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Highlights

We decompose the intergenerational correlation coefficient of education

This allows us to account for mobility patterns of subgroups of the population

We analyse the intergenerational persistence of education in Italy

The persistence of educational attainment is studied, decades after major reforms

College education remains a sort of glass ceiling for many Italian children

Intergenerational Persistence of Educational Attainment in Italy☆

Daniele Checchi[1], Carlo V. Fiorio[2,*], Marco Leonardi[3,*]

Abstract

In this paper we suggest a simple decomposition of the correlation coefficient of education to account for different intergenerational mobility of subgroups of the population, which is of key importance from a policy persepective.

Focussing on the interesting Italian case, we show that the high persistence of educational attainment found in the data is due to a much larger probability of obtaining a college degree of children of highly educated fathers.

Keywords: educational attainment, intergenerational mobility, correlation coefficient
JEL codes: I21; J62: I28
Word count: 1,815 words

1. Introduction

The literature on the temporal evolution of educational attainment by parental background is vast and the correlation coefficient between parents' and children's years of education is the main descriptive statistic used therein.

Blossfeld and Shavit (1993) produced one of the first comparative studies of intergenerational persistence in education by studying the correlation of children's attainment with parental background by age cohorts and claimed that the expansion of higher education gave no contribution to improving intergenerational mobility. More recently, Hertz et al. (2008) provide a large cross-country analysis of intergenerational correlations in educational attainment, documenting large regional differences in educational persistence. Their main conclusion is that global average educational persistence, measured as the correlation between parent's and child's schooling, has remained substantially stable over the last 50 years, despite the increased participation to school of recent cohorts.

In our opinion, the use of the regression coefficient of fathers and children years of education has two main shortcomings. It does not allow one to account for differences in average schooling

☆We thank participants to the SIRE conference on Mobility (Edinburgh), to the Lower conference on 'Intergenerational mobility' (Annency), the SIEP conference (Pavia), as well as seminar participants at University of Cagliari, Milan and the Université Paris 1 Panthéon-Sorbonne. We also thank Massimiliano Bratti, Helena Holmlund and David Margolis for fruitful discussions. Usual disclaimers apply.

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across generations and, above all, to disentangle differential intergenerational mobility of subgroups of the population, which is of key importance from a policy perspective. For instance, the correlation coefficient could decrease because compulsory education increased education for recent cohorts, or because the upward mobility of children of educated fathers dominates the immobility of children of uneducated fathers. This limitation remains also using the standardized correlation coefficient, where parents' and children's years of education are divided by their respective standard deviations to account for different dispersion of education of different cohorts. In Section 2 we suggest a straighforward decomposition of the correlation coefficient of education focussing on the probability of one's educational attainment given that of his father.

Hence we focus on Italy as an interesting case study. Hertz et al. (2008) also document the decreasing intergenerational persistence of educational attainment in Italy, whose absolute levels remain high compared with similarly developed countries. This result is consistent also with Checchi et al. (1999) and d'Addio (2007). In Section 3, using the Bank of Italy data set on Household Income and Wealth, we confirm evidence of the declining intergenerational persistence of education in Italy across different age cohorts and investigate why it has decreased so slowly over time by decomposing the standardized correlation coefficient. We find that the high level of intergenerational persistence of education is largely due to the fact that higher degrees are disproportionally more likely to be attained by children with highly educated fathers.

This decomposition could be easily replicated for better understanding of the trend of educational persistence in other countries.

2. A conceptual framework

The analysis of the intergenerational transmission of education over time is often performed by a univariate regression to be estimated separately for each cohort, such as

$$c_i = \alpha + \rho f_i + \varepsilon_i \qquad for \qquad i = 1, ..., N, \tag{1}$$

where $c_i := C_i/\sigma_c$ and $f_i := F_i/\sigma_f$ are the number of years of education of child i (C_i) and of father (F_i) normalized by their corresponding standard deviations (σ_c, σ_f, respectively), ε_i is an error term and ρ is the correlation coefficient.[4] When the number of years of education is not readily available, a common estimation strategy is to replace the level of education attained with the number of regular years needed to obtain it Black and Devereux (2010).

The coefficient ρ could be interpreted as a measure of the inequality of opportunities due to circumstances, which are independent of a child's effort. However, changes in ρ capture not only changes in the child–father education transmission, but different phenomena such as the secular rise in schooling and changes in compulsory education.

To illustrate this issue, let us rewrite the correlation coefficient as:

$$\rho = \int \underbrace{(c - E(c))(f - E(f))}_{(a)} \underbrace{\Pr(c|f)}_{(b)} \underbrace{\Pr(f)}_{(c)} . \tag{2}$$

This shows that ρ may change over time because of changes in the dispersion of children's or of fathers' (standardized) education around their respective means (term a), because of changes

[4] Alternatively, one could estimate the model $C_i = \gamma + \beta F_i + \upsilon_i$ and interpret β as the elasticity coefficient, provided that the number of years of education variables are measured in logs. The advantage of estimating the correlation coefficient ρ is that it factors out the difference in the variance of educational attainment across generations.

in children education conditional on that of their fathers (term b) or because of changes in the unconditional distribution of fathers'education (term c).

Changes in term (a) can be due to a uniform convergence towards higher levels of education. Term (c) could vary because of institutional framework changes that often go along with the development of a country and increase the level of compulsory education of fathers across generations. Here we suggest to focus on term (b), i.e. on the distribution of children education conditional on that of their fathers, as the policy relevant indicator of intergenerational persistence in educational attainment. In fact, by decomposing the conditional probability $\Pr(c|f)$ and denoting with $t, j \in \{0, 1, ..., E\}$ the educational degree attained, one can easily compute:

an immobility index,

$$\sum_{t} \Pr(c = t|f = t), \tag{3}$$

an upward mobility index,

$$\sum_{j>t} \Pr(c = j|f = t), \tag{4}$$

a downward mobility index,

$$\sum_{j<t} \Pr(c = j|f = t), \tag{5}$$

a "family premium" for education level t:

$$dPr(c = t|f = j) \equiv \Pr(c = t|f = j) - \Pr(c = t) \tag{6}$$

A positive (negative) family premium for education level t means that the family background increases (decreases) one's probability of achieving it.

3. Data and empirical analysis

The empirical analysis of intergenerational transmission of education requires a data set that providing information on the education of children and their parents over time. Here we use the Survey on Household Income and Wealth Historical Archive (SHIW) produced by the Bank of Italy based on biannual surveys, which provides a representative sample of the Italian population in each survey year. Starting from 1993 the SHIW contains a section asking information on the householder's and spouse's parents when they were of the same age as the interviewees, including their education, and we use this information extensively. We pool SHIW waves from 1993 to 2008, selecting only the householders and, when present, their partner. We name "children" the householders and their spouse and analyse their educational achievement as opposed to that of their respective father. As for parents, we retain only fathers' educational attainment[5] and we select only individuals whose age is over 30 at the time of the interview, to reduce the selectivity due to early marriages and/or yet uncompleted educational carrers. Finally, the data set is organised by 5–year cohorts of children's birth years.

Table 1 reports the unconditional distribution of the highest educational attainment of children and fathers organised by children 5–year birth cohorts, where educational attainment has

[5]In previous versions of the paper we considered also the education of the mother but the results are substantially unaffected, most likely due to assortative mating.

been replaced with the legal duration of the degrees considered (i.e. $0, 5, 8$,13, and 18 for no education, primary, lower secondary, upper secondary, and college education, respectively). The table is divided into two parts, one referring to fathers and one to children. The former reports term (c) of equation (2), showing that indeed the marginal distribution of educational attainment of fathers changed over time, increasing their average years of education. The latter shows that also in the children generation the marginal distribution has changed, the percentage of children with no degree decreasing constantly over time. An increasing proportion of children nowadays attains a high school or a college degree: in the most recent cohorts, slightly less than 50% have lower secondary degree and about 10% have a college degree, with an average differential in years of education with respect to their fathers of about 4 years.

The correlation coefficient between standardized children and father number of years of education attained exhibits a constant reduction from 0.63 to 0.50 over the period of investigation. We would like to know whether the relatively high level of the correlation coefficient even in the most recent cohorts, decades after the 1963 reform that raised compulsory education to 8 years, is uniformly due to all groups of children regardless of their fathers' education. To show this, we consider the empirical analogue of equation (2):

$$\widehat{\rho} = \sum_{c,f}(c - E(c))(f - E(f)) \Pr(c|f) \Pr(f) = \sum_{c,f} r_{c,f}, \tag{7}$$

where $c, f = 0, 5, 8, 13, 18$. Table 2 shows the elements $r_{c,f}$ of (7) for the 1930–35, 1945–50 and 1975–80 cohorts only. Line 1 reports the correlation coefficient, $\widehat{\rho}$, which is the sum of the absolute value contributions to the correlation coefficients of each combination of children's and fathers' education and their relative contributions. Line 7 presents the total contribution to $\widehat{\rho}$ of the group of children with fathers with no educational degree and showing that over time this group accounts for a large part of the total correlation, reaching 27% in the last cohort. Line 13 and 19 show that, respectively, the contribution to the correlation coefficient of the group of children with primary and lower secondary educated fathers is instead rather limited. On the contrary, lines 25 and 31 show that nearly 60% of the correlation coefficient, $\widehat{\rho}$, is accounted by the subgroups of high school and college educated parents, respectively.

This table also highlights the fact that intergenerational transmission of education is still highly polarized, despite half a century of economic growth and educational reforms. Considering the link between educational attainment and socio–economic conditions, children growing up in the most disadvantaged families are still very likely to remain disadvantaged (lines 2-4), whereas children of better off families are very likely to retain their relative advantage (lines 23-24 and 29-30).

While the relatively large contribution to $\widehat{\rho}$ of children of little educated fathers can be shown to be due to a correspondingly large term (c) of (2), which is deemed to reduce as the average education of father increases, from a policy point of view, the large contribution of children with highly educated fathers is more worrisome. In fact, the latter is due to intergenerational persistence of education, or term (b) of (2). Focussing on "family premia" defined as in (6) and depicted in Figure 1, one can notice that, net of the unconditional probability of obtaining a college degree, the child of a college graduated father has about 20 percent more chances to obtain a college degree than the child of a father with high school and 50 percent more chances to obtain a college degree than the child of a father with lower secondary education or less. These premia show no clear decreasing trend over time despite increased participation in tertiary education.

Table 1: Highest degree completed by birth cohort.

	Fathers						Children						
Cohort	**NE**	**P**	**LS**	**HS**	**C**	**Av.Yr.**	**NE**	**P**	**LS**	**HS**	**C**	**Av.Yr.**	**N.obs.**
1935	0.62	0.32	0.03	0.02	0.01	2.35	0.25	0.53	0.12	0.07	0.03	5.10	3,934
1940	0.52	0.38	0.05	0.04	0.01	2.99	0.19	0.52	0.16	0.09	0.04	5.75	5,584
1945	0.47	0.42	0.06	0.04	0.02	3.36	0.16	0.50	0.20	0.10	0.03	6.05	6,848
1950	0.40	0.47	0.06	0.05	0.02	3.80	0.08	0.52	0.22	0.13	0.05	6.94	8,155
1955	0.33	0.52	0.08	0.05	0.03	4.34	0.05	0.42	0.29	0.18	0.06	7.87	8,480
1960	0.28	0.56	0.08	0.06	0.02	4.55	0.02	0.34	0.35	0.20	0.08	8.64	9,574
1965	0.24	0.55	0.12	0.06	0.02	4.94	0.01	0.21	0.40	0.28	0.09	9.57	9,305
1970	0.23	0.53	0.14	0.07	0.03	5.26	0.01	0.12	0.43	0.34	0.10	10.22	8,816
1975	0.15	0.54	0.18	0.09	0.05	6.13	0.00	0.06	0.47	0.36	0.11	10.63	8,073
1980	0.12	0.52	0.22	0.11	0.03	6.39	0.00	0.04	0.49	0.36	0.10	10.69	4,628

Note: NE stants for ‘no education’, P for ‘primary’, LS for ‘lower secondary’, HS for ‘higher secondary’, C for ‘college’, Av.Yr. for ‘average years of education’, N.obs. for ‘number of observations in the sample’. Cohort stands for the last year of the five-year-cohort of children birth dates.
Source: Our calculations on SHIW-HA.

4. Conclusions

In this short note we propose a straightforward decomposition of the intergenerational correlation coefficient in educational attainments in Italy, which can be easily applied to investigate the driving forces of educational persistence also in other countries.

We show that educational opportunities in Italy have remained highly polarised, with actual persistence being attributable on one hand to a children born to uneducated fathers and on the other hand to children born to tertiary educated fathers. Both groups point to two different failures in educational policies: the former suggests that education in public schools has been unable to compensate for the lack of educational inputs in the family; the latter indicates that higher education remains a sort of “glass ceiling” for Italian children from weaker backgrounds.

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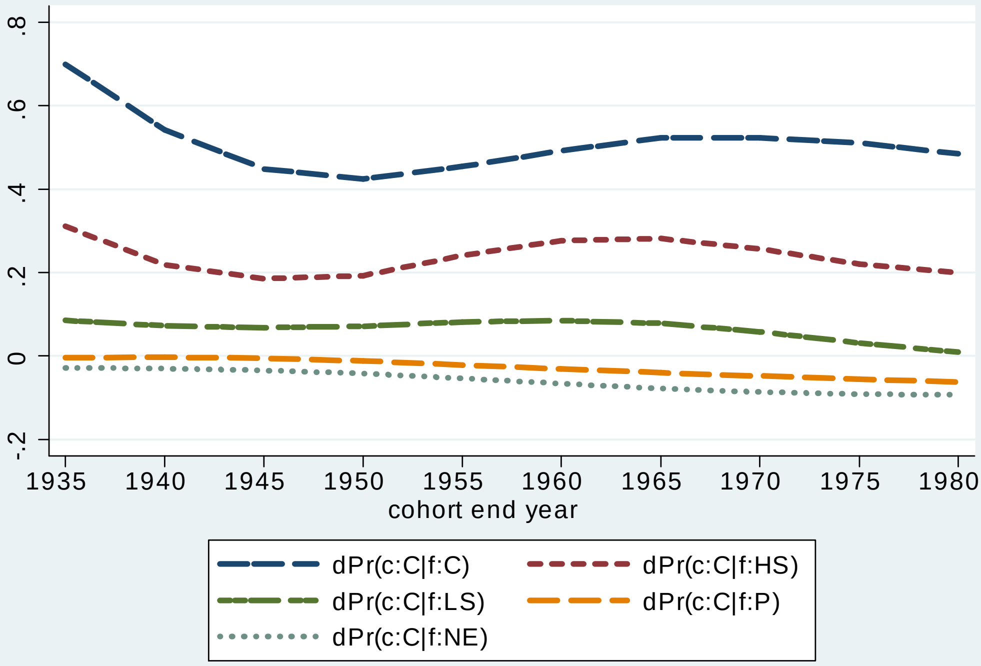
Table 2: Decomposition of the correlation coeffcient, for some relevant cohorts.

Line	*Cohort*		*1930-35*		*1950-55*		*1975-80*	
1	**Correlation coefficient**	$\sum_{c,f} r_{c,f}$	**0.63**	100%	**0.55**	100%	**0.50**	**100%**
2	Child:NE & Father:NE	$r_{c,f} = r_{0,0}$	0.20	31%	0.09	16%	0.02	3%
3	Child:P & Father:NE	$r_{c,f} = r_{5,0}$	0.01	1%	0.15	27%	0.06	11%
4	Child:LS & Father:NE	$r_{c,f} = r_{8,0}$	-0.02	-2%	0.00	0%	0.09	18%
5	Child:HS & Father:NE	$r_{c,f} = r_{13,0}$	-0.01	-2%	-0.02	-4%	-0.02	-4%
6	Child:C & Father:NE	$r_{c,f} = r_{18,0}$	0.00	-1%	-0.01	-1%	-0.01	-1%
7	*Total contribution to the correlation coefficient of the group of children with NE father*	$\sum_c r_{c,0}$	**0.17**	**27%**	**0.20**	**37%**	**0.13**	**27%**
8	Child:P & Father:NE	$r_{c,f} = r_{0,5}$	-0.01	-2%	0.00	0%	0.00	0%
9	Child:P & Father:P	$r_{c,f} = r_{5,5}$	0.00	-1%	-0.02	-4%	0.01	2%
10	Child:LS & Father:P	$r_{c,f} = r_{8,5}$	0.04	6%	0.00	0%	0.08	17%
11	Child:HS & Father:P	$r_{c,f} = r_{13,5}$	0.06	9%	0.02	3%	-0.04	-7%
12	Child:C & Father:P	$r_{c,f} = r_{18,5}$	0.02	3%	0.01	1%	-0.02	-3%
13	*Total contribution to the correlation coefficient of the group of children with P educated father*	$\sum_c r_{c,5}$	**0.10**	**16%**	**0.00**	**0%**	**0.04**	**9%**
14	Child:NE & Father:LS	$r_{c,f} = r_{0,8}$	0.00	0%	0.00	0%	0.00	0%
15	Child:P & Father:LS	$r_{c,f} = r_{5,8}$	0.00	0%	0.00	-1%	0.00	0%
16	Child:LS & Father:LS	$r_{c,f} = r_{8,8}$	0.01	2%	0.00	0%	-0.02	-5%
17	Child:HS & Father:LS	$r_{c,f} = r_{13,8}$	0.03	5%	0.05	8%	0.03	6%
18	Child:C & Father:LS	$r_{c,f} = r_{18,8}$	0.02	3%	0.02	4%	0.02	4%
19	*Total contribution to the correlation coefficient of the group of children with LS educated father*	$\sum_c r_{c,8}$	**0.06**	**10%**	**0.06**	**12%**	**0.03**	**5%**
20	Child:NE & Father:HS	$r_{c,f} = r_{0,13}$	0.00	0%	0.00	0%	0.00	0%
21	Child:P & Father:HS	$r_{c,f} = r_{5,13}$	0.00	0%	0.00	-1%	0.00	0%
22	Child:LS & Father:HS	$r_{c,f} = r_{8,13}$	0.01	1%	0.00	0%	-0.02	-4%
23	Child:HS & Father:HS	$r_{c,f} = r_{13,13}$	0.06	9%	0.06	11%	0.06	13%
24	Child:C & Father:HS	$r_{c,f} = r_{18,13}$	0.07	12%	0.07	12%	0.12	24%
25	*Total contribution to the correlation coefficient of the group of children with HS educated father*	$\sum_c r_{c,13}$	**0.14**	**22%**	**0.13**	**23%**	**0.16**	**32%**
26	Child:NE & Father:C	$r_{c,f} = r_{0,18}$	0.00	0%	0.00	0%	0.00	0%
27	Child:P & Father:C	$r_{c,f} = r_{5,18}$	0.00	0%	0.00	0%	0.00	0%
28	Child:LS & Father:C	$r_{c,f} = r_{8,18}$	0.00	0%	0.00	0%	0.00	0%
29	Child:HS & Father:C	$r_{c,f} = r_{13,18}$	0.02	3%	0.05	8%	0.02	5%
30	Child:C & Father:C	$r_{c,f} = r_{18,18}$	0.13	21%	0.11	20%	0.11	23%
31	*Total contribution to the correlation coefficient of the group of children with C educated father*	$\sum_c r_{c,18}$	**0.16**	**25%**	**0.15**	**28%**	**0.14**	**27%**

Notes: NE stants for ‘no education’, P for ‘primary’, LS for ‘lower secondary’, HS for ‘higher secondary’, C for ‘college’.
Source: Our calculations on SHIW-HA.

Figure 1: The family premia for college education



Notes: C=college, HS=higher secondary, LS=lower secondary, P=primary, NE=no education