Research article

The impacts of family background on children's educational attainment and earnings

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Abstract: This study analyzes the parental schooling and income impacts on their children's outcomes that to a large extent determine the standard of living they achieve in the future: educational attainment and earnings. OLS estimations of child schooling and child earnings regressions are conducted. The results point to a strong positive relationship between children's outcomes and their family background characteristics. The estimated strong intergenerational links promise children of highly educated and wealthy parents a high standard of living while doom children of low educated and poor parents to enjoy a lower quality of life. Persistency in intergenerational links found in this study proves to be an obstacle in overall economic development which may call for the government to generate policies that break the harmful intergenerational links either through providing equal opportunity in accessing education for low-income/low educated families' children or through redistributing income across poor families that help them invest more in their children's human capital.

Keywords: Intergenerational Mobility, Human Capital, Personal Income

JEL Codes: D31, J24, J62

1. Introduction

The intergenerational schooling and income mobility literature present evidence on the non-negligible impacts of parental characteristics on their children's educational attainment and income[2]. Each branch mainly documents either causal relations or mere correlations between positions of parents in their income or years of schooling distributions and the corresponding positions of their children in their distributions. The intrinsic value of this effort stems from the fact that strong intergenerational schooling or income links may be detrimental to economic growth and hurt children with low educated or poor parents via limiting their chances of living a decent quality of life in the future. The findings of strong intergenerational schooling associations of Johnson and Stafford (1973) and Leibowitz (1974) combined with the implication of the human capital theory of Ben-Porath (1967), which suggests that educational attainment is a key determinant of an individual's lifetime earnings, doom unlucky children of low educated parents in terms of promising them lower levels of future earnings and in turn a lower standard of living. A similar conclusion using intergenerational income links is drawn by Mayer (2010): children of poor families achieve lower levels of schooling and earn less in their adulthood compared to children of wealthy families. The long-lasting devastating consequences of strong intergenerational education or income links require studying whether the links are persistent and causal. If a persistent pattern in intergenerational links can be depicted, then a

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[2] For a survey of international results on education and income mobility see Holmlund, Lindahl and Plug (2011), and Mayer (2010). For recent national education mobility estimates in Turkish context see Aydemir and Yazici (2019), and Duman (2021a). For income mobility estimates in Turkish context see Duman (2021b).

government may intervene by redistributing income among poor households to the extent that investing in their children's human capital becomes affordable or the government may directly invest in the human capital of children from vulnerable households to fight against income inequality and poverty that may arise in the future among the generation of today's youngsters.

The main empirical challenge in this context is a consistent estimation of intergenerational mobility coefficients. The estimated intergenerational schooling coefficient may be confounded by systematic differences in parental income which comoves with the education level of the parents. That is, higher educated parents may earn more than less educated parents since the skills they acquire in the school may be rewarded highly in the labor market. The higher educated parents, thanks to their higher wealth level, may invest more in their children's education and may provide suitable environments that enhance the learning processes of their children. Ability is another confounder of the intergenerational schooling relation. More able parents may obtain more years of schooling than less able parents, and in the presumption that ability is genetically transmitted from parents to their children, more able parents are more likely to have children of high intellectual capacity who eventually obtain more years of schooling than children of less able/less-educated parents. Analogously, the ability is a confounder of the intergenerational income mobility coefficient estimate. If these confounders are not accounted for, the estimated intergenerational links become merely associations. Studies that try to abstract from such confounding effects in estimating intergenerational linkages use either samples restricted to identical twin fathers (or mothers) and their children (see Holmlund, Lindahl, & Plug, 2011; Behrman and Rosenzweig, 2002), adoptee parents, and adopted children (see for a survey of results Holmlund *et al.*, 2011) or IV estimation strategies. Black, Devereux, and Salvanes (2008) are a perfect example in this context where they identify exogenous variation in parental education through instrumenting with a schooling reform that increases compulsory schooling from seven to nine years in Norwegian municipalities at different periods between 1959 and 1973. The two years increase in the schooling of parents that comply with the reform is independent of their innate ability and constitutes the exogenous part of parental schooling that is used as identifying variation. Black *et al.* (2008) estimate the null effect of father's schooling and statistically significant low positive effect of mother's schooling on offspring's educational attainment. Solon (1992) implements OLS and IV estimation techniques to bound the true intergenerational income correlation from the bottom and above, respectively. He concludes that the true correlation in the log earnings of fathers and their sons is around 0.4.

This study differentiates from the intergenerational education and income mobility literature in trying to consistently estimate the effects of both parental characteristics (schooling and income) simultaneously on each child outcome separately. A combination of empirical strategies presented in Behrman and Rosenzweig (2002) and Shea (2000) is used to achieve this goal. This study also contributes to the scarce literature on the impacts of parental characteristics on their children's outcomes in the Turkish context.

The paper is organized as follows: Section 2 describes in detail the empirical methodologies of Behrman and Rosenzweig (2002) and Shea (2000) that this paper benefits from in identification and provides a summary of international findings. Section 3 describes the dataset used and presents some descriptive statistics. In section 4 results are presented and lastly, section 5 concludes.

2. Literature review and estimation issues

This paper adopts largely from Behrman and Rosenzweig (2002) and Shea (2000) in identification. In a nutshell, Behrman and Rosenzweig (2002) focus on consistent estimation of intergenerational schooling correlations while Shea (2000) focuses on consistent estimation of intergenerational income correlations. This paper creatively combines empirical methodologies of both studies to achieve a consistent estimation of parental schooling and income effects in a context where child schooling/earnings is a function of both parental characteristics. Both studies assume that a child's unobserved schooling (earnings) endowments are stochastically determined by their parents' earnings

(schooling) endowments. The studies differ in how they account for parents' endowments: Behrman and Rosenzweig (2002) regresses parental income on years of schooling and experience of the parent and takes the residual as a measure of heritable earnings endowment of the parent; Shea (2000) favors using an instrument such as union membership that captures variation in parental income that is exogenous to the parent's schooling endowments. Next, the details of their estimation strategies are explained.

Behrman and Rosenzweig (2002) try to consistently estimate the intergenerational schooling impacts. They try to take care of the ability bias by making use of a sample consisting of twin fathers and their children and twin mothers and their children, respectively. To account for assortative mating[3] they add both parents' years of schooling separately in the estimation equation.

$$S_{ij}^{c} = \gamma_1 S_j + \gamma_2 S_j^{s} + \mu_1 h_j + f_j + \mu_2 h_j^{s} + \epsilon_{ij}^{c} \quad (1)$$

Above is the equation that is estimated by Behrman and Rosenzweig (2002) to estimate the impact of parental schooling on children's educational attainment. S_{ij}^{c} represents the years of schooling of the child i in family j, S_j is the mother's years of schooling in family j, S_j^{s} is the father's years of schooling in family j, h_j are mother's heritable earnings endowments, f_j is mother's childrearing ability, h_j^{s} is father's heritable earnings endowments, and ϵ_{ij}^{c} is an orthogonal error term.

$$H_{ij} = \beta S_{ij} + \pi E_{ij} + h_{ij} + v_{ij} \quad (2)$$

This equation represents the earnings equation of parents and is used by Behrman and Rosenzweig (2002) to obtain the unobservable heritable earnings endowments that are needed in equation (1). H_{ij} is the log of earnings of individual i in family j, S_{ij} are the total years of schooling of individual i in family j, E_{ij} represents the experience of individual i in family j, h_{ij} is the heritable earnings endowments of individual i in family j and v_{ij} represents an orthogonal error term.

In equation (1) since ϵ_{ij}^{c} is an orthogonal error term (i.e., cannot include child's ability because child's ability is assumed to be correlated with his/her parents' education due to the genetic transmission of ability), the child's endowments must be captured by his parents' endowments and this is how Behrman and Rosenzweig (2002) incorporate stochastically determined endowments assumption into their estimation equation. In this equation, the parents' schooling coefficients, when controlled for their endowments, estimate the effects of environmental inputs on their children's education. These environmental inputs include the time allocations made by parents to their children, the parental skill in parenting, and good inputs to their children's human capital.

There are two problems present in the intergenerational schooling equation that may result in biased estimates. First, a parent's schooling is correlated with his/her endowment. Unless the coefficients of parents' endowments are estimated to be zero in equation (1) omitting them would result in biased estimation of parental schooling coefficients. That is, instead of being genetically transmitted if a child's endowments are determined by a random shock, then the intergenerational schooling estimates would be unbiased. Second, a parent's schooling is correlated with the endowments of the spouse due to nonrandom matching in the marriage market. Both problems present challenges in consistently estimating the intergenerational schooling impacts.

Behrman and Rosenzweig (2002) make use of a sample consisting of twin male and twin female parents and their children to consistently estimate the schooling coefficients. They have 668 identical twin pairs born in Minnesota between 1936 and 1955 of whom 424 are female twin pairs and 244 are

[3] This is an assumption that says matching in marriage market is not random: people marry those who are more like them. In intergenerational education mobility context, assortative mating translates to more educated mothers marrying more educated fathers.

male twin pairs. Each one of the twins has a child at least 18 years old during the study. By differencing identical female twins' children's educational attainment regression equations, they get rid of the mother's heritable earnings endowment and childrearing ability since identical twins have the same genetic code and thus, the same endowments and in the literature, the intergenerational schooling relation is assumed to be a linear one. Still, the father's unobserved heritable earnings endowment biases the schooling coefficients of both parents. One remedy may be to include the father's income in equation (1) but Behrman and Rosenzweig (2002) find it unappealing due to the strong correlation between paternal schooling and paternal income. Behrman and Rosenzweig (2002) use equation (2) to find the father's heritable earnings endowments and insert the estimated paternal earnings endowment into equation (1). However, the residual obtained by subtracting the effects of schooling and experience from earnings contain both father's heritable earnings endowment h and a noise term v. If v is mostly measurement error or an independently and identically distributed shock then the residual obtained from equation (2) measures endowments with an error which leads to biases in schooling mobility coefficients (Behrman & Rosenzweig, 2002). They come up with the idea that since v is orthogonal to paternal schooling in equation (2) and in addition, is not heritable, excluding v from equation (2) would result in a residual which only captures father's unobserved heritable earnings endowments and using this residual in equation (1) does not bias the estimated effect of father's schooling on his children's schooling unless couples sort on v in the marriage market. This is the methodology being used to estimate intergenerational schooling coefficients when the sample consists of twin mothers. When twin fathers are used as the sample, a similar approach is used with a slight difference. By differencing identical male twins' children's schooling equations, they get rid of the father's heritable earnings endowments. Mother's earnings endowment can be estimated using the residual method explained before. However, a mother's childrearing ability is still not accounted for and biases the intergenerational schooling estimates. Behrman and Rosenzweig (2002) suggest that if childrearing ability and paternal schooling are positively correlated in the population, then the father's schooling estimate would be upward biased. It is expected to obtain higher estimates for paternal schooling if estimated using male twins sample instead of being estimated using female twins sample (Behrman & Rosenzweig, 2002). They use this comparison as a robustness check for their results. Behrman and Rosenzweig (2002) find a significant positive effect for a father's schooling and a significant negative effect for a mother's schooling. The negative significant effect for mother's schooling is what distinguishes Behrman and Rosenzweig (2002) from other twin studies in the literature which find no effect for mother's schooling.

Shea (2000) tries to exploit an exogenous variation in parental income to identify a causal intergenerational income effect. He argues that a child's income depends on two variables: human capital and luck. The human capital of a child consists of things like innate ability, manual dexterity, education, work ethic, etc. Some of the components of human capital are observable like education and some are not. Shea (2000) also argues that the human capital of a child depends on the human capital and income of his/her parents.

$$Y_i = H_i + L_i \tag{3}$$

$$H_i = \rho H_{i-1} + \gamma Y_{i-1} + \varepsilon_i \tag{4}$$

In (3), Y_i represents the child's income, H_i represents the child's human capital and L_i stands for the luck component. In (4), a child's human capital depends on parents' human capital H_{i-1}, parents' income Y_{i-1} and an orthogonal error term ε_i. In (4), Shea (2000) argues that H_{i-1} represents the genetic transmission of ability from parents to the child. Behrman and Rosenzweig (2002) compare to Shea (2000) in assuming transmission of ability among generations. Shea (2000) argues that innate ability is a part of someone's human capital and a child's human capital depends on his parents' human capital via the intergenerational ability transmission channel. Therefore, equation (4) implies that a child's unobserved ability is stochastically determined by his parents' abilities and this is also in line with Behrman and Rosenzweig (2002). By combining (3) and (4) we get:

$$Y_i = \rho H_{i-1} + \gamma Y_{i-1} + L_i + \varepsilon_i \quad (5)$$

This equation tells us that a child's income depends on his parents' human capital, parental income, and the child's luck. The error term ε_i is orthogonal to parental attributes since it is orthogonal to parental attributes in equation (4). Estimating equation (5) with OLS using child's log of earnings as dependent variable and father's log of earnings as the independent variable of interest results in biases since high able parents may earn more and due to genetic transmission of ability may have high ability children who earn more as well. The correlation between a parent's unobserved heritable endowments and his/her income causes biases in all coefficients. Shea (2000) considers parental income as the only endogenous variable in her model; however, Behrman and Rosenzweig (2002) argue that in addition to parental income, parental schooling which is part of parental human capital is also endogenous in this context. Shea (2000) argues that estimating (5) with OLS results in an upward bias in the estimate of parental income because parental income and parental endowments are positively correlated and parental endowments which form the endowments of children are also positively correlated with child's income.

Shea (2000) decomposes a parent's income into a parent's human capital and a parent's luck.

$$Y_{i-1} = H_{i-1} + L_{i-1} \quad (6)$$

$$H_{i-1} = \alpha_1 X_{i-1} + u_{i-1}^H \quad (7)$$

$$L_{i-1} = \beta_1 X_{i-1} + \beta_2 Z_{i-1} + u_{i-1}^L \quad (8)$$

Parent's human capital H_{i-1} consists of observable parental attributes X_{i-1} like education and experience and unobservable characteristics u_{i-1}^H like schooling endowments. The parental luck component L_{i-1} can be decomposed into observable parental attributes X_{i-1} and some other observable attributes Z_{i-1} which form the basis for the instrumental variable and an unobservable component which is denoted by u_{i-1}^L. Shea (2000) tries to capture a variation in income that is orthogonal to parent's heritable endowments. The justification of using IV estimation comes from the assumption that conditional on observables X_{i-1}, Z_{i-1} is orthogonal to the unobserved schooling endowment u_{i-1}^H that is transferred across generations. The exogenous variation in the father's income is due to factors like union, industry, and job loss that represent luck. By plugging equation (7) into equation (5), Shea (2000) achieves the final regression equation which is estimated by instrumenting parental income Y_{i-1} with Z_{i-1}:

$$Y_i = \rho\alpha_1 X_{i-1} + \rho u_{i-1}^H + \gamma Y_{i-1} + L_i + \varepsilon_i \quad (9)$$

Shea (2000) uses PSID data and focuses on the father's income as the independent variable and his children's income as the dependent variable. The bias in equation (9) arises due to the correlation between heritable father's endowment u_{i-1}^H and father's income. The estimation strategy adopted in this paper differentiates from Shea (2000) by proxying parent's schooling endowment u_{i-1}^H instead of instrumenting Y_{i-1} due to data limitations. The proxy measure is achieved by applying Behrman and Rosenzweig's (2002) method of estimating the residual from a regression of parental income on parental schooling and age. The implicit assumption in applying this strategy is a strong positive correlation between earnings and schooling endowments: high able parents with more schooling endowments are more likely to acquire more schooling, in return are more likely to create large labor market networks (i.e., high earnings endowments) that benefit them obtaining high paying jobs.

Shea (2000) concludes that the OLS estimate of intergenerational income correlation is 0.136 which is significant at 5%. IV estimate is indistinguishable from zero. The OLS estimate of father's income effect on children's total years of schooling is 0.373 and it is significant at 5% whereas IV estimate is again zero for children's schooling. Therefore, based on IV estimation results Shea (2000)

concludes that there is no impact of parental income on children's income or children's schooling when father's schooling is accounted for.

3. Data and descriptive statistics

This study exploits variation in child and parent characteristics from a nationally representative annual household survey conducted by the Turkish Statistical Institute (2011) "Household Budget Survey". To increase the sample size, I pooled nine waves of the surveys covering the years 2003-2011. The surveys contain information on demographic characteristics including the last finished schooling level, current and previous employment status, earnings both in cash and in-kind from the last 12 months, expenditures, and household asset ownership. The pooled cross-sectional data set contains information on 98,568 households.

Table 1. Descriptive Statistics

Variables	Sons Sample		Daughters Sample	
	Fathers	**Sons**	**Fathers**	**Girls**
Age	57.32	28.54	57.67	28.56
Annual earnings	16,350	10,720	16,770	10,136
Education[a]				
No qualification	0.097	0.021	0.077	0.059
Low level	0.762	0.501	0.724	0.435
Middle level	0.085	0.320	0.118	0.268
High level	0.054	0.156	0.079	0.237
Occupation[b]				
Top executive and managerial	0.163	0.069	0.180	0.039
Professional	0.020	0.053	0.029	0.152
Assistant professional	0.027	0.061	0.040	0.115
Clerical	0.022	0.058	0.032	0.196
Service and sales	0.058	0.155	0.069	0.113
Farmer and livestock workers	0.418	0.189	0.330	0.198
Craftsmen and foremen	0.100	0.179	0.123	0.055
Operatives	0.086	0.119	0.096	0.042
Unskilled labor	0.100	0.113	0.097	0.085
Married	0.97	0.45	0.97	0.10
No. of siblings	-	2.25	-	2.39

Notes: The descriptive statistics are for sons and daughters who have non-missing education and earnings information and who have fathers with non-missing education and earnings information. (a) No qualification represents illiterate individuals. The low level represents individuals who are junior high school graduates or have less than junior high school level education. The middle level represents individuals who have a high school diploma. The high level represents individuals who have a 2-year or 4-year university or master's or Ph.D. diploma. (b) Professions are categorized according to ISCO 88. Sons sample consists of 8,046 father-son pairs. The daughter sample consists of 3,890 father-daughter pairs. The descriptive statistics for sons and girls are for the oldest son and oldest daughter in the household. Annual earnings are in December 2011 Turkish Liras.
Source: Duman (2021a).

The purpose of this study is to quantify the impact of parental attributes (e.g., education and income) on their children's earnings and educational attainment. To achieve this goal, parents and their children should be identified in the sample. Since the dataset is not longitudinal, children who left their parents' households and form their own cannot be matched with their parents. However, the data set allows matching parents and children if they live in the same household. Though, the sample constructed by choosing the households where parents and their children live together may be highly selected and may not be representative of the population.

Table 1 gives the descriptive statistics for children who have non-zero earnings and non-missing information on last finished schooling level and who have fathers with non-zero earnings and non-missing information on last finished schooling level. The samples constitute sons and daughters who are between ages 25 and 34. The descriptive statistics are given for the oldest son or oldest daughter present in the household and their matched fathers. Choosing the oldest son or oldest daughter is to preserve independence across observations and to reduce potential life-cycle bias as individuals in their early ages may have fewer earnings or wages due to having less experience (Zimmerman, 1992). Annual earnings are reported in December 2011 Turkish Lira.

In both samples, the corresponding average age of sons and daughters as well the corresponding average age of fathers in sons' and fathers in daughters' samples are similar. The mean annual earnings of sons are slightly larger than the mean annual earnings of daughters. When the focus is on fathers, the pattern is reversed: fathers in the daughters' sample earn slightly more than fathers in the sons' sample. There is an improvement in educational attainment levels attained moving from the generation of fathers to the generation of their children. In the fathers-sons sample, fathers with lower secondary or less than lower secondary education constitute 76% of all fathers. 8% of the fathers have high school education and only 5% have tertiary education. Around 10% of fathers are illiterate. The illiteracy rate significantly decreases to 2.1% in the sons' generation. The share of sons with lower secondary or less than lower secondary education is around 26 percentage points less than the corresponding figure for their fathers. The high school share increases from 8% to 32% moving from fathers' generation to sons' generation. Lastly, the share of tertiary education tripled in the sons' generation. Similar patterns arise for the fathers-daughters sample with an important difference; fathers in the daughters' sample have a lower share of illiteracy and lower secondary education and have higher shares of high school and tertiary education compared to fathers in the sons' sample. In the fathers-sons sample, 42% of all fathers work as a farmer or livestock worker which most likely implies that these families are located in rural areas. The corresponding figure for the fathers-daughters sample is around 33%. Since the occupational opportunities in rural areas are not that much in number compared to urban areas and on average occupations in rural areas may pay less compared to occupations in urban areas, the fathers in the fathers-sons sample have on average lower annual earnings compared to fathers in the fathers-daughters sample. This observation necessitates controlling for the location of households in child outcome regressions. As expected, a low share of daughters is married in the fathers-daughters sample.

4. Results

In this section, a set of regressions are run to estimate the causal impacts of parental schooling and parental income on their children's schooling and income. The identification strategy depends mainly on Behrman and Rosenzweig (2002) and Shea (2000). The identification differs from Behrman and Rosenzweig (2002) by allowing parents' income to play a role in determining a child's human capital. This change in identification is also to test Shea's (2000) argument that a child's human capital depends on the human capital of his/her parents and his parents' income. Behrman and Rosenzweig (2002) omit father's income in trying to estimate causal parental schooling impacts on children's educational attainment with the argument that father's income and father's schooling are highly correlated and may cause multicollinearity which complicates interpreting the estimated impacts. However, highly educated parents may have high earnings and therefore may invest more in their

children's human capital. In such a scenario, omitting parental income may cause upward biased parental schooling estimates. Shea (2000) controls for father's earnings in trying to estimate causal parental income impacts on children's income and omits mother's earnings. In this study, father's earnings and mother's earnings are summed up and included in the child's schooling and earnings equations because as Behrman and Rosenzweig (2002) argue there is non-random matching in the marriage market and, thus father's earnings may be correlated with mother's earnings which in the case of omitting mother's earnings will cause bias in father's earnings estimates. To be able to sum up father's and mother's earnings and include them in the schooling and income equations, the necessary assumption is that there is no bargaining effect in the household which implies that the impact of any additional TL on children's outcomes is the same whether it is provided by the mother or the father. The identification strategy makes the well-known assumption that a child's endowments are stochastically determined by his/her parents' endowments. So, the schooling and income equations of the child include his/her father's and mother's endowments. To account for unobserved heritable parental endowments, the method suggested by Behrman and Rosenzweig (2002)—estimating the residuals from the father's and mother's earnings equation by subtracting the impacts of schooling and experience—is applied. Note that although in the empirical methodology of Shea (2000) consistent estimation of income mobility correlations requires accounting for unobserved parental schooling endowments, this study proxies parental schooling endowments with parental earnings endowments in child's income regressions by assuming a strong correlation between the two. The residuals obtained in this method capture father's and mother's earnings endowments and a part which is assumed to be neither i.i.d. nor measurement error. The residual obtained from the mother's earnings equation does not capture childrearing ability and there is no way to control for mother's childrearing ability. Nevertheless, omitting mother's childrearing ability in child's schooling or income equations causes biased estimates only if the father's schooling or father's income is correlated with the mother's unobserved childrearing ability. It is expected that there is a random matching in the marriage market with respect to the mother's childrearing ability because there is no obvious and observable signal for the mother's childrearing ability that can be matched on by the fathers. Therefore, omitting a mother's childrearing ability is assumed to cause no serious problems in consistently estimating parental income and parental schooling impacts.

$$O_{ij}^{c} = \gamma_1 S_j + \gamma_2 S_j^{s} + \gamma_3 I_j + \gamma_4' X_j + \mu_1 h_j + \mu_2 h_j^{s} + \epsilon_{ij}^{c} \tag{10}$$

$$I_{ij} = \beta S_{ij} + \pi A_{ij} + h_{ij} + v_{ij} \tag{11}$$

Above are the equations used to estimate the causal parental schooling and income impacts on children's outcomes. O_{ij}^{c} represents the outcome of the child i in family j (e.g., log of annual earnings and educational attainment), S_j is the mother's educational attainment in family j, S_j^{s} is the father's educational attainment in family j, I_j is the log of the total of father's and mother's earnings, X_j is a vector of covariates including a dummy indicating whether the family lives in an urban or rural area, and the number of siblings in the household, h_j are mother's heritable earnings endowments, h_j^{s} is father's heritable earnings endowments, and ϵ_{ij}^{c} is an orthogonal error term. Equation (11) is used to obtain the heritable earnings endowments of parents. I_{ij} is the log of earnings of individual i in family j, S_{ij} is the educational attainment of individual i in family j, as a proxy measure of experience A_{ij} represents the age of individual i in family j, h_{ij} is the heritable earnings endowments of individual i in family j and v_{ij} represents an orthogonal error term. The educational attainment variable for both parents and their children is an ordinal variable with 11 distinct values. Although the dependent variable in schooling regressions is not a continuous variable, the OLS estimation method was used to estimate the impact of parental characteristics. The ordered logit estimation method is another method commonly used to estimate treatment impacts when the dependent variable is an ordinal variable. However, in this context using the ordered logit estimation method complicates interpreting the coefficients.

Table 2 presents the estimates of parental schooling and parental income effects on their children's educational attainment by investigating the impacts separately for sons and daughters. The first and third columns do not try to account for genetically transmitted ability whereas the second and fourth columns try to account for the genetically transmitted ability by plugging the residuals from equation (11) for fathers and mothers into the child's schooling equation. The dependent variable is the educational attainment of the oldest son/daughter (aged between 25 and 34) in the household who has non-missing information on his/her parents' schooling and earnings. Controlling for father's and mother's endowment does not seem to change the parental schooling coefficients significantly for sons with a slight increase in both father's and mother's schooling coefficients. Controlling for heritable parental endowments slightly decreases the parental schooling estimates for daughters. This result from the daughters sample is in line with the expectation that omitted parental endowments upward biases parental schooling estimates. Nevertheless, parental schooling has a positive significant impact on a child's schooling regardless of the sex of the child. These results are consistent with the findings of Björklund, Lindahl, and Plug (2004) who, with a sample of adoptive parents and adopted children, find positive and significant impacts for father's and mother's schooling on children's schooling.

Table 2. Causal parental schooling and income impacts on children's educational attainment

	Dependent variables			
	(1)	**(2)**	**(3)**	**(4)**
Variables	**son's education**	**son's education**	**daughter's education**	**daughter's education**
father's education	0.328***	0.370***	0.243***	0.227***
	(0.0400)	(0.0421)	(0.0574)	(0.0712)
mother's education	0.213***	0.232***	0.185***	0.165***
	(0.0379)	(0.0400)	(0.0515)	(0.0624)
log of total earnings	0.506***	0.195	0.951***	1.181**
	(0.0936)	(0.176)	(0.200)	(0.521)
rural	-0.290*	-0.317**	-1.404***	-1.401***
	(0.159)	(0.159)	(0.366)	(0.365)
no of siblings	-0.209***	-0.198***	-0.148	-0.153
	(0.0492)	(0.0499)	(0.122)	(0.124)
father's heritable endowment		0.284***		-0.117
		(0.109)		(0.359)
mother's heritable endowment		0.0157		-0.0998
		(0.0477)		(0.111)
control for genetically transmitted ability	No	Yes	No	Yes
observations	905	900	370	370
R-squared	0.426	0.430	0.467	0.469

Notes: The table presents the impacts of parental income and schooling on the educational attainment of the oldest son/daughter in the household. Heteroskedasticity robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Living in rural areas has significant negative impacts on child's schooling. This may be due to the limited educational opportunities in rural areas or due to children's responsibilities in helping their parents working in the field, taking care of their siblings while their parents are working, etc. The increase in the number of siblings by reducing the available per capita resources in the household

seems to have a long-lasting negative impact on sons (maybe they need to drop out of school to enter the labor force and provide additional income to the household) whereas girls do not seem to be affected by the increase in the number of siblings. Total parental earnings have positive significant impacts for girls whereas the positive impact becomes insignificant for sons once heritable earnings endowments of parents are controlled for. The results on positive parental income impacts on children's educational attainment are in line with Shea (2000). A potential strong correlation between parental endowments and parental earnings may lead to a large drop in statistical precision of total earnings in the sons' sample.

Table 3. Causal parental schooling and income impacts on children's earnings

	Dependent variables			
	(1)	**(2)**	**(3)**	**(4)**
Variables	**son's earnings**	**son's earnings**	**daughter's earnings**	**daughter's earnings**
father's education	0.0266	0.0419	0.0123	0.101*
	(0.0230)	(0.0262)	(0.0373)	(0.0539)
mother's education	0.00496	0.0166	0.107***	0.176***
	(0.0217)	(0.0240)	(0.0343)	(0.0434)
log of total earnings	0.155***	0.0176	0.339**	-0.656
	(0.0489)	(0.124)	(0.132)	(0.430)
rural	-0.201***	-0.198***	-0.222	-0.236
	(0.0724)	(0.0725)	(0.176)	(0.173)
no of siblings	-0.0849***	-0.0778***	-0.203***	-0.197***
	(0.0234)	(0.0242)	(0.0574)	(0.0580)
father's heritable endowment		0.0843		0.685**
		(0.0850)		(0.339)
mother's heritable endowment		0.0663**		0.243***
		(0.0321)		(0.0848)
control for genetically transmitted ability	No	Yes	No	Yes
observations	903	898	370	370
R-squared	0.076	0.081	0.225	0.251

Notes: The table presents the impacts of parental income and schooling on the earnings of the oldest son/daughter in the household. Heteroskedasticity robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 3 presents the estimates of parental schooling and income impacts on their children's earnings by investigating the impacts separately for sons and daughters. When parental earnings endowments are not accounted for, the results suggest positive and significant correlations between total household earnings and child earnings regardless of the gender of the child. When the genetically transmitted ability is controlled for, neither parental schooling nor parental income estimates are significant for sons even though they are all positive. On the other hand, both parents' schooling estimates are significant for daughters with mothers' schooling estimates having a larger coefficient. The drop in effect size of total household earnings coefficients once the genetically transmitted ability is accounted for is in line with parental earnings endowments being positively correlated with parental income.

Table 4 presents the estimates of parental schooling and income impacts on their children's outcomes without separating the sample into sons and daughters, in addition, it is allowed for siblings to take place in the sample. Since siblings live in the same household, they may receive the same

shocks which make their errors correlated. Moulton's (1986) formula is used to address the correlated residuals among siblings. The results suggest that father's and mother's education have significant and positive impacts on children's education and earnings whereas parental earnings do not have a significant impact once genetically transmitted ability is accounted for.

Table4. Causal parental schooling and income impacts on children's outcomes

	Dependent variables			
Variables	**(1) child's education**	**(2) child's education**	**(3) child's earnings**	**(4) child's earnings**
father's education	0.318***	0.353***	0.0204	0.0589**
	(0.0351)	(0.0463)	(0.0176)	(0.0232)
mother's education	0.213***	0.229***	0.0427**	0.0346*
	(0.0353)	(0.0362)	(0.0178)	(0.0182)
log of total earnings	0.590***	0.325	0.181***	-0.00367
	(0.0889)	(0.204)	(0.0444)	(0.102)
rural	-0.549***	-0.574***	-0.137**	-0.138**
	(0.140)	(0.140)	(0.0697)	(0.0698)
no of siblings	-0.197***	-0.194***	-0.100***	-0.0923***
	(0.0465)	(0.0467)	(0.0232)	(0.0233)
father's heritable endowment		0.254*		0.104
		(0.141)		(0.0705)
mother's heritable endowment		-0.00240		0.0907***
		(0.0531)		(0.0267)
control for genetically transmitted ability	No	Yes	No	Yes
bbservations	1,372	1,366	1,370	1,364
R-squared	0.447	0.452	0.107	0.112

Notes: The table presents the parental earnings and education impacts on their children's outcomes. The sample includes all children within a household without restricting to the oldest child or without segregating them into boys or girls. Robust standard errors that allow for correlated residuals among siblings are presented in parenthesis. *** p<0.01, ** p<0.05, * p<0.1

Conclusion

This study analyzes the parental schooling and income impacts on their children's outcomes that most likely determine the standard of living they achieve in the future: educational attainment and earnings. The sample includes households in which either a son or a daughter aged between 25 and 34 with non-zero earnings and non-missing education have parents with non-zero earnings and non-missing education. Pooled cross-sections of Household Budget Surveys including years 2003-2011 being used as the data source. In main regressions, the sample is restricted to the oldest son/oldest daughter and their parents while in a robustness check the sample includes all siblings in a household. For the latter, consistent estimation of the variance-covariance matrix is achieved via clustering standard errors at the household level.

The evidence presented suggests that parental schooling has a positive significant impact on a child's schooling regardless of the sex of the child. This result is robust to the inclusion of parental earnings endowments in the regression specification. It implies that parental input into a child's human capital in the form of parenting, time allocation, and goods input is beneficial for the child in obtaining

higher levels of education. The evidence presented on the impact of parental earnings on children's outcomes is mixed due to the potential multicollinearity between parental earnings endowments and their income. When the genetically transmitted ability is omitted, parental earnings have significant positive impacts on a child's schooling and earnings. Once parental earnings endowments are accounted for, parental income effects become insignificant which suggests that omitted ability biases the parental schooling and income effects upwards. The evidence presented on the impact of parental schooling on children's earnings is in favor of girls. This may be due to the bargaining effect: with mothers having more education, they may obtain bargaining power and use it in favor of their daughters. The results on parental income and schooling effects are on par with those of Behrman and Rosenzweig (2002) and Shea (2000). Although the evidence presented is mixed, it suggests that it is more probable that higher parental schooling or higher parental income or both benefits the children than being destructive with respect to their educational attainment or earnings. However, the same phenomenon can be interpreted as family background characteristics being strong determinants of a child's two key components of future success, happiness, and prosperity. The estimated strong intergenerational links promise children of highly educated and wealthy parents a high standard of living while doom children of low educated and poor parents to live a poor quality of life in the future. Persistency in intergenerational links found in this study proves to be an obstacle in overall economic development which may call for the government to generate policies that break the harmful intergenerational links either through providing equal opportunity in accessing education for low-income/low educated families' children or through redistributing income across poor families that help them invest more in their children's human capital (Duman, 2021b).

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