Competition and Academic Achievement in Comparative Perspective

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Background

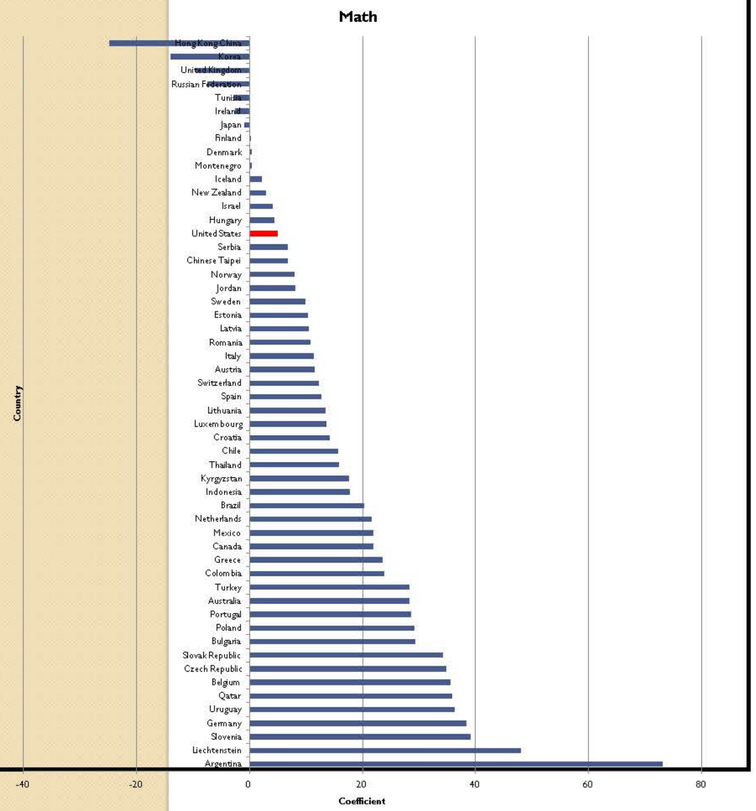
• On March 13 2010, the Obama administration released its blueprint for revising the Elementary and Secondary Education Act (ESEA). It provides incentives for states to adopt academic standards and create accountability systems that measure student growth. This study aims to examine the effects of four education reforms similar to several of the Obama administration's proposed changes on test scores from the 2006 Program for International Student Assessment (PISA) examination administered by the Organization for Economic Co-operation and Development (OECD).[2]

•The four variables supported by the literature are: The (1) presence of national standards, (2) tracking of student achievement, (3) tracking of Teacher achievement based on students' scores, and (4) competition between two or more schools for the same students.[1]

Research Questions

• Which of the four main independent variables have a measurable correlation with an increase in any of the test scores?

• Are these effects possibly mitigated by other factors such as sex, socioeconomic status, or the characteristics of the school?



Methods

Sample

•In 2006, 57 countries/ economies participated in the PISA survey.

• . The students tested by PISA are aged between 15 years and 3 months and 16 years and 2 months at the beginning of the assessment period. The current school year of the pupils is not taken into consideration.

•To fulfill OECD requirements, each country must draw a sample of at least 5,000 students. In small countries like Iceland and Luxembourg, where there are less than 5,000 students per year, an entire age cohort is tested.

•France and Macao China were removed from the analysis due to incomplete information

•The United States was removed from the analysis of reading scores because that portion was not administered in the States.

Methodology

• The data are arranged into 3 layers: the individual(393990 sample), schools(725), and Countries(55).

• OLS is insufficient to use variables collected at the School(national standards, hiring practices) and the Country levels(Human Development Index). Hierarchical Linear Modeling(HLM) is preferable to OLS because HLM controls for these nested effects.

•HLM formula- Level 1

$$y_{ij} = \beta_{0j} + \beta_{1j} x_{1ij} + r_{ij}$$

where y_{ij} is the observed value of outcome y for observation i nested within group j, $_{0j}$ is the intercept for group j, $_{1j}$ is the regression slope of y on x within group j, and r_{ij} is the person and group specific residual.[4]

$$\beta_{0j} = \gamma_{00} + \gamma_{01} w_{1j} + \gamma_{02} w_{2j} + \gamma_{03} w_{1j} w_{2j} + u_{0j}$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11} w_{1j} + \gamma_{12} w_{2j} + \gamma_{13} w_{1j} w_{2j} + u_{1j}$$

The Substitution

$$y_{ij} = \gamma_{00} + \gamma_{01} w_{1j} + \gamma_{02} w_{2j} + \gamma_{03} w_{1j} w_{2j} + \left(\gamma_{10} + \gamma_{11} w_{1j} + \gamma_{12} w_{2j} + \gamma_{13} w_{1j} w_{2j}\right) x_{1ij} + \left(u_{0j} + u_{1j} x_{1ij} + r_{ij}\right)$$

•The data was imputed using SAS to combine the Plausible Values for the three different sections and the missing data in the set.

Results

• The results for model 1 on all outcomes indicate that competition is significant and Tracking teacher achievement is significant for the reading outcome.

•For the successive models, all four of the main independent variables drop out when the effects of SES variables between schools and countries captured by the HDI 2005 numbers are included.

Conclusions

• Competition between two or more schools has a positive correlation with higher test scores across the disciplines of the PISA.

•This effect seems to move hand in hand with SES variable levels. Further study is required to determine whether competition is spurious or should it be considered a confounding factor.

Math	Model 1	Model 2	Model3
National Standards	0.47	0.99	1.43
Track Teacher Achievement	-1.71	-3.36	-2.81
Tracking Student Achievement	0.91	0.97	0.23
Competition	12.39	1.66	2.03
Village	-30.43	14.02	17.89
Small Town	-14.23	9.83	11.17
Town	-3.04	6.84	7.74
Female	-18.78	-18.14	-19.52
Language spoken at home matches Test	15.73	10.94	10.8
Middle Secondary	-60.65	-53.55	-50.83
Human Development 2005		323.56	509.17
Parents' Education		2.02	0.63
Parents' Occupation,		2.51	1.88
Wealth		-3.61	-3.39
Education Resources,		43.78	33.11
Parents' Education,		1.01	0.96
Parents' Occupation,		0.52	0.49
Wealth,		-1.13	-1.04
Education Resources,		7.08	5.86
Funding from Benefactors			0.12
Funding from Fees			-0.01
Funding from other Sources			0.13
Private school			-3.07
Teacher to Student ratio			-0.12
Resource score			5.83
School Size			0
Class Size			0.32
Tracks for students			-5.09
Ability not in admission			-1.36
Philosophy not in admission			1.72
Teachers Certified			9.82
Teachers with Bas			11.7
National Hiring			-5.27
National Salaries			5.61
National Budget			2.14
National texts			-2.42
Principal/Teacher Hiring			2.73
Principal/Teacher Salary			-2.13
Principal/Teacher Budget			0.2
Principal/Teacher Texts			-0.46
Repeat			-0.23
Lesson time Math			7.96
Math no importance			-30.47

References

1. "A Blueprint for Education" http://www2.ed.gov/policy/elsec/leg/blueprint/index.html
2. Chapter 2 of the publication "PISA 2003 Assessment Framework", pdf
3. **PISA 2006 Technical Report**
4. Raudenbush, S. W. (2002). Hierarchical Linear Models Applications and Data Analysis. Thousand Oaks Sage Publications.
5. Ravitch, D. (2010). The death and life of the great American school system : how testing and choice are undermining education. New York, Basic Books.