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Abstract

There are natural differences in children's initial endowments and cognitive abilities. How parents respond to these differences, have significant implications on the children's future chances and prospects. In this paper, we assess whether parents in Egypt compensate for or reinforce the endowment differences among their children, using test scores as an observable proxy for initial endowments and participation in private tutoring as a measure of schooling investment. The paper makes use of a unique longitudinal dataset with information on schooling to provide evidence on the effect of children's cognitive ability differentials on parental investment in the Egyptian context. We find that parents allocate equal financial resources to siblings regardless of the observed endowment differences, which support the neutrality hypothesis. Results also show that maternal education level, child's age, and sex are significantly associated with a parental differential investment in siblings' human capital, where families whose mothers are with higher education provide more support to the less endowed sibling. Results also show a robust higher tutoring investment in favor of female children. Parents are more likely to spend more on private tutoring for the younger sibling than the older sibling. There is also no statistically significant regional difference in the likelihood of investment in children schooling

Keywords: Siblings; Cognitive Endowments; Tutoring; Egypt.
JEL Classifications: D13, J13.

1. Introduction

As in many developing countries, Egypt has made great progress in increasing access to education, where the net enrolment rate has shifted from 64% in 1978 to 98% in 2016 (World Bank, 2016). Despite this progress, Egypt faces several challenges contributing to the country's low quality of education, where Egypt is ranked 133 out of 137 concerning the quality of education (Scwab, 2018). These include high enrollment, high pupil /teacher ratio (UNICEF, 2012, 2014), and inadequate educational infrastructures such as sufficient schools and highly skilled teachers (El-Baradei, 2013; World Bank, 2008). The poor quality of education resulted in a low rate of return in the labor market (Psacharopoulos and Patrinos, 2004; Patrinos and Montenegro, 2014; Said, 2015; Rizk, 2019).

In response to these challenges, private tutoring becomes a growing phenomenon as it is perceived by families as the only route to provide the necessary learning support to students belonging to the low-quality public schools. In Egypt, families spend substantially on private tutoring due to poor quality of primary education, particularly in public schools (Elbadawy, 2013), which constitutes a considerable share of the household budget (El-Baradei, 2013; Dang & Rogers, 2008).

There are natural differences in children's initial endowments and cognitive abilities. How parents respond to these differences, have significant implications on the children's future chances and prospects. The question is debatable in the literature with inconclusive findings. Some studies found reinforcing effects where parents direct financial and nonfinancial resources to more able children to maximize returns to investment (Griliches, 1979; Behrman, Pollak and Taubman, 1982; Becker and Tomes, 1986). Others found compensating effects, where parents seek to compensate or equalize gaps in children outcomes, so they divert more resources to less endowed children (Behrman, Rosenzweig, & Taubman, 1994; Datar, Kilburn, & Loughran, 2010; Rosenzweig & Schultz, 1982), still others found neutral effect of child endowment differences and parental investment decisions (Almond and Currie, 2010; Yi *et al.*, 2015). Also, socio-economic and demographic factors could shape the investment strategy that parent can follow (Eirich, 2011; Erola, Jalonen and Lehti, 2016), where wealthy families could adopt compensating strategies to equalize outcomes across siblings and at the same time, poor families may decide to invest their limited resources on higher endowed children (Hsin, 2012).

In this paper, we assess whether parents in Egypt compensate for or reinforce the endowment differences among their children, using test scores as an observable proxy for initial endowments. We use participation in private tutoring as a measure of schooling investment either by making parents allocate more time or financial resources to the focal child. Specifically, we investigate the association between sibling differences in primary test scores and differences in parental investments that siblings receive.

To the authors' knowledge, and to date, this is the first study that explores the effect of initial cognitive ability differences on parent's investment decisions among siblings. We find that parents allocate equal financial resources to siblings regardless of the observed endowment differences which are in support of the neutrality hypothesis.

The paper is organized as follows. Section 2 reviews the literature. Section 3 presents the data. Section 4 discusses the methodology. Section 5 is dedicated to empirical findings, and section 6 concludes the paper.

2. Literature review

Theoretically, there are two main competing theories on how parents respond and allocate the household's resources among children with different endowments. A parent is either concerned with efficiency or equity when deciding on resource allocations between siblings. Becker & Tomes (1976) argue that parents adopt reinforcing strategy among sibling, under the condition that marginal returns to investment is higher when the child is of higher ability. In this case, parents have more aversion to efficiency, not equity. On the contrary, Behrman, Pollak, & Taubman (1982) show that parents may decide to compensate for siblings' ability differences and tend to allocate more resources to the less-able sibling if the parents are motivated by equity more than efficiency.

A growing empirical literature has emerged to examine the effect of siblings' endowment differences on parents' investment decisions and with mixed findings. While the findings of several studies support the reinforcing hypothesis (Almond & Mazumder, 2013; Frijters, Johnston, Shah, & Shields, 2013; M. Rosenzweig & Schultz, 1982), other studies support the compensating hypothesis (Griliches, 1979; Rosenzweig and Wolpin, 1988; Bharadwaj, Løken and Neilson, 2013), and some found mixed strategies (Behrman, Rosenzweig and Taubman, 1994; Ayalew, 2005; Datar, Kilburn and Loughran, 2010; Hsin, 2012; Yi *et al.*, 2015; Restrepo, 2016; Majid, 2018), while others found no effect for siblings' endowment differences on parents' investment decisions, which is in support of the neutrality hypothesis (Almond and Currie, 2011; Abufhele, Behrman and Bravo, 2017a).

These studies have differed in the way they measure children's endowments. While the extant literature mostly focuses on health endowment differentials among siblings and how it affects parental investment decisions, other studies focused on sibling differences in education endowments. For example, using mother and family fixed effects, Datar et al., (2010) used differences in birth weight across siblings to examine the impact on parental investment. In another study, Fan & Porter (2019) focused on primary children's cognitive abilities variation using siblings' fixed effects with instrumental variables such as rainfall shocks in Ethiopia and found parents tend to compensate low ability children through increase cognitive investment.

Several other studies have examined how the demographic and family characteristics, such as child's sex, maternal education, and family size, affect parental responses to siblings' differences in endowments. Hsin (2012) found that more educated mothers allocate more time and resources to less endowed siblings, demonstrating that compensating effects for highly educated mothers are much stronger for early-life disadvantaged siblings. Aizer & Cunha (2012) found that parents adopt a reinforcing strategy with a larger family size in the USA. Black, Devereux, & Salvanes (2010) found adverse effects for the large household size on the IQ scores of siblings in Norway, and hence, parents tend to compensate for the sibling differences in endowments by spending more on the low ability child. Regarding family composition, investment favors older children in the USA (Behrman, 1988; Garg and Morduch, 1998). For gender bias, Rosenzweig & Schultz (1982) analyzed the intra-household allocation of resources by sex differences and found that women's rate of return in the labor market is relatively high, and thus, female siblings receive more resources relative to a male sibling. While other studies found a pro-male gender bias within the household. For instance, Azam & Kingdon (2013) found that parents spend less on daughters by sending them to fee-free public schools and sending sons to private schools. Others found little evidence on the gender bias in Malaysia and India respectively (Chaudhuri and Roy, 2006; Kenayathulla, 2016).

It has been shown that parental response to differences in children's endowments differs depending on the dimension of human capital. Behrman, Rosenzweig, & Taubman (1994) used school attainment as a proxy for education endowments and body mass index (BMI) as a proxy for health endowments and found that parents devote more resources (reinforcing) for twins with high school attainment. Ayalew (2005) used health endowments differences for siblings estimated from dynamic health production function and found that equity between siblings is much more substantial in parents health investment decisions while reinforcing allocation of parents' resources are dominant in education investment decisions using test scores as a proxy for educational attainment in Ethiopia. Datar, Kilburn, & Loughran (2010) suggest that parental investments in child education widen the gap in the initial endowments between siblings, while parents compensate for innate differences in health endowments at birth in the USA. Yi, Heckman, Zhang, & Conti (2015) found evidence of a compensating investment in children with early health shocks but a reinforcing investment in education. The same conclusion reached in Mexico by Majid (2018) using body mass index for age between siblings as a proxy for health endowments and expenditure on education as a fraction of total consumption and found that parents compensate for differences in health endowments but adopt reinforcing investment in education. Among the studies that examine the effect of sibling endowments using data on twins (Abufhele et al., 2017; J. R. Behrman et al., 1982; J Behrman et al., 1994).

While the literature is rich with studies that examine the effect of private tutoring, as a measure of human capital investment, in Egypt ((Elbadawy, 2013), to the best of the author's knowledge, and to date, this is the first study that examines the effect of siblings' cognitive ability differences on

parental human capital investment decisions, as measured by the spending on tutoring, in the Egyptian context.

3. Data

This paper uses data from the Egyptian Labor Market Panel Survey (ELMPS). The ELMPS is a panel survey consisting of three waves; 1998, 2006, and 2012 and includes detailed information on individuals' education characteristics. In this paper, the panel structure of the ELMPS was used to identify the siblings within a household. The 2012 wave of the ELMPS used to examine the cognitive differences between siblings and how affects the parental allocation of resources. As, 2012 data followed households and split households over time, as well as adding refresher sample for a total of 12,060 households and 49,186 individuals (Assaad and Krafft, 2013). Parents' schooling investment decisions are based on the 2012 round of survey.

In the analysis, the sample is restricted to only two siblings, randomly selected, who complete primary education and who are observed in at least one round (1998, 2006, or 2012) and who live within their households with their parents' heads of households. The sample consists of 950 siblings from 450 households. Table 1 presents summary statistics for the variable that are used in the analysis.

Table 1: Descriptive statistics

Child characteristics	
Age	18.94
Sex	
Male	57.47
Female	42.5
Sibling characteristics	
Age	15.58
Sex	
Male	55.79
Female	44.2
Household characteristics	
Wealth quintiles	
Lowest	16
Second	18.9
Third	20
Fourth	20.4
Fifth	24.6
Mother's education	
Less than intermediate	60.63
Intermediate	28
University and Above	11.37
Father's education	
Less than intermediate	50.95
Intermediate	32.6
University and Above	16.42
Place of residence	
Urban	52.21
rural	47.79

4. Methodology

To investigate the association between sibling differences in primary test score and differences in parental investments that siblings receive, a latent variable is hypothesized , S_{ij}^{*} , for schooling investment, which is a function of the child level, sibling, parental and household characteristics as in equation (1).

$$S_{ij}^{*} = \alpha_i + \sum_{k=1}^{K} \beta_{ki} X_{kij} + u_i \qquad (1)$$

Where S_{ij} is the outcome variable of child i in household j measured as the difference in investment outcome between index child and the other sibling, and it takes three values; -1, 0, and 1. X_{ki} is a K vector of child level, sibling and family characteristics, and u_i is the standard random error term.

Expenditure on private tutoring as a fraction of family income, receiving group or private tutoring, are used as a direct measure of school investment. The key control variables of interest, $primaryscore_i$ and $index_i$ denote the child's primary score as a measure of the own endowment, $index_i$ is a binary variable equals 1 if the sibling has a higher primary score and equals zero otherwise. X_{ij} is a vector of child and sibling level characteristics including child's age, and sex. Y_j is a vector of parental and household-level characteristics including the mother's education level, the father's education level, the household economic status measured by the wealth index, and the region of residence.

Schooling investment, S_{ij}^* is a latent index and is constructed from the data as an ordinal variable measured on a scale from -1 to 1. An individual reports a given level of schooling investment ($S_i = r$ where $r \in [-1,1]$) if the latent variable lies between arbitrary and unknown threshold values, λ_r, whose values are estimated from the data. In such ordinal measures of the dependent variable, it is standard to use an ordered probit model as in equation (2). The merit of the ordered probit model is that it explicitly accounts for the ordinal nature of the dependent variable. However, Ordinary Least Squares treats the differences between the different rankings of the dependent variable similarly (Green, 2012).

$$\Pr(S_i = r) = \Phi(\lambda_{r+1} - \sum_{k=1}^{K} \beta_{ki} X_{ki}) - \Phi(\lambda_r - \sum_{k=1}^{K} \beta_{ki} X_{ki}) \qquad (2)$$

Where $\lambda_0 = -\infty$, $\lambda_1 = 0$, $\lambda_{r+1} = \infty$, and $\Phi(.)$is the cumulative normal distribution.

5. Empirical Results

Table 2 in the Appendix presents the estimated coefficients of the ordered probit model for different model specifications. As the most basic setting, model (1) shows the results where only the primary score of the focal child and sibling score index (takes the value of 1 if sibling has a higher score and zero otherwise). In model (2), own and sibling score along with the focal child characteristics were added. In model (3), sibling and child characteristics along with their endowments were added. In model (4), family characteristics including father's and mother's education as well as household characteristics including household wealth index and the region of residence. In model (5), added interactions between child primary score and wealth and between score and parental education. Finally, in model (6), added interactions between focal child score and his/her sibling characteristics.

To examine whether parents compensate for or reinforce endowments, we are interested in the coefficients of the child's own primary score (own endowment) and that of the sibling (sibling endowment). As shown in Table 2 (model 1), though the coefficient of the child's own primary score shows a positive sign and that for the sibling endowment shows a negative sign in all of the

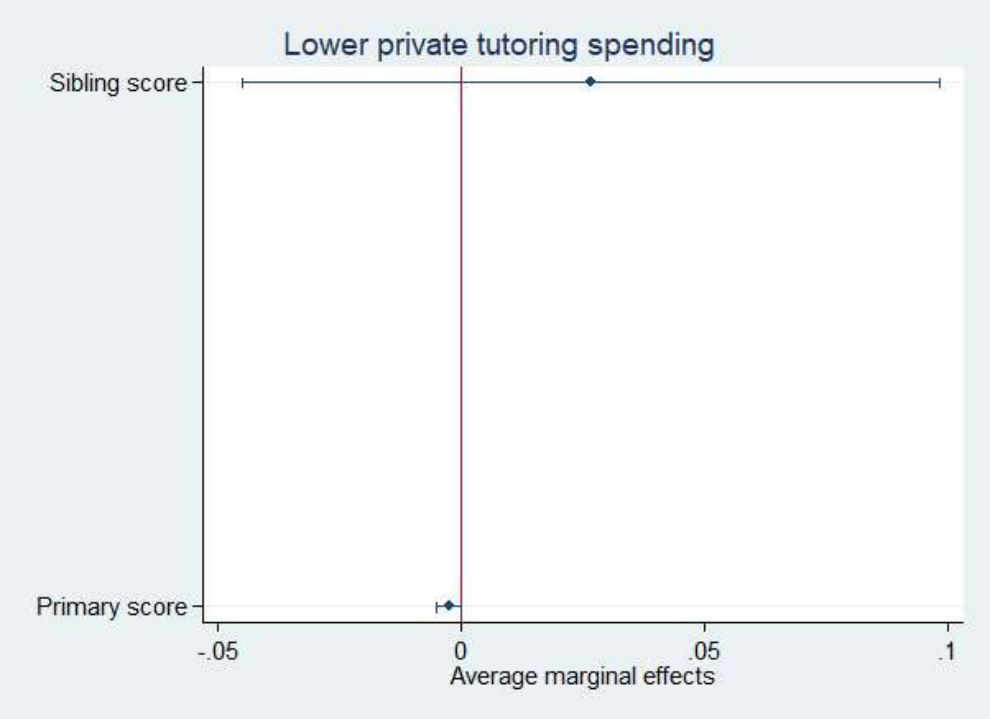
estimated models, none of the coefficients is statistically significant but for the baseline model 1 in which the own score coefficient is statistically significant but is very small in magnitude. These results support the neutrality hypothesis in Egypt.

Since the coefficients of the ordered probit model are difficult to interpret, we also present the estimated average marginal effects of all the covariates for the three outcome levels of the dependent variable (under, equal, and over investment). These marginal effects are presented in Tables 3 to 5 in the appendix.

Determinants of spending less on private tutoring within household

As in illustration, Figure 1 shows the predicted effect of child's score and sibling's score index when no other variables are controlled for. An increase in the child's own score reduces parent's decision to spend less on tutoring (reinforcing effect) but it is very small in magnitude. However, having sibling with higher primary score does not affect the chances of spending less on the focal child. This shows equal allocation of financial resources on siblings' private tutoring regardless of the differences in scores between siblings.

Figure 1: Predicted probabilities of lower private tutoring spending by own and sibling endowments (primary score)

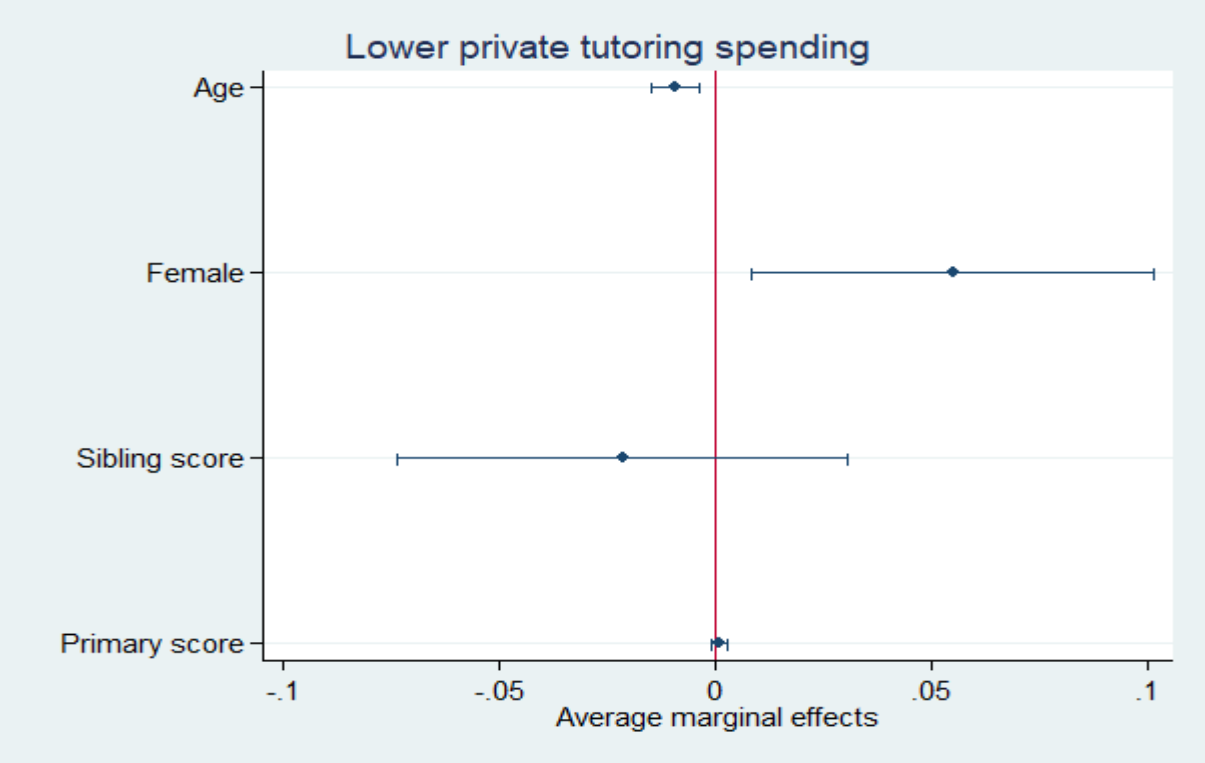


Author's calculations based on ELMPS 2012.

Figure 2 demonstrates the predicted effect of own and sibling score when the focal child characteristics are controlled for. Compared to males, being a female student decreases the chances

of spending less on private tutoring by 8%. As student gets older, the chances of spending less on tutoring increase.

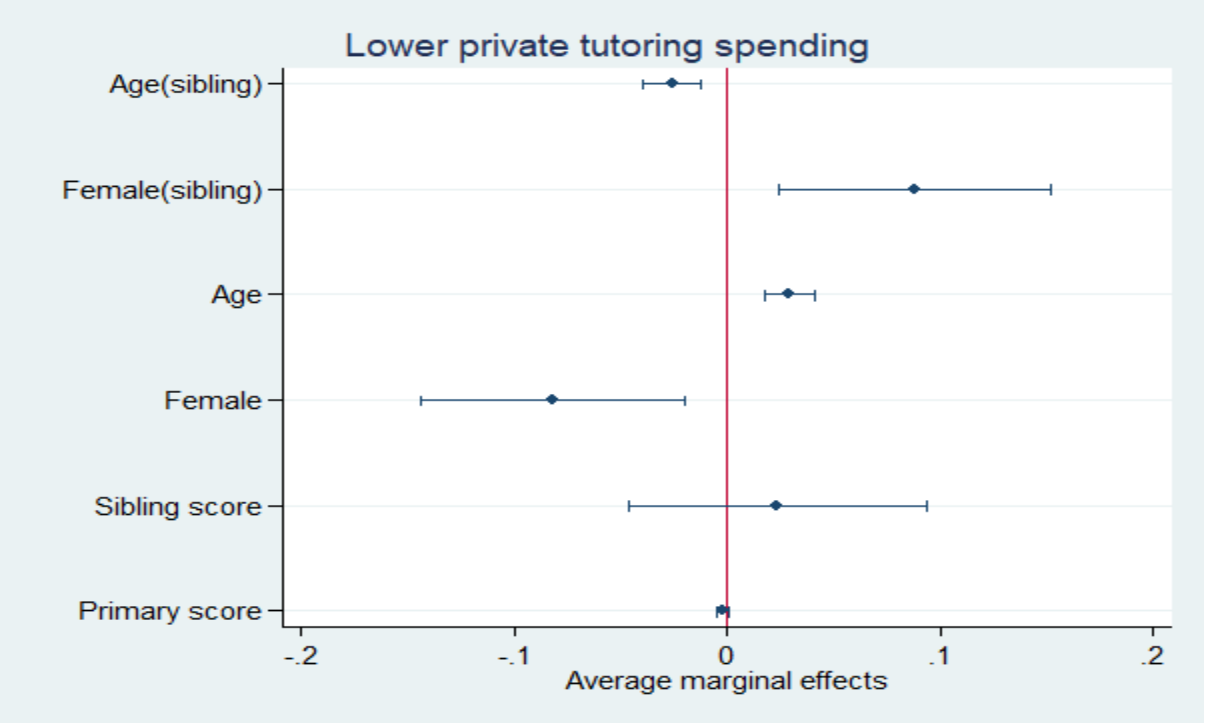
Figure 2: Predicted probabilities of lower private tutoring spending by primary score and own characteristics



Author's calculations based on ELMPS 2012.

Figure 3 shows the predicted effect of own and sibling score when controlling for both the focal child and his/her sibling characteristics. Compared to males, students whose sibling is female are 8 percentage points more likely to report lower spending on tutoring. While, student whose sibling is older are 2.5 percentage points less likely to report lower spending on private tutoring.

Figure 3: Predicted probabilities of lower private tutoring spending by primary score, own and sibling characteristics

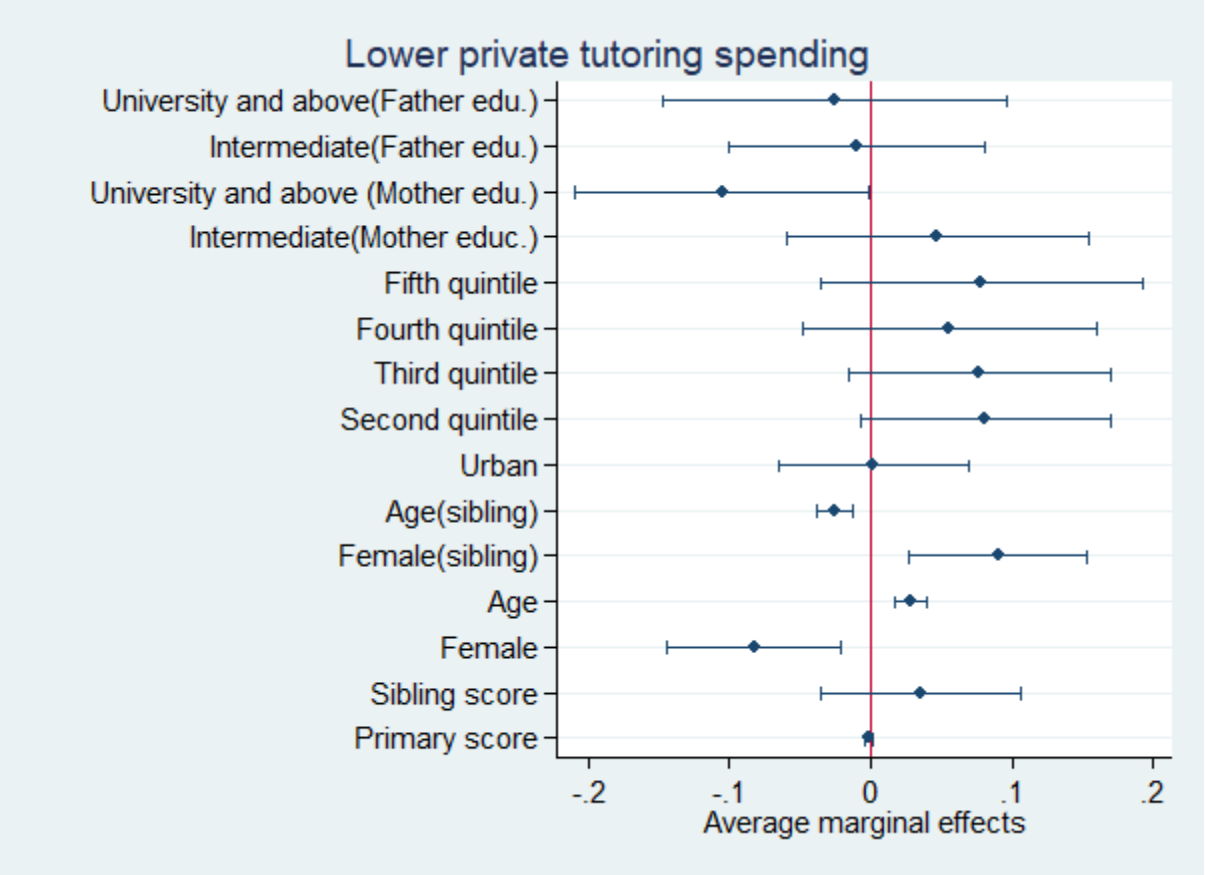


Author's calculations based on ELMPS 2012.

Figure 4 shows the predicted effect of own and sibling score when controlling for all background characteristics. Results are robust to the different model specifications (1-6). There is no clear association between regional differences or wealth quintiles in the likelihood of investment in children's education. Only mother's education has a powerful effect on private tutoring spending. Where students' whose mothers with a university degree and above are 10.5 percentage points less likely to have a lower spending on tutoring compared to mothers with less than intermediate schooling. Father's education has no statistically significant association with the schooling investment in children. In general, there is a higher tutoring investment in favor of female students. On average, female students are 8.3 percentage points less likely than males to have less schooling investment relative to their siblings. Students whose sibling is a female are more likely to report having less schooling investment. In particular, a student with a female sibling is about 9 percentage points more likely than with a male sibling to report lower schooling investment. As the student's age increases, the likelihood of having a lower schooling investment increases. In particular, as a student's age increase by one extra year, the probability of reporting a lower schooling investment increases by 3.8 percentage points. A one-year increase in the age of the sibling lowers the probability of reporting a lower schooling investment by 2.5 percentage points.

In model (5) and (6), where interactions of primary school with both family and sibling characteristics found to be insignificant and this is consistent across the three outcomes[2].

Figure 4: Predicted probabilities of lower private tutoring spending by primary score, own, sibling characteristics and parental characteristics



Author's calculations based on ELMPS 2012.

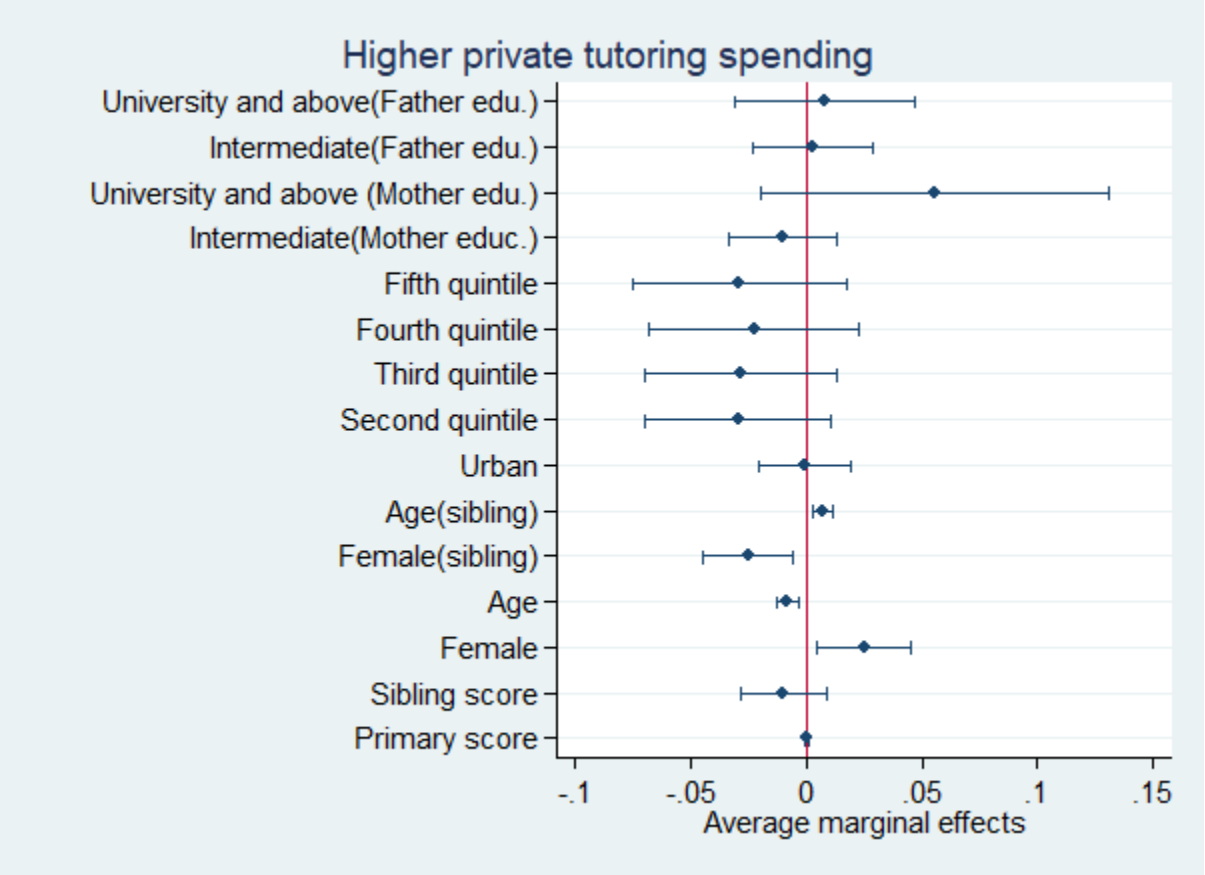
Determinants of spending more on private tutoring within household

Consistent with the results of the predicted probability of lower private tutoring spending (see Table 4 in appendix)[3], there is a higher tutoring investment in favor of female students compared to male students (Figure 5). On average, female students have higher chances of receiving higher private tutoring spending by 2.5 percentage points. Also, students whose sibling is a female have lower chances of receiving higher tutoring spending by 2.5 percentage points. The likelihood of receiving higher private tutoring spending significantly decreases with the child's age and increase with the sibling's age. There is no association between parental education, place of residence, household wealth and the likelihood of receiving higher tutoring spending.

2 See appendix, table (3) to table (5), all the interactions are insignificant.

3 Marginal effects of higher investment shows the estimates of model (4), which include the child's own, sibling and household characteristics.

Figure 5: Predicted probabilities of higher private tutoring spending by primary score, own, sibling characteristics and parental characteristics

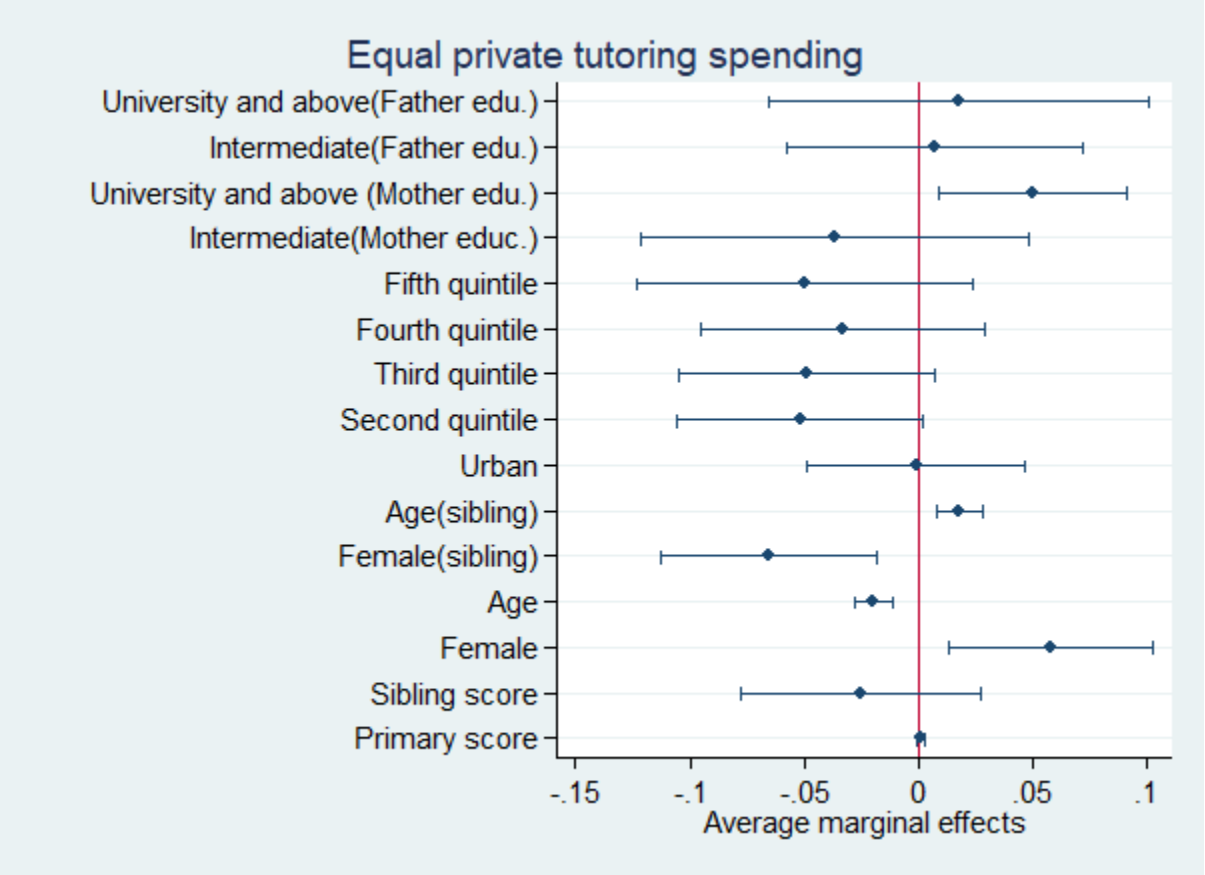


Author's calculations based on ELMPS 2012.

Determinants of spending equally on siblings' private tutoring

Figure 6 shows the predicted probability of spending equally on siblings 'tutoring. Consistent with both lower and higher private tutoring spending, still the primary score of the focal child and his/her sibling has no effect on parent's decision to spend on tutoring which confirms the neutrality hypothesis. Compared to males, females are more likely to receive equal tutoring spending. However, student whose sibling is female is 6 percentage points less likely to receive equal tutoring spending than male. As student age increases, the likelihood to receive equal tutoring spending decreases. On the other hand, one year increases in the age of sibling increases the chances of receiving equal private tutoring spending. A student whose parents in the second and the third wealth quintiles are less likely to spend equally on siblings' tutoring than the poorest wealth quintile. Students with university degree and above mothers are more likely to spend equally on private tutoring spending than mothers with less than intermediate education.

Figure 6: Predicted probabilities of equal private tutoring spending by primary score, own, sibling characteristics and parental characteristics



Author's calculations based on ELMPS 2012.

6. Conclusions

A growing body of theoretical, empirical literature has emerged to examine the mechanisms underlying parental investment responses to their children's differences in endowments. This paper aimed to answer one central question of whether parents in Egypt reinforce or compensate for the observed endowment differences between siblings. In other words, are Egyptian parents motivated to be equity or efficiency? While most of the previous studies have focused on initial differences in health endowments between siblings, this paper contributed to the extant literature by examining the cognitive ability differences between siblings using primary test scores and differences in parental investment that siblings receive in Egypt. The paper concludes that the parent's investment acts as a net equalizer between siblings in financial terms. This result suggests that differences in primary scores between siblings are muted by parental responses which imply spending equal amounts on both siblings regardless of the differences in their scores. This emphasizes on the importance monitoring parental responses to siblings 'ability gaps on designing public policies, as simply parents can offset public interventions by allocating more financial resources within household. Since 1960, free public education introduced and has been undermined by private tutoring spending which took place within families which instead of

achieving equality of opportunity in access free public education, has resulted in extreme inequality in access (Assaad, 2013).This finding is in line with the results of several previous studies supporting the neutrality parental behavior (Yi et al., 2015;Abufhele, Behrman, & Bravo, 2017; Douglas Almond & Currie, 2011).

The findings of the current study reveal that the socio-economic household characteristics are significantly associated with a parental differential investment in siblings' human capital, where families whose mothers are with university education provide more support to lower score siblings and hence devote fewer resources to private tutoring. The burden of private tutoring spending falls exclusively on the worse-off group.Father's education has no statistically significant association with the schooling investment in children. Results also show a robust higher tutoring investment in favor of female students. Finally, parents are more likely to spend more on private tutoring for the younger sibling than the older sibling. This could be because either parent may have higher earnings when they have their later sibling or parents benefit from the education of children born early (Booth and Kee, 2009). There is also no statistically significant regional difference in the likelihood of investment in children's schooling.

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Appendix

Table 2: Estimates of the ordered Probit model (Coefficients)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
VARIABLES						
Child's characteristics						
Primary score	0.00916**	0.00479	0.00759	0.00575	0.00137	0.0104
	(0.00465)	(0.00490)	(0.00508)	(0.00586)	(0.0164)	(0.0247)
Female		0.300**	0.321**	0.332***	0.322**	0.334***
		(0.125)	(0.126)	(0.128)	(0.127)	(0.128)
Age		-0.0492***	-0.113***	-0.109***	-0.112***	-0.108***
		(0.0148)	(0.0236)	(0.0235)	(0.0240)	(0.0243)
Sibling characteristics						
Index	-0.0958	-0.111	-0.0909	-0.139	-0.146	-0.139
	(0.131)	(0.132)	(0.136)	(0.138)	(0.139)	(0.139)
Female			-0.336***	-0.349***	-0.347***	-0.806
			(0.125)	(0.126)	(0.126)	(0.743)
Age			0.0999***	0.0999***	0.102***	0.130
			(0.0270)	(0.0264)	(0.0269)	(0.0997)
Wealth quintiles						
Second				-0.343*	-0.791	-0.354*
				(0.203)	(1.201)	(0.202)
Third				-0.328	-0.800	-0.334
				(0.213)	(1.328)	(0.213)
Fourth				-0.246	-0.566	-0.250
				(0.240)	(1.423)	(0.239)
Fifth				-0.333	-0.911	-0.347
				(0.252)	(1.580)	(0.250)
Mother's education						
Intermediate				-0.173	-1.240	-0.170
				(0.199)	(1.359)	(0.199)
University and above				0.520*	2.500	0.523*
				(0.304)	(2.058)	(0.301)
Father's education						
Intermediate				0.0372	0.930	0.0200
				(0.181)	(1.251)	(0.180)
University and above				0.102	1.210	0.0949
				(0.252)	(1.489)	(0.253)
Place of residence						
Rural				-0.00650	-0.363	-0.00883
				(0.136)	(0.813)	(0.136)
Interaction of wealth quintiles with primary score						
Second X primary score					0.00601	
					(0.0159)	
Third X primary score					0.00609	
					(0.0173)	
Fourth X primary score					0.00419	
					(0.0184)	
Fifth X primary score					0.00801	

					(0.0207)	
Interaction of mother education with primary score						
Intermediate X primary score					0.0132	
					(0.0163)	
University and above X primary score					-0.0206	
					(0.0249)	
Interaction of father education with primary score						
Intermediate X primary score					-0.0118	
					(0.0155)	
University and above X primary score					-0.0143	
					(0.0187)	
Interaction of place of residence with primary score						
Rural X primary score					0.00437	
					(0.0103)	
Interaction of sibling characteristics with primary score						
Female X primary score						0.00587
						(0.00928)
Age X primary score						-0.000452
						(0.00142)
Constant cut1	-0.166	-1.349**	-0.946	-1.288**	-1.664	-0.983
	(0.383)	(0.554)	(0.584)	(0.622)	(1.337)	(1.899)
Constant cut2	2.466***	1.372**	1.872***	1.600**	1.246	1.908
	(0.396)	(0.562)	(0.601)	(0.637)	(1.336)	(1.892)
Observations	475	475	475	475	475	475

Notes: The dependent variable measured as the difference in spending on private tutoring between index child and the other sibling and it takes three values;-1, 0, 1(under, equal, and over investment).
*** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in parentheses.

Table 3: Marginal effects (lower investment)

VARIABLES	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Child characteristics						
Primary score	-0.00255**	-0.00128	-0.00196	-0.00146	-0.00154	-0.00156
	(0.00129)	(0.00131)	(0.00131)	(0.00148)	(0.00149)	(0.00148)
Female		-0.0791**	-0.0816**	-0.0828***	-0.0799***	-0.0834***
		(0.0326)	(0.0317)	(0.0313)	(0.0309)	(0.0312)
Age		0.0132***	0.0292***	0.0278***	0.0283***	0.0273***
		(0.00393)	(0.00596)	(0.00579)	(0.00588)	(0.00594)
Sibling characteristics						
Index	0.0267	0.0300	0.0237	0.0356	0.0374	0.0353
	(0.0366)	(0.0361)	(0.0356)	(0.0360)	(0.0360)	(0.0352)
Female			0.0881***	0.0902***	0.0893***	0.0926***
			(0.0327)	(0.0323)	(0.0323)	(0.0329)
Age			-0.0258***	-0.0254***	-0.0259***	-0.0243***
			(0.00690)	(0.00660)	(0.00667)	(0.00729)
Place of residence						
Rural				0.00165	0.00746	0.00224
				(0.0345)	(0.0348)	(0.0345)
Wealth quintiles						
Second				0.0812*	0.0792*	0.0836*
				(0.0453)	(0.0454)	(0.0449)
Third				0.0772	0.0802*	0.0780*
				(0.0474)	(0.0484)	(0.0472)
Fourth				0.0560	0.0567	0.0565
				(0.0534)	(0.0551)	(0.0529)
Fifth				0.0785	0.0708	0.0816
				(0.0585)	(0.0584)	(0.0578)
Mother's education						
Intermediate				0.0473	0.0641	0.0462
				(0.0549)	(0.0629)	(0.0548)
University and above				-0.105**	-0.152***	-0.106**
				(0.0531)	(0.0383)	(0.0525)
Father's education						
Intermediate				-0.00952	-0.00728	-0.00511
				(0.0462)	(0.0455)	(0.0461)
University and above				-0.0255	-0.0283	-0.0236
				(0.0620)	(0.0586)	(0.0618)
Observations	475	475	475	475	475	475

Notes: The dependent variable measured as the difference in spending on private tutoring between index child and the other sibling and it takes three values;-1, 0, 1(under, equal, and over investment).
Standard errors in parentheses
*** p<0.01, ** p<0.05, *p<0.1

Table 4: Marginal effects (Higher investment)

VARIABLES	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Child characteristics						
Primary score	0.000754*	0.000383	0.000578	0.000428	-0.000157	0.000402
	(0.000414)	(0.000400)	(0.000405)	(0.000445)	(0.000500)	(0.000456)
Female		0.0241**	0.0247**	0.0251**	0.0240**	0.0252**
		(0.0105)	(0.0103)	(0.0103)	(0.00993)	(0.0103)
Age		-0.00393***	-0.00860***	-0.00814***	-0.00827***	-0.00802***
		(0.00144)	(0.00238)	(0.00230)	(0.00233)	(0.00235)
Sibling characteristics						
Index	-0.00788	-0.00865	-0.00692	-0.0100	-0.0105	-0.0104
	(0.0105)	(0.00974)	(0.0101)	(0.00944)	(0.00931)	(0.0100)
Female			-0.0245**	-0.0251**	-0.0246**	-0.0232**
			(0.0100)	(0.00998)	(0.00980)	(0.0101)
Age			0.00760***	0.00744***	0.00755***	0.00695**
			(0.00232)	(0.00224)	(0.00228)	(0.00270)
Place of residence						
Rural				-0.000484	-0.000587	-0.000657
				(0.0101)	(0.0107)	(0.0101)
Wealth quintiles						
Second				-0.0295	-0.0248	-0.0306
				(0.0206)	(0.0209)	(0.0208)
Third				-0.0285	-0.0250	-0.0292
				(0.0212)	(0.0213)	(0.0214)
Fourth				-0.0227	-0.0197	-0.0232
				(0.0233)	(0.0233)	(0.0234)
Fifth				-0.0289	-0.0219	-0.0301
				(0.0234)	(0.0246)	(0.0235)
Mother's education						
Intermediate				-0.0104	-0.00945	-0.0102
				(0.0120)	(0.0104)	(0.0119)
University and above				0.0553	0.119*	0.0556
				(0.0384)	(0.0618)	(0.0381)
Father's education						
Intermediate				0.00270	-0.00214	0.00144
				(0.0131)	(0.0150)	(0.0130)
University and above				0.00782	0.00453	0.00728
				(0.0198)	(0.0225)	(0.0199)
Observations	475	475	475	475	475	475

Notes: The dependent variable measured as the difference in spending on private tutoring between index child and the other sibling and it takes three values;-1, 0, 1(under, equal, and over investment).
Standard errors in parentheses.
*** p<0.01, ** p<0.05, *p<0.1

Table 5: Marginal effects (Equal investment)

VARIABLES	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Child characteristics						
Primary score	0.00180**	0.000902	0.00138	0.00103	0.00170	0.00116
	(0.000912)	(0.000922)	(0.000925)	(0.00105)	(0.00116)	(0.00105)
Female		0.0549**	0.0569**	0.0578**	0.0559**	0.0581**
		(0.0237)	(0.0232)	(0.0228)	(0.0227)	(0.0228)
Age		-0.00926***	-0.0206***	-0.0196***	-0.0201***	-0.0193***
		(0.00282)	(0.00464)	(0.00442)	(0.00449)	(0.00448)
Sibling characteristics						
Index	-0.0188	-0.0214	-0.0166	-0.0256	-0.0269	-0.0249
	(0.0263)	(0.0265)	(0.0252)	(0.0268)	(0.0270)	(0.0255)
Female			-0.0636***	-0.0652***	-0.0646***	-0.0694***
			(0.0245)	(0.0242)	(0.0243)	(0.0256)
Age			0.0182***	0.0179***	0.0183***	0.0173***
			(0.00535)	(0.00509)	(0.00513)	(0.00530)
Place of residence						
Rural				-0.00117	-0.00687	-0.00158
				(0.0244)	(0.0251)	(0.0244)
Wealth quintiles						
Second				-0.0517*	-0.0544*	-0.0530*
				(0.0274)	(0.0283)	(0.0271)
Third				-0.0486*	-0.0552*	-0.0488*
				(0.0286)	(0.0317)	(0.0283)
Fourth				-0.0333	-0.0371	-0.0332
				(0.0317)	(0.0357)	(0.0311)
Fifth				-0.0496	-0.0489	-0.0515
				(0.0374)	(0.0388)	(0.0369)
Mother's education						
Intermediate				-0.0369	-0.0546	-0.0360
				(0.0433)	(0.0542)	(0.0432)
University and above				0.0501**	0.0323	0.0503**
				(0.0209)	(0.0443)	(0.0208)
Father's education						
Intermediate				0.00682	0.00942	0.00367
				(0.0331)	(0.0323)	(0.0330)
University and above				0.0177	0.0238	0.0163
				(0.0422)	(0.0372)	(0.0420)
Observations	475	475	475	475	475	475

Notes: The dependent variable measured as the difference in spending on private tutoring between index child and the other sibling and it takes three values;-1, 0, 1(under, equal, and over investment).
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1