The International effects of School Resources on eighth grader academic achievement.

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Background of Study

The purpose of the study is primarily to determine whether or not there exists a clear delineation between the impact of school resources on academic achievement in rich and poor countries. Research dating from the mid 1980's suggests that rich countries gain almost no benefit from increasing school resources while poor countries do see a gain in achievement, the supposition was only tested in the past few years, where is was seen to be true in the case of a number of Latin American Countries (Long 2006, Gamoran and Long 2007). By expanding the testing range, both in terms of geographic region and total number of countries, we will be able to determine whether or not a this tendency, known as a threshold affect, holds true on a global basis.

Data Used

The majority of the data we used was gathered using two distinct Educational surveys, the 2003 Trends in International Mathematics and Science Study (TIMSS), and the 2006 Programme for International Student Assessment (PISA). These two studies provided parallel data for the individual and school level variables that formed the first two tiers of the final hierarchical model. The third and final tier, that of country level data, was created using data gathered from various sources, including the 2003/2007 C.I.A. World Factbooks and the United Nations Educational, Scientific, and Cultural Organization (UNESCO).

Tables

Table 1: Models 1 and 2b

model1	Coefficient	model2b	Coefficient
INTRCPT1,	374.54 *	INTRCPT1,	14.07
GDPPC,	0.32 *	GDPPC,	0.20 *
SCHINCT,	7.48 *	SCHINCT,	-4.23
CCLSSIZE,	1.19	CCLSSIZE,	0.37
		AVGEDER,	9.38 *
		AVGPARED,	3.68 *
		AVGBOOK,	0.33 *
		AVGCALC,	33.80 +
		AVGCOMP,	5.87
		AVGDESK,	41.05 *
TEACHED,	0.88	TEACHED,	-0.06
TEXTBOOK,	7.63 *	TEXTBOOK,	6.12 *
SCHCOMPC,	21.21	SCHCOMPC,	21.90 *
INTERNET,	-6.27 *	INTERNET,	-1.45 *
SCHOOLSR,	9.97 *	SCHOOLSR,	3.30 *
TEACHSR,	1.7	TEACHSR,	1.11
		HOMECALC	12.65 *
		HOMECOMP	3.77 *
		HOMEDESK	5.37 *
		HOMEBOOK	0.12 *
		EDER	4.47 *
		EDHIGH	0.78 *

Controlling for Language, Sex, School Size, and Community Size

Key:
*=significant
+=marginally significant

Table 2: Models 3, 4, and 4b

Model3	Coefficient	model4	Coefficient	model4b	Coefficient
INTRCPT1,	410.94 *	INTRCPT1,	300.36 *	INTRCPT1,	-5.08
GDPPC,	0.07	GDPPC,	0.09 *	GDPPC,	0.34 *
SCHINCT,	15.38 *	SCHINCT,	12.15 *	SCHINCT,	-0.22
GDPPC,	-0.07 *	GDPPC,	-0.06 *		
CCLSSIZE,	-14.25	CCLSSIZE,	-12.56 *	CCLSSIZE,	0.36
GDPPC,	0.11 *	GDPPC,	0.09 *		
				AVGEDER,	9.36 *
				AVGPARED,	3.69 *
				AVGBOOK,	0.33 *
				AVGCALC,	34.15 +
				AVGCOMP,	5.6
				AVGDESK,	41.10 *
TEACHED,	2.32 *	TEACHED,	1.95 *	TEACHED,	0.88
GDPPC,	-0.01 +	GDPPC,	-0.00 *	GDPPC,	-0.00 *
TEXTBOOK,	5.47	TEXTBOOK,	5.35	TEXTBOOK,	5.27
GDPPC,	0.01	GDPPC,	0.01*	GDPPC,	0
SCHCOMPC,	83.62 *	SCHCOMPC,	75.84 +	SCHCOMPC,	52.73 *
GDPPC,	-0.27 *	GDPPC,	-0.23	GDPPC,	-0.14 +
INTERNET,	-5.64 *	INTERNET,	-4.21 *	INTERNET,	-0.1
GDPPC,	0	GDPPC,	0	GDPPC,	-0.01 +
SCHOOLSR,	9.00 *	SCHOOLSR,	7.34 *	SCHOOLSR,	2.71
GDPPC,	0	GDPPC,	0	GDPPC,	0
TEACHSR,	1.57	TEACHSR,	1.5	TEACHSR,	1.29
GDPPC,	0	GDPPC,	0	GDPPC,	0
		HOMECALC	13.26 *	HOMECALC	12.65 *
		HOMECOMP	4.48 *	HOMECOMP	3.77 *
		HOMEDESK	5.93 *	HOMEDESK	5.37 *
		HOMEBOOK	0.13 *	HOMEBOOK	0.12 *
		EDER	4.57 *	EDER	4.47 *
		EDHIGH	0.89 *	EDHIGH	0.78 *

Controlling for Language, Sex, School Size, and Community Size

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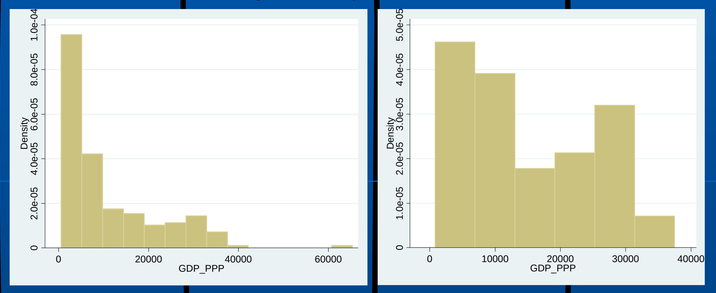
Table 3: Descriptive Statistics

variable	mean	standard error	# of observ-ations	standard deviation
Individual Variables				
math	461.938	0.303868	228706	145.3195
homedesk	0.816272	0.000827	228706	0.395498
homebook	71.2435	0.147166	228706	70.37951
eder	16.3059	0.006269	228706	2.998037
edhigh	12.5918	0.011546	228706	5.521669
School Variables				
cclssize	3.98203	0.001525	6474	0.122703
schcompc	0.050361	0.000873	6474	0.070243
internet	2.30844	0.014204	6474	1.14287
schinct	0.112721	0.003756	6474	0.302212
textbook	0.96521	0.002075	6474	0.166957
teached	17.8124	0.017183	6474	1.382564
teachsr	2.77769	0.008538	6474	0.686977
schoolsr	2.85122	0.009043	6474	0.72761
avgeder	16.2086	0.016059	6474	1.292126
avgpared	12.7616	0.034215	6474	2.752979
avgbook	73.9667	0.47734	6474	38.40734
avgdesk	0.823294	0.002198	6474	0.176854
Country Variables				
gdppc	15392.9	1555.31	47	10662.67

Figure 1: Comparison of Total GDP



Global GDP

GDP of Countries in TIMSS

Variables

The five Models shown to the right all contain as their Y value a numerical score of quantitative knowledge and attainment. The primary variables tested for correlation with these math scores were those selected to depict the resources individual schools possessed, and is therefore labeled school resources. On the individual level, family background questions were included in two of the models to give further information on the total resources available to test takers, and this effect was replicated in the school level tier by taking the average background per school. Controls, such as sex and community size, were present in both the individual and school-level tiers, which allowed the differences between samples to be normalized. Finally, the country level tier contained the Gross Domestic Product of each country, allowing us to determine whether or not the threshold affect mentioned above takes place. To aid in this, the school resource variables were intercepted with GDP in two of the models.

Models

Model 1: Math=School Resources+Controls+GDP

Model 2b: Math=School Resources+Family Backgroun+School-Level Family Background+Controls+GDP

Model 3: Math=School Resources+Controls+GDP+GDP* School Resources

Model 4: Math=School Resources+Family Background+School-Level Family Background+Controls+GDP+GDP *School Resources

Model 4b: Math=School Resources+Family Background+School-Level Family Background+Controls+GDP+GDP *School Resources

Methodology

The preliminary data extraction and recoding was carried out using SAS, Stata, Stat Transfer, and SPSS, although the majority of this step used the Stata statistical software. SPSS and Stat Transfer were used solely to facilitate preliminary extraction and interim transferal of the data, while SAS was used to carry out a Multiple Imputation program on the data. Multiple Imputation is a process that uses the law of large numbers and the standard error to fill in missing data, allowing our datasets to work in the final statistical program we used, HLM, or Hierarchical Linear Modeling Software. HLM allowed us to create three tiered models with the first tier containing individual-level variables, the second school-level, and the third country-level. Without multi-tiered modeling, the regression analyses we would have performed would have been flawed, and we would have been unable to accurately examine the effects of third tier variables intercepting second tier variables.

Results and Conclusion

The story told by the models seems to do little to prove the existence of a threshold effect. Differences in GDP had a negligible impact, and the difficiencies of the sample group of countries, noted below, does not enable the research to completely represent the global trends in GDP (see Figure 1). Despite this, there are a number of secondary results that reveal interesting correlations between minor school resource variables controlling for family background. The significant correlations on resource variables such as school incentives, even when controlling for family background, offer support to the disproval of earlier held beliefs that school resources have no effect on attainment after the inclusion of family background as a controlling factor. In conclusion, our study was useful, but not as insightful into the nature of Of course, this bias is to be expected, as richer countries are both more inclined and better equipped to take part in such surveys than poorer ones. However, future educational surveys that show a more realistic breakdown in global income could be used to more conclusively prove or disprove the existence of a threshold effect on school resources.

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