The rocky road to post-compulsory education in Turkey: Intergenerational educational mobility

Ayça Akarçay Gürbüz, Sezgin Polat
Galatasaray University

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Abstract

We estimate the intergenerational transmission of education in Turkey using micro-data from the 1990 and 2000 censuses. We construct a unique historical series of provincial enrolment rates by gender to isolate the environmental effect on parental education using an instrumental variable (IV) approach. The results reveal that the effect of maternal education is not linear and is stronger particularly for daughters. Intergenerational educational inequality decreases over time, with a greater improvement in the case of sons. Village residence and poor labour market conditions are other significant obstacles to girls' compared to boys' post-compulsory education.

Keywords: Education, Intergenerational transmission, Turkey
JEL classification: I21, C26, O53

1. Introduction

Educational mobility across generations is one of the major indicators of a country's performance in terms of social mobility and, by extension, equality of opportunity (fairness, meritocracy, inclusiveness) and economic efficiency. Other measures of intergenerational social mobility are income, wages, occupation and social class mobility. In conformity with the global secular trend over the second half of the twentieth century, Turkey has experienced a massive expansion of education provision. However, studies of educational persistence across generations in Turkey are rare. Among other issues, many studies estimate the correlations between parental education and children's outcomes, rather than the intergenerational transmission of education per se. In fact, beyond the correlation between parental and child education, the literature has stressed the role of the educational environment and opportunities in assessing the causal relations underlying the intergenerational transmission of education.

Using micro data provided in the 1990 and 2000 census surveys[1] by the Turkish Statistical Institute (TurkStat), we here estimate the intergenerational transmission of education in Turkey and its evolution. More precisely, we estimate the probability of having completed at least one level of post-compulsory schooling, defined as having obtained a lower secondary diploma. Using various publications of the National Education Statistics, we construct a unique historical series of provincial enrolment rates which we use as an instrumental variable (IV) that accounts for the parents' (mother and father) educational environment.

Using completed years of schooling, we find that the impact of paternal education is lower in the IV estimates compared to standard (probit) estimates. Furthermore, the impact of the mother's education on the daughter's education remains higher than that on the son's education. Using parental education in categories reveals that parents having less than the post-compulsory education levels constitutes a major impediment to the probability of their offspring obtaining a post-compulsory diploma, especially daughters.

[1] Also available online at IPUMS.

The next section gives a short literature survey on the empirics of intergenerational educational mobility, and reviews the studies on educational outcomes in Turkey. Section 3 describes the data and the construction of the IV, and in Section 4 the probit and IV estimation results are presented and discussed. Section 5 concludes.

2. Literature

The links between economic development and education are manifold. Education increases human capital and productivity; indirectly, education enhances health awareness, which also contributes to productivity; and, in turn, productivity is expected to positively affect wages/incomes. Further, education and income mobility seem to be correlated such that educational mobility is also likely to decrease income inequality: "(l)ower mobility in both income and education tends to be correlated with greater inequality, lower educational spending and higher returns to education", (Blanden, 2013: 62). The persistence of educational attainment across generations is one of the factors[2] that affects educational outcomes, and this "has implications for economic efficiency if the talents of those from poorer families are under-developed or not fully utilized, as those from poorer backgrounds will not live up to their productive potential" (Blanden, 2013: 38). Based on evidence from 42 countries over 50-year trends, Hertz's findings suggest that the more equal a society is, the weaker is the intergenerational correlation, where Latin American countries are contrasted to Nordic countries Hertz et al. (2007). Similarly, Causa and Johansson (2010) oppose the more equal Nordic countries with Southern European countries while Blanden (2013) contrasts Nordic countries with developing countries, Southern Europe and France using various social mobility indicators.

Understanding the mechanisms underlying the intergenerational transmission of mobility is therefore an important policy issue in terms of promoting equity and economic efficiency. The major difficulty in quantifying the magnitude of the intergenerational transmission of education lies in the identification strategy one adopts. Although there is a correlation between parents' and children's education, determining a causal relationship necessitates identifying the factors lying behind the transmission process in order to distinguish environmental factors (nature) from the ability dimension that may be inherent to more educated parents (nurture). Björklund and Salvanes (2011), Black and Devereux (2011) and Holmlund et al. (2011) identify three approaches that promise to overcome the issue of the omitted variable bias: twins, adoptees and instrumental variable estimates.

Black and Devereux (2011) and Holmlund et al. (2011)'s surveys suggest that results are highly sensitive to data and the methodology used. Holmlund et al. (2011)'s empirical work applying all three methods to the single dataset of the Swedish register finds that the results are sensitive to the identification strategy and that the OLS estimates are greater than the IV estimates. Overall, although parental education has a causal effect on children's educational outcomes, meaning there is a robust "nurture" effect besides the "nature" effect, the evidence is mixed concerning its magnitude and the importance of the father vs. the mother. Additionally, these effects may not be the same across child gender. Surveys including information on twins or adoptees that are adapted to the analysis of intergenerational transmission of education are rare, such that the IV approach is the most commonly used; furthermore, "the IV approach is preferable to twin/adoptee strategies as it isolates the effect of an exogenous change in education of parents" (Black and Devereux, 2011: 1527). The lack of data availability on the intergenerational education aspects of twins/adoptees as well as the possibility of constructing

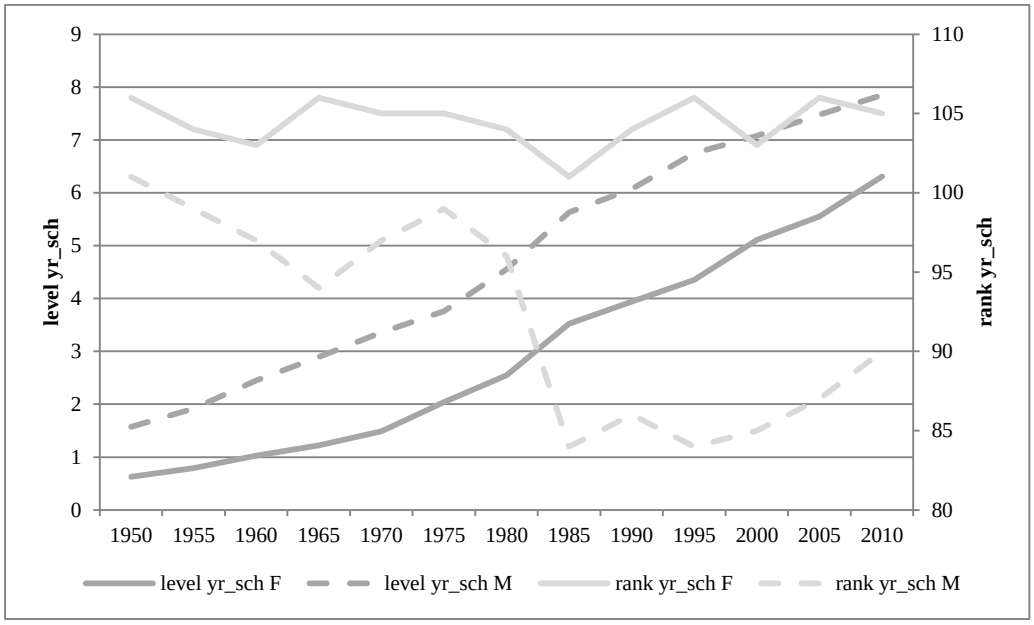
[2] Health policies and financial constraints range among other significant factors affecting educational outcomes, (Björklund and Salvanes, 2011).

data for local enrolment rates, motivate our use of the IV approach. Nevertheless, this approach also comes with a number of caveats, as raised by (Black and Devereux, 2011: 1526): "(t)he first is the credibility of the instrument; while it is not difficult to determine whether the instrument has a strong first stage, the excludability of the instrument is inherently untestable"; second "(e)ven if the instrument is valid, the generalizability of the estimates is also an issue. Under monotonicity, among other assumptions, IV estimates provide the LATE (local average treatment effects); that is, the causal effect for those whose behavior is actually influenced by the instrument." In this respect, our study is also subject to the LATE issue; nevertheless, it may yet provide insights as to these particular households that are characterized by poor educational endowments. Although most studies use institutional reform affecting parents' educational environment as an IV, we use local enrolment rates of parents' birth province, for two main reasons. First, the generations of parents considered in this study have all passed through the same general kind of education system – that is, no substantial educational reforms divide the group under study. Moreover, in developing countries, de jure changes are not always matched by de facto change, due to relatively weaker enforcement and physical capacities. Typically, in Turkey, although primary education has been compulsory throughout the period under consideration, the evidence suggests that this has not been reflected evenly across the country in terms of compliance, that is, observed schooling years and enrolment ratios. Many of the decisions taken at the National Education Council's annual meetings have not taken effect, such that the evolution of primary education attainment has been gradual rather than discrete. Second, local enrolment rates provide a de facto – more realistic – proxy of parental education environment. Consequently, this overcomes the issue of who really is affected by education reforms and how much.

Turkey starts off with very low levels of primary education such that primary education attainment remains extremely heterogeneous across regions and its increase in time affects a very large share of the population. Primary education started to be compulsory as early as the nineteenth century under the modernization efforts of the Ottoman Empire (Somel, 2001). However, in practice the increase in schooling has been very slow, despite repeated political endeavours under Ottoman rule up to the end of the nineteenth century, and the modernization efforts under the early Republican era which reiterated the political will to enhance the educational attainments of the population. Compulsory schooling was limited to primary level throughout the period for the population considered in this study. Despite various attempts at extending compulsory schooling to eight years, the reform was enacted only in 1997. In 1935 the adult (population 15 years of age and above) literacy rate was 18.7 percent (30.8 for men and 8.0 for women). However, these figures reached a level of 86.5 in 2000 (94.4 for men and 78.5 for women).[3] As for the enrolment rates, defined as population enrolled in primary schools divided by population aged 5-14, they increased from 16.5 percent (20.7 for men and 11.8 for women) in 1935 to 73.6 percent (76.9 for men and 69.9 for women) in 2000, and 86.0 (86.4 for men and 85.5 for women) in 2010. In other words, educational attainment increased together with a decrease in the gender gap. The Barro-Lee dataset (2010) confirms these improvements; however, in comparative terms the progress in years of schooling is less impressive: although Turkey's rank among 146 countries has somewhat improved, the relative evolution of the female population has not been quite as good as that of the male population (Figure 1).

[3] Turkish Statistical Institute (2013).

Figure 1. Average years of schooling, Turkey – rank in world



Note.- Rank among 146 countries. yr_sch years of schooling, F female, M male, population 15 years of age and over.
Source: Barro and Lee (2010).

Determinants of various types of educational outcomes have been widely studied, among others in Tunalı (1996), Tansel (2002), Dayıoğlu (2005), Smits and Hoşgör (2006), Aytaç and Rankin (2004), Rankin and Aytaç (2006), Rankin and Aytaç (2008), Kırdar (2009). These studies use various micro data such as the Demographic and Health Survey, Household Income Survey, Household Labor Force Survey, or the Family Structure Survey. While these studies estimate correlates, very few deal with the exogeneity issue: Dayıoğlu et al. (2009) use the 1998 Turkish Demographic and Health Survey, which includes information on twins used as an IV, and they estimate the effect of the number of siblings, birth order and sex composition on school enrolment. Berker (2009) uses the 1990 and 2000 censuses and the migrant/native ratio in 1990 as an IV to assess the effect of migration inflows on lower and upper secondary school completion rates of native children. Kırdar et al. (2014) use the 2003 and 2008 Turkey Demographic and Health Surveys (TDHS) and the Compulsory Education Law enacted in 1997 that extended compulsory education from five to eight years, in order to estimate the impact of the law on the equality of educational attainment.[4] Overall, although most of these studies include parental education as a correlate, none estimate the intergenerational transmission of parental education in terms of a causal relation.

3. Data

This study aims to contribute to the literature by providing evidence from Turkey using a 5% nationally representative sample from two censuses (1990 and 2000). In line with recent developments in the empirical study of intergenerational mobility, we use an IV to test for the causal relation between parents' and children's education. We do not have complete information on children who are attending post-secondary education. It is very likely that a

[4] More recently the 1997 Compulsory Education Law has also been used to account for the causal relation between education and non-educational outcomes Cesur and Mocan (2014), Güleşçi and Meyersson (2015), Dinçer et al. (2013), and Kırdar et al. (2014).

great portion of them leave the parental household for marriage or to attend higher education.[5] Hence, considering years of schooling for the dependent variable would lead to a selection bias, since only those children who stay in the household during post-secondary education would appear in the sample. For these reasons, we use a probit model to estimate the probability of a child having obtained at least one post-compulsory diploma (lower or upper secondary school diploma) for the cohorts under consideration. The major advantage of the census survey is that it is the most representative population data at a disaggregated regional level which is crucial to our understanding of educational environment as captured by the IV. On the flip side, it bears weaknesses in terms of health and socioeconomic variables, extensive information on family characteristics, and so forth.

Our dependent variable is a child aged 16-17, born in 1974-75 and 1984-85 respectively for the 1990 and 2000 censuses.[6] Table 1 gives information on the basic data restrictions. As school starting age is 6 or 7,[7] lower secondary school completion corresponds to eight years of education corresponding to 14 or 15 years of age. We set the upper limit of the child's age to 16-17 in order to have the largest sample of children co-residing with parents and avoid the selection bias. Indeed, above 16-17 years of age, children are more likely to leave the parental household, especially those who do not extend their education: girls are likely to leave for marriage and boys for compulsory military service. We consider boys and girls separately, and for each gender we estimate the impact of father and mother separately.[8] The age ranges for mothers and fathers are respectively 31-54 and 31-64. We omit households with missing information on child or parent, with a child born abroad, and polygamous and single-parent households. We also drop children that are grand-children in the household as parent information is unknown. Parental education is measured as completed years of schooling in the continuous model, where the categorical education variables are converted into schooling years: 0, 5, 8, 11 and 15 years for respectively no diploma, primary, lower secondary, upper secondary school and post-secondary diplomas; while it is kept as categorical, corresponding to last diploma obtained, in the discrete model. Consequently, parental years of schooling used in the estimations below actually are completed years of education corresponding to a given diploma. Admittedly, completed years of schooling somewhat underestimates the actual years of schooling, as drop-outs are not accounted for. The instrumental variable is defined as

$$E_{(g,r,c)} = \left(\frac{enrolled\ primary\ school\ population}{population\ at\ schooling\ age}\right)$$

where g, r and c respectively stand for gender, province and year.

The enrolled primary school population is taken from the National Education Statistics publications. Primary school types vary across time, and we sum all types of public schools

[5] Leaving for university studies is motivated by two factors: the availability of university establishments at parental residence location and the central university entrance examinations which somewhat reduces the choice of university location.

[6] The 1997 reform does not affect our population, given that persons subject to the law are those born in 1986 and later.

[7] Legally, school starting age varies in time between six and seven but in practice remains seven for a large share of the population considered here.

[8] Admittedly, including spouse's education allows us to control for assortative mating, however if the rate is high then an issue of multicollinearity may arise. Given the large share of the low-educated population, assortative mating is prevalent among this population for supply reasons in Turkey. More generally, as discussed in Björklund and Salvanes (2011: 224) either approach can be adopted and both are relevant. Facing the bias vs control trade-off we have opted not to include spouse's education and to account for the impact of each parent's education separately, independently from whether the impact is also affected by the nature of mating.

that include compulsory schooling.[9] Population by age comes from five-year Census of Population publications which provide age in categories.[10] We take the sum of categories 5-9 and 10-14, such that the population at schooling age is defined as 5-14. Finally, we construct enrolment ratios and match them with parents at birth place at the age of 7. As enrolment ratios are available every five years the match is undertaken by age brackets as given in Table 2. Households where parents for whom residence location at schooling age is unclear are omitted, and the residence information is deduced from the current, birth and recent migration experience (having migrated in the last five years) questions in the censuses as given in Table 3. As geographical administrative units vary over time, we define a harmonized provincial classification on the basis of the 67 provincial breakdowns (corresponding to the year 1985) for compatibility across census surveys and enrolment ratios.[11]

Table 1. Basic restrictions

	Child	Mother	Father
Age	16-17	31-54 Mother at 14-38	31-64 Father at 14-48
Criteria	Min. Age: Finishing middle school Max. age: Co-residing with parents/ Military service	Marriage Fecundity	Marriage Father age
Born census 1990	1974-75	1936-59	1926-59
Born census 2000	1984-85	1946-69	1936-69
Omitted households	Missing information on child or parent Child born abroad Households other than 1 mother and 1 father omitted – polygamous or single parent households		
Omitted children (16-17)	If child is grand-child (parent unknown)		

Table 2. Parental cohorts and corresponding enrolment ratios

	1990 census						
Age	31-34	35-39	40-44	45-49	50-54	55-59	60-64
Birth date	1956-59	1951-55	1946-50	1941-45	1936-40	1931-35	1926-30
School starting year	1963-67	1958-62	1953-57	1948-52	1943-47	1938-42	1933-37
Corresponding enrol. ratio	1964-65	1959-60	1954-55	1949-50	1944-45	1939-40	1934-35
	2000 census						
Age	31-34	35-39	40-44	45-49	50-54	55-59	60-64
Birth date	1966-69	1961-65	1956-60	1951-55	1946-50	1941-45	1936-40
School starting year	1973-77	1968-72	1963-67	1958-62	1953-57	1948-52	1943-47
Corresponding enrol. ratio	1974-75	1969-70	1964-65	1959-60	1954-55	1949-50	1944-45

[9] These include 5-year primary schools, 3-year primary schools (until 1940), the first five years of 8-year elementary schools that are mandatory, and among these all types of schools – normal, boarding and special.

[10] The first census year is 1927, then starting in 1930 censuses are undertaken every five years. The first enrolment ratio is enrolled population for the year 1926-27 divided by population at school age in 1927. The 1940 census does provide population figures by province but not age categories, these are deduced them from the 1935 and 1945 censuses, assuming age structure in 1940 is the mean of the age structures in 1935 and 1945. Another issue was the increase in geographical administrative units: for the new provinces we take the structure of provinces they were attached to in the 1935 census. For the province of Hatay (Antioch) which becomes part of the Republic from 1939 onwards, we take the population information of the neighbouring province of Gaziantep in 1935.

[11] The provincial breakdown of a given census does not always coincide with that of the corresponding schooling year. For example, the provincial breakdown of the population at schooling age taken from the 1935 census does not match with that of the enrolled population during the 1934-1935 school year, whereas the 1934 breakdown holds.

Table 3. Parental residence location - additional restrictions

Census information on locality	Defined as
current = birth = five years ago	born local
current = birth ≠ five years ago	born local
current ≠ birth = five years ago	new migrant
current = five years ago ≠ birth	omitted parent
current ≠ birth ≠ five years ago	omitted parent
birth abroad	omitted parent

Figure 2 gives the provincial enrolment rates and the inequality of enrolment rates across provinces as measured by the Gini index. Figure 3 provides similar evidence accounting for schooling years of provincial population by five year cohorts. The inequality figures show that, although decreasing, there has been some heterogeneity across provinces and that there has been a persisting gender gap.

Figure 2. Provincial enrolment rates and inequality

Source: Authors' calculations from National Education Statistics and TurkStat censuses.

Figure 3. Schooling years by 5-year cohorts and inequality index

Source: Authors' calculations from the 2000 census survey.

We use a number of controls from the information that is available in both censuses; Table 4 provides summary statistics for all the variables, according to the sample used in the estimations. These controls include siblings by gender, current residence location (city centre, district, village), house ownership, migration information (being born at the local residence location is opposed to having moved within the last five years), province fixed effects and an indicator of employment prospects. One important factor that potentially affects educational decisions is the probability of finding a job.

This may be related to labour demand conditions. The Middle East and North African region is typically characterized by low levels of labour force participation and employment rates. This has major implications in terms of educational attainment: the evidence suggests that beyond poor education quality that constitutes an impediment to participation, sluggish labour demand conditions negatively affect education demand and that the issue is more severe for the female population in the Arab (Tzannatos, 2014) and more generally the MENA (World Bank, 2008) regions. Although MENA countries, including Turkey, have achieved much in closing the gender gap in terms of compulsory education, their performances in terms of post-compulsory education have been relatively less successful which arguably may be related to the labour market conditions.

More particularly, in the case of women, the local employment rate may capture a kind of neighbourhood effect that counteracts social norms and values inhibiting female labour-force participation. In other words, the existence of female employment may encourage post-compulsory educational attainment by girls with a view to participating the labour force. This is why the indicator of employment prospects is constructed as the share of employed population having a post-compulsory diploma in the active population at the local level (district) and by gender in order to account for the latter effect.

The descriptive statistics suggest that the level of this indicator is strikingly low: respectively 20.2 and 4.7 percent for men and women in 1990 and 27.7 and 7.1 percent for the year 2000. The rates are somewhat increasing which implies a certain improvement in returns to education however it remains low, especially for women.

Table 4. Descriptive summary

	1990 census						2000 census					
Variables	All Basic Rest.		Mother Rest.		Father Rest.		All Basic Rest.		Mother Rest.		Father Rest.	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Post-comp. Grad.	0.36	0.48	0.32	0.46	0.31	0.46	0.50	0.50	0.47	0.50	0.47	0.50
Gender (female=1)	0.50	0.50	0.50	0.50	0.50	0.50	0.48	0.50	0.49	0.50	0.49	0.50
Age	16.46	0.50	16.45	0.50	16.45	0.50	16.48	0.50	16.48	0.50	16.48	0.50
Mother												
No schooling	0.52	0.50	0.54	0.50	0.55	0.50	0.37	0.48	0.39	0.49	0.39	0.49
5 Years Primary	0.43	0.50	0.42	0.49	0.42	0.49	0.52	0.50	0.52	0.50	0.52	0.50
Lower Secondary	0.02	0.14	0.01	0.12	0.01	0.12	0.04	0.20	0.04	0.19	0.04	0.19
Upper Secondary	0.02	0.14	0.01	0.11	0.01	0.11	0.05	0.22	0.04	0.20	0.04	0.20
Post-secondary	0.01	0.10	0.01	0.08	0.01	0.08	0.02	0.14	0.01	0.12	0.01	0.12
Father												
No schooling	0.22	0.41	0.24	0.43	0.24	0.43	0.12	0.32	0.13	0.33	0.12	0.33
5 Years Primary	0.64	0.48	0.65	0.48	0.65	0.48	0.60	0.49	0.62	0.48	0.62	0.49
Lower Secondary	0.06	0.23	0.05	0.22	0.05	0.22	0.11	0.31	0.10	0.30	0.10	0.31
Upper Secondary	0.04	0.21	0.03	0.18	0.03	0.18	0.11	0.31	0.10	0.30	0.10	0.30
Post-secondary	0.04	0.20	0.03	0.16	0.03	0.16	0.07	0.25	0.05	0.22	0.05	0.22
Siblings												
No girl sibling	0.27	0.44	0.26	0.44	0.25	0.44	0.34	0.47	0.32	0.47	0.32	0.47
Sibling 1 girl	0.33	0.47	0.32	0.47	0.32	0.47	0.34	0.48	0.34	0.47	0.34	0.47
Sibling girls>=2	0.40	0.49	0.42	0.49	0.43	0.49	0.31	0.46	0.34	0.47	0.34	0.47
No boy sibling	0.20	0.40	0.19	0.39	0.19	0.39	0.27	0.44	0.26	0.44	0.26	0.44
Sibling 1 boy	0.34	0.47	0.33	0.47	0.33	0.47	0.38	0.48	0.36	0.48	0.36	0.48
Sibling boys>=2	0.46	0.50	0.48	0.50	0.48	0.50	0.35	0.48	0.38	0.49	0.38	0.49
City centre	0.39	0.49	0.27	0.44	0.26	0.44	0.45	0.50	0.33	0.47	0.33	0.47
District	0.20	0.40	0.21	0.41	0.22	0.41	0.21	0.41	0.25	0.43	0.25	0.43
Village	0.42	0.49	0.52	0.50	0.53	0.50	0.33	0.47	0.43	0.49	0.43	0.49
House Ownership	0.80	0.40	0.84	0.37	0.84	0.36	0.76	0.43	0.81	0.40	0.81	0.40
Born local	0.82	0.39	0.94	0.24	0.94	0.24	0.79	0.40	0.94	0.24	0.94	0.24
Emp. prospects	12.51	10.16	10.78	9.14	10.70	9.09	17.76	12.86	15.50	12.08	15.48	12.04
No. Obs.	71,069		52,774		52,089		85,434		57,768		58,260	

4. Estimation and Results

The standard model used to measure schooling decisions includes future gains and the costs of education under the income constraint. Family (parental) background might also enter the equation. The intergenerational linkage should include parental background and some environmental factors that are likely to limit access to education. In case of intergenerational educational inequality, transmission through family requires some nurture component as well as some environmental factors that are likely to limit access to education. We first run a standard probit model to estimate the probability of attending post-compulsory education, given in Eq. (1):

$$S_{i,j}^{c} = \delta_0 + \delta_p S_{i,j}^{p} + \delta_k X_{i,j} + v_{i,j}^{c} \quad (1)$$

where $S_{i,j}^{c}$ is the indicator of having obtained at least a lower secondary level diploma. This indicator takes the value of 1 if the child i in household j has obtained a post-compulsory diploma and takes 0 if he/she has not. $S_{i,j}^{p}$ denotes parental education of child i in household j. $X_{i,j}$ denotes a set of controls and $v_{i,j}^{c}$ is the error term. Descriptive statistics for the IV model are summarized in Table 4.

There are several shortcomings to the standard model defined in Eq. (1). First, it masks some exogenous variation that might bias the true effect of parental education, such as cohort variation due to compulsory education reforms. The change in compulsory years of schooling might exogenously increase the education level of some younger parents. Although the IV

procedure is a commonly used strategy, various studies using IV have documented that the compulsory reforms are not evenly implemented across regions and that spatial variation should be considered. Consequently, exogenous variations are not limited to reforms, but also include regional disparities regarding infrastructural capacity in terms of schools, teachers or classrooms, and compliance enforcement. Secondly, in addition to the IV issue, the effect of parental education could be nonlinear given the fact that the number of parents with no schooling is significant. We first follow the usual IV procedure where the model assumes a linear parental education effect, and secondly we follow the two-stage residual inclusion (2SRI) procedure which allows us to estimate the categories of parental education. The first stage of IV estimation is given in Eq. (2) for the usual IV procedure. For the discrete model, the OLS estimation in Eq. (2) is replaced in the first stage with an ordered probit where the categorical dependent variable is defined as levels of parental education:

$$S_{i,j}^{p} = \alpha_0 + \alpha_p E_{i,j}^{p} + \alpha_k X_{i,j} + u_{i,j}^{p} \quad (2)$$

where E is primary school enrollment ratio at parent's province at age 7 (for the correspondence between parent birth date and date of local enrolment ratio see Table 3).

The second stage IV estimation is given in Eq. (1) for the IV procedure:

$$S_{i,j}^{c} = \delta_{0,iv} + \delta_{p,iv} S_{i,j}^{p} + \delta_{k,iv} X_{i,j} + v_{i,j}^{cp} \quad (3)$$

Our use of enrolment rates of parents as an IV can be justified by several reasons. One, as mentioned above, is the inability of central governments to evenly (uniformly) enforce compulsory school attainment across years and provinces. This variation could be taken as an exogenous factor similar to a reform. Second, there is a remarkable and persistent gender difference in schooling across provinces as shown in Figures 2 and 3 above.

Tables 5 to 10 provide the estimation results. All estimations include province specific fixed effects which are expected to capture unobservable factors across provinces that are likely to affect both the parent and the child. Probit estimations of the full sample with only the basic restrictions are given in Tables 5 and 6.

Tables 7 to10 give the results of the probit and IV estimations for the sample subject to both the basic and additional restrictions (Tables 1 and 2). In Tables 7 to 9 parental education is converted into schooling years and the estimated effect is linear. Table 10 displays the summary results of the impact of parental education in categories.[12] Here, we control for the same set of variables except that parental education is categorical in the second stage under the assumptions of the 2SRI method.

Overall, the results show that both household and regional characteristics have an influence over the schooling decision. However, the full model suggests that the predictive power of the estimation is greater for girls' compared to boys' schooling outcomes. Furthermore, with some exceptions, the effect of parental education decreases in the IV estimates, and relatively more so for paternal education.

[12] See Tables A1, A2 and A3 in appendix for the complete estimation results.

Table 5. Marginal effects of the probability of having completed at least lower secondary school - all children, sample with basic restrictions, linear parental education

	1990		2000		1990		2000		1990		2000	
	All				Boys				Girls			
Gender (female=1)	-0.057***	-0.069***	-0.022***	-0.026***								
	(0.007)	(0.006)	(0.007)	(0.007)								
Mother Sch. Years	0.036***		0.027***		0.035***		0.023***		0.034***		0.030***	
	(0.001)		(0.001)		(0.001)		(0.001)		(0.001)		(0.001)	
Father Sch. Years		0.041***		0.030***		0.043***		0.027***		0.038***		0.031***
		(0.001)		(0.000)		(0.001)		(0.001)		(0.001)		(0.001)
Sibling 1 girl	-0.022***	-0.021***	-0.031***	-0.030***	-0.021***	-0.020***	-0.033***	-0.031***	-0.020***	-0.020***	-0.026***	-0.027***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Sibling girls>=2	-0.070***	-0.072***	-0.066***	-0.068***	-0.066***	-0.070***	-0.074***	-0.072***	-0.071***	-0.072***	-0.060***	-0.065***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)	(0.005)	(0.006)	(0.006)
Sibling 1 boy	-0.050***	-0.049***	-0.042***	-0.041***	-0.056***	-0.050***	-0.047***	-0.045***	-0.047***	-0.050***	-0.037***	-0.039***
	(0.005)	(0.005)	(0.004)	(0.004)	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Sibling boys>=2	-0.134***	-0.130***	-0.118***	-0.117***	-0.147***	-0.138***	-0.122***	-0.117***	-0.118***	-0.120***	-0.111***	-0.113***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)	(0.006)
District	0.013**	0.012**	0.029***	0.031***	0.070***	0.063***	0.059***	0.059***	0.017**	0.020**	0.028***	0.030***
	(0.006)	(0.006)	(0.005)	(0.005)	(0.009)	(0.009)	(0.007)	(0.007)	(0.008)	(0.008)	(0.007)	(0.007)
Village	-0.207***	-0.184***	-0.126***	-0.111***	-0.137***	-0.117***	-0.067***	-0.053***	-0.222***	-0.198***	-0.161***	-0.145***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.008)	(0.008)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
House Ownership	-0.038***	-0.024***	-0.020***	-0.018***	-0.020***	-0.006	0.006	0.008	-0.052***	-0.039***	-0.045***	-0.041***
	(0.005)	(0.005)	(0.004)	(0.004)	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Born local	-0.026***	0.001	0.032***	0.055***	-0.031***	-0.006	0.023***	0.042***	-0.019***	0.009*	0.042***	0.066***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Emp. prospects	0.003***	0.003***	0.004***	0.004***	0.006***	0.005***	0.005***	0.005***	0.011***	0.010***	0.007***	0.007***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	71,069	71,069	85,434	85,434	35,714	35,714	44,173	44,173	35,355	35,355	41,261	41,261
Pseudo R-squared	0.186	0.211	0.113	0.122	0.134	0.160	0.0779	0.0879	0.251	0.275	0.153	0.160

Notes.- The omitted categories are; native-born child residing in city centre with no male or female siblings. Adana is the reference province. Provincial fixed effects (67) are included. Robust standard errors in parentheses.*** p<0.01, ** p<0.05, * p<0.1.

Table 6. Marginal effects of the probability of having completed at least lower secondary school - all children, sample with basic restrictions, categorical parental education

	1990		2000		1990		2000		1990		2000	
	All				Boys				Girls			
Gender (female=1)	-0.060***	-0.071***	-0.019**	-0.024***								
	(0.007)	(0.006)	(0.007)	(0.007)								
Mother												
No schooling	-0.467***		-0.305***		-0.421***		-0.248***		-0.484***		-0.350***	
	(0.013)		(0.009)		(0.018)		(0.012)		(0.019)		(0.012)	
5 Years Primary	-0.302***		-0.149***		-0.259***		-0.113***		-0.321***		-0.174***	
	(0.013)		(0.008)		(0.018)		(0.011)		(0.019)		(0.012)	
Upper Secondary	0.055***		0.002		0.071***		0.003		0.022		-0.001	
	(0.018)		(0.011)		(0.024)		(0.015)		(0.027)		(0.016)	
Post-secondary	0.109***		0.007		0.103***		-0.003		0.111***		0.007	
	(0.021)		(0.014)		(0.028)		(0.020)		(0.034)		(0.021)	
Father												
No schooling		-0.418***		-0.306***		-0.437***		-0.309***		-0.384***		-0.295***
		(0.008)		(0.007)		(0.012)		(0.010)		(0.011)		(0.010)
5 Years Primary		-0.260***		-0.153***		-0.253***		-0.143***		-0.252***		-0.159***
		(0.008)		(0.005)		(0.011)		(0.007)		(0.011)		(0.008)
Upper Secondary		0.121***		0.053***		0.100***		0.029***		0.132***		0.075***
		(0.011)		(0.007)		(0.015)		(0.010)		(0.016)		(0.010)
Post-secondary		0.201***		0.102***		0.166***		0.062***		0.219***		0.131***
		(0.011)		(0.008)		(0.015)		(0.011)		(0.017)		(0.012)
Sibling Effects												
Sibling 1 girl	-0.021***	-0.020***	-0.032***	-0.031***	-0.020***	-0.019***	-0.035***	-0.033***	-0.019***	-0.019***	-0.027***	-0.027***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Sibling girls>=2	-0.067***	-0.069***	-0.067***	-0.069***	-0.064***	-0.067***	-0.074***	-0.074***	-0.069***	-0.070***	-0.061***	-0.065***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)	(0.005)	(0.006)	(0.006)
Sibling 1 boy	-0.047***	-0.046***	-0.043***	-0.043***	-0.054***	-0.049***	-0.048***	-0.047***	-0.044***	-0.047***	-0.040***	-0.041***
	(0.005)	(0.005)	(0.004)	(0.004)	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Sibling boys>=2	-0.130***	-0.126***	-0.119***	-0.118***	-0.144***	-0.135***	-0.122***	-0.118***	-0.114***	-0.116***	-0.112***	-0.114***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)	(0.006)
District	0.013**	0.011*	0.029***	0.029***	0.068***	0.061***	0.059***	0.057***	0.016*	0.018**	0.029***	0.029***
	(0.006)	(0.006)	(0.005)	(0.005)	(0.009)	(0.009)	(0.007)	(0.007)	(0.008)	(0.008)	(0.007)	(0.007)
Village	-0.205***	-0.180***	-0.125***	-0.108***	-0.136***	-0.114***	-0.066***	-0.051***	-0.220***	-0.195***	-0.159***	-0.142***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.008)	(0.008)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
House Ownership	-0.037***	-0.020***	-0.018***	-0.016***	-0.020***	-0.003	0.007	0.009	-0.051***	-0.034***	-0.043***	-0.040***
	(0.005)	(0.005)	(0.004)	(0.004)	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Born local	-0.023***	0.006	0.030***	0.052***	-0.028***	-0.002	0.021***	0.039***	-0.016***	0.014**	0.039***	0.065***
	(0.005)	(0.004)	(0.004)	(0.004)	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Emp. prospects	0.003***	0.002***	0.004***	0.004***	0.006***	0.005***	0.006***	0.005***	0.010***	0.010***	0.008***	0.008***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	71,069	71,069	85,434	85,434	35,714	35,714	44,173	44,173	35,355	35,355	41,261	41,261
Pseudo R-squared	0.189	0.214	0.115	0.124	0.136	0.162	0.0790	0.0899	0.254	0.279	0.155	0.162

Notes.- The omitted categories are; native-born child residing in city centre with no male or female siblings. Adana is the reference province. Provincial fixed effects (67) are included. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 7. Marginal effects of the probability of having completed at least lower secondary school - all children, restricted sample, linear parental education

	1990		2000		1990		2000	
	Probit	IV	Probit	IV	Probit	IV	Probit	IV
Gender (female=1)	-0.072***	-0.075***	-0.055***	-0.054***	-0.079***	-0.071***	-0.053***	-0.041***
	(0.007)	(0.007)	(0.009)	(0.010)	(0.007)	(0.008)	(0.009)	(0.010)
Mother Sch. Years	0.032***	0.037***	0.027***	0.027***				
	(0.001)	(0.003)	(0.001)	(0.003)				
Father Sch. Years					0.038***	0.028***	0.030***	0.018***
					(0.001)	(0.002)	(0.001)	(0.004)
Siblings								
Sibling 1 girl	-0.021***	-0.020***	-0.024***	-0.024***	-0.022***	-0.024***	-0.025***	-0.028***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Sibling girls>=2	-0.060***	-0.056***	-0.053***	-0.053***	-0.064***	-0.069***	-0.051***	-0.059***
	(0.005)	(0.005)	(0.005)	(0.006)	(0.005)	(0.005)	(0.005)	(0.006)
Sibling 1 boy	-0.046***	-0.044***	-0.033***	-0.033***	-0.044***	-0.047***	-0.031***	-0.037***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.005)	(0.005)
Sibling boys>=2	-0.118***	-0.112***	-0.089***	-0.089***	-0.114***	-0.123***	-0.088***	-0.101***
	(0.005)	(0.006)	(0.006)	(0.007)	(0.005)	(0.006)	(0.005)	(0.007)
District	0.019***	0.019***	0.026***	0.026***	0.018***	0.019***	0.027***	0.026***
	(0.007)	(0.007)	(0.006)	(0.006)	(0.007)	(0.007)	(0.006)	(0.006)
Village	-0.216***	-0.208***	-0.151***	-0.151***	-0.187***	-0.206***	-0.132***	-0.153***
	(0.006)	(0.008)	(0.006)	(0.007)	(0.006)	(0.007)	(0.006)	(0.009)
House Ownership	-0.032***	-0.030***	-0.035***	-0.035***	-0.028***	-0.033***	-0.032***	-0.037***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Born local	-0.008	-0.010	0.045***	0.045***	0.014*	0.009	0.067***	0.059***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.009)
Emp. prospects	0.004***	0.003***	0.004***	0.004***	0.004***	0.004***	0.004***	0.004***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	52,774	52,774	57,768	57,768	52,089	52,089	58,260	58,260

Notes.- The omitted categories are; native-born child residing in city centre with no male or female siblings. Adana is the reference province. Provincial fixed effects (67) are included. The restricted sample includes children having a native born or recent migrant parent. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 8. Marginal effects of the probability of having completed at least lower secondary school - boys, restricted sample, linear parental education

	1990		2000		1990		2000	
	Probit	IV	Probit	IV	Probit	IV	Probit	IV
Mother Sch. Years	0.032***	0.032***	0.023***	0.022***				
	(0.001)	(0.005)	(0.001)	(0.004)				
Father Sch. Years					0.042***	0.032***	0.027***	0.016**
					(0.001)	(0.004)	(0.001)	(0.007)
Siblings								
Sibling 1 girl	-0.020***	-0.020***	-0.033***	-0.033***	-0.020***	-0.022***	-0.032***	-0.035***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Sibling girls>=2	-0.061***	-0.061***	-0.064***	-0.065***	-0.066***	-0.072***	-0.061***	-0.069***
	(0.007)	(0.008)	(0.008)	(0.008)	(0.007)	(0.008)	(0.007)	(0.008)
Sibling 1 boy	-0.048***	-0.048***	-0.042***	-0.043***	-0.041***	-0.046***	-0.040***	-0.045***
	(0.008)	(0.008)	(0.007)	(0.007)	(0.008)	(0.008)	(0.007)	(0.008)
Sibling boys>=2	-0.127***	-0.127***	-0.097***	-0.098***	-0.117***	-0.128***	-0.096***	-0.108***
	(0.008)	(0.009)	(0.008)	(0.009)	(0.008)	(0.009)	(0.008)	(0.010)
District	0.075***	0.075***	0.058***	0.058***	0.065***	0.069***	0.058***	0.060***
	(0.010)	(0.011)	(0.009)	(0.009)	(0.010)	(0.011)	(0.009)	(0.009)
Village	-0.154***	-0.153***	-0.087***	-0.088***	-0.128***	-0.143***	-0.067***	-0.083***
	(0.009)	(0.011)	(0.009)	(0.010)	(0.009)	(0.011)	(0.008)	(0.012)
House Ownership	-0.019**	-0.019**	-0.007	-0.007	-0.014	-0.018*	-0.006	-0.010
	(0.009)	(0.010)	(0.009)	(0.009)	(0.009)	(0.010)	(0.008)	(0.009)
Born local	-0.011	-0.011	0.049***	0.049***	0.003	-0.001	0.063***	0.056***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.013)	(0.012)	(0.013)
Emp. prospects	0.006***	0.006***	0.005***	0.005***	0.006***	0.006***	0.005***	0.006***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	26,288	26,288	29,671	29,671	25,938	25,938	29,968	29,968

Notes.- The omitted categories are; native-born child residing in city centre with no male or female siblings. Adana is the reference province. Provincial fixed effects (67) are included. The restricted sample includes children having a native born or recent migrant parent. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 9. Marginal effects of the probability of having completed at least lower secondary school - girls, restricted sample, linear parental education

	1990		2000		1990		2000	
	Probit	IV	Probit	IV	Probit	IV	Probit	IV
Mother Sch. Years	0.030***	0.039***	0.030***	0.029***				
	(0.001)	(0.004)	(0.001)	(0.004)				
Father Sch. Years					0.033***	0.024***	0.031***	0.016***
					(0.001)	(0.003)	(0.001)	(0.006)
Siblings								
Sibling 1 girl	-0.018***	-0.015**	-0.014**	-0.014**	-0.019***	-0.021***	-0.015**	-0.018***
	(0.006)	(0.006)	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)	(0.007)
Sibling girls>=2	-0.056***	-0.050***	-0.042***	-0.043***	-0.058***	-0.062***	-0.040***	-0.050***
	(0.006)	(0.006)	(0.007)	(0.008)	(0.006)	(0.006)	(0.007)	(0.008)
Sibling 1 boy	-0.047***	-0.044***	-0.024***	-0.025***	-0.051***	-0.052***	-0.022***	-0.029***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)
Sibling boys>=2	-0.107***	-0.099***	-0.076***	-0.077***	-0.109***	-0.116***	-0.075***	-0.091***
	(0.007)	(0.008)	(0.008)	(0.009)	(0.007)	(0.007)	(0.008)	(0.010)
District	0.023**	0.020**	0.028***	0.028***	0.030***	0.031***	0.034***	0.033***
	(0.010)	(0.010)	(0.009)	(0.009)	(0.010)	(0.010)	(0.009)	(0.010)
Village	-0.222***	-0.210***	-0.183***	-0.185***	-0.192***	-0.209***	-0.164***	-0.191***
	(0.008)	(0.010)	(0.008)	(0.010)	(0.008)	(0.010)	(0.008)	(0.013)
House Ownership	-0.042***	-0.037***	-0.059***	-0.060***	-0.039***	-0.045***	-0.054***	-0.061***
	(0.008)	(0.008)	(0.008)	(0.009)	(0.008)	(0.008)	(0.008)	(0.009)
Born local	-0.005	-0.008	0.035***	0.035***	0.025***	0.019*	0.065***	0.056***
	(0.010)	(0.010)	(0.011)	(0.012)	(0.010)	(0.010)	(0.012)	(0.013)
Emp. prospects	0.012***	0.010***	0.008***	0.008***	0.012***	0.014***	0.009***	0.011***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	26,486	26,486	28,097	28,097	26,151	26,151	28,292	28,292

Notes.- The omitted categories are; native-born child residing in city centre with no male or female siblings. Adana is the reference province. Provincial fixed effects (67) are included. The restricted sample includes children having a native born or recent migrant parent. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 10. Marginal effects of the probability of having completed at least lower secondary school – all children, restricted sample, categorical parental education

	All				Boys				Girls			
	1990		2000		1990		2000		1990		2000	
	Probit	IV	Probit	IV	Probit	IV	Probit	IV	Probit	IV	Probit	IV
Mother												
No schooling	-0.462***	-0.492***	-0.304***	-0.276***	-0.412***	-0.370***	-0.239***	-0.171***	-0.481***	-0.549***	-0.360***	-0.333***
	(0.019)	(0.034)	(0.012)	(0.028)	(0.025)	(0.044)	(0.015)	(0.036)	(0.027)	(0.045)	(0.016)	(0.036)
5 Years Primary	-0.314***	-0.325***	-0.154***	-0.143***	-0.265***	-0.251***	-0.109***	-0.085***	-0.338***	-0.369***	-0.191***	-0.180***
	(0.019)	(0.021)	(0.011)	(0.015)	(0.025)	(0.027)	(0.015)	(0.019)	(0.027)	(0.029)	(0.015)	(0.020)
Upper Secondary	0.042	0.051*	-0.008	-0.019	0.068**	0.057	0.004	-0.022	-0.003	0.024	-0.028	-0.039
	(0.026)	(0.026)	(0.015)	(0.017)	(0.032)	(0.041)	(0.021)	(0.023)	(0.041)	(0.039)	(0.020)	(0.026)
Post-secondary	0.102***	0.119***	0.002	-0.024	0.122***	0.100*	0.008	-0.055	0.057	0.108**	-0.023	-0.050
	(0.030)	(0.032)	(0.020)	(0.031)	(0.038)	(0.053)	(0.027)	(0.041)	(0.055)	(0.051)	(0.035)	(0.048)
Father												
No schooling	-0.386***	-0.314***	-0.305***	-0.174***	-0.436***	-0.351***	-0.309***	-0.137***	-0.325***	-0.261***	-0.293***	-0.176***
	(0.011)	(0.023)	(0.008)	(0.034)	(0.015)	(0.032)	(0.012)	(0.052)	(0.013)	(0.029)	(0.011)	(0.041)
5 Years Primary	-0.242***	-0.206***	-0.162***	-0.108***	-0.256***	-0.218***	-0.152***	-0.086***	-0.215***	-0.179***	-0.167***	-0.115***
	(0.010)	(0.014)	(0.007)	(0.015)	(0.014)	(0.019)	(0.009)	(0.022)	(0.013)	(0.018)	(0.009)	(0.020)
Upper Secondary	0.130***	0.100***	0.045***	-0.005	0.088***	0.058**	0.016	-0.046**	0.157***	0.121***	0.073***	0.023
	(0.016)	(0.016)	(0.008)	(0.013)	(0.021)	(0.024)	(0.012)	(0.022)	(0.021)	(0.025)	(0.013)	(0.018)
Post-secondary	0.224***	0.163***	0.097***	-0.018	0.172***	0.113***	0.055***	-0.092**	0.257***	0.182***	0.132***	0.019
	(0.016)	(0.026)	(0.011)	(0.031)	(0.020)	(0.034)	(0.015)	(0.045)	(0.025)	(0.039)	(0.017)	(0.040)

Notes.- This is a summary table of Tables A1, A2 and A3 provided in the appendix. The omitted categories are; native-born child residing in city centre with no male or female siblings. Adana is the reference province. Provincial fixed effects (67) are included. The restricted sample includes children having a native born or recent migrant parent. Bootstrapped standard errors (based on 200 replications) in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

The probit estimations (1990 vs 2000) using continuous parental education suggest that intergenerational educational mobility has increased for boys while it has remained fairly stable for girls, and that the paternal impact is greater especially on son's, and is less differentiated from maternal education in the case of daughters. A majority of the estimates of parental correlates in Turkey have also found a larger effect of the father's education on children. On the other hand, the IV estimations which take into account the educational environment show the paternal impact as lower than the probit estimates. Compared to the probit estimates, in the IV estimates the marginal effects of maternal education remain fairly constant, except on daughters in 1990 where it is higher.

The IV-probit estimations further suggest that the mother's education has a greater impact on both daughters' and sons' educational outcomes throughout the period. Both maternal and paternal education's impact on sons and daughters decreases in time, meaning mobility has increased more than is suggested by the probit estimates, whereas it seemed to remain fairly stable for girls. This implies that the improvement in educational environment has effectively increased mobility, but that this improvement has been more beneficial as regards paternal education. The maternal impact is more persistent especially for daughters. Consequently there is still room for policies targeting the enhancement of women's educational attainment that potentially affect their child's – namely the daughter's – education and raise intergenerational educational mobility. These results are complementary to Kırdar et al. (2014)'s estimates, who find that although the extension of compulsory schooling in 1997 from five to eight years has contributed to the narrowing of the gender gap in terms of compulsory school attainment, the gender gap in terms of post-compulsory school attainment has not decreased as much. Our study suggests that, alongside other factors, the effect of maternal education probably plays an important role.

For the discrete model (2SRI estimation), maternal education has a threshold effect below compulsory education, and is insignificant above the post-compulsory level (Table 10).[13] Having a mother below eight years of education produces a clear disadvantage in achieving post-compulsory education, especially for daughters. The negative effect of lower parental education is also valid for fathers however the impact of paternal education persists and is positive at higher levels of education. A minimum level of parental education may complement a child's home learning and cognitive development, and provide an environment that is relatively more conducive to schooling. More generally, it may impact on the organization of daily life schedules (for example, meal and sleeping time) at early stages of child development. Specifically, concerning girls, mothers' education may minimize the participation of daughters in household chores and dependent care, leaving more time for education-related activities. This fact might reveal that higher marginal effects under the threshold might point to a trap situation for girls whose mothers have no schooling. However, despite its persistence, the impact of the threshold decreases over time, which implies improvement in the

[13] Given discrepancies in the data sources and methodologies it is difficult to make a comparison. Although they do not instrument for parental education, Daouli et al. (2010)'s work on Greece is quite similar to ours: they use census data and estimate the probability of having completed at least lower secondary school for daughters aged16-17, using comparable controls to ours. The significant marginal effects of mother's and father's education are respectively -0.155 and -0.142 for less than primary level schooling in 1991. The corresponding figures are -0.484 and -0.384 for our full sample in 1990 (Table 6). The same figures are -0.259 (mother) and insignificant (father) for Greece in 2001, and -0.350 and -0.295 for Turkey in 2000. For higher levels of education marginal effects are positive for both parents in Greece, decreasing substantially for mothers in 2000, but with smaller values compared to Turkey, for example, the paternal impact for high-school and post-secondary levels is 0.024 and 0.043 in Greece in 2001, and 0.075 and 0.131 in Turkey in 2000. Overall the comparison suggests that the mobility has been less in Turkey.

intergenerational transmission of education inequality. As to the increasing non-linear effect of paternal education, it may be the outcome of uneven bargaining power within the couple. Either the effect is confounded with income – if the father is assumed to be the breadwinner of the household, some components of the paternal education level may be capturing the missing income effect in the model – or traditional decision – making prevails in the household which gives priority to the husband rather than the wife.

We find a negative siblings effect that increases with the number of siblings, on both genders for both years, which is a sign of resource constraints. The effect decreases in time especially for girls. These effects are gender biased: the negative externality of male sibling(s) is higher than that of female sibling(s). Overall, the negative impact of siblings remains higher on boys, which may be due to behavioural factors (relatively more disruptive behaviour), meaning their educational outcomes are more negatively affected by the existence of siblings, more so in the case of male siblings. Overall, the greater the number of brothers, the greater the invested resources and the lower the probability of post-compulsory schooling for the sibling (whether male or female). Unfortunately we are unable to control for the peer effects as the survey provides information about co-residing household members. Using the 1998 TDHS, Dayıoğlu et al. (2009) estimate the causal impact of siblings on the enrolment of children aged 8-15 and find that the gender composition of siblings only matters for girls. The difference may be due to the difference in the dependent variable: the probability of obtaining at least one post-compulsory school diploma is a stricter constraint than enrolment probability. Also, the TDHS allows (Dayıoğlu et al., 2009) to account for differentiated effects across income groups, where they find that the effect is valid for poorer households and that the effect becomes positive in wealthier households, which they attribute to the reference group argument.

House ownership is the only variable that could proxy the wealth effect in the model. Although it is negative and significant in the full sample, the effect is limited. The wealth effect is stronger for girls, and contrary to what is seen with boys, it is significant in all specifications. Note that the marginal effect is the net effect after computing the interactions with residence dummies (district centre or village) in order to control for house value. The negative significant effect can be interpreted as indicating that the benefits (returns) of schooling outweigh the costs for girls in poorer households. It could be a strategy serving to secure better mating opportunities (marrying-up) and/or increases in life-time earnings. However, this result needs to be interpreted cautiously, as household ownership is only a proximate indicator of wealth. Higher levels of educational attainment are likely to be positively correlated with income or wealth. We do not have enough evidence to support further discussion, but the asymmetric effect of house ownership on girls deserves further investigation.

Being born locally as opposed to being a recent migrant does not have a significant effect in 1990, except for some specifications. The effect of being a native turns positive and significant for the 2000 census but remains very limited. We have to keep in mind that the restricted model only captures the immigration effect for those who moved recently (no later than 5 years). This is an expected outcome, as the 1990s are marked by forced migration and population displacements due to violent conflicts in the eastern regions arising from the Kurdish issue; but also by poor regional policies and decreases in agricultural subsidies affecting other less-developed regions. Overall, these may have contributed to the migration of mainly disadvantaged households, perpetuating their deficiencies in terms of educational outcomes in their new location of residence.

The effect of residing in a village is negative and very strong. It appears that living in a village is a major impediment to post-compulsory schooling, in conformity with previous findings of

studies on the determinants of educational outcomes in Turkey. It decreases the likeliness of boys by 15%, while for girls the effect is more pronounced – around 20% and persisting over time. Private returns to education remain lower in rural areas where low-skilled farming activities prevail. Furthermore, it maybe that education supply remains low and that the cost of schooling is relatively higher in terms of commuting and the relative income of rural households which is likely to be lower. In rural areas returns to education are lower for girls, who are more caught up in household chores and are extensively engaged in unpaid family work. Kırdar et al. (2014) also find that the extension of compulsory schooling has not decreased much in terms of urban-rural gaps post-compulsory schooling. Alongside policies aiming at decreasing schooling costs, rural development policies that would contribute to the development of non-rural wage activities may also increase the expected returns to education and post-compulsory attainment in rural areas. For boys, the effect of residing in a village is decreasing. It is difficult to explain the asymmetric impact in terms of gender. One possible explanation is that for many, post-compulsory education in rural areas was only available at physically remote places. This in turn meant using transportation or attending boarding schools, which was a more common practice among boys relative to girls. A complementary explanation may be the greater opportunity/possibility for boys of moving out for employment or higher education purposes, which motivated post-compulsory schooling attainment. On the other hand, residing in a district (or county) has a positive and significant coefficient. The results suggest that there have been significant improvements in the development of smaller urban centres particularly for girls: living in a district centre as opposed to living in a provincial centre had a negative impact on schooling outcomes in 1990, but this effect disappears in 2000. For the overall effect, it can be argued that district centres have the optimal scale and provide a better school environment than villages or cities. Villages are sometimes very remote and lack enough students or teachers to have proper classes at each level. Cities, on the other hand, are more segregated in terms of class size and school quality. Depending on the scale of suburban area and migration inflow, a city centre might have over-sized classes, an insufficient number of teachers for separate classes, and higher drop-out rates.

The employment prospects indicator can be seen as a measure of gender-specific human capital proxy defined at the district level. In the narrower sense, it can be interpreted as the aspirations of post-compulsory graduates in terms of job opportunities in the local non-agricultural labour market. We include a gender dimension to the variable to capture the participation issue of women in the paid sectors.[14] Besides cultural and regional factors, local labour market conditions provide a material motivation for the schooling of girls and may also decrease the role of other factors. The marginal effects on girls' access more than doubles that of boys and persists over time despite the decrease in the gender gap of educational attainment. The results suggest that in comparing two regions where the employment prospects gap is increasing, the marginal effect would be very substantial.

5. Conclusion

We have estimated the intergenerational transmission of education in Turkey using the 1990 and 2000 censuses. We instrument parental education by constructing a historical series of compulsory education enrolment rates at the provincial level. Overall, we find that the impact of parental education on the probability of the child completing a post-compulsory education level is decreasing. Consequently, intergenerational educational mobility has increased in accordance with the increase in enrolment rates in compulsory schooling over time; however, the intergenerational transmission levels remain relatively high, especially for girls.

[14] We ignore the bias due to selective migration.

Estimations using parental education level in categories reveal non-linearities. Having a parent with a lower-than-post-compulsory education level constitutes an important obstacle to the offspring's probability of completing lower secondary school education. This effect is largest for mother-daughter pairs. An important policy implication is that deficiencies in the supply of and/or compliance with compulsory schooling hinder educational outcomes, especially for the female population. Among other factors, living in a rural area is another major obstacle to post-compulsory school completion. This effect decreases for girls, but not by much. This calls for greater policy involvement in terms of increasing educational supply, decreasing attainment costs and enforcing compliance in these areas. Siblings also affect post-compulsory education negatively, especially for boys, and the effect increases with the number of siblings. Other things being equal, policies targeting the increase of fertility rates are likely to have an adverse effect on post-compulsory educational outcomes. Two factors have a positive impact: living in a district, and local employment prospects. Large cities are characterized by well-being and educational heterogeneity, such that the development of smaller-size cities would be favourable in terms of educational outcomes. Last, employment prospects also influence educational decisions. Demand-side policies in general, and more specifically those affecting female labour-force participation, are likely to be beneficial for post-compulsory schooling.

Appendix

Table A1. Marginal effects of the probability of having completed at least lower secondary school - all children, restricted sample, categorical parental education

	1990		2000		1990		2000	
	Probit	IV	Probit	IV	Probit	IV	Probit	IV
Gender (female=1)	-0.074***	-0.076***	-0.053***	-0.049***	-0.080***	-0.073***	-0.053***	-0.037***
	(0.008)	(0.007)	(0.009)	(0.010)	(0.007)	(0.008)	(0.009)	(0.010)
Mother								
No schooling	-0.462***	-0.492***	-0.304***	-0.276***				
	(0.019)	(0.034)	(0.012)	(0.028)				
5 Years Primary	-0.314***	-0.325***	-0.154***	-0.143***				
	(0.019)	(0.021)	(0.011)	(0.015)				
High School	0.042	0.051*	-0.008	-0.019				
	(0.026)	(0.026)	(0.015)	(0.017)				
Post-secondary	0.102***	0.119***	0.002	-0.024				
	(0.030)	(0.032)	(0.020)	(0.031)				
Father								
No schooling					-0.386***	-0.314***	-0.305***	-0.174***
					(0.011)	(0.023)	(0.008)	(0.034)
5 Years Primary					-0.242***	-0.206***	-0.162***	-0.108***
					(0.010)	(0.014)	(0.007)	(0.015)
High School					0.130***	0.100***	0.045***	-0.005
					(0.016)	(0.016)	(0.008)	(0.013)
Post-secondary					0.224***	0.163***	0.097***	-0.018
					(0.016)	(0.026)	(0.011)	(0.031)
Siblings								
Sibling 1 girl	-0.019***	-0.019***	-0.025***	-0.026***	-0.021***	-0.022***	-0.026***	-0.028***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Sibling girls>=2	-0.058***	-0.056***	-0.054***	-0.057***	-0.061***	-0.064***	-0.052***	-0.061***
	(0.005)	(0.005)	(0.005)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)
Sibling 1 boy	-0.043***	-0.042***	-0.035***	-0.036***	-0.042***	-0.044***	-0.033***	-0.039***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Sibling boys>=2	-0.114***	-0.112***	-0.090***	-0.093***	-0.110***	-0.115***	-0.089***	-0.104***
	(0.005)	(0.005)	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)	(0.006)
District	0.019***	0.019***	0.025***	0.025***	0.018**	0.018***	0.025***	0.023***
	(0.007)	(0.007)	(0.006)	(0.007)	(0.008)	(0.007)	(0.006)	(0.006)
Village	-0.213***	-0.209***	-0.150***	-0.154***	-0.182***	-0.195***	-0.129***	-0.155***
	(0.006)	(0.007)	(0.006)	(0.006)	(0.006)	(0.007)	(0.006)	(0.008)
House Ownership	-0.033***	-0.032***	-0.033***	-0.034***	-0.025***	-0.029***	-0.030***	-0.037***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Born local	-0.006	-0.008	0.042***	0.043***	0.020***	0.016**	0.064***	0.054***
	(0.009)	(0.008)	(0.009)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Emp. prospects	0.004***	0.004***	0.004***	0.004***	0.003***	0.004***	0.003***	0.004***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Res. Regional		-0.004		0.004		0.009***		0.016***
		(0.003)		(0.003)		(0.003)		(0.004)
Observations	52,774	52,774	57,768	57,768	52,089	52,089	58,260	58,260
Pseudo R-squared	0.187	0.187	0.122	0.122	0.210	0.210	0.132	0.132

Notes.- The omitted categories are; native-born child residing in city centre with no male or female siblings. Adana is the reference province. Provincial fixed effects (67) are included. The restricted sample includes children having a native born or recent migrant parent. Bootstrapped standard errors (based on 200 replications) in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A2. Marginal effects of the probability of having completed at least lower secondary school - boys, restricted sample, categorical parental education

	1990		2000		1990		2000	
	Probit	IV	Probit	IV	Probit	IV	Probit	IV
Mother								
No schooling	-0.412***	-0.370***	-0.239***	-0.171***				
	(0.025)	(0.044)	(0.015)	(0.036)				
5 Years Primary	-0.265***	-0.251***	-0.109***	-0.085***				
	(0.025)	(0.027)	(0.015)	(0.019)				
High School	0.068**	0.057	0.004	-0.022				
	(0.032)	(0.041)	(0.021)	(0.023)				
Post-secondary	0.122***	0.100*	0.008	-0.055				
	(0.038)	(0.053)	(0.027)	(0.041)				
Father								
No schooling					-0.436***	-0.351***	-0.309***	-0.137***
					(0.015)	(0.032)	(0.012)	(0.052)
5 Years Primary					-0.256***	-0.218***	-0.152***	-0.086***
					(0.014)	(0.019)	(0.009)	(0.022)
High School					0.088***	0.058**	0.016	-0.046**
					(0.021)	(0.024)	(0.012)	(0.022)
Post-secondary					0.172***	0.113***	0.055***	-0.092**
					(0.020)	(0.034)	(0.015)	(0.045)
Siblings								
Sibling 1 girl	-0.019***	-0.019***	-0.034***	-0.036***	-0.020**	-0.021***	-0.034***	-0.038***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)	(0.008)	(0.007)	(0.007)
Sibling girls>=2	-0.059***	-0.062***	-0.065***	-0.070***	-0.064***	-0.068***	-0.063***	-0.074***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)	(0.007)	(0.008)	(0.008)
Sibling 1 boy	-0.046***	-0.047***	-0.044***	-0.047***	-0.041***	-0.044***	-0.042***	-0.050***
	(0.008)	(0.008)	(0.007)	(0.007)	(0.008)	(0.008)	(0.007)	(0.007)
Sibling boys>=2	-0.124***	-0.128***	-0.098***	-0.106***	-0.115***	-0.123***	-0.098***	-0.117***
	(0.008)	(0.009)	(0.007)	(0.009)	(0.008)	(0.008)	(0.008)	(0.008)
District	0.075***	0.075***	0.058***	0.059***	0.064***	0.067***	0.055***	0.057***
	(0.010)	(0.010)	(0.008)	(0.009)	(0.010)	(0.010)	(0.008)	(0.009)
Village	-0.152***	-0.156***	-0.086***	-0.093***	-0.123***	-0.136***	-0.066***	-0.092***
	(0.010)	(0.010)	(0.008)	(0.009)	(0.009)	(0.010)	(0.009)	(0.012)
House Ownership	-0.020**	-0.023**	-0.006	-0.009	-0.011	-0.016*	-0.005	-0.012
	(0.009)	(0.010)	(0.008)	(0.010)	(0.009)	(0.010)	(0.008)	(0.009)
Born local	-0.009	-0.007	0.046***	0.049***	0.005	0.003	0.057***	0.046***
	(0.012)	(0.013)	(0.011)	(0.012)	(0.012)	(0.011)	(0.013)	(0.012)
Emp. prospects	0.006***	0.007***	0.005***	0.006***	0.006***	0.006***	0.005***	0.006***
	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Res. Regional		0.005		0.009**		0.011***		0.021***
		(0.005)		(0.004)		(0.003)		(0.006)
Observations	26,288	26,288	29,671	29,671	25,938	25,938	29,968	29,968
Pseudo R-squared	0.130	0.130	0.0801	0.0802	0.155	0.155	0.0920	0.0924

Notes.- The omitted categories are; native-born child residing in city centre with no male or female siblings. Adana is the reference province. Provincial fixed effects (67) are included. The restricted sample includes children having a native born or recent migrant parent. Bootstrapped standard errors (based on 200 replications) in parentheses.
*** p<0.01, ** p<0.05, * p<0.1.

Table A3. Marginal effects of the probability of having completed at least lower secondary school - girls, restricted sample, categorical parental education

	1990		2000		1990		2000	
	Probit	IV	Probit	IV	Probit	IV	Probit	IV
Mother								
No schooling	-0.481***	-0.549***	-0.360***	-0.333***				
	(0.027)	(0.045)	(0.016)	(0.036)				
5 Years Primary	-0.338***	-0.369***	-0.191***	-0.180***				
	(0.027)	(0.029)	(0.015)	(0.020)				
High School	-0.003	0.024	-0.028	-0.039				
	(0.041)	(0.039)	(0.020)	(0.026)				
Post-secondary	0.057	0.108**	-0.023	-0.050				
	(0.055)	(0.051)	(0.035)	(0.048)				
Father								
No schooling					-0.325***	-0.261***	-0.293***	-0.176***
					(0.013)	(0.029)	(0.011)	(0.041)
5 Years Primary					-0.215***	-0.179***	-0.167***	-0.115***
					(0.013)	(0.018)	(0.009)	(0.020)
High School					0.157***	0.121***	0.073***	0.023
					(0.021)	(0.025)	(0.013)	(0.018)
Post-secondary					0.257***	0.182***	0.132***	0.019
					(0.025)	(0.039)	(0.017)	(0.040)
Siblings								
sibling 1 girl	-0.017***	-0.015**	-0.015**	-0.016***	-0.018***	-0.019***	-0.015**	-0.017***
	(0.006)	(0.006)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)
sibling girls>=2	-0.054***	-0.051***	-0.043***	-0.046***	-0.056***	-0.057***	-0.041***	-0.049***
	(0.005)	(0.006)	(0.006)	(0.007)	(0.006)	(0.006)	(0.006)	(0.007)
sibling 1 boy	-0.045***	-0.044***	-0.027***	-0.028***	-0.048***	-0.048***	-0.023***	-0.028***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)	(0.008)
sibling boys>=2	-0.105***	-0.100***	-0.077***	-0.081***	-0.105***	-0.108***	-0.076***	-0.089***
	(0.007)	(0.007)	(0.008)	(0.009)	(0.007)	(0.006)	(0.008)	(0.009)
District	0.022**	0.022**	0.029***	0.029***	0.028***	0.029***	0.032***	0.031***
	(0.009)	(0.011)	(0.009)	(0.010)	(0.011)	(0.010)	(0.010)	(0.010)
Village	-0.220***	-0.213***	-0.181***	-0.185***	-0.189***	-0.200***	-0.160***	-0.185***
	(0.008)	(0.009)	(0.008)	(0.009)	(0.008)	(0.009)	(0.010)	(0.012)
House Ownership	-0.042***	-0.039***	-0.056***	-0.057***	-0.037***	-0.041***	-0.052***	-0.059***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.009)
Born local	-0.003	-0.006	0.033***	0.033***	0.032***	0.027***	0.064***	0.055***
	(0.010)	(0.010)	(0.012)	(0.012)	(0.010)	(0.009)	(0.011)	(0.014)
Emp. prospects	0.012***	0.011***	0.008***	0.009***	0.012***	0.013***	0.009***	0.011***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Res. Regional		-0.007*		0.003		0.007**		0.015***
		(0.004)		(0.004)		(0.003)		(0.005)
Res. No								
Observations	26,486	26,486	28,097	28,097	26,151	26,151	28,292	28,292
Pseudo R-squared	0.247	0.247	0.163	0.164	0.269	0.269	0.172	0.172

Notes.- The omitted categories are; native-born child residing in city centre with no male or female siblings. Adana is the reference province. Provincial fixed effects (67) are included. The restricted sample includes children having a native born or recent migrant parent. Bootstrapped standard errors (based on 200 replications) in parentheses.
*** p<0.01, ** p<0.05, * p<0.1.

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