is more likely to withstand this competitive pressure and to participate against male students. Gneezy et al. (2003) and Niederle and Vesterlund (2005) present experimental evidence that women have an

aversion against competition in tournaments, even though they are not less productive than men. Gneezy and Rustichini (2004) find that the negative effect of competition on female performance exists already at young age, which suggests that this effect is largely biological. Sport and especially competitive sport at younger age might help to overcome this biological difference at least partly.

III. THE EDUCATIONAL AND SPORT SYSTEM IN GERMANY

Most German children enter primary school at the age of six. Tracking into different types of secondary schools generally occurs after four or six years, which depends on the laws of the German federal states. The best students are selected into the so called "Gymnasium". The next lower secondary school type is called "Realschule" and the lowest "Hauptschule". Besides the different classroom prerequisites, the school types differ in length. While "Gymnasium" continues until twelfth or thirteenth grade, "Realschule" finishes after tenth and "Hauptschule" after ninth grade. Good students are allowed to switch from a lower school type to the next higher school type, but this is not very common. Graduates of the "Gymnasium" are qualified to attend universities. However, the German apprenticeship system allocates most adolescents to a further education after finishing "Realschule" or "Hauptschule". In some occupations the vocational degree acquired by the apprenticeship and an additional degree qualify graduates to take up studies in their field at a university.

This brief description shows that German school degrees are more variable than the US school counterparts, because there is no secondary school tracking in the US. The system of professional degrees offers a further distinction, namely into vocational degrees (apprenticeship) and university degrees. Unlike in many US studies we can not only distinguish high school or college dropouts from high school or college graduates, but we can exploit the greater variability in German school degrees and professional degrees.

Not only the educational systems between Germany and the US differ, but also the sport systems. Although professional sport is not the topic of this paper, it is worth

mentioning that professional sports clubs in Germany are deep-rooted in their local environment and are mostly non-profit institutions. Hence, it is uncommon that clubs move, or more precisely are sold, to other cities. Furthermore, German clubs are seldom dedicated to only one sport but they offer a wide range of sports (e.g., soccer clubs have also athletic departments). These differences might be the driving force for the different organization of adolescent sport in Germany and the US. Whereas competitive sport in the US is mostly an inside school activity which is performed in school teams, competitive sport in Germany is rather an outside school activity performed in club teams. In both countries, however, sport is also performed as a leisure activity outside such institutional frameworks in public sport sites.

IV. DATASET, VARIABLES, AND METHOD

For the empirical analysis of the effect of sports on educational attainment, we use the German Socio-Economic Panel (GSOEP). This is a representative survey of persons and households in Germany. Besides the recurrent annual person and household questionnaires, the survey contains a questionnaire that collects biographical background information. Questions on the participation in sports during childhood and adolescence are part of this biography questionnaire since the year 2000. Each respondent of the panel fills in the biography questionnaire in the course of the first interview. Therefore, we can only include individuals into our analysis who entered the survey in or after 2000.

The questions on sport activities ask whether respondents were involved in sports activities other than school gym classes and, if yes, whether they participated in competitions in this sport. While the involvement in sport activities is quite general, participation in competition is a proxy for club sport and the intensity of sport involvement. With respect to educational attainment we use information on the secondary school degree and the professional degree. The school degree is categorized as no degree, low degree (“Hauptschule”), intermediate degree (“Realschule”), and high degree (“Gymnasium”). The professional degree is categorized as no degree, vocational qualification, and university degree. We restrict the sample to Germans having attained

their school degree in West Germany because both, the school system and the sports institutions were quite different in East Germany before reunification. In our sample of 3100 women and 2950 men of all age groups, 64 % of men and 44 % of women have participated in sports activities other than school gym classes during their youth. About 75 % of participating men and 55 % of participating women took part in competitions.

A problem when identifying the causal effect of sport on educational attainment is selection into athletic activities by ability or family background. Fortunately, the biographical information of the GSOEP provides a rich set of control variables to alleviate this problem. We control for age in the year 2000 in order to capture cohort effects. The parents' school degree and job status are included in order to control for the family background and to proxy household income during adolescence, which we do not observe directly. Furthermore, we control for the number of brothers and sisters, because a higher number of siblings implies that each child receives a lower share of the family's resources. Further regressors capture how strongly parents care about the child's performance at school and the share of foreigners in the classroom (as a proxy for school quality). These control variables capture important determinants of educational attainment and of selection into sports and help us to isolate the effect of sports activities on educational attainment. Summary statistics and variable explanations are presented in table A1 in the appendix.

However, we cannot exclude that there remain unobserved factors, such as the student's ability or the parents' values with respect to performance. Neither can we exclude simultaneity of type of school and outside school sport activities. The different school tracks may encourage students to a different extent to take part in outside school sports activities and school tracks may differ in how much time they leave students for outside school activities. Therefore, we apply a selection model and instrumental variable (IV) estimates in our robustness checks. As participation in sports is a time-constant variable in our data, we cannot implement fixed effects models to hold unobserved time-invariant heterogeneity constant.[2]

[2] For a fixed effects approach see Lipscomb (2006), who estimates the impact of sport on test scores and expected future academic attainment at different school grades.

As the education variables are measured on an ordinal scale, we estimate a model for ordinal dependent variables. We chose the generalized ordered probit model (Boes and Winkelmann, 2006). Consider the simple ordered probit model characterized by a latent variable y_i^* modeled as

$$y_i^* = x_i'\beta + u_i, \tag{1}$$

where x_i denotes a vector of regressors, β is a coefficient vector, u is an error term following the standard normal distribution, and i indexes observations. Assume that the observed ordinal dependent variable y_i is measured in J categories. The model for observing a given value j ($j=1,...,J$) of the ordinal dependent variable is

$$y_i = j \quad \text{if} \quad \kappa_{j-1} < y_i^* < \kappa_j, \tag{2}$$

where κ are constant threshold values to be estimated. The threshold values are assumed to be in ascending order and it is understood that $\kappa_0 = -\infty$ and $\kappa_J = \infty$. The probability of observing a given value j of the dependent variable for observation i is:

$$\pi_{ij} = \Phi(\kappa_j - x_i'\beta) - \Phi(\kappa_{j-1} - x_i'\beta), \tag{3}$$

with Φ being the cumulative density function of the standard normal distribution. The simple ordered probit model has a single index $x'\beta$ for all outcome categories j of the dependent variables. This implies the restrictive properties that the relative marginal probability effects are constant and that the marginal probability effects can change their sign only once as one moves from the smallest to the largest outcome.

The generalized ordered probit model (generalized threshold model) does not treat the threshold values as constants but makes them dependent on regressors:

$$\kappa_{ij} = \tilde{\kappa}_j + x_i'\gamma_j \qquad j = 1,...,J. \tag{4}$$

Equation (3) then turns into

$$\begin{aligned} \pi_{ij} &= \Phi(\tilde{\kappa}_j + x_i'\gamma_j - x_i'\beta) - \Phi(\tilde{\kappa}_{j-1} + x_i'\gamma_{j-1} - x_i'\beta) \\ &= \Phi(\tilde{\kappa}_j - x_i'\beta_j) - \Phi(\tilde{\kappa}_{j-1} - x_i'\beta_{j-1}) \end{aligned}, \tag{5}$$

where $\beta_j=\beta-\gamma_j$, since β *and* γ_j cannot be identified separately. Differing from the simple ordered probit model, the generalized ordered probit model has one index $x'\beta_j$ for each category j of the outcome variable. Thus, it allows for more flexibility in the estimation of the marginal probability effects than the simple ordered probit model. For the estimates presented in the next section we find that a likelihood ratio test rejects the more restrictive ordered probit model in favor of the generalized model (for test statistics see bottom of tables 1 and 2).

V. ECONOMETRIC RESULTS

1. Secondary school degree

The effects of participation in sport activities during childhood and adolescence on secondary school degrees of men and women are presented in table 1. The table also reports the effects of the control variables. We find that involvement in sports activities during childhood and adolescence significantly raises the probability of attaining a higher school degree holding other characteristics constant. For example, for men who engage in sports activities the probability of attaining the lowest school degree ("Hauptschule") is reduced by 6.6 percentage points and for women it is reduced by 11 percentage points (see effect of variable "Sport" in table 1). These are sizable effects compared to an average probability of that school degree of about 40 %. The probability of the highest school degree ("Gymnasium") rises by 6.1 percentage points for men and by 5.6 percentage points for women. The average probability of that school degree is about 30 % for men and 22 % for women. Participation in competition has no statistically significant effect for men, but for women it lowers the probability of the lowest school type ("Hauptschule") by an additional 6.5 percentage points and increases that of the intermediate school type ("Realschule") by a similar magnitude (see variable "Competition" in table 1). Interestingly, participation in competition does not raise the probability of the highest school degree. This may indicate that it is hard to combine time-consuming sports (sports associated with competitions) with equally time-consuming studies for the highest school degree. But at least participating in competitions does not decrease the chances of reaching the highest degree, which

implies that time-consuming competitions may offset the otherwise beneficial effect of sports for the highest school degree, but not reverse the sign of the effect.

Insert table 1 about here

The effects of the control variables have the expected sign. The effect of age shows that older cohorts have a lower probability of having obtained the highest school degree. The family background has strong influences. Children of parents with higher school degrees and of parents who care about school performance have higher chances to obtain the highest school degree. It should be noted, however, that whether parents care or not has a less clear-cut and less significant effect for women than for men. A higher share of foreign students is correlated with lower school degrees.

The professional status of the parents also plays a role. If at least one parent occupies a managerial job position, the probability of attaining the highest school degree is considerably higher. If only one parent works, this seems to increase the chances of the highest school degrees somewhat compared to the situation where both parents work. An explanation could be that this situation usually occurs if the working parent has a very high income, i.e., household income is not necessarily lower than if both parents work, and the non-working parent can devote more time to the children. If both parents do not work, this seems to have different effects on men and women. For men this decreases the probability of attaining an intermediate school. For women the effect is insignificant. As expected, a larger number of brothers and sisters decrease the probability of a high school degree for both men and women.

2. Professional degree

The effects of sports and of the control variables on the professional degrees of men and women are presented in table 2. The chances of attaining a university degree as opposed to a vocational qualification or no professional degree are increased due to exercising sports by about 5.3 and 4.7 percentage points for men and women. Participation in competition has again no significant effect for men, but for women the probability of attaining vocational training increases by about 6.4 percentage points if they have

participated in competition. This increase is matched by a decrease of 5.4 percentage points of the probability of attaining no degree. Again, as was the case for school degrees, the probability of reaching the highest professional degree is not influenced by competition into sports.

Insert table 2 about here

The effects of the control variables are similar to those found in the preceding regression of secondary school degree. The control variables indicate that older cohorts of men and women have lower probabilities to obtain a University degree than their younger counterparts. Men and women both seem to be more likely to obtain a University degree if their parents have a higher school degree, if they were in school classes with a lower share of foreign students, and have fewer brothers and sisters. Caring of parents about school performance has beneficial effects on the professional degree of men, but the effect is mixed for women. If at least one parent works in a managerial job position, the chances of attaining a university degree are considerably higher for both men and women. If one of the parents works and the other does not, chances of university are increased for men, although statistically significant only at the 10%-level. The effect if both parents are not working is not statistically significant.

3. Robustness checks

We checked the robustness of our results by implementing different specifications, including a selection model and IV estimates. When comparing specifications with and without control variables, we find that the inclusion of the control variables reduces the estimated marginal effects of sports on educational attainment by about one half. This finding makes us confident that we have controlled for important factors of selection into sports. The control variables that reduce the estimated effect of sports on education most strongly are age and the parents' school degree. Specifying age as a linear function or as a cubic function does not change the results quantitatively or qualitatively in an important way. Another robustness check consists in constructing a different dependent variable with four categories which consist of combinations of school and professional

degrees[3]. The estimations with this dependent variable qualitatively lead to the same evidence of positive effects of sports on educational attainment.

More crucial, however, is the question whether the effect of sport on educational attainment is causal or whether it is due to selection effects or reversed causality, both of which would cause endogeneity of participation into sports and lead to biased estimates. For example, individuals with higher unobserved abilities might be more likely to participate in sports and to obtain higher degrees, or students in higher school tracks may have more free time for outside school activities and, therefore, participate more often in sports. Both would cause an upward bias of the presented marginal effects to the extent that the true effect could even be negative. In order to check whether endogeneity of participation in sport is prevalent in our analysis, we implement treatment regressions and IV estimates of the secondary school degree.

Studies examining the impact of sport have rarely used IV estimates. Eide and Ronan (2001) use individual height of the respondents when they were 16 years of age (sophomores) as instrument for sport participation. Anderson (1998) uses school level information as instruments (e.g., share of students holding part-time jobs, participating in sports or other extracurricular activities). Stevenson (2006) uses a change in legislation (title IX) as an exogenous shock to female sports participation. Since our data neither contains school information nor exogenous shocks on sports participation, we can only use height as an instrument from the aforementioned. The intuition of using height as an instrument is that it is an important asset in most sports (e.g., basketball). Unfortunately, in our data we can only use adult height as a proxy for height when the decision to participate in sports took place. As a second instrument we consider city size of the location in which the student used to live during childhood. The rationale for this

[3] The chosen categories were (1) school degree below high school degree without professional degree, (2) low or intermediate school degree with vocational training, or high school degree without a professional degree, (3) high school degree with vocational training, and (4) university degree. The results for this estimate can be requested from the authors.

instrument is that larger cities have more sports clubs and might offer more sports opportunities than smaller cities. [4]

Table 3 contains the effects of sports on secondary school degrees with ordinary least squares (OLS), treatment and linear IV regressions for men and women separately.[5] Note, that we only use a single explanatory variable for participation in sports which includes also participation in competitions. All control variables are the same as in the generalized ordered probit regression. For the treatment regression and the IV estimation we present two specifications which differ in the choice of the identifying/ instrumental variables. In the first specification we use only height, in the second we chose height and city size.

Insert table 3 about here

The OLS regression results presented in table 3 confirm the positive significant effect of sport on school degree found in the generalized ordered probit regressions presented above. Taking endogeneity into account in terms of the treatment regression and the IV estimation does not modify this result. Sport has still a positive and statistically significant effect on school degrees of men and women. The treatment regression measures a highly significant and substantially negative correlation between the error terms of the outcome and of the selection equation. The effects of sports measured from

[4] As additional instruments we considered health status, weight, and body mass index (BMI) reported as an adult. From a theoretical perspective these instruments are more likely to be influenced by sport activities than influence the participation in sport itself. Hence, they are likely to be bad proxies for health and fitness as adolescence. We therefore did not use these instruments.

[5] Angrist (1991) shows that linear IV estimators perform reasonably well in estimating average treatment effects in models for qualitative outcomes. Consequently, the use of linear IV estimators to estimate treatment effects of binary endogenous variables on binary outcome variables is common; with respect to analyses of sports and educational attainment see Eide and Ronan (2001) as well as Anderson (1998). We translate this practice to the case of an ordinal dependent variable. The results of the linear IV model are compared with those of a treatment regression, which models the dependent variable as continuous and the endogenous regressor as dichotomous (Greene, 2003: 787-788). We use the maximum likelihood estimator. Linear IV estimation is treated for example in Murray (2006).

the treatment and IV estimates are larger than those from the OLS estimation.[6] Possible interpretations for the downward bias of the OLS estimates are that there is a negative selection into sports with respect to unobserved ability and that students of lower school tracks might have more time to participate in outside school sports activities.

We acknowledge that better instruments would be desirable. The association of height with sports may be ambiguous because it can be obstructive in some sports (e.g., gymnastics, wrestling). Moreover, body height might not only directly influence participation in sport but also educational attainment. When analyzing the wage premium of body height during adolescence, Persico et al. (2004) find that part of the height premium may be explained by athletic participation and part of it by greater levels of schooling, suggesting that body height may directly influence the two. If body height has a direct influence on education, it would not be a valid instrument. However, we cannot generally test whether it is a valid instrument. City size might also not only influence opportunities of participation in sports but also opportunities of schooling. However, Sargan's test of overidentifying restrictions does not reject the null hypothesis of no correlation between the instruments and the error term at the 10%-level. In other words, under the assumption that at least one of the instruments is valid, the test indicates that both are valid. Assuming that our instruments are valid, estimates that do not control for selection into sports apparently underestimate the beneficial effect of sports on educational attainment

VI. CONCLUSION

Overall, we conclude that participation of German adolescents in sport activities has significant positive effects on educational attainment. This finding is in line with theoretical considerations about allocation of time and educational productivity. According to our estimates, taking possible endogeneity of participation in sports into account makes the effect stronger. We also find evidence that the effect is generally larger for women than for men, especially if they participate in competitions. However,

[6] Both height and size of city are highly statistically significant in the selection equation and the first stage equation respectively.

the results also point to the fact that taking part in competitions might offset (but not reverse) the beneficial effects of sports on the highest degrees, probably because both competitions and studying for the highest degrees are very time-consuming activities. The positive effects of sport activities should encourage politics to strengthen sport activities in school and out of school. Moreover, parents should be aware of these positive effects, i.e., they should encourage their children to get involved in sports. It seems especially beneficial for girls to participate in sports because it strengthens their position in competing with boys in classroom and probably also their position in male dominated societies and work surroundings.

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TABLES (to be inserted into text)

Table 1: Effects of sport on secondary school degree

	Male				Female			
	No degree	Low degree	Interm. degree	High degree	No degree	Low degree	Interm. degree	High degree
Prob. at means	0.5%	40.5%	28.6%	30.4%	0.7%	37.6%	39.7%	22.1%
Sport	-0.1%	-6.6%	0.6%	6.1%	-0.1%	-11.0%	5.5%	5.6%
	(-0.04)	(-1.67)	(0.21)	(2.27)	(-0.14)	(-4.28)	(2.09)	(2.60)
Competition	-0.2%	-3.8%	3.3%	0.7%	-0.4%	-6.5%	6.6%	0.3%
	(-0.04)	(-0.59)	(1.24)	(0.29)	(-1.01)	(-2.16)	(2.11)	(0.12)
Age	0.00%	0.4%	-1.0%	0.7%	0.02%	0.6%	-0.8%	0.15%
	(-0.03)	(0.93)	(-2.84)	(1.94)	(0.45)	(1.73)	(-2.07)	(0.50)
Age squared / 100	-3E-05	0.4%	0.6%	-1.0%	-0.01%	0.5%	0.2%	-0.7%
	(-0.03)	(0.91)	(1.82)	(-2.81)	(-0.25)	(1.47)	(0.56)	(-2.41)
Parents interm.	-0.1%	-27.3%	2.0%	25.4%	-0.3%	-30.1%	7.5%	22.9%
school	(-0.04)	(-7.56)	(0.82)	(9.67)	(-0.69)	(-14.97)	(2.73)	(8.61)
Parents high	0.0%	-40.1%	-9.3%	49.5%	-0.2%	-40.7%	-4.4%	45.3%
school	(-0.03)	(-17.20)	(-3.85)	(17.88)	(-0.63)	(-24.06)	(-1.55)	(15.45)
Parents care	-0.4%	-5.0%	0.1%	5.3%	-0.4%	0.7%	3.6%	-3.9%
little	(-0.04)	(-0.45)	(0.02)	(1.13)	(-0.85)	(0.16)	(0.91)	(-1.12)
Parents care	-0.9%	-10.9%	3.3%	8.6%	-0.6%	-3.7%	9.3%	-5.0%
somewhat	(-0.04)	(-0.42)	(0.80)	(1.88)	(-1.28)	(-0.91)	(2.35)	(-1.45)
Parents care	-0.5%	-12.1%	0.7%	11.9%	-0.7%	2.7%	-0.1%	-1.9%
strongly	(-0.03)	(-0.74)	(0.14)	(2.21)	(-2.67)	(0.57)	(-0.02)	(-0.50)
Foreigners in class	0.7%	15.4%	-7.9%	-8.2%	1.2%	26.9%	-25.8%	-2.3%
about 25%	(0.04)	(0.81)	(-1.59)	(-1.79)	(0.67)	(4.29)	(-4.43)	(-0.46)
Foreigners in class	1.6%	22.9%	-5.8%	-18.7%	6.2%	28.3%	-17.3%	-17.2%
> 25%	(0.04)	(0.59)	(-0.80)	(-3.68)	(1.49)	(3.63)	(-2.40)	(-5.08)
No parent works	0.7%	6.3%	-10.0%	3.0%	0.3%	-3.4%	-0.3%	3.5%
	(0.04)	(0.33)	(-2.79)	(0.76)	(0.34)	(-0.78)	(-0.07)	(0.86)
One parent works	0.0%	0.9%	-6.0%	5.0%	-0.1%	0.1%	-2.9%	2.9%
	(0.04)	(0.40)	(-2.88)	(2.44)	(-0.45)	(0.04)	(-1.32)	(1.65)
At least one parent	-1.4%	-18.4%	3.6%	16.1%	0.1%	-20.2%	-1.0%	21.0%
managerial position	(-5.60)	(-4.98)	(0.97)	(4.71)	(0.13)	(-5.21)	(-0.23)	(6.07)
No. of brothers	0.1%	2.6%	-0.8%	-1.9%	0.0%	2.4%	-0.2%	-2.2%
and sisters	(0.04)	(0.95)	(-1.53)	(-3.45)	(0.49)	(4.19)	(-0.38)	(-4.02)
Observations	2930				3071			
Log likelihood	-2825.53				-2724.01			

Note: Probabilities and effects computed at means, z-values in parentheses. A LR-Test rejects the simple ordered probit model at the 1%-level. The test statistics for the male and female sample are 150.36 and 185.00 respectively (χ^2-distributed with 30 degrees of freedom). Reference categories are: parents no or low degree, parents care not at all, share of foreigners in class <25%, two parents work not in managerial position.

Table 2: Effects of sport on professional degree

	Male			Female		
	No degree	Voc. degree	University degree	No degree	Voc. degree	University degree
Prob. at means	4.1%	68.7%	27.1%	12.8%	72.9%	14.3%
Sport	-1.1%	-4.2%	5.3%	-4.7%	-0.1%	4.7%
	(-1.05)	(-1.59)	(2.08)	(-2.86)	(-0.03)	(2.75)
Competition	-1.5%	0.5%	1.0%	-5.4%	6.4%	-1.1%
	(-1.47)	(0.20)	(0.41)	(-2.99)	(2.76)	(-0.60)
Age	-0.9%	-1.1%	2.1%	-1.5%	0.7%	0.8%
	(-8.00)	(-3.21)	(5.97)	(-7.19)	(2.29)	(3.39)
Age squared / 100	0.9%	1.1%	-2.0%	1.8%	-0.7%	-1.1%
	(7.87)	(3.14)	(-5.82)	(9.28)	(-2.46)	(-4.52)
Parents interm.	-1.3%	-21.2%	22.5%	-6.8%	-11.1%	17.9%
school	(-1.37)	(-7.84)	(8.41)	(-4.59)	(-4.19)	(7.37)
Parents high	1.4%	-43.4%	42.0%	-7.1%	-28.8%	35.9%
school	(0.90)	(-14.40)	(13.98)	(-4.25)	(-9.47)	(12.20)
Parents care	-2.8%	-4.0%	6.9%	-4.0%	6.0%	-2.0%
little	(-2.48)	(-0.88)	(1.50)	(-1.69)	(1.79)	(-0.71)
Parents care	-4.8%	-5.1%	9.9%	-2.7%	6.4%	-3.7%
somewhat	(-3.62)	(-1.14)	(2.23)	(-1.11)	(1.90)	(-1.31)
Parents care	-3.5%	-8.5%	12.0%	-5.7%	6.3%	-0.6%
strongly	(-4.20)	(-1.61)	(2.24)	(-2.58)	(1.83)	(-0.19)
Foreigners in class	5.1%	0.7%	-5.7%	6.4%	-1.9%	-4.5%
about 25%	(1.86)	(0.13)	(-1.18)	(1.29)	(-0.34)	(-1.29)
Foreigners in class	1.5%	17.3%	-18.8%	24.8%	-15.0%	-9.8%
> 25%	(0.54)	(3.42)	(-4.12)	(3.17)	(-1.83)	(-2.68)
No parent works	0.4%	-1.1%	0.63%	-3.6%	3.2%	0.4%
	(0.31)	(-0.28)	(0.17)	(-1.52)	(0.86)	(0.14)
One parent works	-0.7%	-2.9%	3.6%	0.0%	-1.0%	0.9%
	(-0.90)	(-1.44)	(1.87)	(0.01)	(-0.53)	(0.67)
At least one parent	-3.0%	-16.4%	19.4%	-1.6%	-11.7%	13.3%
managerial position	(-3.69)	(-4.98)	(5.80)	(-0.61)	(-3.44)	(4.73)
No. of brothers	0.6%	1.0%	-1.6%	1.5%	-0.1%	-1.4%
and sisters	(3.35)	(1.91)	(-3.05)	(4.58)	(-0.27)	(-3.05)
Observations		2950			3100	
Log likelihood		-2042.55			-2300.45	

Note: Probabilities and effects computed at means, z-values in parentheses. A LR-Test rejects the simple ordered probit model at the 1%-level. The test statistics for the male and female sample are 99.72 and 86.49 respectively (χ^2-distributed with 15 degrees of freedom). Reference categories are: parents no or low degree, parents care not at all, share of foreigners in class <25%, two parents work not in managerial position.

Table 3: Robustness checks of the effect of sport on secondary school degree

A) Males					
Model	OLS	Treat.reg	Treat.reg	Linear IV	Linear IV
Instruments	-	Height	Height, city	Height	Height, city
Sport	0.142	0.905	0.886	3.714	1.896
	(4.71)	(5.36)	(5.67)	(2.25)	(3.49)
Rho	-	-0.547	-0.538	-	-
P-value of test of rho=0	-	0.002	0.000	-	-
P-value of significance of IVs in selection equation	-	0.000	0.000	-	-
F-test of excluded instruments	-	-	-	5.61	4.80
P-value Sargan test of overidentifying restrictions	-	-	-	-	0.12
B) Females					
Model	OLS	Treat.reg	Treat.reg	Linear IV	Linear IV
Instruments	-	Height	Height, city	Height	Height, city
Sport	0.165	1.195	1.178	2.230	1.515
	(6.45)	(15.56)	(15.07)	(2.38)	(3.48)
Rho	-	-0.773	-0.766	-	-
P-value of test of rho=0	-	0.000	0.000	-	-
P-value of significance of IVs in selection equation	-	0.000	0.000	-	-
F-test of excluded instruments	-	-	-	7.11	5.03
P-value Sargan test of overidentifying restrictions	-	-	-	-	0.47

Note: Z-values in parentheses. All estimates include the same set of control variables as the generalized ordered probit estimates in table 1. The instrument city consists of the dummies city1-city3 (see table A1 for variable descriptions). Rho is the correlation coefficient between the error terms of the selection and the outcome equation.

APPENDIX

Table A1: Variable explanation and summary statistics

Variable Name	Description	Male			Female		
		Mean	S.d.	Obs.	Mean	S.d.	Obs.
Sport	Exercised sport during youth	0.64	0.48	2950	0.44	0.50	3100
Competition	Exercised and took part in competitions	0.49	0.50	2950	0.25	0.43	3100
School degree category 1	No school degree (drop-out)	0.02	0.13	2930	0.01	0.10	3071
School degree category 2	Lowest school degree ("Hauptschule)	0.43	0.49	2930	0.42	0.49	3071
School degree category 3	Intermediate school degree ("Realschule")	0.23	0.42	2930	0.30	0.46	3071
School degree category 4	Highest school degree ("Gymnasium")	0.32	0.47	2930	0.26	0.44	3071
Professional degree category 1	No professional degree	0.06	0.23	2950	0.16	0.37	3100
Professional degree category 2	Vocational degree ("Lehre/Ausbildung")	0.65	0.48	2950	0.66	0.48	3100
Professional degree category 3	University degree ("Fach-hochschule/Universität")	0.29	0.46	2950	0.18	0.39	3100
Age	Age in year 2000 in years	47.26	15.82	2950	47.22	16.57	3100
Age squared / 100	Age squared divided by 100	24.84	15.50	2950	25.04	16.61	3100
Parents intermediate school	Highest school degree of parents "Realschule"	0.17	0.37	2950	0.15	0.36	3100
Parents high school	Highest school degree of parents "Gymnasium"	0.13	0.34	2950	0.14	0.35	3100
Reference: Parents have no or low school degree.							
Parents care little	Parents care little about school performance	0.35	0.48	2950	0.36	0.48	3100
Parents care somewhat	Parents care somewhat about school performance	0.45	0.50	2950	0.42	0.49	3100
Parents care strongly	Parents care strongly about school performance	0.14	0.35	2950	0.16	0.37	3100
Reference: Parents care not at all about school performance.							
Foreigners in class about 25%	Share of foreigners in classroom about 25%.	0.03	0.18	2950	0.03	0.16	3100
Foreigners in class > 25%	Share of foreigners in classroom greater than 25%.	0.02	0.13	2950	0.01	0.12	3100
Reference: Share of foreigners in class <25%.							
No parent works	None of the parents works.	0.07	0.25	2950	0.05	0.22	3100
One parent works	One of the parents works.	0.54	0.50	2950	0.52	0.50	3100
At least one parent managerial position	At least one of the parent has a job position associated with managerial functions.	0.12	0.32	2950	0.10	0.30	3100
Reference: Both parents work, but neither parent in managerial position.							
No. of brothers and sisters	Number of brothers and sisters.	2.07	1.76	2950	2.01	1.69	3100
Height	Body height in cm as adult	178.3	7.01	2624	166.0	6.27	2724

City1	Big city	0.23	0.42	2602	0.23	0.42	2696
City2	Middle sized town	0.17	0.38	2602	0.19	0.39	2696
City3	Small town	0.21	0.40	2602	0.20	0.40	2696
Reference: Countryside.							
Note: All variables are dummies, except for age, number of siblings, and height.							