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ABSTRACT

Intergenerational Persistence in Educational Attainment in Italy*

In this paper we show that there is a reduction in the correlation coefficient between father and children schooling levels over time in Italy. However, focusing on equality of circumstances, we show that there is still a persistent difference in the odds of attaining a college degree between children of college educated parents and children of parents with lower secondary education attainment. The explanation of these trends lies in differential impact of liquidity constraints and risk aversion. Some descriptive evidence on the persistent differential in returns to college education depending on father's education is also provided.

JEL Classification: J62, I38

Keywords: educational attainment, Italy, family background

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1 Introduction

Italy has often been depicted as a country with low intergenerational mobility, given the strong association existing between the socio-economic outcomes of parents and their children as adults (Checchi, Ichino, and Rustichini 1999). In his review of existing cross-country comparative evidence, Corak (2006) laments the scarcity of Italian data. This paper aims to expand our knowledge on intergenerational mobility in Italy over the last century. Given the absence of longitudinal data that span a sufficient time interval, we focus on educational outcomes based on children recall of parental education.

The absence of longitudinal data sets allowing the measurement of intergenerational persistence in incomes has pushed some authors to follow Björklund and Jäntti (1997) in imputing incomes for the parents generation. For example, Mocetti (2008) adopts a two-sample two-stage strategy to estimate intergenerational correlation in incomes for Italy. He uses the Survey of Household Income and Wealth data set conducted by the Bank of Italy (SHIW hereafter) finding that Italy is one of the most immobile country according to this methodology of measurement (with an intergenerational correlation in incomes as high as 0.84). When decomposing intergenerational mobility channels between returns to education and liquidity constraints (preventing children from poor families to achieve higher education), he claims that 60.7% of persistence is attributable to the educational channel, i.e. the dependency of children education onto parental income. Piraino (2007) adopts a similar strategy to predict parental income in the SHIW data set and finds a high intergenerational persistence (in the order of 0.48), where less than one third (28%) is attributable to the educational channel.[1] However this procedure has limitations, as pointed out by Grawe in Corak (2006): on one hand, measurement errors, related to both the imputation procedure and the imperfect recall of children, tend to bias downward the estimated income elasticity; on the other hand, the impossibility to control for varying age distance between the two generations make it impossible to assess the direction and the extent of the bias.

[1] Using ECHP (European Community Household Panel) data, Comi (2004) provides estimates of intergenerational mobility in educational attainment, finding that Italy exhibits a quite low level of mobility. However, the sample of children is rather young, because a vast majority of them is still cohabiting. On the contrary, Chevalier, Denny, and McMahon (2007) using IALS (International Adult Literacy Survey) survey ranks Italy high in terms of intergenerational mobility in education.

In the present paper we exploit information available in the SHIW on educational attainment of children and parents to obtain a view on the long run evolution of intergenerational persistence in Italy. Educational attainment has advantages and disadvantages with respect to income data. On the positive side, it proxies the human capital endowment, which is positively correlated to permanent income; in addition, it is less subject to imperfect recall. On the negative side, it is unevenly distributed in the population, the probability mass being concentrated around the attainment of relevant degrees (sheepskin effects). However, given the absence of proper income data for Italy, we hold that advantages exceed disadvantages in providing an overview of the Italian evolution across age cohorts.

The use of data on educational attainment by parental background is not new. In the 1990s Shavit and Blossfeld (1993) produced one of the first comparative studies of intergenerational persistence in education by studying the correlation of children attainment with parental background by age cohorts and claimed that the expansion of higher education gave no contribution to improving intergenerational mobility. While most of their chapters were based on data sets where parental information originated from children recall, Blanden and Machin (2004) use longitudinal data for the UK, finding that the recent higher education expansion has not been equally distributed across people from richer and poorer backgrounds. Rather, it has disproportionately benefited children from relatively rich families. Holzer (2006) studies the evolution of the association between college attendance and parental income over different age cohorts in Sweden, pointing out that new opening of local colleges has not improved the degree of intergenerational mobility. Similarly, Heineck and Riphahn (2007) find that the association of children and parents educational attainment has not declined in Germany over the last half of previous century.

The frequent finding of a non declining association between children educational attainment and parental background has strengthened the idea of some sort of genetic link underlying educational choices. The idea of intergenerational transmission of ability, originally introduced by Becker and Tomes (1986), has frequently reappeared as one potential explanation of this persistence (see for example Cameron and Heckman 2001). However, more accurate tests of the "nature vs. nurture" hypothesis, based on data on IQ tests, show that the relative impact of cognitive abilities is limited, and cannot account for the entire effect of parental background (see the contributions collected in Arrow, Bowles, and Durlauf (2000), and more recently in Bowles and Gintis (2002)). When the richness of data allows for the decomposition of intergenerational correlation of incomes into ability (further decomposed into cognitive and non cognitive abilities), education and labour market attachment (as in Blanden, Gregg, and Macmillan 2007 for the UK), the main finding is that abilities account for a limited fraction of social immobility, while most of the effect still passes through the educational attainment in the children generation.[2]

Due to the lack of data, we cannot test the extent of association between skill formation and parental background for Italy.[3] In the sequel we study the evolution of intergenerational persistence in educational attainments for Italy, and we decompose this correlation into a "liquidity constraint/risk aversion" component (children from poor families are prevented by entering higher education by lack of resources and/or different degree of risk aversion) and a "labour market" component (children from poor families have lower expected incomes, and therefore less incentive to get educated).

The plan of the paper is as follows. In Section 2 the data are introduced and some descriptive evidence about trend of educational attainments is provided. In Section 3 a simple statistical model for the study of intergenerational transmission of education is discussed and the first empirical results are presented, showing the decrease of the correlation between children and father education over children age cohorts. In Section 4 we isolate the role of intergenerational transmission of education as a component of the child-father education correlation and analyse its temporal evolution. Finally in Section 5 we provide some explanations and in Section 6 we conclude.

2 Data and background analysis

For analysing intergenerational transmission of education one needs to rely on data sets that collect information on the education of children and their

[2] "The dominant role of education disguises an important role for cognitive and noncognitive skills in generating persistence. These variables both work indirectly through influencing the level of education obtained, but are nonetheless important, with the cognitive variables accounting for 20% of intergenerational persistence and non-cognitive variables accounting for 10%." (Blanden, Gregg, and Macmillan 2007).

[3] Checchi and Flabbi (2006) make use of PISA test scores (as proxy for cognitive abilities) to analyse the relative contribution of ability and parental income in sorting into different tracks at high school level. They find that while in the case of Germany ability is more relevant than parental education, the opposite situation occurs in Italy.

parents across time. In Italy there are different data sets reporting this information (from international surveys like IALS or ALL to national surveys like ILFI (Indagine Longitudinale sulle Famiglie Italiane) or ISFOL-Plus), but there is only one dataset with a sufficient number of observations that allows for sample splits according to age cohorts. This is the Survey on Household Income and Wealth (SHIW) conducted biannually on a representative sample of the Italian population; since 1993 the surveys contain a section asking information on the householder's and spouse's parents when they were of the same age as the interviewees, including education, occupation and industry. In order to increase the degrees of freedom available, we pool SHIW waves from 1993 to 2004, selecting only the householder and -when present- his/her partner: we refer to it as the 'children' generation, while information on the 'parent' generation is obtained from their recall. After elimination of repeated observations which belong to the panel section of the data,[4] we remain with 45,682 children (21,241 males and 24,441 females) and 41,134 fathers.[5] Finally, the data set is organised by 5-year cohorts by children's birth years.

Table 1 reports the highest education attainment of fathers and children organised by children-birth-year cohorts. The percentage of children with no degree decreased constantly across time, the percentage of children with only primary education increased over 50% for cohorts born during the 1920s and then it started to decrease in favour of lower secondary schooling. An increasing proportion of children attains a high school or a college degree: in the last cohorts, over 40% of Italians have high school degree, slightly less than 40% have lower secondary degree and over 10% have a college degree. Although also fathers' education increased across time the average years of education of fathers remains well below the average years of education of children, the former being between two and five years smaller than the latter.

The increase of average education induced a reduction of inequality of education as measured by any common inequality measure computed over the years of completed education. However, these measures of inequality might blur the picture of intergenerational transmission of education across

[4] The panel section of the SHIW data set was not considered as the attrition rate is very large and we focus on education of adult population, which is in most cases constant (recall that we call children only householders and their spouses).

[5] Information on mothers are also available (and we exploit them in Table 3) but given the gender discrimination in family educational choices in the grandparent generations, we prefer not to rely on them excessively.

time, also because education has an upward bounded measure. Hence, we revert to the joint analysis of education of children and of their fathers, by age cohort of the child. Figure 1 represents the joint frequency of highest degree attained by children conditional on his father's using a plot where bigger circles means higher frequency. It clearly emerges that for children born in 1911-1920 most of the mass was concentrated in the cell characterised by child with no or primary education and father with no education, while fifty years after most of the mass had moved to the cell where a child holds a lower secondary or high school education and his/her father has primary education. This movement of frequency mass was due partly to economic development and the increasing demand for educated labour and partly to the accomplishment of compulsory education reforms.[6]

The dashed line shows the interpolation of average years of child's education conditional on father's educational title, where no education, primary, lower secondary, high school and college degree are replaced with 0, 5, 8, 13, 18 years of education, respectively. The interpolated line shows that the average child's education conditional on father's is almost linear and that across time it flattened but remained positively sloped, i.e. that the positive correlation of child's-father's education remains also in the younger generations although lower than for older ones. This descriptive evidence aims at analysing the issue in more detail.

3 A conceptual framework and first empirical results

There is a vast literature on the intergenerational correlation of educational achievements and/or incomes. Among the reasons for this correlation the literature considers genetic transmission, access to pre-school facilities, parental care, parental income and/or wealth, parental role model and out-of-school

[6]Five years of compulsory education were actually introduced in 1862 (Legge Casati) but they were never accomplished, since it relied on local municipalities taking responsibility of school building, which they never did due to lack of resources. It was in the aftermath of WWII that the Italian government devoted earmarked resources to school building, and this opened the way to school mass attendance. In 1962 three additional years of compulsory education were added, while postponing the allocation to tracks at the age of 14. Two additional years, taking compulsory education to ten years, were introduced in 2007.

cultural environment. Due to the frequent lack of retrospective information in data, these studies are limited to the correlation between parents' schooling and children schooling. This strategy is open to the criticism that parents' education is an inadequate measure of familiar background because it does not properly take into account the presence of liquidity constraints and of the out-of-school cultural environment. It also neglects the presence of peer effects and the quality of schooling. Unfortunately data often do not indicate the individuals' birth place or the location of the school attended nor they provide information on parents' income. Here we are forced to consider that the intergenerational transmission of education achievement partially includes all these aspects.

To analyse the intergenerational transmission of education, one might want to estimate a regression such as

$$S_i^c = \alpha + \beta S_i^f + \varepsilon_i \text{ for } i = 1, ..., N \tag{1}$$

where, S_i^c, S_i^f are education of child i and of his/her father i, respectively, ε_i is an error term and β is the parameter of interest. The OLS estimate of β is

$$\hat{\beta} = \frac{\sigma_{cf}}{\sigma_f^2} = \rho_{cf}\frac{\sigma_c}{\sigma_f}$$

where σ_j, ρ_{cf} are the standard deviation of errors for $j = c, f$ generations and the correlation coefficient between child's and father's education. One may interpret a decreasing $\hat{\beta}$ as a reduced intergenerational transmission of education, however it might be solely due to a reduction in σ_c/σ_f. As the ratio of standard deviations decreased through time in Italy (see Table 2), we also normalised years of schooling of child and father by the corresponding standard deviation and estimate separately for each cohort the following equation:[7]

$$\frac{S_i^c}{\sigma_c} = \alpha + \rho\frac{S_i^f}{\sigma_f} + \varepsilon_i \tag{2}$$

The temporal evolution of the ρ coefficient can be interpreted in terms of correlation of child's and father's education and as a measure of inequality

[7] In this equation we neglect assortative mating which should reinforce the effect of parents' education and the so called children quantity-quality tradeoff according to which more educated parents have lees children but give them a better education. We also abstract from gender differences in intergenerational persistence.

of circumstances, which are independent on child's effort. A high estimate of ρ would indicate that children schooling is heavily influenced by parents' schooling (which may capture cultural or financial constraints, as well as peer and network effects), whereas an estimate close to zero would indicate that children schooling is independent of family background. The main difference between the β coefficient in (1) and the ρ coefficient in (2) is that the former, by considering the ratio of variances, takes into account also a change of inequality of educational outcomes in children and fathers generations, providing a relative measure of intergenerational mobility. The latter provides an absolute measure of intergenerational transmission, i.e. depurated from possible evolution of the distribution of educational attainments, for instance due to school reforms that increased the average schooling of the population, reducing its variance. International evidence Hertz, Jayasundera, Piraino, Selcuk, Smith, and Verashchagina (2008) shows that in several countries β and ρ coefficients behaved differently.

The review of the literature on the intergenerational transmission of education by Haveman and Wolfe (1995) concludes that parents' education is the most important factor in explaining children success at school. The pervasive question in the literature is whether the high correlation between parents' and children schooling is attributable to the genetic transmission of ability (nature) or to parents' income which makes children schooling more accessible (nurture)? The literature does not provide a consensual answer but in our reading most of the authors agree that the explanation lies mainly in the economic and cultural resources of parents rather than in genetic transmission.

To identify the causal effect of parents' education on children education, the literature has adopted three different strategies involving IV estimation: 1) it has used samples of twins to difference out children ability, 2) it has used samples of families with adopted children, thus ruling out the effect of parents' ability, 3) has exploited various reforms of compulsory education which introduce exogenous variation in parents' education. In general the IV estimates tend to be lower than the corresponding OLS estimates.[8]

As data often do not allow a proper IV estimation of the ρ coefficient,

[8] The most recent examples of IV techniques 1) and 2) are: Behrman and Rosenzweig (2002), Bjiörklund, Lindahl, and Plug (2006), Black, Devereux, and Salvanes (2005), Dearden, Machin, and Reed (1997), Plug and Vijverberg (2003) and Sacerdote (2002). Some examples of the third approach are: Chevalier (2004), Oreopoulus, Page, and Stevens (2006).

the interpretation of ρ is descriptive and not causal. This is not necessarily an insurmountable problem because our main interest is on the changes of the estimates over time. Therefore, assuming that the factors potentially biassing the estimates are time invariant, our interpretation of the results might still be correct.

Using the SHIW data we estimate equation (2) separately for 13 five-year cohorts starting from 1910 onwards. We measure parents' and children highest degree of educational attainment, S_i^f and S_i^c respectively, by imputing the correspondent year length of a normal course of study (5, 8, 13, 18 years of education corresponding to completed primary, lower secondary, high school and college respectively).

The estimates the β and the ρ coefficients are both decreasing across time although the former decreases more due to the decreasing trend of the ratio of the standard deviations (Table 3). The correlation coefficient was equal to 0.575 for the oldest cohort considered, slightly increased in the following two cohorts and gradually decreased since cohorts born after 1920 reaching a value of 0.472 in the youngest cohort considered.

An OLS estimate of equation (2) may be biased due to at least two important omitted variables: parents' ability and parental care for their children. Only in the unlikely case that neither variable affects directly children schooling or is correlated with parents' education, the estimate of ρ would be unbiased.[9] Unfortunately we have no data to measure either of these variables. The only individual characteristics we can control for are sex of child and his/her area of residence, whether in the North, Centre or South of Italy. While the first is expected to be uncorrelated with father's education, omitting the second might induce a positive bias as people living in the North are on average more educated that people living in the South. In columns (B) of Table 3 we control for sex of the child and area of residence showing a positive but relatively small positive bias due to the omission of these two variables although nothing changes in terms of the trend of the coefficient. In column (C), the father's education is replaced by the mother's but again there is no major change in the trend of intergenerational coefficient nor on the magnitude of the estimated coefficients.[10]

[9] Under the reasonable assumption that parents ability is positively correlated with their schooling and with their children's schooling, the bias is expected to be positive. However, no reasonable guess can be put forward as for the correlation between parental care and father's education and this bias cannot be signed.

[10] We also estimated Models (1) and (2) controlling for both parents' education as well

4 A deeper look into education transmission dynamics

The average years of education may hide differences among children of families with different degrees of education. The sociological literature (Schizzerotto and Barone 2006 among others) shows that inequality across families of different backgrounds have disappeared when we consider lower levels of schooling, but is still persistent when we consider college attainment. They refer to this phenomenon as a *reduction in the absolute differences* and *maintenance of the relative differences*. Unlike the sociological tradition, which tends to define family background in terms of occupation and/or class, we stick to our approach in terms of education attainment, to be potentially interpreted as permanent income.

Denoting with c and f the realisations of S^c, S^f, respectively and assuming for simplicity that they both can take only discrete values: 1,2,...,S, the OLS estimation of the correlation coefficient ($\hat{\rho}$) of model (2) can be written as:

$$\hat{\rho} = \sigma_{cf}/\sigma_c\sigma_f = \int (c - E(c))(f - E(f))dF(c|f)dF(f)/\sigma_c\sigma_f \tag{3}$$

$$= \sum_{c,f} \underbrace{(c - E(c))(f - E(f))}_{(A)}\underbrace{Pr(c|f)}_{(B)}\underbrace{Pr(f)}_{(C)}/\sigma_c\sigma_f \tag{4}$$

where E denotes the expected value and (4) follows from (3) when years of schooling of fathers and sons take only discrete values. Hence, $\widehat{\rho}$ depends on how large is the combined effect of the absolute deviation of children's and of fathers' education from their respective means (term (A)), on the marginal distribution of a child's education given that of his/her father (term (B)) and on the marginal distribution of fathers' education (term C).

As the set of possible values that education can take is $\{0, 5, 8, 13, 18\}$, in the present case $\widehat{\rho}$ in each cohort is the sum of 25 elements. Figure 2 presents the decomposition above by grouping the components of $\widehat{\rho}$ into five groups depending on father's education. The vertical sum of all the 25 lines equals

as age and regional controls finding that the integenerational transmission of education between father and child is higher than between mother and child although only the first shows a clear downward trend and the sum of the coefficient is roughly similar to the trend of the coefficient with only one parent in the regression. These results can be obtained from the authors upon request.

the $\widehat{\rho}$ coefficient depicted in the top panel. This decomposition conveys two main messages:

1. about one third of the values of the correlation coefficient of older cohorts is due to the group with uneducated child and uneducated father, but the weight of this group constantly and dramatically decreases over time;

2. a sizable and nondecreasing proportion of the correlation coefficient is due to the group of college educated children and fathers with college or high school education.

While the former is mainly a composition effect, a natural consequence of the increase of average education and of compulsory education reforms, the latter points at the persistence of inequality of opportunity depending on the education of parents. In our view, the term B is the correct measure for analysing intergenerational transmission of education: a system would achieve equality of opportunity (i.e. a child education outcome independent from circumstances such as his father's education) if the probability of obtaining a particular degree were independent of father's educational achievement.

To investigate whether this clear reduction of children-parents educational achievement correlation is similar regardless of parents' background, from here onwards, given the ordinal nature of the data, we collapse previous information in only three levels of education attainment, both for children and parents: level 1 corresponds to lower secondary education or less, level 2 to high school, level 3 to college or more. In order to assess relative differences in the convergence by family backgrounds, we estimate an ordered probit model for the children educational level over a set of individual characteristics and parents' education. Figure 3 plots the marginal effects of an ordered probit estimating the probability of obtaining a lower secondary school degree (panel A), a high school degree (panel B) and a college degree (panel C), conditional on father's education. Father with high school education is the omitted category therefore we compare the predicted probabilities conditional on having a father with lower secondary schooling with the probability conditional on having a father with college or more.

Despite the reduction in absolute numbers of this group, panel A shows that there is no convergence over time in the predicted probabilities of completing compulsory education by family background. The difference in the predicted probabilities between children of parents with lower secondary and children of parents with college remains large over time.

Panel B shows that there is divergence in the predicted probabilities of obtaining a high school degree. While children of poorer background have gained more and more easily access to high school, the children from college educated parents have moved a step ahead by entering college in larger numbers.

Panel C shows that the probability of achieving a college degree is increasingly lower for children of families with a lower education degree, and the difference with their counterparts whose parents have a college degree has become larger over time.

5 Possible explanations

In this section we put forth some potential explanations of the patterns of educational attainment described above, focussing mainly on college education and, for data issues, only on the last cohorts born in 1965-1975 (i.e. the last two points in panel C of Figure 3). We wish to answer the following question: why in a country like Italy where college education is not as expensive as in other countries, private schools are not popular and mobility costs are affordable due to large number of universities (Bratti, D.Checchi, and Blasio 2007), the cohort born in the mid 1970s still has a differential college attainment rate of 40% points depending on the family educational background?

A first classical explanation is based on liquidity constraints: the lower attainment of children living in low-educated families reflects the presence of liquidity constraints. A second possible explanation lies in the differential risk aversion of parents with different education background. Education is usually considered a risk free investment but in principle education is an investment with both uncertain costs (psychic and monetary costs) and uncertain returns. If we assume that education is a risky asset, then risk aversion potentially plays a role in the investment choice (Belzil and Leonardi 2007). If parents with low education are more risk averse and education is a risky investment, other things equal, they may invest less in their children college.

To investigate these two hypotheses, we consider only households with co-habiting children and use the 1995 SHIW data wave which is the only one that contains information both on the head of household's risk aversion and on family wealth and liquidity constraints.

5.1 Liquidity Constraints

Usually the role of liquidity constraints in the education literature is related to the role played by family wealth in determining children education. There is a large literature on the positive relationship between family income and college enrollment recently surveyed by Carneiro and Heckman (2002).[11] The same positive relationship is found in other countries, as can be read in Shavit and Blossfeld (1993).

There are two interpretations of this evidence. The first is the presence of liquidity constraints: credit constraints facing families in a child's adolescent years affect the resources required to finance high school and then college. The second interpretation emphasises the long-run factors associated with higher family wealth which improves children cognitive ability. The correlation between family wealth and children ability could be due to the intergenerational genetic transmission of ability (i.e. parents' ability) and/or to the direct effect of higher resources on the development of children ability. In this last interpretation the effect of wealth on school choice is actually reflecting omitted children ability which is correlated both with family wealth and high school choice. To address the omitted variable bias we instrument wealth with some variables which measure "exogenous" windfall changes in wealth and are presumably uncorrelated with ability. In these data we do not have measures of children ability and therefore we will not be able to assess the importance of credit constraints conditioning on children ability but we use a direct measure of liquidity constraints.[12]

5.1.1 Measures of liquidity constraints

We build a direct measure of liquidity constraints as a dummy to indicate discouraged borrowers and rejected loan applicants (2.5% of the sample). These

[11] Due to data availability the US literature looks at family income rather than wealth and at college enrollment. We extend the conclusions of that literature to the relationship between family wealth and high school choice bearing in mind that the choice of 5-year course high school is very correlated with college enrollment.

[12] In the US literature, Ellwood and Kane (2000) claim that there are substantial credit constraints, Cameron and Heckman (2001) and Carneiro and Heckman (2002) show that controlling for children ability mostly eliminates the family income gaps in college enrollment.

are people who answer yes to either of the following questions: “during the year did you or a member of the household think of applying for a loan or a mortgage to a bank or other financial intermediary, but then changed your mind on the expectation that the application would be turned down?” or “during the year did you or a member of the household apply for a loan or a mortgage to a bank or other financial intermediary and have it turned down?”. We also defined as liquidity constrained people who belong to a family with liquid assets $<1\%$ of total assets (6% of the sample) and those with debt$>25\%$ of total net worth (12% of the sample). The dummy "liquidity constrained" is equal to one if the household is constrained according to any of the three measures.

5.1.2 The Data and Sample Selection

To investigate the two possible explanations of differential college attainment (liquidity constraints and/or risk aversion) by family background, we build two samples. Both samples are made of individuals cohabiting with their original families. The selected individuals must live within the family of origin because we need the information on their parents' wealth and risk aversion, since this information is elicited from the household head only. Unfortunaltely once children leave the family we cannot trace them back to their original parents. Therefore there might be an issue of sample selection of cohabiting children, which we will address later.

We focus on college investment where both liquidity constraints and risk aversion may be relevant. The first sample aims at detecting the effects of liquidity constraints and risk aversion on college enrollment while the second sample aims at detecting the impact on college attainment (assuming that 25-29 years old youngsters are going to obtain a college degree if they have not dropped out by age 24).

The first sample is limited to children of age 19-24 cohabiting with their original families. An individual is eliminated if he or she reports a missing value in any of the following variables: education, age, gender, region of birth, education of the father and mother. This selection process leaves us with a final sample of 1,878 individuals. Table 4 shows the descriptive statistics of all the variables used in the analysis. We run probit models on the choice to enroll in college, where the dependent variable (*collegenroll)* is equal to 1 if the individual holds a secondary school degree and is a student or has already obtained a college degree and is equal to 0 if he or she is not a student. We select the age range between 19-24 in order to consider only individuals who have already terminated high school but (most of them) have not yet finished college, in this respect this sample looks at the effects of liquidity constraints on college enrollment but does not look at the effects on college degree attainment. The sample selection bias potentially introduced by selecting only individuals who live within the family is very limited because over 93% of the 19-24 years old live in the family of origin.

Table 5 shows for each year of age the percentage of children living at home, the percentage of students, the percentage of students living at home and the percentage of those who live in liquidity constrained households according to the overall measure (column 4), the measure based on debt (column 5) and the measure based on low liquid assets (column 6). Potential sample bias of children who still live with their family is the reason why we do not consider in our benchmark specification a larger age range. In the following tables we test the robustness of our results considering the sample of all children aged 19-29 living at parents' home (2,873 individuals). This sample is more selected because not all individuals of age 25-29 still live at home (63% do, see Table 5) but has the advantage of including also individuals who already have finished college education (which is ultimately the object of our investigation). In this case the dependent variable is equal to 1 if one is a student or already holds a college degree and is equal to 0 if he or she is not a student.

The second sample is made of all individuals of age 25-29 cohabiting with their original families. The dependent variable (*collegenroll*) is always equal to 1 if the individual holds a secondary school degree and is a student or has already obtained a college degree and is equal to 0 if he or she is not a student. Of course many more of the 25-29 years old have already obtained a college degree and we assume that those who still live at home and are still students (therefore have not dropped out by age 24) are likely to finish college. The same sample selection criteria as above leaves us with a sample of 995 individuals. In this respect this regression looks at the impact of liquidity constraints on the probability of college attainment. However this sample is more selected because only 63% of all 25-29 years old in this sample still live with their original families (Table 5).

5.1.3 Results

The regressors used are family wealth, parents' education, geographical and sex dummies. All models include also a variable for the number of siblings and the age of the head of household. Columns 1 to 3 of Table 6 look at college enrolment using the sample of children of age 19-24 cohabiting with their original families. Table 6 reports the marginal effects (calculated at the mean of regressors) of parents' education, wealth, sex and area of residence. Richer and more educated parents are significantly more likely to enroll their children to university. Females are more likely to go to college. The effect of liquidity constraints is negative and significant (column 1); when interacted with fathers' education (column 2) points to the existence of relevant liquidity constraints for children of low-education parents which may contribute to explain the gap in Figure 3.[13]

In column 3 we instrument wealth with five variables which measure "exogenous" windfall changes in wealth and are presumably uncorrelated with children ability (Guiso and Paiella 2007). Such measures are the capital gain on one's home property[14], an indicator of house ownership as a result of gift or bequest, the sum of settlements received related to life, health, theft and casualty insurance and the contributions (in money or gifts) received from friends or family living outside the household dwelling. The IV coefficients of wealth in Table 6 are significant and lower (in absolute value) than the OLS.[15]

[13] The main effect of liquidity constraints is significant when we use either the measure of constraints based on debt or on low liquid assets, while the significance of the interaction is driven by the meaure based on liquid assets (see Mazumder 2005).

[14] This is a measure of windfall gains (or losses) on housing constructed using data on house prices at the province level over the years 1980-1994. For homeowners, we compute the house price change since the year when the house was acquired or since 1980 if it was acquired earlier. For tenants we impute a value of zero.

[15] One may expect a bias in the OLS estimate: $collegenroll_i = X_i'\rho + \delta W_i + \delta_1 a_i^f + \delta_2 a_i^c + \varepsilon_{1i}$ Omitted children ability a_i^c is likely to bias the estimate of wealth W_i through two channels. First its correlation with W_i could be due to the intergenerational transmission of ability i.e. a high-ability parent would also be rich and his/her children will also be of high ability because of genetic transmission (this channel is also called "nature"). The second type of bias is due to the direct correlation of W_i and a_i^c independent of a_i^f: Families with high wealth are likely to have high wealth throughout the child's life and high resources are going to improve the quality of education and children ability independently of father's ability, a_i^f (i.e. non-genetically transmitted a_i^c also called "nurture"). Instrumental variables of wealth uncorrelated with parents' ability should be able to account for the second

One problem with the validity of IV is the potential presence of some omitted factor correlated both with family wealth and the IV. To argue that the IV are uncorrelated with the error in our regression relating school choice with family wealth, we need to show that the IV are not linked to some omitted factor (such as individual ability). A proxy of the potentially omitted factor is the head's wage income. The R square of a regression of the head's wage income on the instruments is equal to 0.01. Thus we conclude that our instruments are not correlated with unobserved characteristics which drive wealth. Alternatively we can insert the head's wage in the IV regression: if the instruments are picking up only the exogenous changes in wealth and not omitted ability, then the insertion of income should not affect the results. The results (not shown) are virtually unchanged suggesting that our IV are valid. What is important of the IV estimates is that our basic result that liquidity constraints are relevant for fathers with lower secondary education is confirmed even when wealth is instrumented.

The same benchmark result still holds in the sample of all children aged 19-29 living at home (column 4). Like in the sample of 19-24 years old, the dependent variable is equal to 1 when the college title is already attained or the individual is a student and equal to 0 otherwise. Of course the number of observations in this last column is larger compared to other columns, although the sample is likely to be selected as a relevant proportion of children aged 19-29 might have already left parents' home.

Columns 5 and 7 of Table 6 look at college attainment using the sample of children of age 24-29 cohabiting with their original families (we assume that by age 24 they should have dropped out or are likely to complete college). A caveat is that we may lose those who earn the degree and leave home immediately afterwards. Column 5 shows that liquidity constraints are likely to impact the attainment of the degree also among those who are already enrolled in college. However columns 6 and 7 (IV) show that liquidity constraints ar enot concentrated among low-educated parents. Parents' education and wealth are still significant predictors of their attaining the degree.

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sort of bias. Unfortunately in absence of direct measures of children ability a_i^c, we will not be able to account for the first type of bias. We can sign the OLS bias under plausible assumptions on the parameters. The formula of OLS estimate is: $\widehat{\delta}_{ols} = \delta + \delta_1 \frac{cov(W,a^f)}{V(W)}$. Under the assumption that $\delta_1 > 0$ (i.e. parents' ability affects positively the probability of enrolling in college) and $cov(W, a^f) > 0$ (positive correlation between parents' ability and wealth), the OLS estimate of δ should be biased upwards.

5.2 Risk Aversion

A further explanation takes into account the differences in risk aversion. If parents with low education are more risk averse and education is a risky investment, other things equal, they may invest less in their children college. The scarcity of empirical evidence on the impact of risk aversion on college investment is due to the fact that it is difficult to say whether or not individuals perceive schooling acquisition as a truly risky investment. Potentially there are at least three sources of risk or of uncertainty in marginal benefits and marginal costs of a college education.

First, with respect to the accumulation process, acquiring schooling should be unambiguously viewed as a risky investment. Investment in schooling (and especially college) often implies high opportunity costs and a correct prediction of one's own "ability to learn", but successful grade achievement is rarely a certain outcome. For this reason, the probability of losing the investment paid up front cannot be ignored and may act as a strong disincentive.

Second, at the level of labour market outcomes, the role of one's attitudes towards risk becomes even more complicated. In practice, life cycle earnings are affected by random events such as job offers, layoffs, risk sharing agreements between firms and workers (or unions) and many other events including technological change. Occupation choices may also affect earnings volatility. The ex-ante probability distribution of those labour market outcomes may depend on schooling attainment and on the type of high school, but it is far from clear if accumulated schooling and a specific type of high school contributes to an increase in earnings dispersion or decreases volatility.

Third, potential technological changes affecting the return to schooling may be viewed as an additional element of risk from the perspective of the student. On the other hand, when schooling is viewed as facilitating adjustment to technological change, this uncertainty may turn out to favour schooling acquisition (i.e. schooling becomes a form of insurance as in Gould, Moav, and Weinberg (2001)).

Belzil and Leonardi (2007) studied the role of risk aversion in determining the level of schooling attainment. In this paper we investigate if parents' risk aversion plays a role in the decision to finance children college at equal levels of parents' education and wealth. The focus on parents' risk aversion allows us to complement Belzil and Leonardi (2007)'s work. While they look at the relationship between the *individual's own* risk aversion and schooling *attainment* (high school and college), in this paper we look at the relationship between *parents'* risk aversion and children choice to go to college.[16].

5.2.1 Sample selection and measures of risk aversion

The 1995 wave of the Bank of Italy Survey of Income and Wealth (SHIW) contains a question on household willingness to pay for a lottery which can be used to build a measure of individual risk attitudes.[17] The question has a large number of non responses because many respondents may have considered it too difficult. For our purposes the relationship between non-response and schooling is of particular interest. Those who responded to the lottery question are on average 6 years younger than the total sample and have higher shares of male-headed households (79.8 compared to 74.4 percent), of married people (78.9 and 72.5 percent respectively), of self-employed (17.9 and 14.2 percent) and of public sector employees (27.5 and 23.3 percent respectively). They are also somewhat wealthier and slightly better educated (1.3 more years of schooling).

The difference in education between the total sample and the sample of respondents seems to suggest that - in so far as education is also a proxy for better understanding- non-responses can be ascribed partly to differences in the ability to understand the question. Therefore in some of our estimates

[16] It is plausible that the risky aspect of acquiring schooling involves not only the investment in college but also the choice of the type of secondary school. For the type of school is highly correlated to the choice to go to college and some types of 5-year secondary schools (typically in the academic track) are intended for those who expect to go to college. All the risks potentially attached to the investment in college education can be anticipated in the choice of the type of secondary school and uncertainty about future labour market developments represents a form of risk already at the level of secondary school choice (see Leonardi 2007)

[17] The lottery question is worded as follows: "We would now like to ask you a hypothetical question that we would like you to answer as if the situation was a real one. You are offered the opportunity of acquiring a security permitting you, with the same probability, either to gain a net amount of Lit. 10 million (roughly €5,000) or to lose all the capital invested. What is the most you are prepared to pay for this security?"

The respondent can answer in three possible ways: 1) give the maximum price he/she is willing to pay, which we denote as *bet*; 2) don't know; 3) don't want to participate. Of the 8,135 heads of household, 3,288 answered they were willing to participate and reported a positive maximum price they were willing to bet (prices equal to zero are not considered a valid response). The valid responses to the question - *bet* - range from Lit. 1,000 to Lit. 100 million. Of the 3,288 heads, only 1878 have children aged 19-24 living at home. 96% of this sample is risk averse i.e. reported a maximum price *bet* less than Lit. 10 million, the rest is risk neutral or risk lover.

we control for the possibility that nonresponses may induce selection bias. To this extent we include in the model an equation where the probability of responding to the risk aversion question depends on exogenous individual characteristics and measures of the quality of the interview given by the interviewer which are exogenous to the schooling choice. We estimate a Heckman selection model of the probability of response on age, sex and education of the head's parents. The selection equation includes also five measures of the quality of the interview.[18] From this selection model we take the Mills ratio which we use to control for non response to the risk aversion question.

At a theoretical level, it is easy to show that there is a one-to-one correspondence between the value attached to the lottery and the degree of risk aversion. For a given level of wealth (w_i) and a potential gain (g_i), the optimal bet (bet_i) must solve the expected utility equation:

$$U_i(w_i) = \frac{1}{2}U_i(w_i + g_i) + \frac{1}{2}U_i(w_i - bet_i) = EU(w_i + R_i) \tag{5}$$

where R_i represents the (random) return of the lottery. Taking a second-order expansion, and noting that R_i is also the maximum purchase price (bet_i), we get that

$$EU(w_i + R_i) \approx U_i(w_i) + U_i'(w_i)E(R_i) + \frac{1}{2}U_i''(w_i)E(R_i)^2 \tag{6}$$

It is therefore possible to express risk aversion (say the Arrow-Pratt measure given by $\alpha = -U_i''(w_i)/U_i'(w_i)$) as a function of the parameters of the lottery and the the value of the bet of each individual:

$$A(w_i) \simeq \frac{-U_i''(w_i)}{U_i'(w_i)} = 4\left(5 - \frac{bet_i}{2}\right)/(10^2 + bet_i^2) \tag{7}$$

[18] The results of the Heckman model are not shown for reasons of space. The five measures of interview quality which appear in Table 2 of descriptive statistics are the following: No_understand is a dummy equal to 1 if, according to the interviewer, the level of understanding of the questionnaire by the head is poor or just acceptable (as opposed to satisfactory, good or excellent). Difficult in answering is a dummy equal to 1 if, according to the interviewer, it was difficult for the head to answer questions. No_interest is a dummy equal to 1 if, according to the interviewer, the interest for the questionnaire topics was poor or just acceptable (as opposed to satisfactory, good or excellent). No_reliable is a dummy equal to 1 if, according to the interviewer, the information regarding income and wealth are not reliable. No_climate is a dummy equal to 1 if, according to the interviewer, the overall climate when the interview took place was poor or just acceptable (as opposed to satisfactory or good). Only the variables no_understanding and difficult_to_answer are significant in the selection equation.

The sample of interest is restricted to those families with cohabiting children aged 19-24. Of the 3,288 heads with a valid answer to the risk aversion question, only 1,878 have children aged 19-24 living at home. 96% of this sample is risk averse i.e. reported a maximum price *bet* less than Lit. 10 million, the rest is risk neutral or risk lover. A comparison of the empirical distribution of our measure of risk aversion $A(w_i)$ in the sample of 1,878 families with cohabiting children aged 19-24 and in the sample of all lottery respondents including those without children or with children of a different age (the original sample of 3,458 families with a valid response to the lottery question) shows that the two distributions are similar and the bias in terms of risk aversion of considering only households with children of age 19-24 is not serious (see Figure 4).

5.2.2 Results

Columns 1 to 3 of Table 7 look at the effect of risk aversion on college enrolment using the sample of children of age 19-24 cohabiting with their original families. In all columns we control for non-response introducing the Mills' ratio. The results of Table 7 (column 1) indicate that the higher is risk aversion the lower is the probability of enrolling in college. In all specifications we still control for liquidity constraints to be sure that a significant effect of risk aversion is not simply reflecting the presence of liquidity constraints. The interaction (columns 2 and 3) of risk aversion and father low educated is not significant in the sample of 19-24 years old. The interaction is negatively related to the probability of attaining college only for the age group 25-29: the higher is risk aversion, the lower is the probability of attaining college for children of low-educated parents.

One problem with the estimate of risk aversion is that it may pick up some risk associated to the area of residence rather than individual preferences. In a world of incomplete markets, risk aversion may vary not only because of heterogeneity in tastes but also because individuals face different environments. In other words, our measure of risk aversion may be affected by background risk (Guiso and Paiella 2007). Our measure of background risk is intended to measure aggregate risk at the local level. It is obtained by regressing the log of GDP per capita in 1980-1995 for each province on a time trend, computing the variance of the residuals, and then attaching this estimate to all households living in the same province. The variance of GDP at the local level is always insignificant.

Column 3 instruments wealth, column 4 uses the larger sample of all children aged 19-29 living within the family. Similarly to the results relative to liquidity constraints, the coefficient on wealth is lower when we use IV probably reflecting the upward bias of OLS.

Finally in columns 5 to 7 we use the sample of children between 25 and 29 years of age living at home and enrolled in college. Column 5 shows OLS results with only the main effect of risk aversion (not significant), column 6 adds the interactions of risk aversion and father education. Column 7 instruments wealth. Both parents' education and wealth are significant predictors of their attaining the degree. Only in this sample the probability of enrolling in college is negatively correlated with the interaction of risk aversion and father low educated. The results show that parents' risk aversion is likely to impact the attainment of the degree among those who are already enrolled in college (or alternatively that the sample is not representative because we lose those who earn the degree because they leave home).

5.3 Discussion of results

On the basis of the previous two tables we conclude that two plausible explanations of the persisting gap in the attainment of the college degree depending on family background are the presence of liquidity constraints and a differential in parents' risk aversion by education. While liquidity constraints among low educated parents seem to affect enrollment in college (sample of 19-24 years old) rather than college attainment (sample of 25-29 years old), the reverse is true for parents' risk aversion which affects the probability of attaining the college degree only of those already enrolled (sample of 25-29) rather than the younger ones (sample of 19-24).

However, the existence of liquidity constraint and of different degrees in risk aversion by family background may not be the only explanation of the gap in college attainment. Another potential explanation lies in the systematically higher average returns to college for graduates with different father's education due for example to peer effects. In a labour market where a recommendation helps you find a better job, family networking may give access to different opportunities according to parents' education. In this case, other things constant, children from poorly educated and poorly connected families do have lower incentives to terminate college if children of college educated parents get better paid jobs at equal educational attainments.

In Table 8 we show the results of simple OLS regressions of log labour income on standard controls and interactions of education level with father's education. According to the birth cohort the gap in average returns of college between children whose father holds a college degree and whose father holds a lower high school degree is between 10 and 30%.

This evidence is only suggestive of the presence of network effects but cannot be considered definitive. In fact the existence of a differential return to education is plagued by obvious endogeneity issues since it is unclear whether a higher investment in education is a cause or a consequence of higher returns. In other words one cannot exclude that this evidence is actually due to omitted ability bias i.e. that the first order explanation for gaps in enrollment in college by family education is based on long-run family factors that are crystallised in ability.

6 Concluding remarks

In this paper we have shown that the degree of intergenerational mobility in educational attained has significantly increased in Italy over the last century. As such, we might infer that the equality of opportunity of the average individual has increased over time. However the average hides differences. In the general increase in educational attainment, the relative disadvantage of children from poorer background has remained stable, especially when considering both tails of the educational distribution. People from poorly educated parents are at higher risk of not going beyond compulsory education (corresponding to 8 years of education). They also suffer a disadvantage in achieving college education.

We provide an interpretation of the persistent gap in educational attainment based on liquidity constraints and the differences in degree of risk aversion by parents' background. If these are potential explanations for the intergenerational persistence of inequality of opportunities, there is some scope for policies aiming to reverse the situation. One set of policies could improve access to credit for Italian families with children in schooling age: recent work (Sciclone 2002) has shown that schooling and college grants so far implemented have proved very ineffective in the Italian education system. Another set of policies should address the issue of insurance against the risk of investment failure. Some sort of graduate tax (like those existing in Australia or in Sweden), whose repayment is conditional on achieving a minimum threshold of earnings, can provide such insurance, thus reducing the influence of risk aversion in preventing college enrolment.

Additional policies, not considered in the present framework, deal with institutional reforms of the educational system. The introduction of the so-called "Bologna system", which pushes all European countries to reorganise their higher education system by creating the possibility of obtaining a degree (equivalent to a Bachelor's degree) after three years of enrolment, should reduce the drop out rates, that affect disproportionately students from poorer background. We have also neglected differences in competences taught at school. The Italian high school system is organised according to different tracks (academic, technical and vocational), and students are selected into different tracks at the age of 14 mostly on family background. If different schools teach different abilities, then even when correcting previous factors (labour and financial markets) the situation could not improve, because students from less educated parents would more frequently end up in vocational schools, which do not provide an academic oriented education. In such a case, the only possible solution would be a comprehensive high school (in the line of the reforms experienced by many European countries in the 70's). If none of these reforms will be undertaken in the near future, we do not expect a persistent decline of the correlation in educational attainment across Italian generations.

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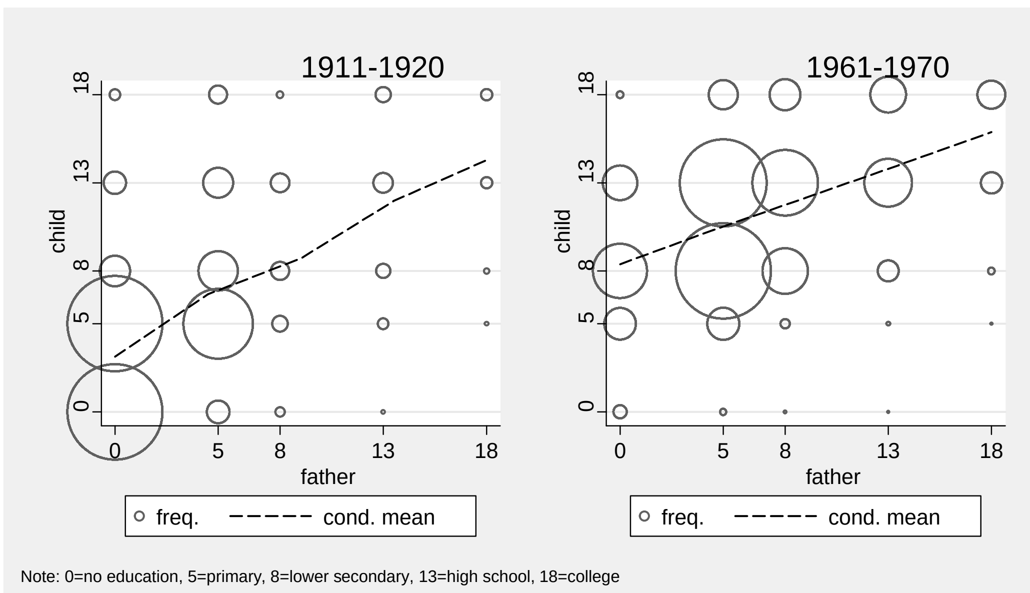

Figure 1: Nonparametric estimation of child over father highest degree completed. 1910-1920 and 1960-1970 children birth cohorts used.

Cohort	no degree (0 years)	primary (5 years)	lower secondary (8 years)	high school (13 years)	college (18 years)	N. obs.	average years of education
				Fathers			
1914 and before	64.0%	27.6%	2.5%	4.2%	1.7%	239	2.43
1915-19	60.9%	30.6%	2.7%	4.5%	1.2%	330	2.56
1920-24	55.8%	35.0%	4.0%	3.7%	1.4%	1070	2.81
1925-29	50.2%	39.3%	5.1%	4.0%	1.5%	1760	3.15
1930-34	43.8%	45.0%	6.1%	4.0%	1.2%	2522	3.47
1935-39	40.9%	46.6%	6.0%	4.7%	1.8%	3077	3.74
1940-44	32.0%	51.9%	8.3%	5.7%	2.2%	3382	4.38
1945-49	27.9%	54.8%	9.7%	5.6%	1.9%	4033	4.59
1950-54	23.8%	55.9%	11.3%	6.6%	2.4%	3760	5.00
1955-59	22.7%	52.8%	14.3%	7.4%	2.8%	3728	5.25
1960-64	17.1%	53.3%	16.8%	9.4%	3.4%	3544	5.85
1965-69	12.0%	51.3%	23.0%	11.0%	2.8%	2508	6.33
1970-74	11.3%	47.9%	24.9%	12.2%	3.7%	1088	6.64

Cohort	no degree (0 years)	primary (5 years)	lower secondary (8 years)	high school (13 years)	college (18 years)	N. obs.	average years of education
				Children			
1914 and before	27.6%	46.0%	9.2%	12.1%	5.0%	239	5.52
1915-19	23.6%	48.2%	13.3%	10.3%	4.5%	330	5.63
1920-24	18.9%	47.8%	14.7%	13.9%	4.8%	1070	6.23
1925-29	14.5%	51.0%	16.1%	13.2%	5.2%	1760	6.48
1930-34	13.5%	50.7%	19.4%	13.0%	3.5%	2522	6.40
1935-39	8.7%	50.7%	19.9%	16.1%	4.7%	3077	7.06
1940-44	4.6%	42.7%	24.7%	21.5%	6.4%	3382	8.06
1945-49	2.4%	32.8%	30.3%	25.9%	8.7%	4033	8.98
1950-54	1.5%	21.7%	34.1%	31.3%	11.4%	3760	9.93
1955-59	0.9%	12.3%	35.4%	40.5%	10.9%	3728	10.67
1960-64	0.6%	7.0%	40.2%	42.6%	9.5%	3544	10.82
1965-69	0.6%	5.3%	39.2%	44.8%	10.2%	2508	11.05
1970-74	0.7%	5.1%	41.4%	44.9%	8.0%	1088	10.83

Source: Our calculations on SHIW.
Note: Cohort refers to the year of birth of child.
The term *children* defines the set of householders and the spouse, when present.
Fathers is the set of fathers of *children*.

Table 1: Highest degree completed by birth cohort.

cohort	σ_c	σ_f	σ_c/σ_f
1910-1914	1.00	0.85	1.18
1915-1919	1.00	0.83	1.21
1920-1924	1.04	0.81	1.29
1925-1929	1.02	0.87	1.17
1930-1934	0.99	0.84	1.18
1935-1939	1.01	0.89	1.14
1940-1944	1.02	0.91	1.13
1945-1949	1.03	0.90	1.15
1950-1954	0.98	0.92	1.06
1955-1959	0.89	0.96	0.92
1960-1964	0.80	0.99	0.80
1965-1969	0.78	0.95	0.82
1970 and after	0.75	1.03	0.73

Table 2: Standard deviations of education of children and of fathers, with their ratio.

	Model (1)			Model (2)		
	(A)	(B)	(C)	(A)	(B)	(C)
	$\hat{\beta}_{father}$	$\hat{\beta}_{father}$	$\hat{\beta}_{mother}$	$\hat{\rho}_{father}$	$\hat{\rho}_{father}$	$\hat{\rho}_{mother}$
1910-1914	0.660***	0.654***	0.812***	0.575***	0.570***	0.525***
	(0.030)	(0.030)	(0.041)	(0.028)	(0.027)	(0.028)
1915-1919	0.682***	0.658***	0.779***	0.586***	0.565***	0.492***
	(0.031)	(0.031)	(0.043)	(0.028)	(0.028)	(0.029)
1920-1924	0.748***	0.722***	0.781***	0.608***	0.587***	0.532***
	(0.020)	(0.020)	(0.024)	(0.017)	(0.017)	(0.018)
1925-1929	0.659***	0.651***	0.711***	0.588***	0.582***	0.530***
	(0.016)	(0.016)	(0.020)	(0.015)	(0.015)	(0.016)
1930-1934	0.622***	0.602***	0.665***	0.555***	0.536***	0.504***
	(0.015)	(0.015)	(0.018)	(0.014)	(0.014)	(0.014)
1935-1939	0.596***	0.588***	0.643***	0.552***	0.544***	0.493***
	(0.014)	(0.013)	(0.017)	(0.013)	(0.013)	(0.013)
1940-1944	0.575***	0.565***	0.625***	0.530***	0.521***	0.485***
	(0.013)	(0.013)	(0.016)	(0.013)	(0.013)	(0.013)
1945-1949	0.566***	0.558***	0.618***	0.504***	0.497***	0.477***
	(0.013)	(0.013)	(0.015)	(0.012)	(0.012)	(0.012)
1950-1954	0.550***	0.541***	0.565***	0.511***	0.503***	0.463***
	(0.013)	(0.013)	(0.015)	(0.012)	(0.012)	(0.013)
1955-1959	0.472***	0.459***	0.481***	0.489***	0.475***	0.445***
	(0.012)	(0.012)	(0.015)	(0.012)	(0.012)	(0.013)
1960-1964	0.435***	0.423***	0.446***	0.499***	0.485***	0.452***
	(0.012)	(0.012)	(0.015)	(0.013)	(0.013)	(0.013)
1965-1969	0.459***	0.437***	0.430***	0.500***	0.476***	0.430***
	(0.015)	(0.015)	(0.017)	(0.015)	(0.015)	(0.015)
1970 and after	0.382***	0.357***	0.353***	0.472***	0.442***	0.410***
	(0.017)	(0.018)	(0.019)	(0.018)	(0.018)	(0.019)
Obs.	44609	44609	44425	44609	44609	44425
R squared	0.871	0.875	0.868	0.878	0.882	0.875
p-value	0.000	0.000	0.000	0.000	0.000	0.000

Source: our calculations on SHIW.
Notes: Standard errors in parenthesis. * p<.10, ** p<.05, *** p<.01
Model (1) estimates the β coefficient as in eq. (1), Model (2) estimates the ρ coefficient as in eq. (2).
In column (A) only the father's schooling (S_i^f) is included. In column (B) also regional (3 main areas) and sex dummies are included. In column (C), the mather's schooling (S_i^m) and geographical area and sex dummies are included.
Note: Standard errors in parenthesis.

Table 3: Corrected $\hat{\rho}$ coefficient for models of intergenerational education transmission, by birth cohort of child.

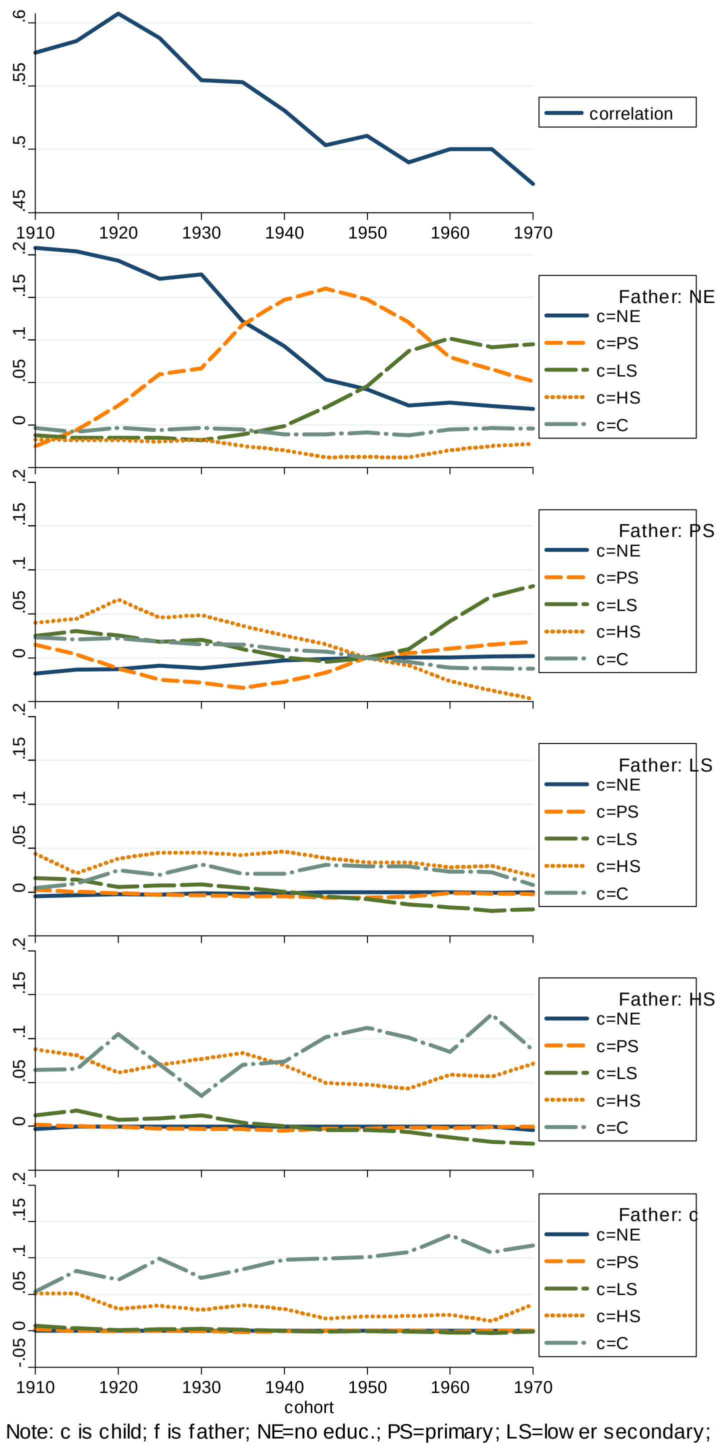

Figure 2: Decomposition of $\widehat{\rho}$ coefficient (Model 2, column (A), Table 3) depending on father's education. The $\widehat{\rho}$ coefficient of the first panel is equal to the vertical sum of the following 5 panels.

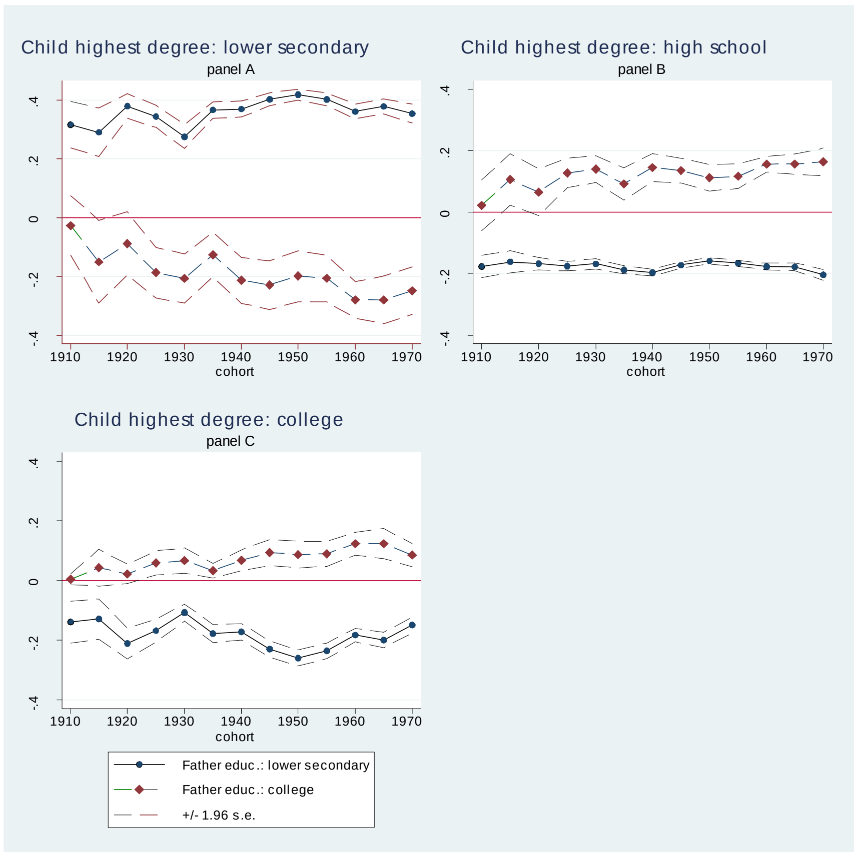

Figure 3: Marginal effects of ordered probits.

Variable	Obs	Mean	Std. Dev.	Min	Max
collegenroll	1878	0.37	0.48	0	1
age	1878	21.55	1.66	19	24
female	1878	0.48	0.50	0	1
household size	1878	4.34	1.09	2	9
number of siblings	1878	1.25	0.99	0	6
father's age	1878	52.93	6.07	33	83
Centre	1878	0.21	0.41	0	1
South	1878	0.43	0.50	0	1
Father: lower secondary	1878	0.73	0.45	0	1
Father: college	1878	0.07	0.26	0	1
wealth (euro 000.000)	1878	3.06	4.43	-.72	67.85
no_understand	1878	0.15	0.36	0	1
difficult	1878	0.04	0.20	0	1
no_interest	1878	0.22	0.42	0	1
no_reliable	1878	0.15	0.36	0	1
no_climate	1878	0.06	0.23	0	1
capital house (euro)	1824	1.47	1.32	-101823.1	2285816
house gift	1878	0.35	0.90	0	1
insurance (euro)	1878	92.60	1084.91	0	27000
benefits (euro)	1878	912.44	6991.44	0	159000
public aid (euro)	1878	72.24	888.82	0	19500
friends money (euro)	1878	215.60	2542.40	0	98000
liquidity constraint	1878	0.21	0.41	0	1
risk aversion	879	0.23	0.16	-.08	.39992
vargdp	1878	1.63	4.79	.0005263	22.26255

Table 4: Some descriptive statistics for the sample of children aged 19-24.

age	% who live at home	% student	% students who live at home	% liq. constr.	% liq. constr. (debt measure)	% liq. constr (liquid assets)
19	98.5%	45.0%	45.0%	22.5%	15.6%	9.8%
20	98.5%	43.1%	42.8%	21.1%	14.5%	8.8%
21	96.0%	39.9%	39.3%	20.9%	15.9%	7.2%
22	92.8%	30.6%	30.3%	24.3%	14.5%	12.0%
23	90.6%	30.1%	29.5%	18.0%	11.3%	9.3%
24	86.2%	26.7%	26.2%	26.2%	17.0%	12.2%
25	72.8%	30.1%	27.5%	20.4%	13.2%	10.3%
26	73.5%	26.8%	25.1%	17.7%	10.4%	8.4%
27	65.5%	21.3%	18.9%	18.3%	13.6%	8.0%
28	56.5%	19.5%	15.0%	26.2%	18.9%	9.1%
29	45.0%	17.7%	13.2%	25.1%	17.7%	12.1%

Table 5: Percentage of children aged 19-29 living at home.

	Probability of enrolling in college				Probability of attaining college		
	age 19-24	age 19-24	age 19-24	age 19-29	age 25-29	age 25-29	age 25-29
	OLS	OLS	IV	OLS	OLS	OLS	IV
wealth (euro 000.000)	0.021***	0.021***	0.019***	0.018***	0.017***	0.017***	0.017***
	(0.003)	(0.003)	(0.005)	(0.003)	(0.004)	(0.004)	(0.006)
female	0.082***	0.082***	0.082***	0.091***	0.102***	0.102***	0.101***
	(0.024)	(0.024)	(0.024)	(0.019)	(0.032)	(0.032)	(0.033)
Centre	-0.016	-0.015	-0.011	-0.004	0.005	0.005	-0.005
	(0.032)	(0.032)	(0.032)	(0.025)	(0.042)	(0.042)	(0.042)
South	0.032	0.034	0.041	0.091***	0.182***	0.182***	0.182***
	(0.029)	(0.030)	(0.030)	(0.023)	(0.039)	(0.039)	(0.040)
n. siblings	-0.038***	-0.038***	-0.033**	-0.036***	-0.029*	-0.029*	-0.027
	(0.014)	(0.014)	(0.014)	(0.011)	(0.017)	(0.017)	(0.017)
father age	-0.005**	-0.005**	-0.003*	-0.004***	-0.000	-0.000	-0.001
	(0.002)	(0.002)	(0.002)	(0.001)	(0.003)	(0.003)	(0.003)
father: lower secondary	-0.357***	-0.338***	-0.346***	-0.326***	-0.303***	-0.304***	-0.310***
	(0.029)	(0.031)	(0.031)	(0.025)	(0.043)	(0.044)	(0.044)
father: college	0.204***	0.223***	0.239***	0.217***	0.213***	0.210***	0.213***
	(0.059)	(0.061)	(0.060)	(0.048)	(0.078)	(0.080)	(0.080)
liquidity constraint	-0.153***	-0.017	-0.037	-0.036	-0.087**	-0.102	-0.094
	(0.030)	(0.083)	(0.081)	(0.069)	(0.042)	(0.121)	(0.122)
liq.constr. & father lower sec.		-0.159**	-0.165**	-0.116*		0.018	-0.008
		(0.078)	(0.077)	(0.068)		(0.149)	(0.145)
liq.constr. & father college		-0.185	-0.120	-0.106		0.055	-0.002
		(0.154)	(0.185)	(0.151)		(0.323)	(0.302)
obs.	1878	1878	1824	2873	995	995	963
Log likelihood	-1020.261	-1018.427	-1004.310	-1563.227	-530.278	-530.261	-525.847
χ-squared	443.029	446.697	407.807	611.346	184.795	184.828	159.900
Pseudo R squared	0.178	0.180	0.169	0.164	0.148	0.148	0.132

Notes: Standard errors in parenthesis. Omitted categories are: Male, North, father educ: high school, not liquidity constrained, father high school & liquidity constrained

* p<.10, ** p<.05, *** p<.01

Table 6: Liquidity constraints and college enrollment/attainment: marginal effects.

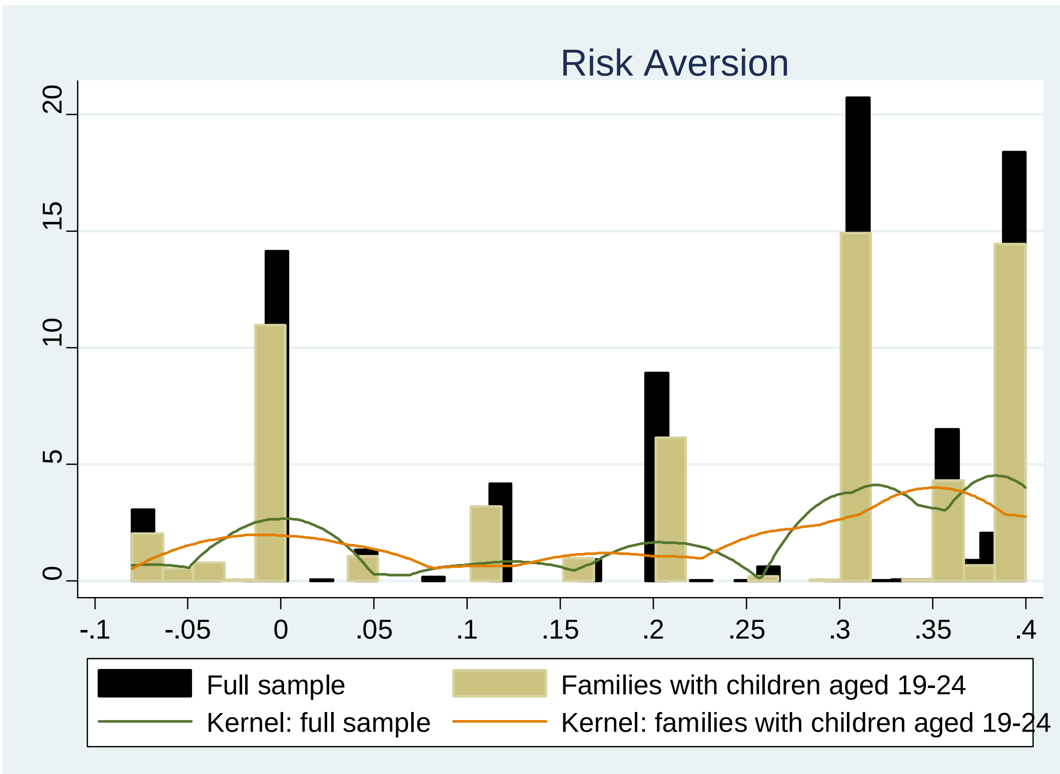

Figure 4: The distribution of risk aversion.

	Probability of enrolling in college				Probability of attaining college		
	age 19-24	age 19-24	age 19-24	age 19-29	age 25-29	age 25-29	age 25-29
	OLS	OLS	IV	OLS	OLS	OLS	IV
wealth	0.032***	0.031***	0.030***	0.022***	0.012**	0.012**	0.031***
	(0.006)	(0.006)	(0.009)	(0.004)	(0.006)	(0.006)	(0.010)
female	0.085**	0.086**	0.076**	0.084***	0.078	0.092*	0.084*
	(0.036)	(0.036)	(0.036)	(0.029)	(0.049)	(0.050)	(0.050)
center	-0.050	-0.044	-0.038	-0.023	-0.009	0.000	0.009
	(0.050)	(0.051)	(0.050)	(0.040)	(0.068)	(0.069)	(0.070)
south	0.050	0.043	0.050	0.096***	0.174***	0.193***	0.218***
	(0.044)	(0.045)	(0.045)	(0.035)	(0.059)	(0.060)	(0.061)
father educ: lower sec.	-0.230***	-0.217***	-0.207***	-0.193***	-0.266***	-0.118	-0.124
	(0.055)	(0.077)	(0.076)	(0.063)	(0.082)	(0.116)	(0.116)
father educ: college	0.217**	0.104	0.159	0.157	0.312**	0.276	0.238
	(0.089)	(0.143)	(0.133)	(0.120)	(0.143)	(0.229)	(0.232)
liquidity constraints	-0.102**	-0.101**	-0.125***	-0.078**	-0.002	-0.006	0.005
	(0.048)	(0.048)	(0.046)	(0.038)	(0.067)	(0.067)	(0.069)
risk av	-0.221*	-0.189	-0.113	-0.052	-0.148	0.292	0.311
	(0.115)	(0.215)	(0.215)	(0.176)	(0.157)	(0.312)	(0.317)
mills	-0.796***	-0.741***	-0.665**	-0.572***	-0.363	-0.332	-0.332
	(0.264)	(0.264)	(0.261)	(0.194)	(0.285)	(0.286)	(0.291)
n. siblings	-0.020	-0.022	-0.021	-0.040**	-0.075***	-0.079***	-0.083***
	(0.020)	(0.020)	(0.020)	(0.016)	(0.026)	(0.027)	(0.028)
father age	0.009*	0.008	0.007	0.006	0.003	0.002	0.002
	(0.005)	(0.005)	(0.005)	(0.004)	(0.006)	(0.006)	(0.006)
risk av.&f.lower sec.		-0.091	-0.231	-0.249		-0.636*	-0.652*
		(0.258)	(0.256)	(0.208)		(0.364)	(0.369)
risk av.&f. college		0.504	0.278	0.390		0.229	0.056
		(0.526)	(0.498)	(0.437)		(0.826)	(0.823)
vargdp		-0.005	-0.006	-0.002	0.005	0.004	0.005
		(0.004)	(0.004)	(0.003)	(0.005)	(0.005)	(0.005)
Obs.	879.000	879.000	866.000	1321.000	442.000	442.000	433.000
Log likelihood	-455.346	-453.755	-461.194	-693.675	-231.365	-229.447	-224.636
χ-squared	257.688	260.870	230.587	337.177	87.682	91.519	89.667
Pseudo R squared	0.221	0.223	0.200	0.196	0.159	0.166	0.166

Notes: Standard errors in parenthesis. Omitted categories are: Male, North, father educ: high school, father high school & risk av.
* p<.10, ** p<.05, *** p<.01

Table 7: The role of risk aversion: marginal effects.

	birth cohort 1940-1949	birth cohort 1950-1959	birth cohort 1960-1969	birth cohort 1970-over
age	0.123***	0.126***	0.111***	0.264***
	(0.044)	(0.024)	(0.024)	(0.056)
age squared	-0.001***	-0.001***	-0.001***	-0.004***
	(0.000)	(0.000)	(0.000)	(0.001)
female	-0.373***	-0.427***	-0.405***	-0.325***
	(0.021)	(0.015)	(0.016)	(0.031)
Center	-0.044*	-0.067***	-0.109***	-0.155***
	(0.025)	(0.018)	(0.021)	(0.041)
South	-0.176***	-0.232***	-0.272***	-0.240***
	(0.023)	(0.017)	(0.019)	(0.037)
Education: lower secondary	-0.465***	-0.396***	-0.201**	0.166
	(0.111)	(0.106)	(0.082)	(0.124)
Education: college	0.132*	0.248***	0.161***	0.200**
	(0.077)	(0.051)	(0.050)	(0.088)
child lower secondary & father lower secondary	-0.093	0.013	-0.114	-0.264**
	(0.098)	(0.100)	(0.077)	(0.117)
child lower secondary & father college	-0.180	0.456	-0.061	-0.034
	(0.289)	(0.434)	(0.240)	(0.582)
child high school & father lower secondary	-0.179***	-0.093**	-0.087***	0.033
	(0.057)	(0.037)	(0.033)	(0.053)
child high school & father college	-0.138	-0.027	0.136*	0.105
	(0.119)	(0.077)	(0.077)	(0.114)
child college & father college	0.006	-0.043	-0.105**	-0.036
	(0.067)	(0.045)	(0.051)	(0.106)
child college & father lower secondary	0.179**	0.174***	0.057	0.312***
	(0.085)	(0.060)	(0.063)	(0.114)
Constant	7.126***	7.220***	7.840***	5.511***
	(1.171)	(0.521)	(0.431)	(0.784)
Observations	4657	6935	5725	1430
R-squared	0.191	0.209	0.160	0.174
F-stat	84.128	140.648	83.650	22.946

Source: our calculations on SHIW1993-SHIW2004.
Notes: Dependent variable is log-income from employment and self-employment. Standard errors in parenthesis. * p<.10, ** p<.05, *** p<.01

Table 8: Returns to college by father's education