Economics Bulletin

Volume 33, Issue 2

Impact of household educational expenditures on the test scores of children

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Abstract

With the aim of investigating the effects of household educational expenditures on the test scores of children, I construct an instrumental variable for the endogenous household educational expenditures by taking advantage of the educational fee reduction reform in China. I do not find any significant effects of household educational expenditures on the test scores of children. I also do not find any significant effects for households with income per capita in the top or bottom 50 percentile in the village.

The author acknowledges the financial support from the China National Natural Science Foundation (Project ID: 71103108).
Citation: Xinzheng Shi, (2013) "Impact of household educational expenditures on the test scores of children", *Economics Bulletin*, Vol. 33 No. 2 pp. 1177-1184.
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Submitted: February 28, 2013. **Published:** May 13, 2013.

1. Introduction

Many studies have focused on how family income affects the educational outcome of children (Dahl and Lochner, 2012; detailed surveys are also provided by Duncan and Brooks-Gunn, 1997; Haveman and Wolfe, 1995; and Mayer, 1997). The amount of money spent on the education of children is an important channel. However, few studies have investigated the effects of such expenditures on the educational outcome of children. This paper investigates this relationship. In this study, household educational expenditures are referred to as money voluntarily spent by parents on such items as pens, exercise books and supplementary tutoring, but excluding money spent on school requirements such as school and textbook fees.

One challenge in identifying the effects of household educational expenditures on the educational outcome of children lies in the endogenous household educational expenditures. This paper takes advantage of the educational fee reduction reform that took place in China in 2005 to construct an instrumental variable (IV) for household educational expenditures. In this large-scale program, known as "Two Exemptions One Subsidy (TEOS)," students enrolled in primary and middle schools are exempted from paying school fees. Students from poor families do not pay textbook fees, and also receive a living subsidy if they reside in school dormitories. Shi (2012) shows that parents spent the reduced educational fees on the educational expenditures of children targeted by the reform. Given the exogeneity of the reform, the reduced educational fees can be used as an IV for household educational expenditures.

Exploiting the IV strategy, this paper finds no significant effects of household educational expenditures on the educational outcome of children, which is measured by their test scores in Chinese language and mathematics. This paper also does not find any significant effects for households having income per capita in the top 50 percentile in the village or households having income per capita in the bottom 50 percentile in the village.

2. Data and empirical models

The data used in this paper were collected as part of the Gansu Survey of Children and Families (GSCF), which was conducted in 2000, 2004, and 2007. The detailed description of the GSCF can be found in Shi (2012).

The main analysis in this paper focuses on the sampled 9 to 12 year-old children who were enrolled in schools in 2000 and 2007. Therefore, the repeated cross-sectional data are actually used. All the monetary values were divided by the Gansu provincial CPI (using 2000 as the base year) to adjust for inflation between periods.

The following equation is estimated:

$$Y_{ivt} = \alpha_0 + \alpha_1 * HEE_{ivt} + \alpha_2 * X_{ivt} + \alpha_3 * Villvar_{v,2000} * Year_{2007} + Village_v + Year_t + \varepsilon_{ivt} \quad (1)$$

Y_{ivt} is the educational outcome of child i living in village v in year t, which is measured by the standardized Chinese language and mathematics test scores.[1]

HEE_{ivt} is the household educational expenditures on child i, which is endogenous. An IV is constructed, namely, FR_{ivt}. FR_{ivt} refers to educational fee reductions received by child i living in village v in year t. It is assigned a value of zero for 2000, which is before the reform. For years after the reform (i.e., 2007), FR_{ivt} equals the reduced educational fees from the reform. Shi (2012) provides a detailed description of how FR_{ivt} is constructed.

[1] In 2000, half of the sampled 9-12 years old children were randomly chosen to take a Chinese language test while the other half took a mathematics test. In 2007, all the sampled 9-12 years old children took both the Chinese language test and the mathematics test.

X_{ivt} represents other individual and household level control variables, including gender, age, a dummy for being healthy, weekly hours put to study, dummies for grade levels enrolled, mother's schooling years, father's schooling years, mother's weekly hours with the child, father's weekly hours with the child, land area per capita, ratio of enrolled children, and total number of family members.

One concern in estimating equation (1) is that the pre-reform village level factors could affect the growth of children's test scores. Therefore, a vector of interactions of village level variables in 2000 with year 2007 dummy, $Villvar_{v,2000} * Year_{2007}$, is included in regression (1).[2] $Village_v$ and $Year_t$ are village and year fixed effects, respectively. ε_{ivt} is an error term.

See Table 1 for the summary statistics of main variables used in the estimation.

3. Results

Table 2 presents the impact of household educational expenditures on the test scores of children. For brevity, only the coefficients on household educational expenditures and the reduced educational fees are presented.

Table 2 shows that no coefficients on household educational expenditures from OLS are significant, whether for Chinese (column 1) or mathematics (column 4) test scores. The coefficients on the educational fee reductions from the reform (first stage results) are significant at the 5 percent level for both Chinese (column 2) and mathematics (column 5) test scores. However, the F-values for testing the null hypothesis that the coefficients equal zero are lower than 10, suggesting that the IV is weak. Given the difficulty of making accurate inferences in IV regressions with weak instruments (Andrew and Stock, 2005), columns 3 and 6 show the results from a conditional IV regression (Andrew, Moreira, and Stock, 2006), where the standard errors and the significant tests are adjusted because of the presence of the weak instrument. The coefficients on the educational expenditures are not significant either for Chinese (column 3) or mathematics (column 6) test scores. The confidence intervals (CI) based on the conditional likelihood ratio (CLR) approach (Moreira, 2003) for this coefficient confirm the finding.

I further investigate whether such effects exist for sub-groups of households categorized by household income per capita. Table 3 presents the results. However, we can see from Table 3 that, whether for households with income per capita in the top 50 percentile or in the bottom 50 percentile in the village, coefficients on household educational expenditures are not significant.

4. Conclusion

Taking advantage of the educational fee reduction reform in China, I construct an IV for

[2] The village level variables include the illiteracy ratio, ratio of primary school graduates in the labor force, primary school enrollment rate, middle school enrollment rate, an indicator for having pre-school classes, distance of primary school from the village seat, the log value of money given to schools by the village, an indicator for having a primary school run by the village, an indicator for having a middle school run by the village, an indicator for having a railway through the village, an indicator for having a bus stop in the village, the log value of the average agricultural income per capita, the log value of average industrial income per capita, the ratio of households engaged in non-agricultural work, the ratio of households running household enterprises, the log value of wages for men engaged in non-agricultural work, the log value of wages for women engaged in non-agricultural work, the log value of wages of the laborers in agricultural production, an indicator for having enterprises owned by the county, an indicator for having enterprises owned by the township, and an indicator for having private enterprises.

household educational expenditures in order to investigate the effects of household educational expenditures on the educational outcome of children, which is measured by their Chinese and mathematics test scores. The results show that household educational expenditures do not have significant effects on the Chinese and mathematics test scores of children. There are also no significant effects for households with income per capita in the top or bottom 50 percentile in the village, respectively.

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Table 1 Summary Statistics

	2000		2007	
	Mean	S.D.	Mean	S.D.
Standardized mathematics scores	0.020	1.015	0.004	0.989
Standardized Chinese scores	0.011	1.039	-0.039	1.001
Educational expenditures on children(*yuan*)	111.774	137.586	146.098	198.451
Reduced educational fees from reform(*yuan*)	0	0	94.428	66.600
Ratio of girls	0.461	0.499	0.428	0.495
Age	11.071	1.125	11.270	1.214
Healthy	0.732	0.475	0.715	0.452
Hours spent on homework per week	10.352	6.225	10.282	4.561
Mother's schooling years	4.251	3.498	5.031	3.472
Father's schooling years	7.024	3.522	7.182	2.918
Land areas per capita (*mu*)	2.092	1.504	2.099	1.528
Mother's weekly hours with children	1.656	2.981	3.758	5.313
Father's weekly hours with children	2.083	3.498	3.627	5.105
Ratio of children enrolled	0.419	0.143	0.415	0.152
Ratio of children enrolled in primary schools	0.982	0.132	0.948	0.221
Family size	4.506	1.068	4.316	1.163
Household income per capita (*yuan*)	1067.332	1361.502	1367.091	2162.481

Table 2 Impact of educational expenditures on the test scores of children

	(1)	(2)	(3)	(4)	(5)	(6)
	Chinese test scores			Mathematics test scores		
	OLS	2SLS		OLS	2SLS	
		First stage	Second stage		First stage	Second stage
	Chinese test scores	Educational expenditures	Chinese test scores	Math test scores	Educational expenditures	Math test scores
Educational expenditures	-0.004		-2.463	-0.265		1.055
	(0.228)		(2.143)	(0.224)		(1.871)
Reduced educational fees		0.453			0.467	
		(0.221)**			(0.214)**	
Observations	1295	1295	1295	1283	1283	1283
R-squared	0.24	0.37	0.14	0.31	0.41	0.28
F-value		4.18			4.75	
CLR CI			[-8.885, 1.595]			[-2.822, 6.280]

Standard errors are in parentheses, and calculated by clustering over villages; * significant at 10%; ** significant at 5%; *** significant at 1%.

Notes:

(1) Individual level variables and household level variables are controlled. See the text for the detailed description of these variables. Year and village fixed effects are also controlled in all regressions.

(2) Interactions of village level variables in 2000 with year 2007 dummy are controlled in the regressions. See Footnote 1 for the list of village level variables.

Table 3 Impact of educational expenditures on test scores of children for households with different incomes per capita

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Chinese test scores				Mathematics test scores			
	Top 50%		Bottom 50%		Top 50%		Bottom 50%	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Educational expenditures	-0.070	-0.546	-0.144	-2.905	-0.440	0.732	-0.064	1.129
	(0.411)	(2.094)	(0.286)	(3.668)	(0.345)	(2.400)	(0.319)	(2.727)
Observations	634	634	737	737	600	600	683	683
R-squared	0.33	0.33	0.30	0.20	0.41	0.39	0.38	0.36
CLR CI		[-6.234, 4.470]		[-33.522, 5.524]		[-5.038, 9.635]		[-6.189, 13.923]

Standard errors are in parentheses, and are calculated by clustering over villages; * significant at 10%; ** significant at 5%; *** significant at 1%.

Note: See the note in Table 2 for additional variables controlled for in the regressions.