Why Does Height Matter for Educational Attainment? Evidence from German Pre-Teen Children

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Abstract

Several studies have shown that body height is positively associated with educational attainment. We investigate the mechanisms behind this relationship for Germany. Using data on pre-teen students, we show that taller children are more likely to enroll in the most academic secondary school track. This is due to primary school teachers giving better recommendations to taller students, given their academic achievement. We suggest that teachers actually reward higher social skills. In fact, we find that taller children tend to have higher social skills already at age 3. Finally, the results show a gender-specific pattern.

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Keywords: Height, Physical Stature, Tracking, Teacher recommendation, Educational attainment, Noncognitive skills

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1 Introduction

There is extensive and consistent evidence that taller adults earn higher wages in the labor market (see, e.g., Case and Paxson (2008b); Persico, Postlewaite, and Silverman (2004); and Heineck (2005)). In addition, various studies show that body height is also positively related to educational attainment.[1] This relationship is documented both in studies that use large samples and in smaller within-siblings comparisons. Teasdale, Owen, and Sørensen (1991) use a representative sample of more than 76,000 Danish men. They find a positive relationship both between height and educational attainment and between height and intelligence. Bielicki and Charzewski (1983) employ a sample of Polish adult brothers who differ in both education and height. They show that the fraction of pairs in which the taller brother is better educated is significantly larger than the fraction of pairs in which the taller brother is less educated. Silventoinen, Kaprio, and Lahelma (2000) use a dataset with almost 9,000 adult Finnish twin pairs and find that the positive relationship between height and educational attainment is mainly due to nongenetic family factors. Magnusson, Rasmussen, and Gyllensten (2006) employ a nation-wide cohort study of over 950,000 Swedish men and find that men taller than 194 cm are two to three times more likely to obtain higher education compared to men shorter than 165 cm—controlling for cognitive ability and parental socioeconomic position. This association remains statistically significant within brother-pairs, suggesting that non-familial factors contribute to the height-education relationship.

This paper is the first study that sheds light on the relationship between height and secondary school track in Germany, where the tracking decision is a strong predictor of final educational attainment. We also investigate the mechanisms that drive this relationship. We contribute to the literature in several ways. First, we add new evidence on the importance of noncognitive skills for educational attainment. Second, we explore the role of height for the transition from primary to secondary school, i.e. the secondary school track decision. This decision is especially crucial in Germany because it strongly determines educational attainment and affects future labor market outcomes. Dustmann (2004), for example, documents that the German tracking system produces low intergenerational mobility and shows that different secondary school tracks translate into substantial wage differentials later in life. In fact, the German school system is characterized by rigid

[1] Cinnirella and Winter (2009), e.g., show that height and educational attainment are positively correlated in several European countries. Case, Paxson, and Islam (2008) show that half of the labor market height premium in Britain can be explained by the positive association between height and educational attainment.

early tracking. After primary school, at about age 10, students are tracked into differing-ability schools.[2] In order to study the impact of height on the secondary school track decision, we employ a longitudinal dataset that observes students immediately before and after tracking. Besides a measure of height, the data include information on the students' academic achievement at the end of primary school and their socioeconomic background. Furthermore, we exploit another feature of the German school system which allows us to shed more light on the determinants of the transition from primary to secondary school. Primary school teachers provide a more or less binding recommendation for the secondary school track on which parents base the school decision for their children. We observe teacher recommendations for all children in the sample.

We find that taller students have a significantly higher probability of enrolling in the most academic secondary school type, controlling for parental background and for students' school performance at the end of primary school. We show that the association between height and the tracking decision is due to primary school teachers' recommendations: controlling for students' academic achievement, taller students are more likely to receive a recommendation for the most academic secondary school type. One possible explanation for this finding could be that taller people are more intelligent. Case and Paxson (2008b), for example, suggest that taller workers earn higher wages because they are more intelligent. They show that height and cognitive abilities are positively correlated already at age 3 and throughout childhood.[3] To the extent that students' cognitive abilities affect teachers' recommendations mainly through academic achievement, our results suggest that height has an effect on recommendations independent of cognitive abilities.

A growing body of research documents that noncognitive skills developed during early childhood are important predictors of later educational attainment (see Bowles, Gintis, and Osborne (2001), Chamorro-Premuzic and Furnham (2005), Heckman and Rubinstein (2001), and Heckman, Stixrud, and Urzua (2006)).[4] Using information on children aged 2 to 3, we analyze whether, and how strong, height is associated with social skills, one form of noncognitive skills. Thus, we employ a second dataset which contains information on height and on children's noncognitive skills.

[2]Because mobility between different secondary school types is quite limited (Jürges and Schneider (2007)), the tracking decision strongly determines final educational attainment.

[3]Case and Paxson suggest that the pre-natal environment and nutrition during childhood determine both body height and cognitive ability.

[4]Noncognitive skills (also called personality traits) developed during infancy and childhood also predict a variety of labor market outcomes such as wages and risk-taking behavior in adulthood.

We find that taller children aged 2 to 3 have higher social skills than shorter children, net of parents' education and family income. Because height at age 3 is strongly correlated with height at age 10 and previous research consistently shows that differences in noncognitive skills among very young children tend to persist throughout childhood,[5] we suggest that primary school teachers reward taller students for their higher social skills.

Finally, we find a consistent gender-specific pattern: results in both datasets are significant only for boys. In this respect, there is some evidence from psychological studies that the relationship between social behavior and body height is different for boys and girls. Biller (1968), for example, shows that, according to ratings of kindergarten teachers, body height is related to the social behavior of young boys: tall boys tend to be more dominant in their male peer group than short boys. Eisenberg, Roth, Bryniarski, and Murray (1984) show that mothers of preschool children rate tall boys as more competent than short boys. They find that this pattern is less clear for girls.

Our hypothesis that higher social skills are associated with higher educational attainment is in line with Persico, Postlewaite, and Silverman (2004) who explain the height premium in the labor market with accumulated social skills. They show that the adult height premium is essentially eliminated when controlling for teen height. They argue that taller teenagers are more likely to participate in sport activities and clubs during adolescence, thereby accumulating social skills that are rewarded later in the labor market. In contrast to Persico, Postlewaite, and Silverman (2004), we show that differences in social skills across individuals of differing height arise at a very early stage in life.

The rest of the paper proceeds as follows. Section 2 briefly describes the German school system. Section 3 reports our results on the relationship between height and secondary school track and between height and teacher recommendations. Section 4 presents results on the association between height and social skills during early childhood. Section 5 concludes.

[5]For evidence from psychological literature on the persistence of personality traits, see Caspi (2000); Newman, Caspi, Moffitt, and Silva (1997); and Roberts and DelVecchio (2000). Carneiro, Heckman, and Krueger (2003); Cunha, Heckman, Lochner, and Masterov (2006); Cunha and Heckman (2007) present evidence on the early emergence of gaps in both cognitive and noncognitive abilities. Borghans, Duckworth, Heckman, and ter Weel (2008) review empirical studies that relate personality traits and cognitive abilities to adult outcomes.

2 The German Educational System

As the German school system differs considerably from that in the U.S. and many other countries, we provide a brief overview of the aspects that are relevant to this study.[6] A characteristic feature of the German school system is the secondary school track choice at a very early stage. After completing 4 years of primary school (*Grundschule*),[7] at about age 10, students are allocated to one of three different secondary school types. The three traditional school types are general school (*Hauptschule*), intermediate school (*Realschule*), and high school (*Gymnasium*).[8] The least academic track (general school) provides basic general education and lasts five years (in some states six years). Intermediate schools provide a more extensive general education and usually cover grades 5 to 10. The intermediate school leaving certificate qualifies a student to attend a school that provides vocational or higher education entrance qualification, whereas a leaving certificate from general school allows only attendance of vocational schools. High school provides the most academic education and covers grades 5 to 12 (or 5 to 13, depending on the federal state schooling laws). The high school leaving certificate (*Abitur*) is a prerequisite for attending university or other institutions of higher education. Thus, high school is the only secondary school track that provides direct entry into tertiary education.

Parents' secondary school track decision for their child is based on a teacher recommendation. At the end of primary school, students do not take any ability test which might provide information on the child's academic potential. Neither do exist formal exit examinations to facilitate the secondary school track decision. Instead, primary school teachers usually recommend a secondary school track for each student. This recommendation is primarily based on the academic achievement of the student, especially the performance in Math and German. This recommendation is more or less binding, depending on the state's schooling laws. If the primary school's recommendation is at odds with the parents' wishes, the final decision lies either with the parents, the secondary school, or the school supervisory authority, depending on the state laws. Lower educated parents might be less confident or less interested in their child's education, and consider the recommendation as

[6] See Lohmar and Eckhardt (2008) for a more detailed description of the German school system.

[7] In two states, Berlin and Brandenburg, primary school lasts 6 years.

[8] In the school year 2006/07, the distribution between the three traditional secondary school types was as follows: 22 percent of the students attended general school, 27 percent attended intermediate school, and 51 percent attended high school. These figures are based on Statistical Yearbook (2008, p.133). In some states, a fourth type of secondary school exists. Comprehensive schools (*Gesamtschule*) offer all lower and upper secondary education levels. Where comprehensive schools exist, only a minor fraction of students attends this school type.

more binding than parents with higher educational attainment (Dustmann (2004)). Better educated parents might likewise be more likely to send their child to high school even if the child did not receive a high school recommendation.

Mobility between secondary schools is theoretically possible but limited in practice. Jürges and Schneider (2007) use the German PISA extension study, a cross-sectional dataset representative for the cohort of 15-year-old students, and show that mobility is limited, with downward mobility being more common than upward mobility. They find that less than 5 percent of the students who had *not* received a recommendation for high school attended high school in grade 9 (5th grade of secondary school). In contrast, 21 percent of those students who received a recommendation for high school did not attend high school in grade 9. Because (upward) mobility is limited in practice, the secondary school track decision at the end of primary school has strong impacts on final educational attainment and later labor market outcomes.

3 Height and Secondary School Track

In this section, we first describe our dataset. Then we present Probit model results of the association between height and secondary school track and the results of the association between height and teacher recommendation.

3.1 The Youth Panel

In order to examine the role of height for the secondary school track choice, we use the Youth Panel (*Kinderpanel*), a longitudinal dataset with focus on the transition from primary to secondary school. This study is conducted by the German Youth Institute (*Deutsches Jugendinstitut*), the largest German non-university social science research institute in the area of children, youths, and families. The survey consists of three waves that were collected in autumn 2002, spring 2004, and autumn 2005. The target population are German-speaking children aged 5 to 12 who live with their German-speaking parents in Germany. Children were sampled on the basis of the register of residents in 100 representatively selected municipalities. Oral interviews have been conducted with mothers and children, whereas fathers were asked to fill out a questionnaire.[9]

[9]The dataset and all questionnaires (in German language) are online available at http://213.133.108.158/surveys/index.php?m=msg,0&gID=4.

Our final sample consists of 189 boys and 226 girls who were mainly born between October 1993 and September 1994. All children in the sample attended primary school in waves 1 and 2 and secondary school in wave 3. Mothers report the height of their offsprings (only) in wave 3, i.e. immediately after the secondary school track decision took place. When height is reported, children were between 11.0 and 12.75 years old.[10]

As we are interested in assessing the effect of height when the transition from primary to secondary school takes place, we need to adjust reported height because it is reported for students from two different grades (5th or 6th grade). We maintain reported height of 5th graders, i.e. those students who entered secondary school only a few months before height was reported. We subtract the average height difference between 6th and 5th graders from the height of 6th graders. This adjustment is done separately for boys and girls.[11] It ensures that the new measure reflects height as if it was reported at the beginning of secondary school (5th grade) for all students in the sample.

Most importantly, we also observe students' school performance. Mothers report their offsprings' school performance in mathematics, orthography, and reading at the end of primary school, i.e. immediately before secondary school tracking takes place.[12] Analog to German school grades, mothers indicate academic performance of their children on a scale from 1 to 4: "very good" (1), "good" (2), "not so good" (3), and "not good at all" (4). As noted above, teachers base their school recommendations primarily on the performance in math and German. Thus, we are able to control for the child's academic achievement in those subjects on which primary school teachers base their recommendations. We observe teachers' recommendations for all children in our sample.

Table 1 presents descriptive statistics by gender. We use *Secondary School Track* and *Teacher Recommendation* as outcomes in two separate Probit models. Both dependent variables are binary and equal 0 if the student attends (received a recommendation for) general school or intermediate school, and equal 1 if the student attends (received a recommendation for) high school.[13] In our sample, 54.5 percent of the boys attend high

[10]Strauss and Duncan (1996) show that measured height and mother-reported height are very close for 12-year-old children. Thus, we believe that reported height in our sample does not suffer from systematic measurement errors.

[11]The relative position within the height distribution is very stable at this age. Medical literature reports a height correlation coefficient of 0.98 between age 11 and age 12 for boys (see Humphreys, Davey, and Park (1985, p.1467)).

[12]School performance is reported in wave 2 when 69.3 percent of the boys and 75.2 percent of the girls in our sample attended the last grade of primary school. School performance refers to the penultimate grade of primary school (grade 3) for the other students. We assume that performance in grade 3 is a good proxy for the performance in grade 4.

[13]General school and intermediate school are combined because of the small sample size.

school, while 56.1 percent of the boys received a recommendation for high school. The respective fractions are larger for girls: 61.1 percent attend high school and 63.7 percent received a recommendation for high school. For both gender the proportion of high school recommendations is marginally larger than the proportion of students who actually attend high school. This means that most students comply with the secondary school track recommendation of their primary school teacher.

Height refers to the adjusted measure described above. Means and standard deviations of height are very similar across gender. Boys perform better in math (1.68) than girls (1.94), while girls do better in orthography (1.88) and reading (1.58) than boys (2.22 and 1.76, respectively). We also control for mother's school degree and whether she received a degree at a university or at a university of applied sciences (*Fachhochschule*).[14] Finally we also control for family income. *High Household Income* is a binary variable which indicates whether the net monthly household income exceeds the threshold of 3250€.[15]

Since previous literature has shown that relative age in primary school has an impact on educational outcomes, we control for age at the end of 4th grade (see, for example, Angrist and Krueger (1992) and Puhani and Weber (2007)). Similar to other countries, school entry age in Germany is defined by a specific cut-off date (often June 30). Children who turn 6 before that date usually start primary school in August or early September. Children who turn 6 after the cut-off date start primary school one year later. However, children might enroll one year earlier or one year later than scheduled by the cut-off date. We include, therefore, two binary variables that indicate whether a child was enrolled early (about 7 percent in our sample) or whether he was enrolled late (about 3 percent).

3.2 Results

Because secondary school track and teacher recommendation are binary outcomes, we run standard Probit models to examine the relationship between height and these two outcomes. Table 2 presents coefficients and standard errors (in parenthesis) of these models. Column 1 shows that height is statistically significantly associated with secondary school track for boys. The magnitude of the effect is also economically significant: a 1cm increase in height is associated with a 1.6 percentage points increase in the probability of attending high school. Thus, a one standard deviation increase in height is associated with an 11.4 percentage points higher probability of attending high school. The magnitude of this height

[14] All estimation results are robust to including also father's educational attainment.

[15] This threshold denotes the top quartile of the income distribution in our sample.

effect is similar to the effect of performing *good* at math relative to performing *not so good* or *not good at all* (13.7 percentage points). The one standard deviation height effect is also similar in size to the effect of coming from a family with a top quartile household income instead of coming from a family with a lower household income (12.6 percentage points). Given the rich set of control variables, the results indicate that height has a significant effect on secondary school track choice independent of students' academic performance and parental background.

As described above, school recommendations of primary school teachers strongly affect the secondary school track choice. Column 2 shows that height is strongly related to teacher recommendations for boys. The coefficient on height is statistically highly significant and—given the high compliance with teacher recommendations—of similar magnitude compared as the height coefficient in the secondary school track model (Column 1). A one standard deviation increase in height is associated with a 13.6 percentage points higher probability of receiving a high school recommendation. The comparison with the observed probability that a boy receives a high school recommendation (56 percent) reveals the economical importance of this relationship: A one standard deviation increase in height is associated with a 24 percent higher probability of receiving a recommendation for the most academic secondary school track. The magnitude of this effect is especially remarkable given that we control for students' academic performance at the end of primary school which is supposed to be the most important determinant of teacher recommendations. Indeed, school performance has the expected sign and high explanatory power in both models.[16] Good grades in math and orthography are strongly associated with the recommendation and attendance of high school. Reading skills have no an independent impact on teacher recommendations. Contrary to previous studies, we do not find an effect of relative age on the secondary school track decision independent of school performance.

The positive association between height and high school attendance is not statistically significant for girls (p-value = 0.31; see Column 3). Similarly, there is no relationship between height and teacher recommendation for girls (Column 4). Note, however, that the impact of school performance at the end of primary school is similar across gender. The difference is that good or very good math skills seem to be more important for girls than for boys, whereas orthography seems to matter more for boys. School performance is a strong predictor of secondary school track and teacher recommendation for both sexes.

[16]Separate Probit models with school performance as the only explanatory variable (not reported) yield high pseudo R-squared: 0.307 in the male and 0.244 in the female sample.

We do not control directly for students' cognitive abilities in these models. To the extent that intelligence is positively correlated with height, the coefficient on height would be biased upward. In fact, several recent studies have shown a positive association between height and cognitive abilities. Case and Paxson (2008b), for example, suggest that taller workers have on average higher wages because they are more intelligent. They show that height is positively correlated with cognitive abilities already at age 3. We argue, however, that the estimated coefficients on height are unbiased because students' cognitive abilities affect teacher recommendations entirely through the impact on school performance. Given that we control for students' school performance, we suggest that height affects teacher recommendations independent of cognitive abilities.

In principle, various channels could cause the relationship between height and teacher recommendations (for boys). Statistical discrimination seems not likely because teachers have good information on students' productivity.[17] We suggest, however, that height is a marker for social skills which are unobservable to the econometrician but observable to the teacher. That is, we argue that 'better' recommendations for taller boys actually reward higher social skills. We provide evidence for this hypothesis in the next section.

4 Height and Social Skills during Early Childhood

The results presented above show that taller boys are, *ceteris paribus*, more likely to attend the most academic secondary school track than shorter boys. This relationship is due to the fact that taller students are much more likely to receive a teacher recommendation for high school, controlling for academic achievement in primary school and parental background. In this section, we provide evidence that social skills might drive the positive association between height and teacher recommendation.

4.1 The German Socio-Economic Panel Study

In order to test this hypothesis, we use an additional dataset which consists of the offsprings of the respondents to the German Socio-Economic Panel (GSOEP). The GSOEP is a large

[17]Statistical discrimination has been studied mainly in the employer-employee framework where an employer has little knowledge about an applicant's productivity. Therefore, employers might base their hiring decision on the applicant's observable characteristics such as education and gender that are correlated with productivity. Cinnirella and Winter (2009) argue that statistical discrimination might explain the height premium in the labor market.

annual household survey, representative of the German resident population.[18] Participants answer detailed questionnaires covering diverse topics such as demographic characteristics, educational attainment, and health.[19] The data used in this section derive mainly from the mother-child questionnaires which collect information on children between age 2 and 3. These questionnaires contain questions on the child's health, including height and weight, and most importantly, on the child's adaptive behavior. Data have been collected in 2005, 2006, and 2007.

Height and weight as well as the assessments of the child's adaptive behavior and abilities are reported by the mother. Due to the German health-care system for infants, misreporting of height and weight is not an issue here. In fact, height and weight of infants are measured on a regular basis due to mandatory (and free of charge) preventive medical check-ups. At each control, the anthropometric measures are updated in a medical record booklet which is kept by the family. Cawley and Spiess (2008) report that 98 percent of the GSOEP children take part in these regular check-ups.

Mothers are asked to indicate the level of a variety of developmental outcomes for their child. The outcomes collected in the GSOEP are a modified version of the German Vineland scale that has been developed to study children behavioral development in Germany (see Tietze (1998)).[20] More precisely, mothers are asked to rate their child's ability in performing five different tasks in four domains: social skills, verbal skills, motor skills, and activities of daily living. Tasks in the domain *social skills* include the child's ability in (i) calling familiar people by name, (ii) participating in games with other children, (iii) getting involved in role-playing games, (iv) showing a preference for certain friends, and (v) calling own feelings by name. The domain *verbal skills* includes the abilities in (i) understanding brief instructions, (ii) forming sentences with at least two words, (iii) speaking in full sentences (with four or more words), (iv) listening attentively to a story for five minutes or longer, and (v) passing on simple messages. The domains *daily activities* and *motor skills* are discarded because we assume that these noncognitive abili-

[18]For a detailed description of the GSOEP see Schupp and Wagner (2002), Haisken-DeNew and Frick (2003), and Wagner, Frick, and Schupp (2007).

[19]All questionnaires, in German and in English, are online available at http://panel.gsoep.de/soepinfo2007/.

[20]See Sparrow, Balla, and Cicchetti (1984) for the original Vineland scale. Schmiade, Spiess, and Tietze (2008) use the GSOEP mother-children data and study the instrumental quality (reliability, validity, sensitivity) of the 20-item mother questionnaire on the adaptive behavior of their children in the areas of language, everyday skills, motor skills, and social relationships. They conclude that the conditions of objectivity and reliability are to a large degree fulfilled. Furthermore, they find that the scale is valid and that it is sensitive with respect to children's age.

ties will not affect future educational attainment.[21] This choice is based upon the studies of Cunha and Heckman (2008, 2009) which show that noncognitive skills developed during early childhood are strong determinants of later educational attainment and labor market outcomes. In fact, their studies include, among others, personality traits such as antisocial behavior and peer problems which are similar to our measure of social skills.

Mothers can indicate their child's abilities with "yes", "to some extent" or "no." The outcome variables *social skills* and *verbal skills* equal the number of "yes"-answers across the five tasks of the respective domain. Thus, the dependent variables can range from zero to five. Given the categorical nature of the dependent variables, we employ ordered Probit models.[22] We control, among other things, for age and age squared of the child, age of the mother, educational attainments of the parents, and net household income. A recent paper by Cawley and Spiess (2008), using the same dataset, shows that obesity is correlated with social and verbal skills. Thus, we present our results with and without a variable indicating obese children. Obesity is defined according to clinical weight classifications using standard reference values for German children (see Kromeyer-Hauschild et al. (2001)). Children are defined as obese if their body mass index (BMI) is above the historic 97th percentile. According to this definition, 7.0 percent of the boys and 10.3 percent of the girls in the sample are obese.

Table 3 presents descriptive statistics by gender. The sample consists of 330 boys and 340 girls. The means of the two dependent variables, *social skills* and *verbal skills*, are high for both gender: the mean score of social skills is 3.9 for boys and 4.2 for girls. Average verbal skills is 4.1 for boys and 4.2 for girls. Boys are slightly taller than girls and the standard deviations of height are very similar across gender.

4.2 Results

The ordered Probit estimates in Table 4 show that taller boys tend to have higher social skills than shorter boys (Column 1). Note that controlling for obesity does not change the results (Column 2), though the point estimate of height becomes slightly smaller. The magnitude of the height effect is economically significant: A one standard deviation increase

[21] The domain "activities of daily living" includes the child's ability to (i) correctly use a spoon to eat, (ii) to blow his nose without assistance, (iii) to use the toilet correctly, (iv) to dress up correctly, and (iv) to brush teeth without assistance. Motor skills consist of the abilities to (i) walk forward down the stairs, (ii) open doors with door handle, (iii) climb up obstacles, (iv) cut paper with scissors, and (v) draw recognizable shapes. We find that height is positively related to motor skills among boys and girls. Skills of daily activities are positively related to height only among boys.

[22] Standard OLS regressions yield very similar results.

in height is associated with a 5.7 percentage points increase in the probability that the social skills index equals the highest value. Compared with a predicted baseline probability of 37.5 percent, this effect amounts to a 15.2 percent higher probability that boys' social skills are maximum.[23] In contrast, there is no significant relationship between height and social skills for girls. The estimates reveal furthermore some structural differences between boys and girls that are difficult to explain. The presence of more siblings in the household, for example, is negatively related to social skills for boys, but positively related to social skills for girls. Similarly, household income is positively associated with social skills for boys but negatively for girls.[24] Yet, as expected, visiting a day care center seems to increase social skills for both gender.

Table 5 reports the results for children's verbal skills. There is no significant association between height and verbal skills for boys (Columns 1 and 2). For girls, the association is positive and significant only when obesity is not taken into account (Columns 3 and 4). Obesity and verbal skills are significantly negatively related for both boys and girls, as was documented before by Cawley and Spiess (2008). The differences across gender described above are also present with verbal skills as dependent variable.

In sum, we find that taller boys have significantly higher social skills than shorter boys already at age 2-3, independent of parent's education, family income, and attendance of a day care center. This relationship is not present for girls. It is important to note that the same gender pattern exists for the relationship between height and the attendance (recommendation) of high school (see Table 2).

Social skills have been shown to be significant predictors of educational attainment and labor market outcomes (Cunha and Heckman (2008, 2009)). We suggest that social skills might play an important role also for teacher recommendations. We suppose that teachers reward taller students because they observe that taller students have higher social skills than their shorter classmates. We suggest therefore that the positive association between height and social skills explains our finding that taller students obtain better school recommendations, and are thus more likely to attend high school.

This hypothesis is based on two assumptions. First, social skills are persistent over time: children with higher social skills at age 3 tend to have higher social skills also at age 10. Cunha and Heckman (2009, p.12) present evidence for this assumption when they stress that the formation of social skills originates before formal schooling begins, and

[23]This marginal effect was computed for a 3-year old boy with average male height, with a 33-year-old mother living in West Germany.

[24]Cawley and Spiess (2008) find the same differences across gender.

that differences across individuals persist throughout childhood. Psychologists have used longitudinal studies to investigate the persistence of personality traits from early childhood into adulthood. They consistently find that differences in personality traits at age 3, such as extraversion, are predictors of personality differences in adolescence and adulthood (see, for example, Caspi (2000), Newman, Caspi, Moffitt, and Silva (1997), and Roberts and DelVecchio (2000)).

The second assumption requires that individuals maintain their relative height position: Children who are relatively tall at age 3 are relatively tall at age 10. Studies on human biology report a strong correlation between height during childhood and adult height. Tanner et al. (1956) document very large intra-individual correlation coefficients of body height between age 2 and age 5 ($\rho = 0.83$) and age 3 and age 5 ($\rho = 0.87$). Furthermore, they show that height at age 3 is the best predictor of adult height ($\rho = 0.80$) among all height measurements up to age 5.[25] Case and Paxson (2008a) also report a strong association between height at age 3 and adult height, with a correlation coefficient greater than 0.7 for both males and females. In the light of this evidence, we confidently infer that the positive relationship between height and social skills observed for boys aged 2 to 3 is likely to persist up to age 11. Thus, height as a marker of social skills is likely to affect the crucial secondary school track decision.

Finally, we have not addressed the issue why height and social skills are significantly related for boys but not for girls. Psychological studies have found similar gender-specific relationships between body height and social behavior. Eisenberg, Roth, Bryniarski, and Murray (1984), for example, find that mothers of preschool children rate tall boys as more competent than short boys, while this pattern is less clear for girls. More research on the gender-specific relationship between height, social behavior, and self-esteem is clearly warranted.

5 Conclusion

In this paper, we examine the relationship between body height and secondary school track decision for Germany and suggest a potential channel. First, we find that—ceteris paribus—taller boys are more likely to attend the most academic secondary school track (Gymnasium) than shorter boys. We find that this relationship is due to the fact that primary school teachers give "better" school recommendations to taller boys independent

[25] The figures refer to males. Figures for females are very similar.

of their academic achievement. We consider height as a marker for social skills and argue that teachers reward taller students because they have higher social skills relative to their shorter classmates. In order to test this hypothesis, we analyze the relationship between height and social skills for children aged 2 to 3. We find that, already at this age, there is a positive relationship between children's height and social skills. Consistent with the height-schooling pattern, this association is significant only for boys. Given that social skills persist through childhood and that children tend to keep their relative height position between age 3 and age 10, we suggest that the positive association between height and social skills found for children aged 2 to 3 will play a major role in the later secondary school track decision.

This decision is crucial in Germany since children at age 10 are tracked into different educational paths which strongly determine their future labor market outcomes (Dustmann (2004)). In fact, critics of the tracking school system argue that students in low-ability classes are systematically disadvantaged by worse learning environments which increase the skill gap across ability groups. Furthermore, they argue that the tracking decision—which is strongly affected by the socioeconomic background of the student—will increase disadvantages for students with a low socioeconomic background. Hanushek and Woessmann (2006), for instance, present evidence that early tracking increases educational inequality, measured as the country-specific dispersion of test scores obtained in international student achievement tests. We suggest that (early) school tracking might not only be detrimental for students with a low socioeconomic background but also for students with low social skills.

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Tables

Table 1: Descriptive Statistics (Youth Panel)

	Males		Females	
Variables	Mean	Std. Dev.	Mean	Std. Dev.
Secondary School Track				
General or Intermediate School	0.455		0.389	
High School	0.545		0.611	
Teacher Recommendation				
General or Intermediate School	0.439		0.363	
High School	0.561		0.637	
Height in cm	148.2	7.3	148.4	7.5
School Grade (in wave 3)				
5th Grade	0.307		0.248	
6th Grade	0.693		0.752	
Age at end of 4th grade	10.5	0.4	10.4	0.4
Early Primary School Enrollment	0.069		0.075	
Delayed Primary School Enrollment	0.032		0.031	
Small town (< 20,000 people)	0.429		0.385	
School Performance in Primary School				
Math	1.68	0.66	1.94	0.67
Orthography	2.22	0.79	1.88	0.73
Reading	1.76	0.62	1.58	0.64
Mother's Education				
General School	0.222		0.217	
Intermediate School	0.450		0.398	
High School	0.328		0.385	
University (of applied sciences) Degree	0.212		0.217	
High Household Income	0.249		0.217	
Observations	189		226	

Notes: *General school* is Hauptschule, *intermediate school* is Realschule, and *high school* is Gymnasium. *School Performance in Primary School* was reported by the mother when the child was either in 3rd or 4th grade of primary school. Mothers' performance assessments range from 1 (very good) to 4 (not good at all). *High Household Income* equals 1 if the monthly net household income exceeds 3250 €.

Table 2: Relationship between Height, Secondary School Track, and Teacher Recommendation (Youth Panel)

	Males		Females	
Dependent Variable:	Secondary School Track	Teacher Recommendation	Secondary School Track	Teacher Recommendation
	(1)	(2)	(3)	(4)
Height	0.042**	0.048***	0.015	–0.002
	(0.018)	(0.018)	(0.015)	(0.015)
Math: Very Good	1.392***	1.996***	2.248***	2.366***
	(0.446)	(0.566)	(0.410)	(0.429)
Math: Good	0.374	1.238**	1.389***	1.389***
	(0.452)	(0.572)	(0.338)	(0.327)
Orthography: Very Good	1.714***	1.854***	0.972**	1.358***
	(0.457)	(0.464)	(0.421)	(0.423)
Orthography: Good	1.084***	1.506***	0.696**	0.530*
	(0.295)	(0.320)	(0.340)	(0.318)
Reading: Very Good	0.459	0.948	0.732	1.008**
	(0.577)	(0.647)	(0.478)	(0.496)
Reading: Good	0.660	0.968	–0.033	0.516
	(0.522)	(0.603)	(0.436)	(0.459)
Age at end of 4th grade	0.174	0.061	–0.220	0.018
	(0.330)	(0.341)	(0.347)	(0.341)
Early school enrollment	0.492	0.641	–0.085	0.427
	(0.580)	(0.570)	(0.480)	(0.470)
Late school enrollment [a]		–1.012	–0.317	–0.431
		(0.695)	(0.627)	(0.604)
Small town/countryside	Yes	Yes	Yes	Yes
Mother's education	Yes	Yes	Yes	Yes
High household income	Yes	Yes	Yes	Yes
Observations	183 [a]	189	226	226
Pseudo R-Squared	0.452	0.480	0.423	0.440

Notes: Coefficients from Probit Models reported with standard errors in parentheses. The dependent variables *Secondary School Track* and *Teacher Recommendation* equal 0 for general school (*Hauptschule*) and intermediate school (*Realschule*), and equal 1 for high school (*Gymnasium*). Reference categories for mother's performance assessments are "Not so good" and "Not good at all." *Mother's Education* includes the following dummy variables: intermediate school, high school, and University/University of Applied Sciences Degree. Significance levels: * p<0.10, ** p<0.05, *** p<0.01.

[a] *Delayed school enrollment* predicts outcome perfectly. 6 observations dropped.

Table 3: Descriptive Statistics (GSOEP)

	Males		Females	
Variables	Mean	Std. Dev.	Mean	Std. Dev.
Social skills	3.9	1.2	4.2	1.0
Verbal skills	4.1	1.1	4.2	1.0
Height (in cm)	95.2	6.4	93.6	6.7
Obesity	0.070		0.103	
Age (in months)	33.7	4.1	33.4	3.9
Age of mother (in years)	33.4	5.7	33.5	5.4
Mother is immigrant	0.161		0.141	
Number of other children in household	0.9		0.9	
Child in day care center (more than 4 hrs per week)	0.391		0.371	
West Germany	0.764		0.768	
Single parent household	0.091		0.109	
Net monthly household income (in Euro)	2754	1507	2774	1567
Mother's Education				
No school degree	0.024		0.006	
General school	0.148		0.165	
Intermediate school [a]	0.442		0.474	
High school	0.342		0.321	
Vocational training	0.645		0.688	
University (of applied sciences) degree	0.224		0.218	
Father's Education				
Vocational training	0.597		0.544	
University (of applied sciences) degree	0.233		0.250	
Observations	330		340	

Notes: The outcome variables *Social skills* and *Verbal skills* are indices based on mother's information. The indices range from 0 to 5.
[a] Also contains the category *Other school degree*.

Table 4: Relationship between Social Skills and Height during Early Childhood (GSOEP)

Dependent variable: Social skills	Males		Females	
	(1)	(2)	(3)	(4)
Height (in cm)	0.032***	0.024**	0.013	0.007
	(0.011)	(0.011)	(0.010)	(0.011)
Age (in months)	0.107	0.050	0.304	0.308
	(0.217)	(0.219)	(0.206)	(0.207)
Age squared	–0.001	–0.000	–0.004	–0.004
	(0.003)	(0.003)	(0.003)	(0.003)
Age of mother (in years)	0.002	0.004	–0.024*	–0.024*
	(0.013)	(0.014)	(0.014)	(0.014)
Mother is immigrant	0.172	0.202	–0.405**	–0.409**
	(0.183)	(0.184)	(0.194)	(0.194)
Number of other children in household	–0.203***	–0.202***	0.216***	0.225***
	(0.071)	(0.071)	(0.075)	(0.075)
Child in day care center (more than 4 hrs per week)	0.290*	0.263*	0.261*	0.287*
	(0.153)	(0.154)	(0.158)	(0.159)
West Germany	–0.262	–0.295	0.043	0.070
	(0.181)	(0.182)	(0.181)	(0.181)
Single parent household	0.236	0.269	–0.976***	–0.923***
	(0.337)	(0.337)	(0.326)	(0.327)
Net monthly household income (in 1000 Euro)	0.150***	0.149***	–0.027	–0.021
	(0.057)	(0.057)	(0.046)	(0.047)
Obesity		–0.589**		–0.332
		(0.251)		(0.220)
Parents' Education	Yes	Yes	Yes	Yes
Imputed income	Yes	Yes	Yes	Yes
Observations	330	330	340	340
Pseudo R-Squared	0.058	0.064	0.054	0.057

Notes: Ordered probit coefficients reported with standard errors in parentheses. The dependent variable *Social skills* is an index which ranges between 0 and 5 for boys and between 1 and 5 for girls. *Obesity* is a binary variable indicating obese children according to the German clinical definition. *Parents' Education* contains the following dummy variables: mother has no school degree, mother has general school degree, mother has high school degree, school degree of mother missing; mother completed vocational training; mother completed university degree; father completed vocational training; father completed university degree; mother education missing, father education missing. Significance levels: * p<0.10, ** p<0.05, *** p<0.01.

Table 5: Relationship between Verbal Skills and Height during Early Childhood (GSOEP)

Dependent variable: Verbal skills	Males		Females	
	(1)	(2)	(3)	(4)
Height (in cm)	0.013	0.001	0.023**	0.016
	(0.011)	(0.011)	(0.010)	(0.011)
Age (in months)	0.330	0.245	0.101	0.108
	(0.228)	(0.231)	(0.238)	(0.239)
Age squared	–0.004	–0.002	–0.000	–0.000
	(0.003)	(0.003)	(0.004)	(0.004)
Age of mother (in years)	0.034**	0.037***	–0.026*	–0.025*
	(0.014)	(0.014)	(0.014)	(0.014)
Mother is immigrant	0.081	0.126	–0.545***	–0.558***
	(0.188)	(0.189)	(0.195)	(0.196)
Number of other children in household	–0.203***	–0.205***	0.226***	0.239***
	(0.074)	(0.074)	(0.075)	(0.075)
Child in day care center (more than 4 hrs per week)	0.281*	0.233	0.155	0.191
	(0.161)	(0.163)	(0.165)	(0.166)
West Germany	0.017	–0.040	0.319*	0.357*
	(0.187)	(0.188)	(0.186)	(0.188)
Single parent household	0.393	0.456	–1.010***	–0.955***
	(0.343)	(0.345)	(0.326)	(0.328)
Net monthly household income (in 1000 Euro)	0.046	0.045	–0.093*	–0.089*
	(0.058)	(0.058)	(0.048)	(0.048)
Obesity		–0.886***		–0.418*
		(0.258)		(0.218)
Parents' Education	Yes	Yes	Yes	Yes
Imputed income	Yes	Yes	Yes	Yes
Observations	330	330	340	340
Pseudo R-Squared	0.085	0.098	0.105	0.110

Notes: Ordered probit coefficients reported with standard errors in parentheses. The dependent variable *Verbal skills* is an index which ranges between 0 and 5. *Obesity* is a binary variable indicating obese children according to the German clinical definition. *Parents' Education* contains the following dummy variables: mother has no school degree, mother has general school degree, mother has high school degree, school degree of mother missing; mother completed vocational training; mother completed university degree; father completed vocational training; father completed university degree; mother education missing, father education missing. Significance levels: * p<0.10, ** p<0.05, *** p<0.01.