

# Intergenerational Persistence in Educational Attainment in Italy

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## **Abstract**

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, focussing 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 tentative evidence on the persistent differential in returns to college educations depending on father's education is also provided.

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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 et al., 1999). In his review of existing crosscountry comparative evidence, Corak (2006) laments the scarcity of data available for this country. 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, for two reasons. The first one is because educational attainment has worth by its own. The Italian Constitutional Law, introduced 60 years ago, declares that the state should remove any obstacle of social and economic nature that impedes social mobility and that the highest degrees of education should be attained on the basis of merit.<sup>1</sup> As a consequence, a high level of intergenerational mobility can be interpreted as supportive evidence for the Constitutional mandate. The second reason is that the absence of longitudinal datasets 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 (2006) adopts a two-sample two-stage strategy to estimate intergenerational correlation in incomes for Italy. He uses the Survey of Household Income and Wealth dataset conducted by the Bank of Italy (SHIW hereafter) finding that Italy is one of the most immobile country under this methodology of measurement (with an intergenerational correlation in incomes as high as 0.84). When decomposing intergenerational mobility channels between return to education and liquidity

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<sup>1</sup>The article 34 of the Italian Constitutional law states that "The school is open to everyone. Initial education, taught for at least eight years, is free and compulsory. The deserving ones, even if lacking economic means, are entitled to reach the highest level of education. The Italian Republic makes such right effective through scholarships, household subsidies and any other form of grants, which has to be assigned through public competition."

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. Also Piraino (2007) adopts a similar strategy to predict parental income in the SHIW dataset, finding a high intergenerational persistence (in the order of 0.48), where less than one third (28%) is attributable to the educational channel.<sup>2</sup> However this procedure has limitations, as pointed out by Grawe in Corak (2006): on one side, 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.

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

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<sup>2</sup>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 2005 using IALS (International Adult Literacy Survey) survey ranks Italy high in terms of intergenerational mobility in education.

new. Shavit and Blossfeld (1993) were among the first to produce a comparative study of intergenerational persistence in education by studying the correlation of children attainment with parental background, confirming the absence of contribution of the higher education expansion in 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 et al. (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 et al., 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.<sup>3</sup>

Due to the lack of data, we cannot test the extent of association between skill formation and parental background for Italy.<sup>4</sup> 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 education attainments is provided. In Section 3 a simple 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.

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<sup>3</sup>"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, p.C58).

<sup>4</sup>Checchi and Flabbi 2007 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.

## 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 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 containing 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 waves from 1993 to 2004, selected only the householder and -when present- his/her partner (which we refer to as the 'children' generation) and their parents. After elimination of repeated observations which belong to the panel section of the data,<sup>5</sup> we remain with 45,682 children (21,241 males and 24,441 females) and 41,134 fathers. 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%

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<sup>5</sup>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 spouse).

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 time, also due to the fact that 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. Across this period, dispersion also increased. This movement of frequency mass was due partly to the development of the country that asked for more education and partly to the accomplishment of compulsory education reforms.<sup>6</sup>

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

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<sup>6</sup>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 up 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 last year.

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 youngest generations although lower than for older ones. This descriptive evidence points at analysing the issue in more detail.

### 3 The Model 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 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 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

$$S_i^c = \alpha + \gamma S_i^f + \varepsilon_i \text{ for } i = 1, \dots, N \quad (1)$$

where,  $S_i^c, S_i^f$  are education of child  $i$  and of father of child  $i$ , respectively,  $\varepsilon_i$  is the error term and  $\gamma$  is a parameter. The OLS estimate of  $\gamma$  is

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

where  $\sigma_j, \rho_{cf}$  are the standard deviation of errors for  $j = c, f$  generations and the correlation coefficient between child's and father's education. Clearly, a decreasing  $\hat{\gamma}$  cannot be interpreted as a reduced intergenerational transmission of education as it might be solely due to a reduction in  $\sigma_c/\sigma_f$ . As the ratio of standard deviations decreased through time in Italy (see Table 2), we normalised years of schooling of child and father by the corresponding standard deviation and estimate separately for each cohort the following equation:<sup>7</sup>

$$\frac{S_i^c}{\sigma_c} = \alpha + \beta \frac{S_i^f}{\sigma_f} + \varepsilon_i \quad (2)$$

The temporal evolution of the OLS coefficient is interpreted in terms of correlation of child's and father's education and as a measure of inequality of circumstances, which are independent on child's effort. A high estimate of  $\beta$  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 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'

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<sup>7</sup>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 less children but give them a better education.

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 parents' 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.<sup>8</sup>

As data often do not allow a proper IV estimation of the  $\beta$  coefficient and therefore the interpretation of  $\beta$  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 biasing 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 years of education (5, 8, 13, 18 years of education corresponding to primary, lower secondary, high school and college respectively).

The estimate of the correlation coefficient shows a clear downward trend across time (Table 3). It was equal to 0.575 for the oldest cohort consid-

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<sup>8</sup>The most recent examples of IV techniques 1) and 2) are: Behrman and Rosenzweig (2002), Bjiörklund et al. (2006), Black et al. (2005), Dearden et al. (1997), Plug and Vijverberg (2003) and Sacerdote (2002). Some examples of the third approach are: Chevalier (2004), Oreopoulos et al. (2006).

ered, 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  $\beta$  would be unbiased.<sup>9</sup> 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 than people living in the South. Model 2 in Table 3 controls 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 but nothing changes in terms of the trend of the coefficient. In Model 3, the father's education is replaced by mother's but again there is no major change in the trend of intergenerational coefficient nor on the magnitude of the estimated OLS coefficient. Finally, in Model 4 we included both parents' education as well as age and regional controls finding that the intergenerational 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.<sup>10</sup>

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<sup>9</sup>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.

<sup>10</sup>As an illustration of IV estimates we could use the reform of 1962 which made lower secondary school compulsory for all cohorts born after 1950. The OLS estimation obtained on the pooled data is  $\hat{\beta} = 0.548$ . The IV estimate obtained instrumenting  $S_i^f$  with the grandfather's education and a dummy for the reform is  $\beta = 0.540$ . Similarly to most of the

## 4 A deeper look into education transmission dynamics

The mean of 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 permanent income, as proxied by parents' education attainment.

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:  $1, 2, \dots, S$ , the OLS coefficient of model (2) is equal to the correlation coefficient and can be written as:

$$\hat{\beta} = \sigma_{cf} / \sigma_c \sigma_f = \sum_{c,f} (c - E(c))(f - E(f)) Pr(c, f) / \sigma_c \sigma_f \quad (3)$$

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

where  $E$  denotes the expected value. Hence,  $\hat{\beta}$  depends on how large is the combined effect of the absolute deviation of children's and of fathers' education from their respective average (term (A)), on the marginal distribution of a child's education given that of his/her father (term (B)) and on the marginal

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literature, IV estimates are lower than OLS estimates. One limitation of this strategy is that the reform applied uniformly on the whole Italian territory, therefore preventing any variation across parents who belong to the same cohort, moreover it affects only few cohorts.

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  $\hat{\beta}$  in each cohort is the sum of 25 elements. Figure 2 presents the decomposition above by grouping the components of  $\hat{\beta}$  into five groups depending on father's education. The vertical sum of all the 25 lines equals the  $\hat{\beta}$  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 across time;
2. a sizable and nondecreasing proportion of the correlation coefficient is due to the group of college educated child and father with college or high school education.

While the first is mainly a composition effect, a natural consequence of the increase of average education and of compulsory education reforms, the second 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 was equal regardless of the father's achievement. In other terms, one would find equality of opportunity only if the distribution of the term B was uniform.

To investigate whether this clear reduction of children-parents educational achievement correlation is similar regardless of parents' background, from here

onwards we consider 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 obtaining any given degree 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 tentative 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 et al., 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 credit 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).<sup>11</sup> 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 improve 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.<sup>12</sup>

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<sup>11</sup>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.

<sup>12</sup>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.

### 5.1.1 Measures of liquidity constraints

We use the 1995 SHIW because it is the only wave with measures of liquidity constraints. We build a direct measure of liquidity constraints as a dummy to indicate discouraged borrowers and rejected loan applicants. These 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 and those with debt  $>25\%$  of total net worth.

### 5.1.2 The Data and Sample Selection

To investigate the two possible explanations of differential college attainment 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 and the lottery question is asked to the household head only. Unfortunately 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 conditional on enrollment.

The first sample is limited to children of age 19-23 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 and occupation of the father and mother. This selection process leaves us with a final sample of 2,435 individuals. We run probit models on the choice to enroll in college, where the dependent variable is equal to 1 if the individual holds a secondary school degree and is a student and is equal to 0 if he or she is not a student. We select the age range between 19-23 in order to consider only individuals who have already terminated high school but 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 95% of the 19-23 years old live in the family of origin. Potential sample bias of children who still live with their family is the reason 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. This sample is more selected because not all individuals of age 24-29 still live at home (81% do) but has the advantage of including also individuals who already have finished college education (which is ultimately the object of our research). 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 of all individuals of age 24-29 cohabiting with their original families conditional on college enrollment. The same sample selection criteria as above leaves us with a sample of 834 individuals. We run probit models where the dependent variable is equal to 1 if the individual has obtained a college degree and is equal to 0 if he or she holds a lower degree and is still

a student. 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 69% of all 24-29 years old in this sample still live with their original families.

### 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 family components, the number of family income recipients, the number of siblings, and 5 dummies each for the occupation of the father and of the mother which are not reported for space reasons.

Columns 1 to 4 of Table 4 look at college enrolment using the sample of children of age 19-23 cohabiting with their original families. Table 4 shows 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 (column 1) and significant and 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.

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<sup>13</sup>, the age of the father of the head of household (in three dummies-born between 1900-1909, born 1910-1919 and born 1920 or af-

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<sup>13</sup>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.

ter) as a proxy of inherited wealth, 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 4 are significant and higher (in absolute value) than the OLS.<sup>14</sup>

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

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<sup>14</sup>One may expect a bias in the OLS estimate:  $collegeenroll_i = X_i'\beta + \delta W_i + \delta_1 a_i^f + \delta_2 a_i^c + \varepsilon_{1i}$

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 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:  $\hat{\delta}_{ols} = \delta + \delta_1 \frac{cov(W, a^f)}{V(W)}$ . 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  $\delta$  should be biased upwards.

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). In this case 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 6 of Table 4 look at college attainment conditional on enrolment using the sample of children of age 24-29 cohabiting with their original families. Columns 5 and 6 show that liquidity constraints are unlikely to impact the attainment of the degree among those who are already enrolled in college. The sample in these two columns is limited to students between 24 and 29 years of age living at home; the dependent variable is equal to 1 if they attain the degree and 0 if they are still students. Neither parents' education nor wealth is a significant predictor of their attaining the degree, conditional on being students. An alternative explanation is that we lose those who earn the degree and leave home immediately afterwards.

## **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 indi-

viduals 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 et al. (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 go to college at equal levels of parents' education and wealth. The focus on parents' risk aversion allows us to comple-

ment 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.<sup>15</sup>

### 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.<sup>16</sup> 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. 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

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<sup>15</sup>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 secondary schools -5 year courses-are intended for those who predict 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)

<sup>16</sup>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 1075 have children aged 19-23 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.

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 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.<sup>17</sup> 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:

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<sup>17</sup>The results of the Heckman model are not shown for reasons of space. The five measures of interview quality are the following: No\_understanding 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. Atmosphere 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.

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

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

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

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:

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

The sample of interest is restricted to those families with cohabiting children aged 19-23. Of the 3,288 heads with a valid answer to the risk aversion question, only 1179 have children aged 19-23 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 1,179 families with cohabiting children aged 19-23 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 19-23 is not serious (see Figure 4).

### 5.2.2 Results

Columns 1 to 5 of Table 5 look at the effect of risk aversion on college enrolment using the sample of children of age 19-23 cohabiting with their original families. The results of Table 5 (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 to 5) of risk aversion and father low educated is significant negatively related to the probability of enrolling in college: the higher is risk aversion, the lower is the probability of enrolling in college for children of low-educated parents.

The estimate of risk aversion 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 in the following way: for each province we regress the log of GDP per capita in 1980-1995 on a time trend and compute the variance of the residuals. We then attach this estimate to all households living in the same province. The variance of GDP at the local level is insignificant.

Column 3 instruments wealth, column 4 instruments wealth and controls for non-response introducing the Mills' ratio and column 5 uses the larger sample of all children aged 19-29 living within the family. All columns confirm the robustness of the result that the probability of enrolling in college is negatively correlated with the interaction of risk aversion and father low educated. Similarly to the results relative to liquidity constraints, the coefficient on wealth is

higher when we use IV probably reflecting the presence of measurement error in wealth.

Finally in columns 6 and 8 we use the sample of children between 24 and 29 years of age living at home and enrolled in college. The dependent variable is equal to 1 if they attain the degree and 0 if they are still students. Column 6 shows OLS results, column 7 instruments wealth and column 8 introduces the Mills' ratio. Neither parents' education nor wealth and risk aversion are significant predictors of their attaining the degree, conditional on being already enrolled in college. The results show that parents' risk aversion is unlikely 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. Both liquidity constraints and risk aversion seem to affect enrollment in college rather than college attainment conditional on enrollment.

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 of college 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 con-

stant, 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 6 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 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 attainment 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 inefficient 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 to obtain 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 pro-

vide 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.

## 7 Figures and tables

Cohort	<b>Fathers</b>						N. obs.	average years of education
	no degree (0 years)	primary (5 years)	lower secondary (8 years)	high school (13 years)	college (18 years)			
1914 and before	60.9%	28.5%	4.7%	4.1%	1.8%	680	2.66	
1915-19	60.5%	30.4%	3.3%	4.0%	1.8%	730	2.62	
1920-24	57.0%	34.7%	3.7%	3.4%	1.1%	2,113	2.68	
1925-29	51.0%	37.6%	5.6%	4.1%	1.7%	2,919	3.17	
1930-34	44.8%	43.9%	6.0%	3.9%	1.3%	3,578	3.42	
1935-39	41.2%	45.8%	6.3%	4.8%	1.9%	4,119	3.76	
1940-44	33.3%	50.5%	8.5%	5.5%	2.2%	4,264	4.32	
1945-49	28.4%	53.9%	9.8%	5.8%	2.1%	4,878	4.61	
1950-54	23.8%	55.2%	11.6%	6.9%	2.5%	4,538	5.03	
1955-59	22.4%	52.0%	14.9%	7.6%	3.1%	4,472	5.33	
1960-64	16.9%	52.0%	17.4%	9.8%	3.9%	4,273	5.97	
1965-69	12.0%	50.0%	23.0%	12.0%	3.0%	3,109	6.44	
1970-74	11.9%	44.3%	25.3%	14.3%	4.2%	1,461	6.86	

Cohort	<b>Children</b>						N. obs.	average years of education
	no degree (0 years)	primary (5 years)	lower secondary (8 years)	high school (13 years)	college (18 years)			
1914 and before	37.6%	43.5%	8.5%	7.9%	2.5%	987	4.34	
1915-19	30.3%	46.9%	11.9%	7.8%	3.1%	950	4.86	
1920-24	24.2%	50.1%	11.5%	10.4%	3.8%	2,462	5.45	
1925-29	17.0%	52.1%	14.9%	11.9%	4.1%	3,280	6.08	
1930-34	15.5%	51.4%	17.8%	12.1%	3.3%	3,951	6.15	
1935-39	9.4%	50.5%	19.9%	15.4%	4.6%	4,548	6.96	
1940-44	5.7%	42.5%	25.0%	20.9%	5.9%	4,666	7.90	
1945-49	2.8%	32.9%	29.3%	26.1%	8.9%	5,288	8.98	
1950-54	1.6%	21.6%	33.9%	31.7%	11.2%	4,927	9.93	
1955-59	1.0%	12.7%	35.0%	40.2%	11.2%	4,860	10.66	
1960-64	0.7%	7.1%	39.8%	42.1%	10.3%	4,685	10.86	
1965-69	0.6%	5.5%	39.3%	43.8%	10.8%	3,432	11.05	
1970-74	0.9%	5.1%	39.2%	44.6%	10.3%	1,646	11.04	

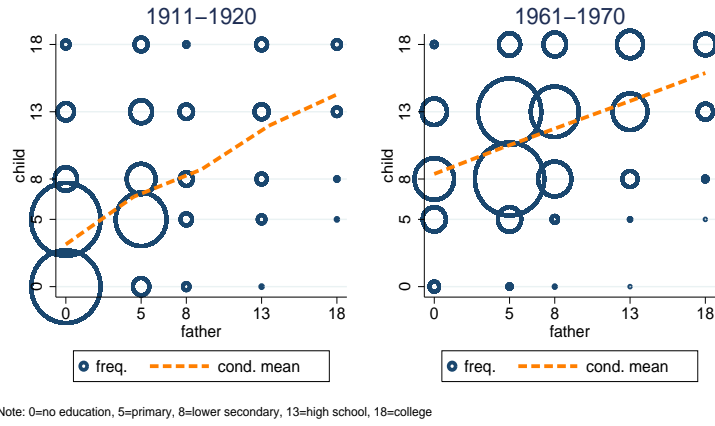
Source: Our calculations on SHIW.

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.



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

cohort	$\sigma_c$	$\sigma_f$	$\sigma_c/\sigma_f$
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	Model 3	Model 4	
	$\beta_f$	$\beta_f$	$\beta_m$	$\beta_f$	$\beta_m$
1910-1914	0.575*** (0.028)	0.570*** (0.027)	0.525*** (0.028)	0.409*** (0.043)	0.209*** (0.043)
1915-1919	0.586*** (0.028)	0.565*** (0.028)	0.492*** (0.029)	0.451*** (0.042)	0.154*** (0.043)
1920-1924	0.608*** (0.017)	0.587*** (0.017)	0.532*** (0.018)	0.430*** (0.026)	0.216*** (0.026)
1925-1929	0.588*** (0.015)	0.582*** (0.015)	0.530*** (0.016)	0.422*** (0.024)	0.207*** (0.024)
1930-1934	0.555*** (0.014)	0.536*** (0.014)	0.504*** (0.014)	0.356*** (0.020)	0.239*** (0.020)
1935-1939	0.552*** (0.013)	0.544*** (0.013)	0.493*** (0.013)	0.394*** (0.019)	0.205*** (0.019)
1940-1944	0.530*** (0.013)	0.521*** (0.013)	0.485*** (0.013)	0.359*** (0.019)	0.217*** (0.019)
1945-1949	0.504*** (0.012)	0.497*** (0.012)	0.477*** (0.012)	0.320*** (0.018)	0.238*** (0.018)
1950-1954	0.511*** (0.012)	0.503*** (0.012)	0.463*** (0.013)	0.365*** (0.018)	0.191*** (0.018)
1955-1959	0.489*** (0.012)	0.475*** (0.012)	0.445*** (0.013)	0.336*** (0.019)	0.188*** (0.019)
1960-1964	0.499*** (0.013)	0.485*** (0.013)	0.452*** (0.013)	0.329*** (0.019)	0.214*** (0.019)
1965-1969	0.500*** (0.015)	0.476*** (0.015)	0.430*** (0.015)	0.345*** (0.021)	0.181*** (0.021)
1970 and after	0.472*** (0.018)	0.442*** (0.018)	0.410*** (0.019)	0.292*** (0.027)	0.198*** (0.027)
Obs.	44609	44609	44425	44114	
R squared	0.878	0.882	0.875	0.885	
p-value	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 only controls for father's education ( $S^f$ ):

$$\text{Model 1: } \frac{S_i^c}{\sigma_c} = \alpha + \beta_f \frac{S_i^f}{\sigma_f} + \varepsilon_i$$

Model 2 controls for father's education ( $S^f$ ) and a set of controls  $X$ :

$$\text{Model 1: } \frac{S_i^c}{\sigma_c} = \alpha + \beta_f \frac{S_i^f}{\sigma_f} + \gamma X_i + \varepsilon_i$$

Model 3 controls for mother's education ( $S^m$ ) and a set of controls  $X$ :

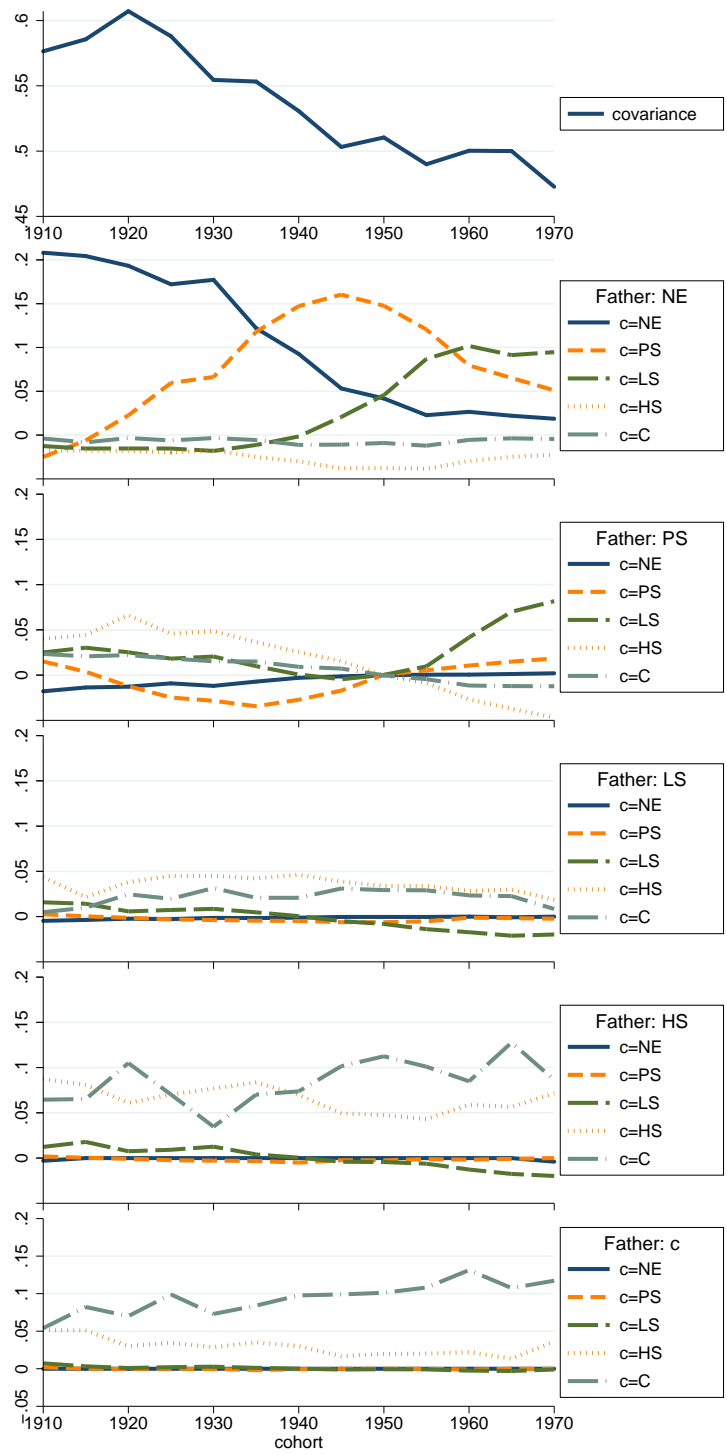
$$\text{Model 3: } \frac{S_i^c}{\sigma_c} = \alpha + \beta_m \frac{S_i^m}{\sigma_m} + \gamma X_i + \varepsilon_i$$

Model 4 controls for both parents' education and a set of controls  $X$ :

$$\text{Model 4: } \frac{S_i^c}{\sigma_c} = \alpha + \beta_f \frac{S_i^f}{\sigma_f} + \beta_m \frac{S_i^m}{\sigma_m} + \gamma X_i + \varepsilon_i$$

Note: The set of controls  $X$  includes sex and regional dummies (3 main areas). Standard errors in parenthesis.

**Table 3:** Corrected  $\beta$  coefficient for models of intergenerational education transmission, by birth cohort of child.



Note: c is child; f is father; NE=no educ.; PS=primary; LS=lower secondary; HS=high school; C=College

**Figure 2:** Decomposition of  $\beta$  coefficient (Model 1, Table 3) depending on father's education. The  $\beta$  coefficient of the first panel is equal to the vertical sum of following 5 panels.

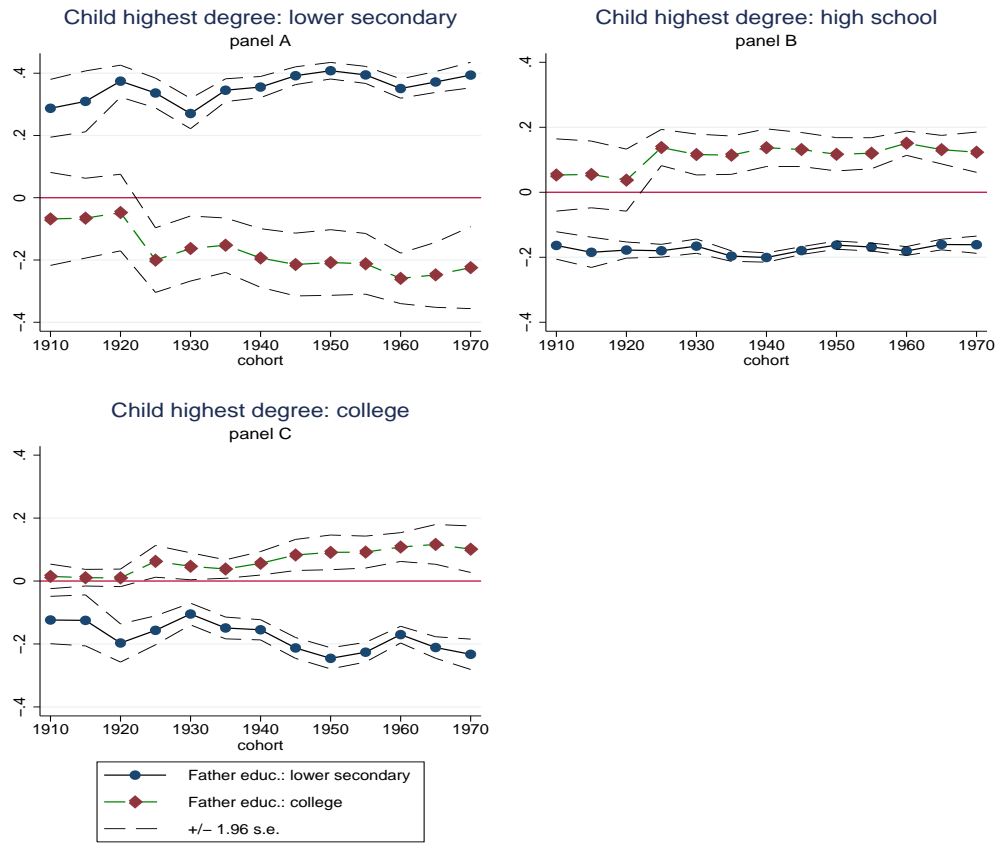


Figure 3: Marginal effects of ordered probits.

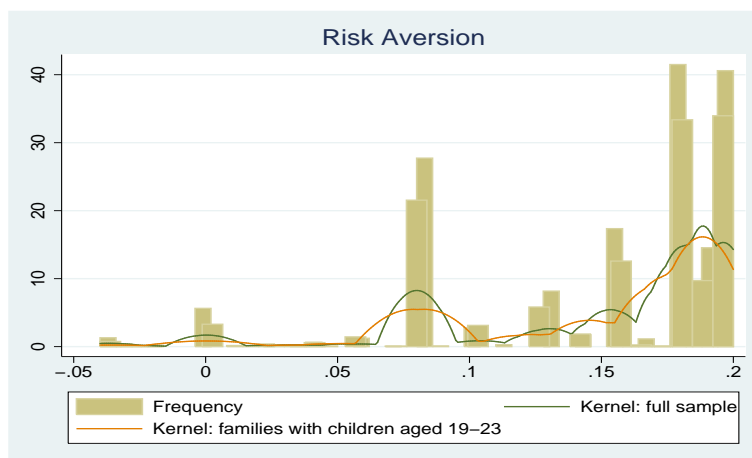


Figure 4: The distribution of risk aversion.

	Probability of enrolling in college				Probability of attaining college	
	age 19-23 OLS	age 19-23 OLS	age 19-23 IV	age 19-29 OLS	age 24-29 OLS	age 24-29 IV
wealth (euro 000.000)	0.276*** (0.042)	0.273*** (0.042)	0.319*** (0.072)	0.248*** (0.033)	0.040 (0.050)	-0.078 (0.108)
female	0.064*** (0.017)	0.064*** (0.017)	0.067*** (0.018)	0.077*** (0.014)	0.013 (0.037)	0.004 (0.038)
Centre	-0.018 (0.023)	-0.017 (0.023)	-0.018 (0.024)	-0.003 (0.019)	-0.013 (0.053)	-0.023 (0.053)
South	0.001 (0.020)	-0.000 (0.020)	0.003 (0.021)	0.044*** (0.016)	-0.028 (0.041)	-0.050 (0.042)
father educ: lower sec.	-0.321*** (0.023)	-0.253*** (0.032)	-0.266*** (0.032)	-0.262*** (0.026)	0.008 (0.051)	0.002 (0.052)
father educ: college	0.184*** (0.051)	0.227*** (0.069)	0.252*** (0.068)	0.155*** (0.049)	0.100 (0.078)	0.118 (0.080)
liquidity constraint	-0.051*** (0.017)	0.052 (0.034)	0.043 (0.035)	0.042 (0.029)	0.074 (0.067)	0.067 (0.068)
liquidity constraint & father lower sec.		-0.136*** (0.039)	-0.136*** (0.040)	-0.105*** (0.032)	-0.086 (0.078)	-0.083 (0.080)
liquidity constrained & father college		-0.084 (0.071)	-0.095 (0.072)	-0.034 (0.060)	-0.143* (0.086)	-0.146* (0.087)
Obs.	2444	2444	2312	3690	673	648
Log likelihood	-1297.699	-1291.355	-1243.602	-1966.375	-429.346	-414.975
$\chi$ -squared	549.827	562.515	511.267	732.192	5.698	5.621
Pseudo R squared	0.175	0.179	0.171	0.157	0.007	0.007

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 4:** Liquidity constraints and college enrollment/attainment: marginal effects

	Probability of enrolling in college					Probability of attaining college			
	age 19-23		age 19-23		age 19-29	age 24-29		age 24-29	
	OLS	OLS	IV	IV	OLS	OLS	IV	IV	
wealth (euro 000.000)	0.316*** (0.066)	0.302*** (0.066)	0.432*** (0.105)	0.435*** (0.105)	0.259*** (0.050)	-0.080 (0.122)	-0.247 (0.175)	-0.275 (0.171)	
female	0.062** (0.024)	0.063** (0.024)	0.057** (0.025)	0.055** (0.025)	0.071*** (0.020)	-0.011 (0.056)	-0.012 (0.056)	-0.009 (0.055)	
Centre	-0.017 (0.035)	-0.015 (0.036)	-0.017 (0.036)	-0.014 (0.036)	-0.011 (0.029)	-0.004 (0.086)	-0.011 (0.086)	0.030 (0.085)	
South	0.023 (0.028)	0.018 (0.029)	0.025 (0.029)	0.035 (0.029)	0.046* (0.024)	-0.079 (0.067)	-0.093 (0.068)	-0.105 (0.066)	
father educ: lower sec.	-0.292*** (0.031)	-0.161* (0.085)	-0.157* (0.085)	-0.121 (0.083)	-0.146** (0.071)	0.037 (0.165)	0.014 (0.164)	-0.057 (0.157)	
father educ: college	0.268*** (0.072)	0.547*** (0.196)	0.582*** (0.157)	0.567*** (0.172)	0.109 (0.130)	-0.214 (0.212)	-0.223 (0.204)	-0.141 (0.243)	
liquidity constraint	-0.026 (0.025)	-0.026 (0.025)	-0.031 (0.026)	-0.033 (0.026)	-0.011 (0.021)	0.061 (0.063)	0.061 (0.064)	0.068 (0.061)	
risk av.	-0.439** (0.224)	0.097 (0.354)	0.099 (0.357)	0.069 (0.355)	0.175 (0.298)	-0.542 (0.726)	-0.630 (0.726)	-0.420 (0.689)	
risk av. & f. lower sec.		-0.834* (0.451)	-0.933** (0.456)	-0.815* (0.456)	-0.926** (0.379)	-0.086 (1.074)	0.082 (1.078)	-0.848 (1.055)	
risk av. & f. college		-1.902 (1.626)	-2.302 (1.588)	-2.314 (1.605)	0.411 (0.743)	2.183 (1.880)	2.327 (1.900)	1.986 (1.813)	
variance of local GDP		-0.003 (0.003)	-0.003 (0.003)	-0.003 (0.003)	-0.001 (0.002)	0.004 (0.006)	0.002 (0.006)	-0.000 (0.006)	
Mills ratio				-0.293*** (0.104)				1.053*** (0.213)	
Obs.	1179	1179	1144	1144	1704	294	285	285	
Log likelihood	-616.465	-613.845	-599.357	-595.218	-901.965	-186.678	-179.977	-169.471	
$\chi$ -squared	297.854	303.094	289.458	297.736	366.694	6.216	8.152	29.165	
Pseudo R squared	0.195	0.198	0.195	0.200	0.169	0.016	0.022	0.079	

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 5:** 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*** (0.044)	0.126*** (0.024)	0.111*** (0.024)	0.264*** (0.056)
age squared	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.004*** (0.001)
female	-0.373*** (0.021)	-0.427*** (0.015)	-0.405*** (0.016)	-0.325*** (0.031)
Center	-0.044* (0.025)	-0.067*** (0.018)	-0.109*** (0.021)	-0.155*** (0.041)
South	-0.176*** (0.023)	-0.232*** (0.017)	-0.272*** (0.019)	-0.240*** (0.037)
Education: lower secondary	-0.465*** (0.111)	-0.396*** (0.106)	-0.201** (0.082)	0.166 (0.124)
Education: college	0.132* (0.077)	0.248*** (0.051)	0.161*** (0.050)	0.200** (0.088)
child lower secondary & father lower secondary	-0.093 (0.098)	0.013 (0.100)	-0.114 (0.077)	-0.264** (0.117)
child lower secondary & father college	-0.180 (0.289)	0.456 (0.434)	-0.061 (0.240)	-0.034 (0.582)
child high school & father lower secondary	-0.179*** (0.057)	-0.093** (0.037)	-0.087*** (0.033)	0.033 (0.053)
child high school & father college	-0.138 (0.119)	-0.027 (0.077)	0.136* (0.077)	0.105 (0.114)
child college & father college	0.006 (0.067)	-0.043 (0.045)	-0.105** (0.051)	-0.036 (0.106)
child college & father lower secondary	0.179** (0.085)	0.174*** (0.060)	0.057 (0.063)	0.312*** (0.114)
Constant	7.126*** (1.171)	7.220*** (0.521)	7.840*** (0.431)	5.511*** (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 6:** Returns to college by father's education

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