Powerful Parental Preferences

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Abstract

In this study, we examine how parents' educational aspirations for their offspring (parental preferences) affect university attendance. We document that even after controlling for cognitive abilities, there is still a significant difference between parental preferences that, in turn, associate very strongly with university attendance. Using regressions based on machine learning techniques, we also find that even if we take into account the factors that determine parental preferences (including parental education, household characteristics and child's cognitive abilities), parental preferences exert a large and significant effect on university attendance.

Keywords: University attendance, Locus of control, Machine learning, PDS Lasso, Educational aspiration
JEL: D91, I21, I23, I24, I26

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1. Introduction

Educational attainment has become an increasingly important determinant of success in many domains, ranging from the labor market to health outcomes (Oreopoulos and Salvanes, 2011). Psacharopoulos and Patrinos (2018) report that returns to investment in education are high and the returns to higher education have even increased in the last decades (in spite of the sustained growth in university enrollment). Tamborini et al. (2015) document that in the US lifetime income of those with at least a BA degree is $587000/840000 higher (for females / males) than the earnings of those without diploma (even after taking into account factors as race, ethnicity, number of children or high school type). Similarly, more educated people tend to enjoy a longer and healthier life (Cutler and Lleras-Muney, 2006; Clark and Royer, 2013), and the gap between the less and more educated seems to grow over time (Meara et al., 2008; Case and Deaton, 2017).[1] Given this evidence, it is puzzling to see large gaps in educational attainment between individuals of different family background (Björklund and Salvanes, 2011). These gaps do not only materialize in educational outcomes, but also in aspirations. Both parents' aspiration for the child's educational level (that we call parental preferences) and the child's educational aspiration associate strongly with family background. Educational aspirations and outcomes are related because the former are a necessary condition for the latter: it seems difficult to obtain a high level of education without aspiring to it. Hence, it is of interest to understand the factors that determine those parental preferences, how parental preferences affect the child's educational aspirations, and the mechanisms through which these aspirations shape educational outcomes.

In this paper, we use a representative sample of the Hungarian adolescent population and their parents to examine the role of parental preferences on university attendance. We capture parental preferences with the following question: *What is the highest level of education that you would like your child to achieve?* We have detailed information about individual characteristics of the adolescents (including cognitive and non-cognitive skills) and the family background (captured by parental education, household income and financial situation, and home environment). The data allow us to see if parental preferences vary with family background and other observable variables. First, we document a large gap in parental preferences conditional on family background, even if we account for the child's cognitive abilities. We also show that parental preferences associate strongly with university attendance, even if

[1] Several studies established causal relationships between education and health outcomes (Conti et al., 2010; Davies et al., 2018).

cognitive skills of the child are accounted for. Obviously, parental preferences associate with a plethora of factors that predict educational attainment. Therefore, in a regression analysis in consecutive specifications we take into account in a systematic way the determinants of parental preferences identified by the literature. We find that even when controlling for all the factors that may affect parental preferences, they exhibit a strong positive association with university attendance.

In section 3 the data are presented. The methodology used in this study is described in 4, and the results are shown in 5.

2. Related literature

Our study aims at contributing to the broad understanding of which factors affect educational attainment and how those factors relate to each other, with a special focus on parental preferences about the child's ideal educational level.

2.1. Parental preferences and related concepts

Before investigating the role of parental preferences in educational attainment, we need to clarify how parental preferences relate to other parental inputs that are affected by family background and the school and that in turn shape the child's educational aspirations and attainment?

An early literature demonstrated that 'significant others' including parents, teachers and peers affect high-school students by shaping their educational ambitions and attitudes (Haller and Butterworth, 1960; Sewell and Shah, 1968; Sewell et al., 1969; Haller and Woelfel, 1972; Hout and Morgan, 1975; Sewell and Hauser, 1972). There are several measures of those ambitions, the most frequent ones being expectations and aspirations. Expectations express what individuals *think* that will happen, while aspirations relate to what people *hope* that will happen (Saha, 1997; Jacob and Wilder, 2010). For instance, Ashby and Schoon (2010) captures parental expectations with *"Which of the following do you think he/she will actually do after this school year?"* and proxies parental preferences with *"Which of the following would you like your teenager to do after this school year?"*. Our dataset contains two questions, one clearly associated to the parent's educational aspiration for their child (*What is the highest level of education that you would like your child to achieve?*), while the other is more related to expectations (*What is the level of education that you consider your child should attain?*). Goldenberg et al. (2001) provide some indication on the relationship between parents' educational aspirations and expectations. They carry out a longitudinal study with 81 immigrant Latino families in the US, and each year they measure both parental aspirations and parental expectations. They

find that aspirations are higher than expectations, and they correlate, the correlation coefficient being about 0.3. Parental preferences are related to the concept of parental encouragement that indicates the adolescents' perception about what their parents desired them to do after finishing high school. Using a US sample, Sewell and Shah (1968) find that family background, cognitive abilities and parental encouragement associate positively. Moreover, parental encouragement has the largest predictive power of college plans, and it has explanatory power over and above family background and cognitive abilities. Carpenter and Fleishman (1987) report similar results analyzing an Australian sample, as parental encouragement associates positively both with the intention to go to university and also with actually attending university.

The notion of parental preferences (and parental encouragement) is also related to the broader idea of parental investments that include all type of resources that parents invest in their offspring, including time, money and efforts to provide a stimulating environment. This literature documents that i) parental investments predict very well important life outcomes (educational attainment, earnings and health), still ii) parental investments vary greatly with family background (Cooksey and Fondell, 1996; Carneiro et al., 2013; Attanasio et al., 2019). Moreover, according to Guryan et al. (2008) it seems that high-SES parents (whose opportunity cost of time is higher than the opportunity cost of their low-SES counterparts) value more the time spent with their children.[2] Often, parental preferences are considered a component of parental involvement (Bloom, 1980; Keith et al., 1992; Singh et al., 1995; Fan and Chen, 2001). Parental preferences for higher education are a necessary condition for parental investment. If parents think that their child ideally should go to university, then they will provide the resources (material and immaterial ones) to make it happen (given the constraints that they face). Sacker et al. (2002) provide evidence that higher parental preferences associate with higher parental involvement.[3]

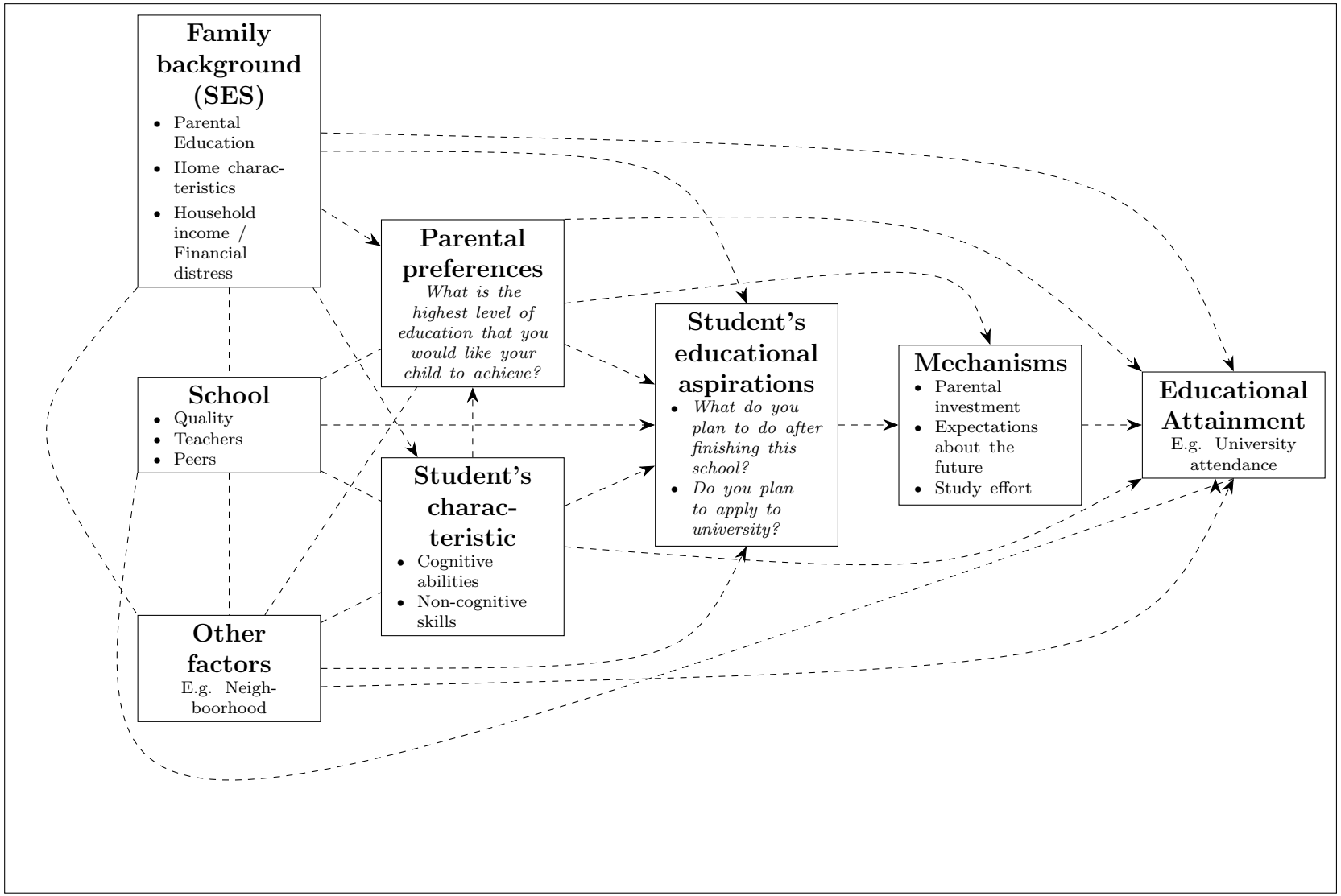
2.2. From family background to educational attainment, through parental preferences

Figure 1 exhibits part of the intricate relationships between factors that - directly or indirectly - affect educational attainment. We use it to place this study into context.

[2]Potential explanations of this finding include spending time with children being more of a luxury good, high-SES parents having a higher relative preference for time spent with their offspring, or the returns of parental investment being higher for high-SES parents.

[3]The relationship is circular as parental involvement affects educational achievement that, in turn, influences parental aspirations.

Figure 1: Factors affecting educational attainment, with a special focus on parental preferences and students' educational aspirations



Disparities in educational attainment between individuals from different family background are large (Haveman and Wolfe, 1995; Black and Devereux, 2010; Bailey and Dynarski, 2011; Björklund and Salvanes, 2011; OECD, 2015; Chetty et al., 2017; Chmielewski, 2019), and they are often mentioned as a main reason behind the persistence of inequality across generations (Corak, 2013; Autor, 2014). Hertz et al. (2008) report that the raw intergenerational correlation between parents' and their offspring's educational attainment ranges from 0.1 to 0.66, most developed countries exhibiting correlations between 0.3 and 0.5. A potential factor behind this finding is the intergenerational transmission of cognitive abilities (Bouchard and McGue, 1981; Bowles and Gintis, 2002; Black et al., 2009; Crawford et al., 2011). Another factor related to family background that affects educational attainment is family income and financial constraints as they play a role in whether an individual is able to participate in higher education (James, 2000; Schoon and Parsons, 2002; Schoon, 2006).[4]

Another potential channel connecting family background and educational attainment runs through aspirations because family background may affect both parental preferences and also student's educational aspirations. Moreover, parental preferences may associate with student's educational aspirations, as depicted in Figure 1. There is a growing literature that documents the difference in parental preferences according to the socioeconomic status (Schoon and Parsons, 2002; Schoon et al., 2007). Willitts et al. (2005) find that 46% of mothers of children aged 14-16 in the UK from the lowest income quintile would like their children to have gone to university by the time they reached their mid-20s, compared to the 78% from the top income quintile. Chowdry et al. (2011) report that while 75.8% of parents of children aged 13-14 in the lowest SES quintile in the UK would like their child to stay in full-time education at 16, the same number for parents from the highest quintile is 91%, the difference being significant at 1%.[5] Bleemer and Zafar (2018) study if a respondent in a representative US survey would recommend university to a 15-year old hypothesized child of a friend, that can be seen as pure educational aspiration for the younger generation. They find that 75.9% / 88% of adults with / without university degree recommend higher education, the gap being significant at the 1% level. In a

[4]Concerning the relative importance of financial constraints and other factors, Cameron and Heckman (1998) and Chevalier and Lanot (2002) find that the influence of such constraints on educational choice is less relevant than family background in the US and in the UK, respectively.

[5]Differences at earlier age are more striking, as Gregg and Washbrook (2011) document that in the UK only 36.5% of mothers from the bottom SES quintile hope that their child will go to university, compared to the 80.5% from the top quintile.

survey experiment using a representative sample of the German population, Lergetporer et al. (2021) document that whereas only 36% of adults without a university education deem a university degree ideal for their child, 74% of university graduates have such aspirations for their offspring. Cheng et al. (2021) also document a gap in parental preferences using a representative sample of US parents. While 91.7% of BA graduates prefer a four-year college for their child, only 66.5% of individuals without an BA degree do so.[6] Parental preferences are not only shaped by family background, but also by the child's characteristics.[7] Better cognitive skills (or the perception of it) being associated with higher parental preferences appear often in studies (Sewell and Shah, 1968; Marini, 1978; Davies and Kandel, 1981; Bond and Saunders, 1999; Sacker et al., 2002).

Students' educational aspirations are also determined to a large extent by family background. Kao and Tienda (1998) document that two aspects of family background (parental education and family income) exhibit a significantly positive association with aspirations to graduate from college in a US sample. They also report that stimulating home environment has an important role (predominantly for younger adolescents). James (2000) report that 53.7% / 59.4% / 77% of Australian high-school students from low- / mid- / high-SES background (captured by parental education) preferred to go to university.[8] Importantly, James (2000) also documents that students from a high-SES background have a significantly more positive views on university, for instance in terms of whether completing a degree is a good investment or not. Garg et al. (2002) show the importance of family background in student's educational aspiration in a Canadian sample. Chowdry et al. (2011) report that in the UK 78.7% of students coming from the lowest SES quintile wants to stay

[6]When assessing family background by income, the corresponding numbers for higher / lower income households are 80.7% and 69.9%.

[7]Spenner and Featherman (1978) provide an early review on the determinants of children's educational aspirations (or achievement ambitions, as they call it): individual characteristics, cognitive skills, socioeconomic factors (e.g. parenting styles and family characteristics), interpersonal relationships and school-related determinants (as socioeconomic and ability composition or neighborhood). Later analyses confirmed the previous findings, see for instance Gutman and Akerman (2008).

[8]The corresponding numbers about definitely planning to enrol in university are 31.2% / 38.1% / 52.6% for students from a low- / mid- / high-SES background. The share of those students who hope to go to university (aspiration), but may not be able (expectations) is almost the double among low-SES students than among high-SES ones (16.2% vs 9.9%). There are several studies (Hanson, 1994; Armstrong and Crombie, 2000; Trusty, 2002) that investigate the gap between students' educational aspirations and expectations. A general finding is that this gap is wider for adolescents from lower socio-economic backgrounds.

in full-time education at age 16, while 93% of their peers from the highest quintile have similar plans, the difference being significant at 1%. Only 49.2% of the students in the first group think that they are likely to apply to university and likely to be admitted, while the same number in the highest quintile is 76.8%, and the difference is significant at 1%. Better cognitive abilities correlate also with higher educational aspirations (Bond and Saunders, 1999; Schoon and Parsons, 2002). Bandura et al. (1996, 2001) find that a non-cognitive trait, namely adolescents' self-efficacy (that is influenced by parental preferences) also shapes their educational aspirations, higher self-efficacy associating with higher aspirations.

Turning to how parental preferences influence student's educational aspirations and educational attainment, Davies and Kandel (1981) show that parental preferences (shaped by family background and the student's cognitive abilities) affect the adolescent's educational aspirations in the US.[9] Marjoribanks (1984, 1997) also reports a strong positive association between parental preferences and the adolescent's educational aspirations in an Australian sample. Similarly, Schoon and Parsons (2002) find that parental aspirations are a strong predictor of children's educational aspirations in the UK.[10] While the most frequent assumption in the literature is that parental preferences affect adolescent's educational aspirations, the direction may be the opposite one. If an adolescent has a strong idea about her aspirations that she tells explicitly her parents, then parents when asked about the ideal level of education for their child may just express the child's aspirations. Or, the relationship may be bi-directional, parental preferences and adolescent's educational aspiration affecting each other and being shaped by other influences as well.

Numerous studies report that parental preferences not only affect student's educational aspirations, but also associate with their academic performance. Natriello and McDill (1986) show that parental preferences affect students' effort (proxied by time spent on homework) in a US sample. Singh et al. (1995) documents that parental preferences associate strongly with educational achievement in the US. In a meta-analysis, Fan and Chen (2001) report that from components of parental involvement parental aspiration/expectation for children's educational level shows the strongest association with academic achievement. The more recent meta-analysis

[9]Parental preferences capture the highest number of years of schooling aspired to, ranging from 11 to 18 years and corresponding to the following levels: less than high school; high school graduation; some college or technical school; college graduation; and graduate school. Student's aspirations referred to the same categories.

[10]Parental preferences were measured by asking parents about their hopes for their child concerning education, with three categories: post-18 education, post-16 education or training, and leave at 16 no further education/training. The same categories applied to student's aspiration.

by Boonk et al. (2018) also echoes the importance of parental aspirations / expectations. To put the importance of parental preferences into context, Davies and Kandel (1981) report that the correlation of parental preferences with the child's educational aspirations is at least twice as large as the best friend's educational aspirations.[11] This finding suggests that parents have a larger influence on students' educational aspirations than peers.

It is difficult to assess the role of aspirations in the sequence running from family background to educational attainment. Schoon (2001) shows that aspiration to become a scientist, health professional or engineer at age 16 associated significantly with occupational attainment at age 33, even when accounting for belief in own ability, cognitive skills, personality traits and family background. Chowdry et al. (2011) decompose the gap in educational attainment at age 16 that they find between students from the lowest and highest SES quintiles. After controlling for attainment at age 11 (that explains 38% of the difference), they find that student's attitudes and behaviors (that contains educational aspirations and plans to go to university, along other elements as belief in own ability, locus of control, or anti-social behavior) account for 15% of the difference, while parental attitudes and behaviors (of which parental preferences is one, along with expectations and parental investments) are responsible for a further 12%. Schools and the direct effect of family background account for 9% and 10%, respectively. Polidano et al. (2013) carries out a similar decomposition exercise to understand the SES-differences in school completion in an Australian sample. They find that differences in parental preferences and the student's education aspirations at age 15 are the most important determinants of the school completion gap.[12]

Higher aspirations lead to higher educational attainment if they affect the behavior and choices of the adolescents and their parents. There are at least three mechanisms through which it can happen that we are able to measure in our data. First, parental preferences and the adolescent's educational aspirations may activate parental investments that foster educational attainment. Second, aspirations may affect the adolescent's expectations about the future. Third, aspirations may be conducive to more effort, for instance studying harder.

[11]Similarly, Kandel and Lesser (1969) find that parental preferences (captured through the question "What is the highest level of education you would like your child to complete?") correlate more with the child's educational expectations than with the best friend's educational expectations about them, even if family background is taken into account.

[12]Unfortunately, they do not separate the effects of parental and student's aspirations.

3. Data

In our analysis, we utilize Life Course Survey (Életpálya) from Hungary. This database consists of a representative sample of adolescents who were attending the 8th grade in May 2006. A sample of 10,000 students was selected from those who took the 8th grade Hungarian National Assessment of Basic Competencies in that year. The selected students were born in 1990 to 1992. Due to attrition, we lose 23.6% of the original sample, and we use population weights to preserve representativeness. 53.5% of the observations are dropped because these students did not complete a high school track allows university application. Finally, 2.6% of the observations are dropped due to missing variables.

The variable of interest in this study is parental preferences. In the 2006 questionnaire, the parents were asked about the ideal level of education for their child, from elementary school to PhD level that is our proxy for parental preferences (*What is the highest level of education that you would like your child to achieve?*). We construct a binary variable from this, being 1 if the parents indicated at least college to be the ideal level of education. This is our measure of parental preferences. In the robustness tests we use parental preferences for the minimum level of the child's education (*What is the level of education that you consider your child should attain?*) which is also converted into a binary variable. This question captures more the expectations that the parents have about their child's attainment. As a robustness check, we will see how our findings change if we use this question.

First, we study how parental preferences vary according to family background and the characteristics of the child. In section 2 we have seen that at least three aspects of the family background are relevant: parental education, home characteristics and family income / financial hardships. Regarding parental education, we have detailed information on educational attainment of the parents and the grandparents as well. As to home characteristics, besides usual features as household size or marital status we have an accurate knowledge about emotional and cognitive aspects of the home environment by virtue of the HOME (Home Observation for Measurement of the Environment) scale, a widely used measure in empirical studies. HOME includes measures related to objects, activities, circumstances, and events at home that may play a role in adolescent development. A short version for young adolescent was administered in the survey, based on the National Longitudinal Survey of Youth (for Human Resource Research, 2004).[13] The HOME scale is often used to proxy parental investments (see, for instance Gennetian, 2005; Mistry et al., 2010; Coneus

[13]The elements of the scale are described in Appendix B.

et al., 2012) because it captures direct aspects of parental investment to provide a cognitively stimulating and emotionally stable environment. We have rich data about the financial situation of the family as we know i) if the family experienced financial distress, ii) household income, iii) if the parents work, and iv) if the are able / willing to pay for the child's education. Regarding the characteristics of the child, we focus on cognitive ability and non-cognitive skills. Cognitive ability is captured by reading and mathematics scores that the child achieved in the Hungarian National Assessment of Basic Competences (NABC), a nationwide test similar to the PISA test, see Sinka (2010) for details. We have data on the locus of control (a short version of the standard Rotter test), self-esteem (The Rosenberg scale) and emotional stability of the child, that constitute our variables of non-cognitive skills.

We have also data about the educational aspirations of the student. More concretely, we know if the student plans to go to university. Related to the student, we also know her expectations about the future. Expectations are measured through five questions in 2008. Respondents have to rate the probability that at the age of 35, i) they will earn more money than the average, ii) they will be in the decile with the highest earnings, iii) they will have a permanent job after finishing school, iv) they will earn more than HUF 100,000 (EUR 278) per month, and v) they will earn more than HUF 200,000 (EUR 556) per month.[14] Our interest in future expectations of the students is motivated by the fact previous research showed that students with more positive expectations fare better academically (Coleman and DeLeire, 2003; Cebi, 2007). We think that it is possible that parental preferences affect those future expectations and it may be a mechanism through which parental preferences operate.

A second channel may be effort that we measure in various ways. First, teacher-given grades on diligence (in 2007, 2008, and 2009) are a good proxy for effort. Second, time spent studying in a week and whether the individual studied after 8 PM on weekdays or studied on weekends (in 2007 and 2008) are also measures of effort. Parental preferences may affect effort since if parents have higher aspiration for their child, then the child may make more effort in studying.

The dependent variable in our regressions is college attendance, and is equal to one if the student attended college at least once during the observation period. We present the summary statistics in Table 1.

[14]The corresponding amounts in USD are 338 and 676. In 2008, HUF 200,000 was considered a high salary.

4. Empirical method

In this paper, we use a post-double selection lasso model (Belloni et al., 2012) to choose the best possible control variables from a rich pool of controls, the dictionary size is 134 variables. This method uses shrinkage and thus selects the optimal model with relatively modest number of variables.

In the double selection, PDS lasso selects control variables which make the best out-of-sample prediction for college attendance (C_i) in the first step, and parental preferences variable (P_i) in the second step. In the last step, a simple OLS regression is estimated using the selected control variables' union.

$$C_i = \alpha P_i + X_i'\gamma + \xi_i \tag{1}$$

The parental preferences (P_i) for the student's ideal highest level of education is measured in 2006, and college attendance (C_i) is measured in 2011 and 2012. Given this timing, any statistical association between these can be the result of two factors. First, the causal effect of parental preferences on college attendance. Second, any common factors that influence both parental preferences and college attendance. These common factors may be part of the family background (such as parental education and labor market status, financial status of the family, etc.), the student's cognitive abilities (math and reading test points) or non-cognitive skills (such as self-esteem, emotional stability and locus of control), these are all measured in 2006. We aim to control for all the important factors affecting P_i and U_i in specifications (1) to (4).

One may be concerned that the parental preferences already reflect the preferences of the student. Thus, we add as a control variable the student's educational aspirations as measured in 2009. This variable captures the student's future plans, and may or may not be influenced by the parental preferences. Once controlled for (in specification (5)), the coefficient of P_i will reflect the effect of parental preferences cleared from the student's aspirations. Furthermore, it is also important to include student's aspirations in the model, because it captures relevant aspects of the school environment and the effect of the peers on the educational outcomes.

We are able to include some further variables which reflect the student's aspirations other than the revealed plans. Such factors are the student's effort and expectations. We report the regression results in specification (6) with adding these as control variables.

5. Findings

5.1. Descriptive statistics

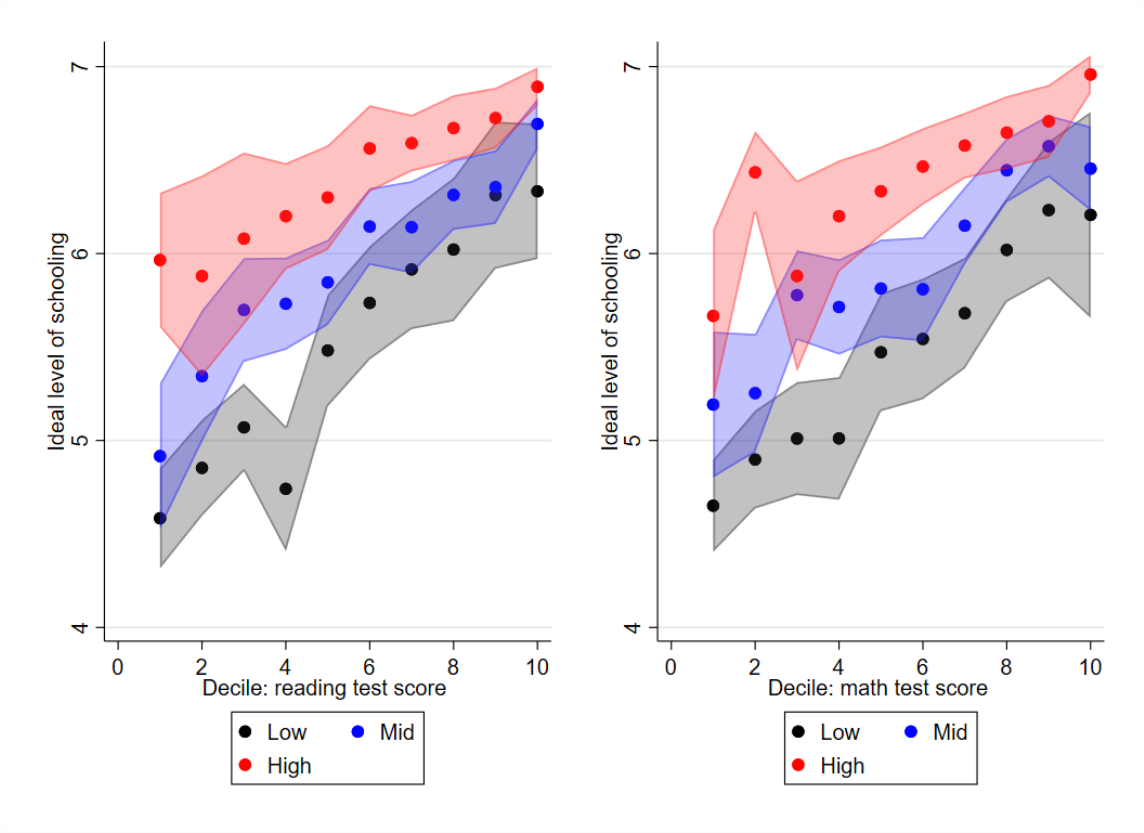
The descriptive statistics about the most important variables are reported in Table 1. The parents' preferences about the ideal level of education of the child are strongly associated to most of the characteristics reported in the table. Better family background (captured by mother's education, household income or home environment), better cognitive abilities (proxied by scores at the national standardized test and GPA), non-cognitive skills, student's aspirations and effort all correlate positively with parental preferences.

Table 1: Descriptive statistics

			Parental preference: Ideal level of education for the child					
	Total	Vocational	Vocational High	High/school Diploma	Technical school after HSD	College	Univ.	PhD
Observations	2017	16	158	25	205	960	569	84
College aspiration	0.57	0.12	0.13	0.22	0.21	0.54	0.82	0.88
College attendance	0.46	0.00	0.08	0.06	0.13	0.40	0.71	0.80
Mother's education:								
- low	0.36	0.63	0.68	0.60	0.60	0.35	0.17	0.37
- mid	0.40	0.33	0.29	0.29	0.30	0.46	0.39	0.29
- high	0.24	0.04	0.03	0.10	0.09	0.18	0.44	0.34
GPA	3.77	3.12	3.26	3.07	3.36	3.69	4.14	4.31
Reading test score*	0.23	-0.67	-0.43	-0.59	-0.35	0.13	0.71	0.73
Math test score*	0.25	-0.58	-0.41	-0.61	-0.28	0.09	0.76	0.97
Female	0.51	0.44	0.41	0.62	0.45	0.55	0.52	0.51
Household income (1000 HUF / month)*	232	169	164	195	196	216	282	230
HOME cognitive scale*	91.49	60.12	73.38	84.86	79.86	90.71	100.65	97.55
HOME emotional scale*	100.47	96.70	96.45	97.38	97.36	100.36	102.58	105.13
Diligence grade***	3.91	3.61	3.40	3.26	3.52	3.84	4.22	4.32
LoC*	0.14	-0.11	0.02	-0.15	0.03	0.13	0.18	0.52

* measured in 2006 / ** measured in 2007 / *** measured in 2009

Figure 2: Preferred level of school (by mother's education)

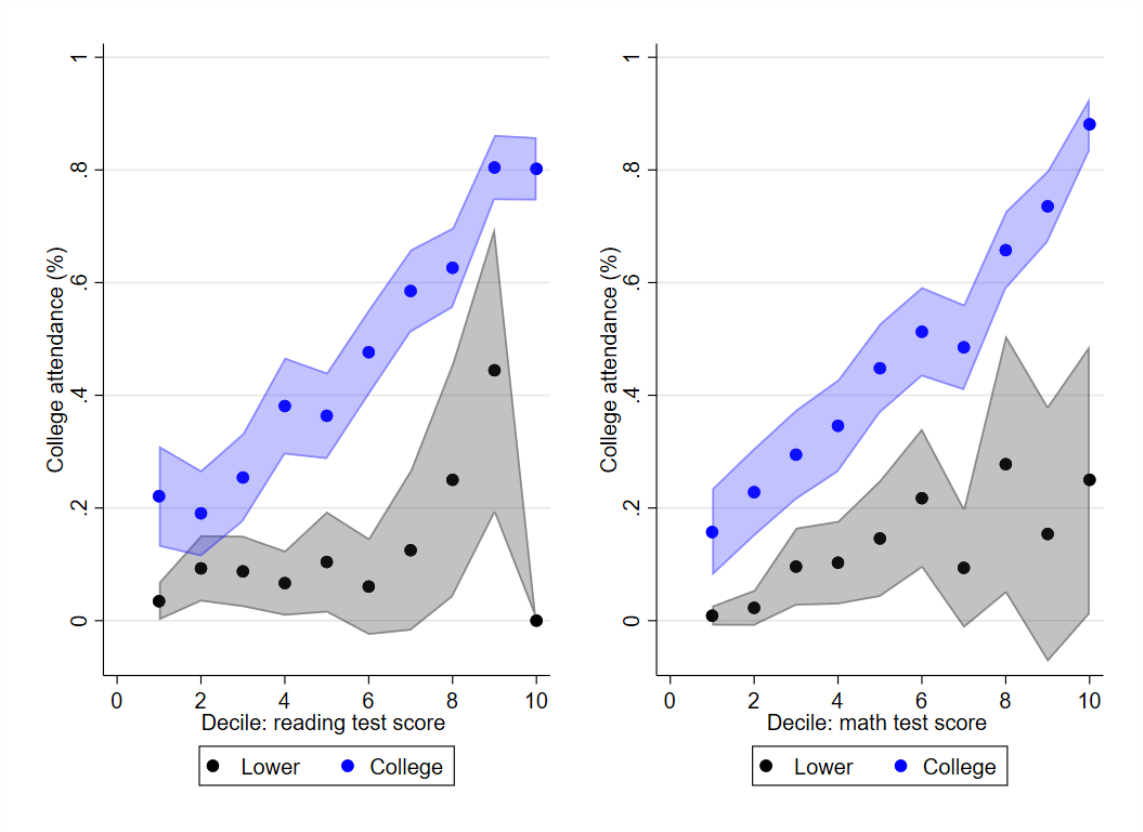


Note: Ideal level of schooling: 1: elementary 2: vocational 3: vocational high school 4: high school 5: technical training after high school diploma 6: college 7: university 8: PhD
Mother's education: Low: Less than high school Mid: High school High: College or higher

Moving beyond simple correlations, parental preferences associate with family background, even if the child's cognitive skills are taken into account. In Figure 2, the ideal level of schooling is reported, split according to the mother's level of education and the cognitive test scores of the students. A mother with a diploma names college or higher levels as the ideal level of education if the child reaches the 3rd or higher decile of the reading test scores and the 4th decile of the math test sores. In contrast, the child of a mother without high-school graduation has to reach at least the 9th decile in math and reading test scores for the mother to think that college or higher would be the ideal level of education for the child. This is a strong indication that parental preferences differ according to family background, even when

the cognitive abilities are taken into consideration. More concretely, the confidence intervals around the point estimates show that there is a clear, statistically significant difference between parental preferences of mothers without high-school graduation and parental preferences of mothers with diploma for any level of cognitive skill of their child.

Figure 3: Probability of college attendance (by parental preferences)



Note: Parental preferences: Lower: ideal education for child is lower than college; College: ideal education for child is at least college

Going one step further, it is not only that parental preferences differ according to family background, but they also seem to influence educational outcomes of the child. Figure 3 illustrates the importance of parental preferences for the child's level of education. Children whose parents prefer at least college education have on average 20 percentage point higher probability of attending college compared to their

peers in the same reading and math test score deciles with lower parental preferences. These figures are based on raw data, so we turn to the regression results to uncover the association of parental preferences with educational outcomes.

5.2. Regression analysis

Table 2: Association of parental preferences with university attendance

	Baseline	+Family background	+Cognitive	+ Noncogn.	+ Aspirations	+ Asp. + Exp. + Eff.
	(1)	(2)	(3)	(4)	(5)	(6)
Ideal education: university	0.450***	0.307***	0.200***	0.200***	0.088***	0.073***
	[0.021]	[0.025]	[0.027]	[0.027]	[0.023]	[0.023]
Parents' education		yes	yes	yes	yes	yes
Financial background		yes	yes	yes	yes	yes
Home environment		yes	yes	yes	yes	yes
Cognitive (test scores)			yes	yes	yes	yes
Noncognitive traits				yes	yes	yes
Student's aspirations					yes	yes
Expectations						yes
Effort						yes
Observations	1,922	1,922	1,922	1,922	1,922	1,922
Clusters	970	970	970	970	970	970
Selected controls	0	7	7	7	6	7
Dictionary size	0	114	116	121	122	134

We report in Table 2 the regression results from the PDS lasso model.[15] In the baseline model (1), the coefficient is 0.45, that is, if we do not control for any other factors, students whose parents think that the ideal level of education is at least college have a 45 percentage point higher probability of attending college. In model (2), 114 variables related to family background are added to the variable dictionary, including for instance parental education, parental investment, HOME scale and variables related to the financial status of the family. Adding these variables decreases the coefficient of parental preferences by about a third to 0.307. That is, taking into account family background mitigates the effect of parental preferences, but still children from families where parents' would like their offspring to go to university are 31 percentage point more likely to attend university. Next, we add cognitive and non-cognitive traits in models (3) and (4), which further shrinks the coefficient of parental preferences to 0.2. As Table 2 indicates while considering cognitive skills reduces the coefficient of parental preferences by 10 percentage point, non-cognitive skills seemingly do not mediate the influence of parental preferences. Note that the PDS lasso algorithm chooses seven of the available 121 variables at this point.

As a further step, in models (5) and (6) we include various factors which capture the student's aspirations as well as the effect of the school and peers. Aspirations (proxied by the student's plan to attend university) appears to be an important mediating factor as its inclusion decreases the coefficient of parental preferences to 0.088. Note that at this stage we have included in the regression most of the variables that in the literature have been found to play a role to explain parental preferences, but still children whose parents believe that they should ideally go to university are about 9 percentage points more likely to do so. In the last specifications, we take into account mechanisms through which parental preferences may operate. However, the students' expectation about the future and their effort (captured through variables related to study time) play only a minor role as they decrease the coefficient of parental preferences only modestly.

After controlling for all these factors the coefficient of parental preferences is still significant at the 1% and large in magnitude. Students whose parents think that the ideal level of education would be at least college, will have a 7.3 percentage point higher probability to attend college. For comparison, to reach a similar increase, one would need to have a two standard deviations higher reading test score, based on the point estimates of the same model. In the final model (6) there are 134 variables in the variable dictionary and 7 variables are chosen by the machine learning algorithm.

[15] The full regression results are in Appendix C.

The variable selection is based entirely on predictive power statistics, still the chosen set of variables is in line with the previous literature.[16] This relatively large variable dictionary covers all the potential factors suggested by the previous literature, thus, it is very likely that this estimate is very close to the causal effect of parental preferences on the student's college attendance.

6. Discussion

In this article, we aim to quantify how strongly parental preferences are associated with an important educational outcome, attending university. We use a machine learning (PDS lasso) algorithm to select the most important control variables from a pool of 134 potential variables which covers all potential factors that shape parental preferences discussed in the literature.

We find that parental preferences are very strongly related to educational outcomes even after controlling for the family background, parental inputs, the child's cognitive and non-cognitive skills, as well as the child's educational aspirations and some channels, like the student's expectations and effort. The association between the parental preferences measured in the first year of high school and the probability of attending college remains large and significant.

According to our results, it is important that the school, the students and the parents are equal partners in the process of improving the educational outcomes of the children. To enhance the chances of college attendance for children from disadvantaged background, the schools could try and provide parents with more information, offer partnership and a stronger cooperation in planning higher studies and form their preferences in other ways.

[16] The explanatory variables included in the last model are related to parental education (mother's education being less than high school, father having university diploma), the cognitive aspects of the home environment, cognitive test scores, student's aspiration to go to university, diligence grade.

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Appendix A. Variables

Appendix A.1. Dictionary size

In the regressions we let lasso to select from the following set of variables.

Table A.3: Set of variables

Variable	Type	N	Mean	SD	Min	Ma
College attendance		6861	0.272264	1	0	0.445
Ideal wanted education for child: university (2006)		6861	0.550066	1	0	0.497
Minimum wanted education for child: university (2006)		6861	0.254919	1	0	0.435
Mother's education: less than high school	Pre-determined	6861	0.522227	1	0	0.499
Mother's education: high school	Pre-determined	6861	0.303309	1	0	0.459
Mother's education: university	Pre-determined	6861	0.174464	1	0	0.379
Father's education: less than high school	Pre-determined	6861	0.714182	1	0	0.451
Father's education: high school	Pre-determined	6861	0.178108	1	0	0.382
Father's education: university	Pre-determined	6861	0.10771	1	0	0.310
HOME cognitive scale	Parental investment	6776	81.2314	130	0	26.42
HOME emotional scale	Parental investment	6699	98.95358	140	10	22.04
How many hours did the parent study with the child	Parental investment	6832	1.802693	3	1	0.876
# of people sleeping in the same room (2006)	Pre-determined	6861	1.528534	8	0.659152	0.854
Household size	Pre-determined	6861	4.320653	15	2	1.358
Social disadvantage (2006)	Pre-determined	6861	0.364087	1	0	0.481
Financial distress (2006)	Pre-determined	6861	0.313074	1	0	0.463
Financial distress (2009)	Pre-determined	6861	0.322694	1	0	0.467
Female	Pre-determined	6861	0.457659	1	0	0.498
Lives with mother	Pre-determined	6861	0.973328	1	0	0.161
Lives with father	Pre-determined	6861	0.804256	1	0	0.396
Has special education needs (SEN)	Pre-determined	6861	0.091386	1	0	0.288
SEN students in the class	Pre-determined	6853	1.155115	23	0	2.574
# of students in the class	Pre-determined	6861	22.39047	43	1	6.033
Household income (2006)	Pre-determined	6855	203505.6	2661000	-120748	1408
Time enrolled to childcare	Pre-determined	6861	2.847908	3	0.5	0.458
How often did the parents read tales?	Pre-determined	6861	17.06078	25	0	8.835
Age of female caretaker	Pre-determined	6861	41.16777	78	9	6.369
Age of female caretaker - squared	Pre-determined	6861	1735.35	6084	81	566.9
Age of female caretaker - squared	Pre-determined	6861	1735.35	6084	81	566.9
Mental, physical or sexual abuse before age 14	Pre-determined	6861	1.478356	19	0	2.518
Parents divorced	Pre-determined	6861	0.208279	1	0	0.406
Roma ethnicity	Pre-determined	6861	0.056989	1	0	0.231
Birthweight under 2500g	Pre-determined	6861	0.082204	1	0	0.274
Been in social home (2006)	Pre-determined	6861	0.008745	1	0	0.093
Has step parents	Pre-determined	6861	0.007579	1	0	0.086
Mother's mother: less than elementary school	Pre-determined	6861	0.181023	1	0	0.385
Mother's mother: elementary school	Pre-determined	6861	0.498032	1	0	0.500
Mother's mother: high school	Pre-determined	6861	0.272701	1	0	0.445
Mother's mother: university	Pre-determined	6861	0.048244	1	0	0.214
Mother's father: less than elementary school	Pre-determined	6861	0.131905	1	0	0.338
Mother's father: elementary school	Pre-determined	6861	0.393674	1	0	0.488
Mother's father: high school	Pre-determined	6861	0.399942	1	0	0.489
Mother's father: university	Pre-determined	6861	0.074479	1	0	0.262
Father's mother: less than elementary school	Pre-determined	6861	0.146334	1	0	0.353
Father's mother: elementary school	Pre-determined	6861	0.635184	1	0	0.481
Father's mother: high school	Pre-determined	6861	0.188748	1	0	0.391
Father's mother: university	Pre-determined	6861	0.029733	1	0	0.169
Father's father: less than elementary school	Pre-determined	6861	0.111646	1	0	0.314

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Table A.3 – continued from previous page

Variable	Type	N	Mean	SD	Min	Ma
Father's father: elementary school	Pre-determined	6861	0.537531	1	0	0.498
Father's father: high school	Pre-determined	6861	0.294126	1	0	0.455
Father's father: university	Pre-determined	6861	0.056697	1	0	0.231
Mental, physical or sexual abuse AFTER age 14	Pre-determined	6861	0.76432	18	0	1.849
Death in the family (2008)	Pre-determined	6861	0.05626	1	0	0.230
Death in the family (2009)	Pre-determined	6861	0.051159	1	0	0.220
Accident in the family (2007)	Pre-determined	6861	0.04562	1	0	0.208
Accident in the family (2008)	Pre-determined	6861	0.036438	1	0	0.187
Accident in the family (2009)	Pre-determined	6861	1.960647	2	1	0.194
Illness in the family (2007)	Pre-determined	6861	0.073459	1	0	0.260
Illness in the family (2008)	Pre-determined	6861	0.072876	1	0	0.259
Illness in the family (2009)	Pre-determined	6861	1.906573	2	1	0.291
Household income (2006)	Pre-determined	6855	203505.6	2661000	-120748	1408
Household income (2007)	Pre-determined	6859	227449.9	2.65E+08	-1296761	3201
Household income (2008)	Pre-determined	6859	197380.4	1.80E+07	-17167.3	2400
Household income (2009)	Pre-determined	6858	196510.5	850000	27000	8453
Reading score	Cognitive	6861	-0.32874	2.870647	-3.77606	1.049
Mathematics score	Cognitive	6332	-0.19194	3.077888	-3.16042	1.032
Emotional stability (2006)	Non-cognitive	6861	6.767381	8	0	1.458
Self esteem (2006)	Non-cognitive	6861	8.186853	10	0	2.117
Locus of control (2006)	Non-cognitive	6861	7.38E-09	1.034737	-2.79959	1
Sociable (2006)	Non-cognitive	6861	5.653695	7	0	1.544
How do you feel about your school	School and peers	6861	1.835447	4	1	0.742
How much pressure do you feel about the school requirements	School and peers	6861	1.777438	4	1	0.729
My teachers incentivize me to tell my opinion	School and peers	6861	2.453432	5	1	1.021
Teachers usually act justful	School and peers	6861	2.406646	5	1	0.970
If I need extra help I get it from the teachers	School and peers	6861	2.076519	5	1	0.910
My teachers care about my personality	School and peers	6861	2.648885	5	1	1.051
A teacher hit one of my classmates	School and peers	6861	1.963416	2	1	0.187
A classmate hit one of the teachers.	School and peers	6861	1.978866	2	1	0.143
Applied to university		6861	0.392363	1	0	0.488
Exp.: earn more than avg (2008)	Expectations	6861	0.532154	1	-0.20324	0.265
Exp.: earn best 10% (2008)	Expectations	6860	0.253149	1	0	0.238
Exp.: permanent employment (2008)	Expectations	6861	0.674177	1	-0.22407	0.276
Exp.: earn ¿ net HUF100.000 (2008)	Expectations	6861	0.601115	1	-0.20751	0.303
Exp.: earn ¿ net HUF200.000 (2008)	Expectations	6861	0.329336	2	-0.09618	0.271
Sedulity grade (2009)	Effort	6861	3.789244	8	1	0.820
Region						
Central Hungary (%)	Pre-determined	6861	0.218919	1	0	0.413
Central Transdanubia (%)	Pre-determined	6861	0.119079	1	0	0.323
Western Transdanubia (%)	Pre-determined	6861	0.101443	1	0	0.301
Southern Transdanubia (%)	Pre-determined	6861	0.100131	1	0	0.300
Northern Hungary (%)	Pre-determined	6861	0.136423	1	0	0.343
Northern Great Plain (%)	Pre-determined	6861	0.183647	1	0	0.387
Southern Great Plain (%)	Pre-determined	6861	0.140359	1	0	0.347
Mother works (2006)	Pre-determined					
No (%)	Pre-determined	6853	0.338246	1	0	0.473
Yes (%)	Pre-determined	6853	0.642346	1	0	0.479
We did not ask (%)	Pre-determined	6853	0.019408	1	0	0.137
Mother works (2007)	Pre-determined					
No (%)	Pre-determined	6861	0.296167	1	0	0.456
Yes (%)	Pre-determined	6861	0.652092	1	0	0.476
We did not ask (%)	Pre-determined	6861	0.051742	1	0	0.221
Mother works (2008)	Pre-determined					
No (%)	Pre-determined	6861	0.269057	1	0	0.443

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Table A.3 – continued from previous page

Variable	Type	N	Mean	SD	Min	Ma
Yes (%)	Pre-determined	6861	0.691882	1	0	0.461
We did not ask (%)	Pre-determined	6861	0.039061	1	0	0.193
Mother works (2009)	Pre-determined					
No (%)	Pre-determined	6861	0.273575	1	0	0.445
Yes (%)	Pre-determined	6861	0.67789	1	0	0.467
We did not ask (%)	Pre-determined	6861	0.048535	1	0	0.214
Father works (2006)	Pre-determined					
No (%)	Pre-determined	6830	0.183602	1	0	0.387
Yes (%)	Pre-determined	6830	0.627526	1	0	0.483
We did not ask (%)	Pre-determined	6830	0.188873	1	0	0.391
Father works (2007)	Pre-determined					
No (%)	Pre-determined	6815	0.150697	1	0	0.357
Yes (%)	Pre-determined	6815	0.628613	1	0	0.483
We did not ask (%)	Pre-determined	6815	0.22069	1	0	0.414
Father works (2008)	Pre-determined					
No (%)	Pre-determined	6717	0.150216	1	0	0.357
Yes (%)	Pre-determined	6717	0.621855	1	0	0.484
We did not ask (%)	Pre-determined	6717	0.227929	1	0	0.419
Father works (2009)	Pre-determined					
No (%)	Pre-determined	6647	0.175568	1	0	0.380
Yes (%)	Pre-determined	6647	0.579961	1	0	0.493
We did not ask (%)	Pre-determined	6647	0.244471	1	0	0.429

Appendix B. Description of the Home Cognitive and Emotional Scale

Here we present the items that make up the Home Cognitive and Emotional Scale.

Table B.4: Home Cognitive and Emotional Scale

Home Cognitive Scale Question	Freq.	Percent	Home Emotional Scale Question	Freq.	Percent
Has more than 20 books.			I used to tidy up and clean my room.		
Not true	3,402	(34.2%)	Not true	1,512	(15.1%)
True	6,546	(65.8%)	True	8,501	(84.9%)
There is at least one musical instrument at home.			I used to clear away the things in my room.		
Not true	7,239	(72.34%)	Not true	1,581	(15.81%)
True	2,768	(27.66%)	True	8,421	(84.19%)
The family has at least one newspaper subscription.			I usually subsume my time.		
Not true	7,155	(71.63%)	Not true	567	(5.67%)
True	2,834	(28.37%)	True	9,433	(94.33%)
Reads for fun at least weekly.			We meet with relatives and friends at least once in a month.		
Not true	5,592	(56.29%)	Not true	3,071	(30.73%)
True	4,343	(43.71%)	True	6,924	(69.27%)
The family encourages to have a hobby.			I spend time with my father more than once in a week.		
Not true	1,898	(19.02%)	Not true	5,101	(51.2%)
True	8,083	(80.98%)	True	4,860	(48.8%)
Participates in tutorial lectures.			Outdoor activity with my father at least once in a week.		
Not true	6,022	(60.15%)	Not true	4,960	(50.75%)
True	3,990	(39.85%)	True	4,813	(49.25%)
Have gone to museum in the past year with a family member.			Eat a meal with both parents each day.		
Not true	5,807	(58.11%)	Not true	5,911	(59.33%)
True	4,186	(41.89%)	True	4,052	(40.67%)

Continued on next page

Table B.4 – continued from previous page

Home Cognitive Scale Question	Freq.	Percent	Home Emotional Scale Question	Freq.	Percent
Have been to a concert or theatre in the past year with a family member.			The parent would not hit the child is he/she were cursing.		
Not true	5,939	(59.47%)	Not true	357	(3.59%)
True	4,048	(40.53%)	True	9,587	(96.41%)
There are discussions in the family about what was seen on TV.			The parent had to hit the child at most once in the past week.		
Not true	2,868	(29.71%)	Not true	28	(0.29%)
True	6,784	(70.28%)	True	9,777	(99.71%)
The flat is not dark or dreary.			The mother encouraged the child to participate in the conversation.		
Not true	1,593	(16.04%)	Not true	2,912	(29.59%)
True	8,340	(83.96%)	True	6,930	(70.41%)
The rooms are mostly clean.			The mother answered the child's questions.		
Not true	958	(9.65%)	Not true	4,528	(46.1%)
True	8,969	(90.35%)	True	5,295	(53.9%)
The rooms are mostly tidy.			The mother talked to the child.		
Not true	1,052	(10.59%)	Not true	3,849	(39.14%)
True	8,878	(89.41%)	True	5,985	(60.86%)
The building is safe.			The mother introduced the child to the interrogator.		
Not true	538	(5.45%)	Not true	5,876	(59.61%)
True	9,342	(94.55%)	True	3,981	(40.39%)
			The mother spoke in a positive voice about the child.		
			Not true	936	(9.52%)
			True	8,898	(90.48%)

Appendix C. Complete regression

Table C.5: Association of parental preferences with university attendance - complete regression

	base	exog	(2)+cogn	(3) + noncogn	(4) + aspirations	(4) + aspirations + expectations + effort
	(1)	(2)	(3)	(4)	(5)	(6)
Ideal education for child: university (2006)	0.450***	0.307***	0.200***	0.200***	0.088***	0.073***
	[0.021]	[0.025]	[0.027]	[0.027]	[0.023]	[0.023]
Mother less than high school		-0.102***	-0.069**	-0.069**	-0.038	-0.033
		[0.030]	[0.028]	[0.028]	[0.025]	[0.024]
Mother university		0.063*	0.045	0.045		
		[0.035]	[0.033]	[0.033]		
Father less than high school		-0.046	-0.025	-0.025		
		[0.031]	[0.029]	[0.029]		
Father university		0.154***	0.116***	0.116***	0.103***	0.095***
		[0.042]	[0.039]	[0.039]	[0.029]	[0.029]
HOME cognitive scale		0.002***	0.001**	0.001**	0.001**	0.001**
		[0.001]	[0.001]	[0.001]	[0.001]	[0.000]
Household income (2006)		0.000				
		[0.000]				
Mother's father: university		0.020				
		[0.039]				
Reading score			0.099***	0.099***	0.059***	0.038**
			[0.017]	[0.017]	[0.015]	[0.015]
Mathematics score			0.102***	0.102***	0.073***	0.075***
			[0.016]	[0.016]	[0.014]	[0.014]
Plan to apply to university					0.411***	0.357***
					[0.029]	[0.029]
Sedulity grade (2009)						0.106***
						[0.013]
Constant	0.096***	-0.007	0.132**	0.132**	0.018	-0.351***
	[0.015]	[0.066]	[0.064]	[0.064]	[0.049]	[0.063]
Observations	1,922	1,922	1,922	1,922	1,922	1,922
Clusters	970	970	970	970	970	970
Selected controls	0	7	7	7	6	7
Dictionary size	0	114	116	121	122	134