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Does Private Schooling Improve International Test Scores? Evidence from a Natural Experiment

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Abstract

I estimate the effect of private schooling on Program for International Student Assessment (PISA) scores of 62 countries across the globe from 2000 to 2012. I employ time and country-fixed effects regression models and also use the short-run demand for schooling within a country and year as an instrument for private share of schooling enrollment. I find evidence to suggest that increased private schooling leads to improved PISA scores around the world. Specifically, the model using control variables alongside country and year fixed effects finds that a one percentage point increase in the private share of schooling enrollment is associated with a 1.6-point increase in math scores and a 1.2-point increase in reading scores. However, only one of the two relationships remains statistically significant in the instrumental variables analysis.

Keywords: private school; school choice; PISA; international education

Introduction

During the campaign, the President of the United States called for a twenty-billion-dollar increase in federal funding of private school choice programs across the nation. What impacts would the proposed policy have within the U.S., and what could similar policies do to change educational success around the rest of the world? While some scholars believe that competitive pressures could enhance educational quality while minimizing costs (Friedman & Friedman, 1990; Neal, 2000), others claim that the education sector may not behave like other industries (Gutmann, 1999).

For instance, if families have the ability to choose their educational product, and they do not have the information required to make informed decisions, they may choose schools that actually harm their children in the short-run. Additionally, since individual interests may differ from social interests, families may not choose an educational product that is effective at inculcating math, reading, and science skills (Boyles, 2004; Saltman, 2000). If families do not value the skills that are measured by standardized assessments, we may expect that access to private schools would reduce overall test scores. Moreover, as the father of American public schooling, Horace Mann (1855), argued, common schooling may be necessary in order to inculcate a uniform set of values and to teach children from diverse background to get along with one another and to become proper democratic citizens.

However, if individual families choose educational products that improve cognitive abilities, and standardized tests capture student achievement, we might expect to observe improved Programme for International Student Assessment (PISA) scores resulting from increases in access to private schooling. PISA is a standardized assessment, coordinated by the Organisation for Economic Co-operation and Development (OECD) that examines academic

abilities of 15-year-old children around the world. The assessment is scaled to have a mean of 500 and a standard deviation of 100. In theory, a deviation from the public schooling monopoly on public funding within education systems around the world could increase educational quality through enhanced competitive pressures for schools to improve (Hoxby, 2007; Chubb & Moe, 1990).

In order to test these competing theories, I examine how changes in the private share of schooling within countries are related to PISA scores from 2000 to 2012 after controlling for factors such as gross domestic product (GDP) in billions, population (in millions), and government expenditures as a percent of GPD. This study is able to add to the literature in two significant ways: (1.) removing most of the endogeneity problems that arise from ordinary across-country comparisons by comparing countries to themselves over time, and (2.) using a new instrumental variable, short-run fluctuations in the demand for schooling overall, to exogenously predict the private share of schooling within a given country/year observation. Since access to private schooling can increase competitive pressures and provide valuable information through price differentiation (Friedman, 1997), I expect that increases in the private share of schooling enrollment increase PISA scores.

Theory

An increased share of private schooling within a country can increase the quality of the education experienced by students through increased competitive pressures, specialization, and an improved match between educator and student.

Since most systems of public schooling operate with a monopoly on public funds, public schools enjoy a great deal of monopoly power in general (Chubb & Moe, 1990). In any industry where a producer has extensive monopoly power, quality is held down while prices gravitate

upwards (Samuelson & Nordhaus, 1995). This is because the producer does not have much of an incentive to increase quality and decrease prices. If private schooling is introduced into the system, competitive pressures increase the incentives for both public and private schools to offer the highest-quality education at the lowest cost. Private school choice programs could balance the distribution of power within the school system and families could exercise that power to pressure schools to improve (Egalite, 2013; Figlio & Hart, 2014).

Since public school officials have an incentive to maximize their budgets (Niskanen, 1971), and schools are funded based on enrollment, school leaders are inclined to keep as many students as they can. Moreover, private school choice programs can introduce price differentiation into the system of schooling. Price differentiation can entice new high quality schooling options to enter the market for education and can also communicate valuable information about what is valued by parents and children (Friedman & Friedman, 1990; Hayek, 1945). At the same time, tuition variation rewards high quality schools for serving parents and children while incentivizing low quality schools to either shape up or shut down.

An educational choice system can improve the match between educator and student through specialization (DeAngelis & Holmes-Erickson, 2017). Since all children are unique, they have diverse interests, learning styles, ability levels and family structures. Providing specialized learning environments that meet the unique needs of children can improve the overall educational experience. Indeed, simply increasing the number of diverse options available to children could increase the likelihood that children are matched to a school that interests them. The increases in educational quality influenced by the introduction of private schooling within a country can lead to improved standardized test scores for students.

Alternatively, private schools may provide a quality education to children by enhancing skills that are not easily measured by standardized assessments like PISA. If private schools are allocating more resources towards improving skills that are not captured by standardized tests, we may observe a negative effect of private schooling on PISA scores. Critics of private schooling argue that since parents are not experts in pedagogy or education, they may not make rational decisions when selecting schools for their children. The inability of parents to choose rationally, they argue, may lead to a lower-quality educational experience for children.

Literature Review

The evidence on how private school choice impacts standardized test scores is abundant. Shakeel, Anderson, and Wolf (2016) perform a meta-analysis and systematic review of the evidence from 19 experimental studies and find that private school voucher programs around the world produce small positive impacts on student achievement. They also find that the results are typically larger for reading scores, programs outside of the United States, and publicly funded programs. In the United States, almost all experimental evaluations of private school voucher programs produce null to positive results. There are currently only two exceptions: (1.) Abdulkadiroglu, Pathak, and Walters (2015) find that the Louisiana Scholarship Program has negative impacts on student achievement in initial years and (2.) Dynarski et al. (2017) find that the voucher program in the District of Columbia (D.C.) has negative effects on student mathematics achievement after one year.

While the overall average of the experimental evaluations of private school choice programs is slightly positive overall (Shakeel, Anderson, & Wolf, 2016), the more recent experimental evaluations find null (Mills & Wolf, 2017b) to negative (Abdulkadiroglu, Pathak, & Walters, 2015; Dynarski et al., 2017; Mills & Wolf 2017a) effects on student standardized test

scores. This downwards trend over the years may cause concern about the overall merits and policy implications regarding private school choice programs today. In order to make policy implications regarding recent private schooling conditions, this study empirically examines how fluctuations in the private share of schooling within countries is related to student standardized tests scores in recent years, from 2000 to 2012.

The four experimental evaluations (Angrist et al., 2002; Angrist, Bettinger, & Kremer, 2006; Muralidharan & Sundararaman, 2015; Wolf, Egalite, & Dixon, 2015) of private school choice programs outside of the U.S. find slightly larger positive effects on student achievement. Muralidharan and Sundararaman's (2015) experiment finds that access to private school choice in India improves test scores by around 0.23 standard deviations overall. Tooley and Dixon (2005) also find that access to private schooling is associated with benefits for disadvantaged children around the world. Additionally, Shafiq and Myers (2014) find that access to private school vouchers in Sweden is associated with a slight increase in the students' civic attitudes between 1999 and 2009.

Hanushek, West, and Woessmann (2013) used PISA data to find that autonomy had a positive impact for high-performing countries, but a negative impact for developing countries. While the causal research connecting private schooling and PISA scores has been limited, Hanushek and Woessmann (2010) pointed out their optimism about research on the topic, stating that the outlook for international studies was "clearly bright" since "more than 60 countries" were planning to participate in the 2012 PISA exam.

Few existing studies attempt to determine the effect of private schooling on student test scores around the world. D'Agostino (2016) examined the private share of school enrollment in 30 countries in 2012, but did not find a statistically significant effect on PISA scores. Sakellariou

(2017) examined schooling in 40 countries in 2012 and found that public schools outperformed private on PISA scores. However, since these studies all used cross-country comparisons, they cannot be interpreted as causal.

West and Woessmann (2010) used 2003 PISA data for 29 nation-states and found that countries with higher private share of schooling were associated with improved international test scores. Importantly, they used the percent of Catholics within a country from the year 1900 as an instrument to predict current private share of schooling. Since the historic Catholic share of the population is highly correlated with whether a student ended up in a private school in 2003, and that is unrelated to the student's test score in 2003, they argue, their paper identifies a causal relationship between private schooling and higher student achievement.

While this approach was a decent attempt to remove endogeneity, the instrumental variable is unfortunately correlated with many omitted variables such as current country culture, political structure, and economic structure. For example, it may be that countries with larger Catholic shares of the population in 1900 are also less racially heterogenous in 2003. Racially homogeneous countries may have a less difficult time educating children in math, reading, and science, regardless of whether they are in public or private schools (Partanen, 2011). Because of this, I am doubtful that their instrument removes the endogeneity problem with the explanatory variable of interest. In fact, the use of the variable may introduce more bias than it eliminates, as indicated by the fact that the IV results are over three times the size of the OLS results.

This study improves upon West and Woessmann (2010) in two ways. First, I have access to five separate years of data for 62 nations, so I am able to use year and country fixed effects in order to compare PISA scores within, rather than across, countries. Second, as a robustness check, I use an instrument that is more exogenous to the model than the historical share of

Catholic population: the short-run change in the demand for total schooling within a country and year. Additionally, this study is the first to causally link private schooling to the recent PISA evaluation mentioned by Hanushek and Woessmann in 2010.

Data

I use pooled cross-sectional country-level data from multiple sources for the years of 2000 to 2012. I use data from the World Bank[1] and the United Nations Data Retrieval System[2] for the independent variable of interest, the private share of total primary schooling enrollment. As outlined by OECD,[3] this study defines a private educational institution as one that "is controlled and managed by a non-governmental organization, or if its governing board consists mostly of members not selected by a public agency." I also use the World Bank for GDP, population, life expectancy, and total schooling enrollment.

The three dependent variables of interest are from the Program for International Student Assessment (PISA). I use national-level PISA math, reading, and science test scores for 62 countries around the world from 2000 to 2012. The models use 209 country-year observations for math and science, and 207 country-year observations for reading. These data are publicly-available online at the National Center for Education Statistics website.[4] Of course, since the analytic sample only captures about a third of the 195 countries that exist in 2017, is not globally representative. The analytic sample includes 32 of the 44 countries in Europe, 6 of the 23 countries in North America, 6 of the 12 countries in South America, 15 of the 48 countries in Asia, 2 of the 14 countries in Oceania, and 1 of the 54 countries in Africa.

PISA Assessment

[1] http://data.worldbank.org/indicator/SE.SEC.PRIV.ZS
[2] http://data.un.org/Data.aspx?d=UNESCO&f=series%3APRP_1
[3] https://stats.oecd.org/glossary/detail.asp?ID=2123
[4] http://nces.ed.gov/surveys/pisa/idepisa/dataset.aspx

PISA is a standardized assessment, coordinated by the Organization for Economic Cooperation and Development (OECD), examines academic abilities of 15-year-old children around the world. PISA started in 2000 with 32 participating countries and has been administered every three years. In 2015, nationally-representative samples of children took the assessment from 70 different countries. The subjects included reading, math, science, problem solving, and financial literacy.

In order for the data from a country to be valid, OECD requires that each nation tests at least 4,500 students from at least 150 different schools. The testing period can be no longer than 42 days, and the response rate must be equal to or greater than 65 percent of the original sample of schools. As a validity check, Westat analyzes the final list of schools before data is made publicly-available. At the school level, the response rate must be equal to or greater than 80 percent of the sampled students. The sampling procedure is stratified systematic sampling with each observation weighted by the inverse of the probability of being sampled.

Until 2015, the test was mostly paper-and-pencil with 17 different examination booklets randomly assigned to students. Each student received only one booklet which had four different clusters of material. Each cluster contained about 30 minutes of material on one of the following: reading, math, science, or financial literacy. About half of the questions were multiple-choice, a fifth were short-response, and about a third were constructed-response.

Although the 2015 PISA results are available, I am unable to use them for the analyses since data from the same time period are not yet available for the explanatory variable of interest or the control variables.

Methods

I use a time and country fixed effects regression approach of the form:

$$PISA_{it} = \beta_0 + \beta_1 PrivateShare_{it} + \beta_2 GDP_{it} + \beta_3 GovtExpend_{it} + \beta_4 Pop_{it} + \beta_5 Enroll_{it} + \beta_6 LifeExpect_{it} + \beta_7 Mortality_{it} + \beta_8 Age_{it} + \alpha_i + \varepsilon_{it}$$

Where *PISA* is one of the three dependent variables of interest for country *i* at time period *t*. The three dependent variables of interest are math, reading and science test scores as measured by the international PISA assessment.

PrivateShare is the independent variable of interest, the private school share of total primary schooling enrollment, for country *i* in time period *t*. I expect that the coefficient of interest, β_1, will be positive since private schooling can increase diversity of thought and decrease concentration of power which can lead to increased political and economic freedom.

I include a set of country-level control variables since certain characteristics of countries may cause them to become better educated as well as increase private-sector schooling. For example, an increase in GDP could lead a country to increase spending on public schooling since it has more wealth. Concurrently, the PISA scores for a country is likely to increase due to an increase in its wealth. *GDP* is the gross domestic product for country *i* in year *t*. *GovtExpend* is the total government expenditure as a percent of GDP, *Pop* is the population, *Age* is the age in years, *LifeExpect* is the average life expectancy, *Mortality* is the infant mortality rate, and *Enroll* is the total number of students enrolled in private and public schooling for country *i* in time period *t*. Due to the non-linear relationship between the dependent variables and GDP, population, and enrollment, I also include squares of these terms in the models. Finally, α_i is the set of country-level time-invariant parameters, such as ethnicity, language, and culture, and ε_{it} is the random error term.

Including year fixed effects allows me to control for global time series trends, while including country fixed effects allows me to compare countries to themselves over time. Using

country-level fixed effects is especially important in this type of analysis because of the fact that private schooling systems, and the definition of a private school in general, function differently across countries. Since I am able to compare countries to themselves over time, and definitions of private schooling remain relatively constant within countries, I am able to remove the across-country problem.

In theory, the explanatory variable of interest, private share of total primary schooling enrollment, may still suffer from an endogeneity issue. For example, an omitted variable measuring the amount of regulation in the schooling industry could create an upward bias on the effects since it is negatively associated with private share of schooling and perhaps also negatively correlated with PISA scores as well, since more regulation could simply reduce teacher autonomy in both private and public sectors. Because of this potential issue, I also employ an instrumental variable year and country-level fixed effects two-stage least squares regression of the form:

$$\text{PrivateShare}_{it} = \lambda_0 + \lambda_1 \text{ChildPop}_{it} + \lambda_2 X_{it} + \alpha_i + \varepsilon_{it} \quad (1)$$

$$\text{PISA}_{it} = \beta_0 + \beta_1 \text{PrivateShare}_{it} + \beta_2 X_{it} + \alpha_i + \varepsilon_{it} \quad (2)$$

Where the second-stage, possibly endogenous explanatory variable of interest, *PrivateShare*, is predicted in the first stage with an exogenous instrument, *ChildPop*, the percent of the total population that is between the ages of 0 and 14 for country *i* in year *t*. The instrument represents an unexpected shock in the demand for schooling overall in the short-run. Since public schools around the world are constitutionally-obligated[5] to provide a free primary education for all children, public schools will be more likely to absorb this excess demand. On

[5] http://www.worldpolicycenter.org/policies/is-education-tuition-free/is-primary-education-tuition-free

the other hand, private schools will be less likely to respond to short-run shocks in demand since the profit-incentives for school expansion and market entry may not appear quickly enough.

As a result, I expect that the instrument will be strongly negatively correlated to the share of private schooling enrollment within a country and year. The instrument passes the redundancy condition since it does not directly affect the four outcome variables of interest; the amount of children in a given country/year should not directly affect political or economic freedom within a country/year. Furthermore, when I include this instrument in the structural model, I do not find evidence that the instrument is correlated with any of the outcome variables. Lastly, the instrument is exogenous since it is not correlated with any omitted variables that may concern us. For example, an unexpected shock within a country, such as a coup d'état, could increase the need for private schooling within a specific time frame. While a coup could increase private schooling, the relative amount of children within a country and year is not directly related to the likelihood of a coup. I also include all of the same controls from the previous models in vector X.

Since many observable characteristics of countries can be argued as relatively constant over time, I first present results for the country-level fixed-effects models without time-variant controls. Then, I present results based on the preferred model with year and country-level fixed effects. Finally, I present the instrumental variables year and country-level fixed effects results.

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Table 1: Descriptive Statistics

	Mean	Overall Standard Deviation	Within-Country Standard Deviation	Minimum	Maximum
PISA Math	468.03	56.43	10.52	292.07	573.47
PISA Reading	466.39	50.83	10.96	284.71	556.02
PISA Science	473.13	51.27	8.98	322.03	563.32
Private Share	13.72	16.88	2.97	0.01	99.08
GDP (Billions)	285.49	1,194.73	319.98	0.01	17,348.07
Govt Expend (% GDP)	16.36	8.72	3.21	6.16	27.55
Population (Millions)	34.09	130.62	6.95	0.01	1,364.27
Enrollment (Millions)	3409	12,125.87	1,190.20	0.00	141.15
Life Expectancy	68.38	9.69	1.85	38	83
Infant Mortality (%)	3.19	2.92	0.73	0.20	14.60
Country Age	135.52	288.82	4.61	3	2672
Child Population (%)	30.53	10.82	1.92	12.94	50.41
OECD	0.18	0.38	0	0	1

Results

Year and Country Fixed Effects

Table 2 reports results using country and time fixed effects. Results in this first model indicate that an increase in private share of total schooling enrollment is associated with higher PISA scores for all three subjects.

In particular, Table 2 shows that a one percentage point increase in the private share of schooling enrollment is associated with a 2.5-point increase in math, a 1.4-point increase in reading, and a 1.3-point increase in science. These results are equivalent to a 24 percent of a standard deviation increase in math scores, a 13 percent of a standard deviation increase in reading scores, and a 15 percent of a standard deviation increase in science scores. These effect sizes are considered small to medium using standards created by Jacob Cohen (1992) and Mark Lipsey (1990). However, for research in education, these effect sizes are exceptionally large (Hill et al., 2008).

Table 2: The Effect of Private Schooling on PISA Scores

	Math	Reading	Science
Private Share	**2.513*** (0.000)**	**1.462** (0.015)**	**1.325*** (0.009)**
Constant	444.300*** (0.000)	455.356*** (0.000)	459.266*** (0.000)
R-Squared Within	0.1050	0.1687	0.1077
Countries	64	64	64
N	218	216	218

Note: P-values in parentheses. All models use country and year fixed effects.
* p<0.10, ** p<0.05, *** p<0.01

Year and Country Fixed Effects and Added Controls

Since there are important factors that may significantly vary within countries in a relatively short time period, I include an additional model which controls for many of these factors. Table 3 reports results for the model which includes controls and year and country fixed effects. These results indicate that an increase in private share of schooling enrollment is associated with an increase in PISA scores. However, perhaps because I add in multiple control variables and rely on the statistical power generated by only 206 observations, the standard errors increase relative to the previous model without controls.

Specifically, Table 3 shows that a one percentage point increase in the private share of schooling enrollment is associated with a 1.6-point, or 15 percent of a standard deviation, increase in PISA math scores. A one percentage point increase in the private share of schooling enrollment is associated with a 1.2-point increase in PISA reading scores and a 0.9-point increase in PISA science scores. This equates to an 11 percent of a standard deviation increase in reading scores and a 10 percent of a standard deviation increase in science scores; however, the effect on science becomes statistically insignificant with a p-value of 0.101.

The control variables behave as expected where significance arises. In particular, it appears that large increases in GDP within a country are positively associated with reading test scores, however this is only considered marginally significant. Perhaps this is because wealth and resources can increase the quality of educational institutions and ultimately the well-being, and test scores, of children. Moreover, students in households with higher incomes are more likely to learn vocabulary and grammar in the home (Dahl & Lochner, 2012). As we would expect, infant mortality rates within a country are significantly negatively related to all three types of PISA scores. This particular variable may be capturing many unobservable characteristics within a country that are negatively associated with the well-being of the students and educators, such as disease or poverty-level shifts. If students and educators have to deal with these negative shocks, they will probably have less time and ability to focus their efforts on a successful education.

I do not detect many significant effects of the control variables used, perhaps because there is not much variation within a country for these factors. In other words, it may be that many of the control variables can be considered as country-level fixed effects. Furthermore, since these control variables could simply result in power issues, the previous model may be preferred.

Results for OECD and non-OECD subgroups are found in Table 4. These results indicate that the overall results may be driven largely by non-OECD countries; however, the model for OECD countries also faces a substantial power issue. As shown in Table 1, only 18 percent of the original 209 observations are from OECD countries, and OECD nations have less than half of the amount of private schooling variation observed within non-OECD countries. In fact, the within-country standard deviation for private schooling is around 3.29-percentage points in non-OECD countries, while it is only 1.37-percentage points in OECD countries.

Table 3: The Effect of Private Schooling on PISA Scores

	Math	Reading	Science
Private Share	**1.616****	**1.211***	**0.918**
	(0.016)	**(0.058)**	**(0.101)**
GDP (Billions)	0.002	0.010**	0.003
	(0.725)	(0.042)	(0.504)
GDP^2 (Billions)	-0.000	-0.000	-0.000
	(0.891)	(0.483)	(0.948)
Govt Expend	-1.070	-0.822	-0.167
	(0.250)	(0.356)	(0.830)
Population (Millions)	0.559	-0.627	-1.208
	(0.640)	(0.586)	(0.229)
$Population^2$ (Millions)	-0.001	0.000	0.001
	(0.679)	(0.989)	(0.598)
Enrollment (Millions)	0.005	0.005	-0.002
	(0.547)	(0.537)	(0.732)
$Enrollment^2$ (Millions)	-0.000	-0.000	-0.000
	(0.253)	(0.969)	(0.739)
Life Expectancy	-1.479	-0.467	0.170
	(0.462)	(0.808)	(0.920)
Infant Mortality	-2.661***	-2.373***	-1.301**
	(0.000)	(0.001)	(0.036)
Country Age	-0.364	-0.553	0.044
	(0.542)	(0.335)	(0.930)
Constant	690.103***	690.417***	505.876***
	(0.000)	(0.000)	(0.000)
R-Squared Within	0.2898	0.2974	0.2047
Countries	62	62	62
N	209	207	209

Note: P-values in parentheses. All models include country and year fixed effects.
* p<0.10, ** p<0.05, *** p<0.01

Table 4: Heterogeneous Effects (Year and Country Fixed Effects)

	Math	Reading	Science
Non-OECD	**2.581****	**2.754****	**1.166**
	(0.039)	**(0.021)**	**(0.270)**
OECD	0.576	0.099	0.448
	(0.486)	(0.900)	(0.523)
Controls	Yes	Yes	Yes
R-Squared Within	0.3124	0.3257	0.2120
Countries	62	62	62
N	209	207	209

Note: P-values in parentheses. All models include country and year fixed effects and all added controls. Coefficients are for private schooling in OECD and Non-OECD countries.
* p<0.10, ** p<0.05, *** p<0.10

2SLS Regression with Year and Country Fixed Effects

For each of the three regressions, the instrument is strongly associated with the private share of total schooling enrollment. As shown in Table 4B, the coefficient is around -0.86 in the first stage of each model. In other words, a one percentage point increase in child share of the total population is associated with a 0.86 percentage point reduction in private schooling. This is evidence to confirm the hypothesis that private schools are less able to absorb short-run demand shocks of students than public schools. The instrument is also redundant since child share of population should not directly influence a nation's standardized test scores within a given year. In fact, when I include this as a control in the structural model, the p-value associated the instrument is above 50 percent for math and reading scores. However, I do find a statistically significant negative relationship between the instrument and reading PISA scores. Although this empirical relationship emerges, the relationship between the child share of total population and PISA reading scores does not follow intuition.

I present the results for the second stage of the instrumental variables fixed effects regression in Table 4A below. The p-value for math jumps to around 16 percent and the

coefficient is similar to before, which could be an indication that the model is suffering from a lack of power, which is not uncommon for a 2SLS model with a sample size of only around 200. Conversely, the result for reading scores becomes more statistically significant while the effect size increases to around a half of a standard deviation. The effect for science attenuates to zero. It may be that the instrument is only redundant to the models for math and science. However, intuitively, the instrument is more exogenous to the models than private schooling itself.

Table 4A: The Effect of Private Schooling on PISA Scores (2nd Stage)

	Math	Reading	Science
Private Share	**2.793**	**5.226****	**0.160**
	(0.159)	**(0.014)**	**(0.923)**
Controls	Yes	Yes	Yes
Constant	711.970***	765.267***	491.797***
	(0.000)	(0.000)	(0.000)
R-Squared Within	0.2730	0.0815	0.1936
Countries	62	62	62
N	209	207	209

Note: P-values in parentheses. All models include country and year fixed effects with all added controls. All results are from the second stage of the IV fixed effects models. * p<0.10, ** p<0.05, *** p<0.01

Table 4B: The Effect of Private Schooling on PISA Scores (1st Stage)

	Private (Math)	Private (Reading)	Private (Science)
Child Share	**-0.854*****	**-0.862*****	**-0.854*****
	(0.000)	**(0.000)**	**(0.000)**
Controls	Yes	Yes	Yes
R-Squared Within	0.4232	0.4235	0.4232
Countries	62	62	62
N	209	207	209

Note: P-values in parentheses. All models include country and year fixed effects with all added controls. All results are from the first stage of the IV fixed effects models. * p<0.10, ** p<0.05, *** p<0.01

Conclusion and Policy Implications

The model using control variables and year and country fixed effects finds that a one percentage point increase in the private share of schooling enrollment is associated a 15 percent of a standard deviation increase in math scores, an 11 percent of a standard deviation increase in reading scores, and a 10 percent of a standard deviation increase in science scores; however, these results are statistically insignificant for science, with a p-value of 0.101. In addition, the only results that are robust to the instrumental variables analysis are for reading scores.

Since private schooling can increase scores on international assessments, we should promote policies that increase private schooling within countries. Specifically, decision-makers should consider expanding access to private schooling through private school choice programs such as vouchers, tuition-tax credit scholarships, and education savings accounts. Each of these programs would expand the share of private schooling and competitive pressures within a country. However, decision-makers must realize that there will obviously be heterogeneous effects across countries.

In order to increase the supply of private schooling options, policy-makers may also consider reducing regulatory costs for private schools to participate in school choice programs. After all, recent studies in the U.S. suggest that large packages of regulations may decrease the quality level (Sude, DeAngelis, & Wolf, 2017) and specialization (DeAngelis & Burke, 2017) of the supply of private schools. Lastly, we should increase the amount of data available on private schooling around the world so that researchers could provide examine differential impacts for subgroups. Specifically, city-level data provided by institutions such as World Bank would allow for enough statistical power to detect effects for different regions of the world and different types of countries.

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