What influences the "private school effect?"

Efficiency, stratification, and how much they explain higher achievement in private schools

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Introduction

The literature suggests that there exists a significant "private school effect" – that is, students who attend private schools tend to have higher academic achievement. We examine whether this effect (as measured by scores on a math achievement test) is a result of more efficient use of school resources by private schools, or whether this effect can be explained by increased stratification by socioeconomic status in private schools – two predominant theories that compete in the Does the private school effect literature. disappear when controlling for either resources or for socio-economic status?

How much of an effect does going to private school have on a math score...



Methods

Instead of performing a multivariate regression, which fails to take into account the influence of factors at multiple levels, we examined several models using Hierarchal Linear Modeling (HLM). Estimating models using HLM allows us to layer students within schools within countries and properly account for those effects.

Data & Variables

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Data was collected from the 2003 TIMSS survey and the 2006 PISA survey. In the TIMSS, we only analyzed countries where data about private school status was available. We studied 398,750 15-year-old students from 56 countries in the PISA and 88,626 13-year-old students from 17 countries in the TIMSS.

To compensate for missing data, we used multiple imputation (using the Proc MI procedure in SAS, which uses the MCMC algorithm) and imputed five times.

Results, models 1-6, PISA

Model 1 Model 2 Model 3 Model 4 Model 5 Model 6

Models

Model 1: Private schools + Controls

Model 2: Private schools + Individual family background + controls Model 3: Private schools + Individual family background + School level family background + controls Model 4: Private schools + Individual family background + School level family background + Resources + controls Model 5: Private schools + Resources + controls Model 6: Private schools + Individual family background + School level family background + Resources + (Resources*Private schools) + controls

PISA □ TIM SS

Conclusion

The results from the regressions suggest that the private school effect is significant when controlling for sex, language, community size, and country's GDP. While both controlling for school resources and controlling for individual family background lower the "private school effect," neither does so drastically. This suggests that both improved school resources and individual family background have only limited explanatory power for describing why the private school effect exists.

We also included GDP country-level data from the World Development Indicators 2006, and filled in missing data with results from the CIA World Factbook.

The dependent variable examined was respondent's score on a mathematics test. Other variables were taken from student and school principal questionnaires. These fit in the following general categories: individual family background, school level family background, school resources, private school status, and controls. Controls included respondent's sex, whether the language of the test was the same as the language spoken at the respondent's home, size of the community the school is located in, and country's GDP. Though some slight differences were necessary, efforts were made to keep the variables used in the TIMSS and the PISA comparable.

Family background variables included the number of years of education the respondent's parents had and whether the following possessions were found in the respondent's home: dictionary, computer, calculator, and study desk. To obtain school level family background variables, the responses of each student surveyed within a school were averaged. School resource variables included the average class size, the number of computers per student, the school's size, and how much the school principal thought the shortage of various school resources affected instruction. An index was created to relate several similar of these school shortage variables, which held together well; a Cronbach's Alpha test gave an alpha score of .93 for the TIMSS and .89 for the PISA.

Intercept	404.10 *	358.56 *	185.51 *	171.55 *	333.00 *	170.58 *
GDP	0.14	0.09	-0.05	-0.04	0.13	-0.04
SCHOOL LEVEL						
Private School	24.55 *	17.35 *	-7.82 *	-6.94 +	22.33 *	2.76
Small tow n (3000-15,000)	17.54 *	13.66 *	0.68	-2.39	8.86 *	-2.49
Tow n (15,000-100,000)	28.26 *	21.57 *	-1.02	-5.48 +	15.22 *	-5.61 +
City (100,000 - 1,000,000)	40.80 *	30.23 *	-5.85 +	-11.47 *	23.28 *	-11.56 *
Large City (>1,000,000)	360.37 *	297.71 *	72.16	61.68	308.36 *	61.51
Average parents' years of						
education			4.47 *	4.01 *		3.99 *
Average # of books in home			0.32 *	0.32 *		0.32 *
Proportion of students with a						
dictionary at home			29.31	24.51		24.12
Proportion of students with a						
calculator at home			37.30 *	36.27 *		36.29 *
Proportion of students with a						
computer at home			62.27 *	57.60 *		57.85 *
Proportion of students with a						•
study desk at home			36.03 *	35.50 *		35.56 *
Size of an average <test< td=""><td></td><td></td><td></td><td></td><td></td><td></td></test<>						
language> class				0.41 *	0.81 *	0.45 *
Number of computers at school						
per student				1.39	-4.95	3.6
How unaffected by shortage of						
resources (index)				4.72 *	17.18 *	4.75 *
School size				0.69 *	1.45 *	0.70 *
How unaffected by shortage of						0.40
resources * Private school						0.43
Computers per student " Private						-11
						-0.27
Sex	-16.77 *	-16.20 *	-16.40 *	-16.42 *	-16.79 *	-16.42 *
Whether language of the test is						
the same as language at home	13.76 *	9.48 *	8.71 *	8.62 *	13.58 *	8.62 *
Parents' years of education		1.44 *	1.24 *	1.24 *		1.24 *
Number of books at home		0.09 *	0.09 *	0.09 *		0.09 *
-Whether student has a dictionary						
at home		13.41 *	12.50 *	12.51 *		12.51 *
vvnether student has a calculator						
at home		8.14 *	1.54 *	1.54 *		1.54 *
vvnetner student has a computer			4407*	4407*		
at nome		16.4/*	14.8/ *	14.8/ *		14.87 *
vvnetner student has a study		0.04 *	0.40.+	0 4 0 +		0.40.*
desk at home		3.81 *	3.10 *	3.10 *		3.10 *

In Model 6, not shown in the chart, we include interaction effects for private school status and school resource variables. In the PISA (results shown in table to left), the interaction terms were not significant, suggesting that efficiency of resource use is not supported by the data. (If there were significant interaction terms, it might suggest that the effect of having more school resources was not as large in private schools as in public schools; this would support the efficiency argument). In the TIMSS (not shown in table), there is some partial support for the efficiency theory, though the BIC statistics suggest that Model 5 is a better fit than Model 6.

Adding in controls for school-level family background does cause a more drastic change in diminishing the private school status coefficient, though attending a private school still has a statistically significant effect (though negative in the PISA – more research would be necessary to determine why this is the case). There are many possible explanations for this. The common theory is that this is due to peer effects. Does being around higher-performing students cause higher performance in the individual? Does a higher schoollevel socioeconomic status relate to parents putting more pressure on the school to maintain higher academic standards? Are there fewer academic disruptions? More research is necessary to determine which competing explanation might explain the story better. Variables that might be appropriate for measuring these factors are available in the PISA and TIMSS, so examining these will be the next step. Another possible explanation of the private school effect to examine will be school autonomy, for which some variables exist in the PISA.