

**Teaching Practices and Social Capital**  
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**Online Appendix**

**Appendix A – Database Presentation**

The 1999 CES database assesses the civic knowledge of students in grade 8 (or grade 9 for certain countries) in 25 countries: Australia, Bulgaria, Chile, Cyprus, Czech Republic, Denmark, England, Estonia, Finland, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Norway, Poland, Portugal, Romania, Russian Federation, Slovak Republic, Slovenia, Sweden, Switzerland, United States. The database covers 3,934 schools

The 2006 PIRLS database assesses reading skills in grade 4 in 40 countries: Austria, Belgium (Flemish), Belgium (French), Bulgaria, Canada, China, Denmark, England, France, Georgia, Germania, Hong Kong, Hungary, Iceland, Indonesia, Iran, Israel, Italy, Kuwait, Latvia, Lithuania, Luxembourg, Macedonia, Moldova, Morocco, Netherlands, New Zealand, Norway, Poland, Qatar, Romania, Russian Federation, Scotland, Singapore, Slovak Republic, Slovenia, South Africa, Sweden, Trinidad, Turkey, United States. The database covers 7,245 schools, 204,631 students and 10,267 teachers. For the within school estimates, we restrict the sample to 100,858 students.

The 2007 TIMSS database measures mathematics and science achievement in 8<sup>th</sup> grade in 59 countries: Algeria, Armenia, Australia, Bahrain, Bosnia and Herzegovina, Botswana, Bulgaria, Colombia, China, Czech Republic, Cyprus, Egypt, El Salvador, England, Georgia, Ghana, Hong Kong, Hungary, Indonesia, Iran, Israel, Italy, Japan, Jordan, Korea, Kuwait, Lebanon, Lithuania, Malaysia, Malta, Morocco, Norway, Oman, Palestine, Qatar, Romania, Russian Federation, Saudi Arabia, Scotland, Serbia, Singapore, Slovenia, Sweden, Syria, Thailand, Tunisia, Turkey, Ukraine, United States. The database covers 7,348 schools, 220,909 students and 25,622 teachers.

Table A – Average Number of Observations Per Country, School, and Student

<b>CES database 1999 (25 countries)</b>	Average observation
<i>Number of schools per country</i>	150.2
<i>Number of students per country</i>	3,413
<i>Average number of students per classroom</i>	12.03
<i>Number of teachers per student</i>	1.68
<b>PIRLS database 2006 (40 countries)</b>	
<i>Number of schools per country</i>	179.27
<i>Number of students per country</i>	5234.34
<i>Number of students per classroom</i>	23.42
<i>Number of teachers per student</i>	1.12
<b>TIMSS database 2007 (59 countries)</b>	
<i>Number of schools per country</i>	149.37
<i>Number of students per country</i>	4556.46
<i>Number of students per classroom</i>	23.09
<i>Number of teachers per student</i>	2.38



## Appendix B - Variable Definition

Table B1 – Variables for Student Beliefs (CES)

Variables from CES	Questions	Measures
<i>“Student belief in cooperation among students”</i>	“The goal of education is to understand people with different ideas”, “The goal of education is to learn how to cooperate in groups with other students”.	The answers range from 1 for Strongly Disagree, 2 for Disagree, 3 for Agree and 4 for Strongly Agree. We take the average of the two answers
<i>“Student belief in cooperation with teachers”</i>	“Are students encouraged to make up their own opinion?”, “Do teacher respect your opinion?”, “Do you feel free to express opinions in class?”, “Do you feel free to openly disagree with the teacher?”	The answers range from 1 for Disagree a lot, 2 for Disagree, 3 for Agree, and 4 for Agree a lot. We take the average of the four answers
<i>“Student association membership”</i>	“Have you ever participated to: A student council? A youth organization? A school newspaper? An environmental organization? A UN or UNESCO Club? A Student exchange program? A Human Rights Organization? A Group Conducting Activities? A Charity Collecting? A boy or girl scout group? A cultural association? A computer club? An art, drama or music association? A Sport Organization? An association supported by a religious group?”.	For each association, the answer equals 1 if the respondent participates in it and 0 otherwise. “. The variable is the sum of the 15 items related to an association membership
<i>“Student level of trust”</i>	“How much confidence do you have in: 1) Justice? 2) The Police?, 3) Education institutions/Schools?” 4) Others”.	The answers range from 1 for “Not at all”, 2 for “Little confidence”, 3 for “Confident” and 4 for “Very confident”. We take the average of the four answers.
<i>“Participation in civil society outside the school”</i>	“To become a good citizen, how important it is to you to: i) participate in activities to benefit people in the community, ii) take part in activities promoting human rights? iii) take part in activities to protect the environment? iv) participate in a peaceful protest against a law considered as unjust?”.	The answers range from 1 for Not important to 4 for Very important. We create an index of Participation in social life by taking the average of answers to these questions.
<i>Participation in political life outside the school</i>	- “To become a good citizen, how important is it for you to: i) vote in every election? ii) join a political party? iii) follow political issues in the newspaper, on the radio or on TV?”  -“When everyone has the right to express their opinion freely”, “When many different organizations are available for people who wish to belong to them, is it i) very bad, ii) somewhat bad, iii) somewhat good, iv) very good, for democracy?”	The answers range from 1 for Not important to 4 for Very important. We take the average of answers to these questions.

Table B2 – Variables for Student Beliefs (PIRLS and TIMSS)

<b>Variables from PIRLS</b>	Questions	Measures
<i>“Student beliefs in cooperation among themselves”</i>	“How much do you agree with the statement: 1) Students show respect for each other, 2) Students care about each other, 3) Students help each other with their work”	The answers range from 1 for Disagree a lot, 2 for Disagree, 3 for Agree, and 4 for Agree a lot. We take the average answer to the three questions
<i>“Student beliefs in cooperation with teachers”</i>	“How much do you agree with the statement: teachers care about me”	The answers range from 1 for Disagree a lot, 2 for Disagree, 3 for Agree, and 4 for Agree a lot.
<b>Variables from TIMSS</b>		
<i>Self-confidence</i>	“Mathematics (Science) is more difficult for me than for others”, “I can do well in mathematics (science) if I want to”	We take the average of the two answers. The index takes the values 1 for Low, 2 for Medium and 3 for High Self-confidence.
<i>Positive attitudes</i>	“I enjoy learning mathematics (science)”, “I like mathematics (science)”, “Mathematics (science) is boring”	We take the average of the two answers. The index takes the values 1 for Low, 2 for Medium and 3 for High Positive attitude.

Table B3 – Variables for Teaching Practices

<b>Variables from CES</b>	Questions	Measures
<i>“Horizontal teaching”</i>	How often do students work in groups?	Answers take on values 1 for Never, 2 for Sometimes, 3 for Often and 4 for Very Often.
<i>“Vertical teaching”</i>	“How often does the teacher lecture?”	Answers take on values 1 for Never, 2 for Sometimes, 3 for Often and 4 for Very Often.
<b>Variables from TIMSS</b>		
<i>“Horizontal teaching”</i>	“During a typical week, how often do you ask students to work in groups”	Answers range from 1 for Never, 2 for Some lessons, 3 for About half the lessons and 4 for Every or almost every lesson.
<b>Variables from PIRLS</b>		
<i>Horizontal teaching in general</i>	“In a typical school week, what percentage of time in class with students do you devote to the following strategies: Working with individual or small group of students?”	The answer is percentage of time.
<i>Vertical teaching in general</i>	“In a typical school week, what percentage of time in class with students do you devote to the following strategies: Teaching the class as a whole?”	The answer is percentage of time.
<i>Horizontal teaching during reading activities</i>	“When you have reading instruction and/or do reading activities, how often do you organize students in the following ways? I ask students to work in groups”	Answers range from 1 for Never to 4 for Always.
<i>Vertical teaching during reading activities</i>	“When you have reading instruction and/or do reading activities, how often do you organize students in the following ways? I teach reading as a whole class activity”	Answers range from 1 for Never to 4 for Always.
<i>Horizontal teaching after reading activities</i>	“After students have read, how often do you ask them to do the following? Students talk to each other in groups about what they have read”	Answers range from 1 for Never to 4 for Always.
<i>Horizontal teaching to help a student in difficulty</i>	“I have other students work on reading with the student having difficulties”	Answers range from 1 for Never to 4 for Always.

Table B4 – Variables for Student Characteristics

<b>Variables common to CES, PIRLS and TIMSS</b>	Definition and Measures
<i>Student's age</i>	Age in years and months
<i>Student's gender</i>	Dummy equal 1 for female student
<i>Student's immigrant</i>	Dummy equal 1 if student or the student's parent are born abroad
<i>Number of books at home</i>	Number of books: 1=None, 2= 1-10, 3=11-50, 4=51-100, 5=100-200, and 6= over 200 books.
<i>Parental education</i>	Highest education degree: 1=Primary, lower secondary or no schooling, 2=Finished lower secondary, 3=Finished upper-secondary, 4=Finished post secondary, 5=Finished university.
<i>Parental employment status</i>	1=Never worked, 2=Small business owner, 3=Clerk, 4=Service, 5=Skilled agricultural, 6=Trade/Craft worker, 7=Plant/Machine Operator, 8=General Laborers, 9=Corporate managers, 10=Professional, 11=Technician. We create dummy variables for each occupation.
<i>Parental wealth</i>	From question to the parents: "Compared with other families, how well-off do you think your family is financially: Very well-off, Somewhat well-off, Average, Not very well-off, Not at all well-off"
<b>Variables specific to PIRLS on predetermined cognitive skills</b>	
<i>Entry-grade reading skills</i>	Index from the questions in the parent questionnaire: "How well could your child do the following when he/she began grade 4: "Recognize most of the letters of the alphabet", "Read some words", "Read sentences", "Write letters of the alphabet", "Write some words". Answers for each question: 1=Not at all, 2=Not very well, 3=Moderately well, 4=Very well. PIRLS compute a synthetic index equal 1 for Low skills, 2 for Medium Skills and 3 for High skills at the entry of the 4 <sup>th</sup> grade.
<i>Early home literacy activities</i>	Index from the questions in the parent questionnaire: "Before your child began grade 4, how often did you or someone else in your home do the following activities with him or her?: a) Read Books, b) Tell stories, c) Sing songs, d) Play with alphabet toys, e) Talk about things you had done, f) Talk about what you had read, g) Play word games, h) Write letters or words, i) Read aloud signs and labels, j) Visit a library". The answer for each item equal 1 for Often, 2 for Sometimes and 3 for Never. PIRLS constructs a synthetic index by taking the average of all the items. The index equal 1 for Low, 2 for Medium and 3 for High Early home literacy activities.
<i>Parent attitudes towards reading</i>	Index from the questions in the parent questionnaire: "In a typical week, how much time do you usually spend reading for yourself at home: a) Less than one hour, b) 1-5 hours, c) 6-10 hours, d) More than 10 hours", "Please indicate how much you agree with the following statements: a) I read only if I have to, b) I like talking about books, c) I like to spend my spare time reading, d) Reading is an important activity in my home". The answers equal 1 for Agree a lot, 2 for Agree, 3 for Disagree and 4 for Disagree a lot. PIRLS constructs a synthetic index from those questions that is equal 1 for Low, 2 for Medium and 3 for High parent positive attitudes towards reading.

Table B5 - Variables for Teacher Characteristics

<b>Variables common to CES, PIRLS and TIMSS</b>	Measures
<i>Teacher's age</i>	Variable with six categories: 1=under 25 years old, 2= 25-29 years old, 3= 30-39 years old, 4=40-49 years old, 5=50-59 years old, 6=60 years old or more.
<i>Teacher's education</i>	This variable measures the highest level of former education, in 5 categories: 1=ISCED Level 3 (not completed), 2=ISCED 3, 3=ISCED 4, 4=ISCED 5B, 5=ISCED 5A
<i>Teacher's experience</i>	CES and TIMSS: Number of years of teaching altogether PILRS: 1=One year or less, 2=Two years, 3=Three years, 4=Four years and more
<i>Teacher's gender</i>	Dummy variable equal 1 if female, and 0 for male.
<i>Size of the class</i>	Number of students per classroom and subject
<b>Variables specific to CES</b>	
<i>Teacher's trust</i>	This variable is the average of questions: 1)"How much confidence do you have in the political system?", 2) "How much confidence do you have in elections?", 3) "How much confidence do you have in the judicial system?", 4) "How much confidence do you have in immigration?", 5) "How much confidence do you have in social welfare?", 6) "How much confidence do you have in labor unions?". The answers equal 1 for "Not at all", 2 for "Little confidence", 3 for "Confident" and 4 for "Very confident"
<i>Teacher's beliefs in cooperation</i>	This variable is the average of the questions 1) "Students learn at school to understand people" and 2) "Students learn at school is to cooperate in groups". The answers range from 1 for "Strongly disagree" to 4 for "Strongly agree"
<b>Variables specific to PIRLS and TIMSS</b>	
Training in pedagogy and psychology	"As part of your formal education and/or training, to what extent did you study pedagogy/teaching reading?", "As part of your formal education and/or training, to what extent did you study psychology?", "As part of your formal education and/or training, to what extent did you study remedial reading?", "As part of your formal education and/or training, to what extent did you study reading theory?", "As part of your formal education and/or training, to what extent did you study children's language development?", "As part of your formal education and/or training, to what extent did you study special education?". Answers: 1=Not at all, 2=Overview or Introduction to topics, 3= It was an area of emphasis. The variable is the total average.
Teacher motivation	"How much do you agree with the statement, 'I am content with my profession as a teacher?'," "How much do you agree with the statement, 'I am satisfied with being a teacher at this school?'," "How much do you agree with the statement, 'I would describe the teachers at this school as a satisfied group?'," "How much do you agree with the statement, 'I had more enthusiasm when I began teaching than I have now?'" . Answers: 1=Disagree a lot, 2=Disagree a little, 3=Agree a little, 4=Agree a lot. The variable is the total average

Table B6 - Variables for School Characteristics

<b>Variables common to CES, PIRLS and TIMSS</b>	Measures
<i>Public school</i>	Dummy variable equal 1 if the school is public, and 0 for private
<i>School Socio-economic background</i>	Percentage of students from low-socio economic background attending the school
<i>School social capital</i>	"How frequently each of the following occurs at your school? a) Vandalism, b) Drugs, c) Truancy, d) Racism, e) Religious intolerance, f) Alcohol, g) Bullying, h) Violence". Answers: 1=Often, 2=Sometimes, 3=Never. The variable is the average answers.
<i>School location</i>	Dummy variable for urban/rural and Dummy variables for the geographic location at the regional level

## Appendix C – Main Descriptive Statistics

Table C – Descriptive Statistics on Student Beliefs and Teaching Practices

<b>Student's beliefs</b>	Mean	Std	Min-Max
"Student beliefs in cooperation among students" - CES	3.136	.556	1-4
"Student beliefs in cooperation with teachers" – CES	3.040	.660	1-4
"Student association membership" – CES	2.955	2.331	1-15
"Student trust" – CES	2.824	.537	1-4
"Student Social Life Participation" – CES	2.982	.598	1-4
"Student Political Life Participation"- CES	2.845	.624	1-4
"Student beliefs in cooperation among students" - PIRLS	3.069	.922	1-4
"Student beliefs in cooperation with teachers" - PIRLS	3.402	0.797	1-4
"Student beliefs in cooperation among students" - TIMSS*	.131	.338	0-1
"Student beliefs in cooperation with teachers" - TIMSS	3.544	.767	1-4
"Student self-confidence in math" - TIMSS	2.237	.759	1-3
"Student self-confidence in science" - TIMSS	2.359	.700	1-3
"Student positive attitudes in math" - TIMSS	2.284	.844	1-3
"Student positive attitudes in science" - TIMSS	2.499	.750	1-3
<b>Teaching practices</b>			
"Horizontal teaching" - CES	2.557	.787	1-4
"Vertical teaching" - CES	2.338	.868	1-4
"Horizontal teaching in math" – TIMSS	2.666	.825	1-4
"Horizontal teaching in science" – TIMSS	2.312	.847	1-4
Horizontal teaching (overall percent of time) – PIRLS	.571	.184	0-1
Vertical teaching (overall percent of time) – PIRLS	.231	.149	0-1
Horizontal teaching during reading activities – PIRLS	2.137	.537	1-4
Vertical teaching during reading activities – PIRLS	2.906	.895	1-4
Horizontal teaching to help student in difficulty – PIRLS	.667	.470	0-1

Notes: \* Cooperation with students in TIMSS is measured by the frequency of bullying, harassment and feeling of being made an outsider by other students. A lower coefficient means more cooperation. See Appendix B.

Table C – (Continued) Descriptive Statistics for Student and Teacher Characteristics

	TIMSS		PIRLS		CES	
	Mean	Std	Mean	Std	Mean	Std
Student Gender (female)	.501	.499	.501	.499	.510	.502
Student Age	14.44	.80	10.37	.79	14.66	.70
Parent Highest Education	3.39	1.31	3.48	1.22	3.42	1.35
Number of books at home	2.69	1.26	2.96	1.29	3.02	1.31
Immigrant	.069	.252	.072	.259	.066	.247
Entry-grade reading skills			2.30	.92		
Early home literacy activities			2.46	.60		
Parent attitudes towards reading			2.43	.69		
Teacher age	3.48	1.18	3.66	1.10	3.66	1.10
Teacher gender (female)	.587	.492	.825	.379	.668	.470
Teacher education	4.91	0.92	4.58	1.11	4.016	1.235
Teacher training peda/ psychology			2.59	.57		
Teacher experience	15.10	10.55	2.35 (scale)	1.32	16.71	10.59
Class size	30.78	10.55	26.35	9.31	25.66	6.48

## **Appendix D. Sources of Variation in Teaching Practices**

Table D1 shows the cross-country correlation between teaching practices and the organization of the school system, controlling for income per capita and total spending in education. We use three characteristics of a school system: its degree of accountability, autonomy and competition. From Woessmann (2003), we measure accountability as a dummy equal to 1 if a country has external exit exams at the end of secondary school. We measure autonomy, also from PISA, as the share of schools in a country whose boards exert a direct influence on decision-making about staffing in the school. This measure is a dummy equal to 1 if the principal reports such direct influence. From PISA, we also estimate competition and the degree of choice in the educational system as the share of privately operated schools in a country. We match these indicators with the country average and the country standard deviation in teaching practices. We document the results for teaching practices from PIRLS, for which we have the maximum of observations that overlap with the indicators of school system organization. The results are similar with the other measures of teaching practices. Table D1 shows a positive and statistically significant relationship between accountability or autonomy and the country average for working in groups. There is no correlation with the share of private schools, or with the country standard deviation in teaching practices.

Table D2 checks whether the relationship between teaching practices and student social capital differs across countries. We use PIRLS but the results are identical with CES and TIMSS.

Table D3 documents the sources of variation in teaching practices within countries and within schools. Student characteristics are not significantly related to teaching practices, either between or within schools. The most significant correlate is teacher gender: female teachers rely more on horizontal practices. Teacher education or experience do not have systematic effects. However, having a certificate of training in pedagogy or in psychology is positively related to horizontal teaching, and the effect is statistically significant at the 1 percent level.



Table D1 – Aggregate Cross-Country Correlation between Work in Groups (Country Average and Standard Deviation) and Organization of the School System. OLS Macro Estimates. Source: PISA and PIRLS

	Country average and Country standard deviation in the teaching practice “Work in groups”					
	(1)	(2)	(3)	(4)	(5)	(6)
	Country Average	Country Variation	Country Average	Country Variation	Country Average	Country Variation
Accountability	.070*** (.023)	.023 (.013)				
Autonomy			.110*** (.038)	.013 (.026)		
Choice/Competition					-.035 (.044)	-.020 (.017)
Observations	18	18	18	18	18	18
R <sup>2</sup>	0.26	0.12	0.33	0.01	0.02	0.02

Notes : Additional Controls : Income per capita and total spending in education as a percentage of GDP. Accountability: dummy variable equal 1 if the country has external exit exams at the end of secondary school. Autonomy: share of schools in a country exerting a direct influence on decision-making about staffing. Choice: share of privately operated schools in a country.

Table D2: Within Country Estimates of “Work in Groups” by Clusters of Countries. Source: PIRLS Grade 4

PRACTICES: Work in groups	(1) Top 3 country variation	(2) lowest 3 highest country variation	(3) FRA	(5) USA
<b>Outcomes</b>				
(1) Student Cooperation	0.133*** (0.049)	0.389*** (0.101)	0.385*** (0.120)	0.280** (0.127)
Observations	7021	11622	2941	2770
R <sup>2</sup>	0.02	0.014	0.028	0.057
(2) Teacher cooperation	0.058 (0.044)	0.240*** (0.091)	0.184* (0.100)	0.236*** (0.089)
Observations	6994	11619	2953	2761
R <sup>2</sup>	0.019	0.023	0.02	0.08

Controls: Country fixed effects. Student characteristics: test scores in reading achievement, age, gender, immigrant, parental education, number of books at home, parental socio economic background. Teacher characteristic: age, gender, education, experience. Class Characteristic: class size, average and standard deviation in reading test scores. Robust standard errors clustered at the school level. Countries in Column (1): Italy, Singapore and Taiwan. Countries in Column (2): Sweden, Norway and Israel.

\*\*\* p<0.01

\*\* p<0.05

\* p<0.1

TABLE D3 - Source of Variation in Reading Teaching Practices – Within Countries and Within Schools  
 - Source: PIRLS grade 4th

VARIABLES	(1)	(2)	(3)	(4)
	Percent of time group activities	Percent of time lecturing to the whole class	Percent of time group activities	Percent of time lecturing to the whole class
	Within countries		Within Schools	
Student gender	0.001 (0.002)	0.000 (0.002)	-0.000 (0.001)	0.001 (0.001)
Student Age	0.000 (0.002)	-0.001 (0.003)	0.001 (0.001)	-0.001 (0.001)
Immigrant	0.000 (0.004)	0.007 (0.005)	0.000 (0.002)	0.001 (0.002)
Mother's education	0.001 (0.001)	-0.001* (0.001)	0.000* (0.000)	-0.000 (0.000)
Father's education	-0.001* (0.000)	0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)
Number of books at home	-0.000 (0.001)	0.000 (0.001)	0.000 (0.000)	0.000 (0.000)
Teacher gender (female)	0.008 (0.008)	-0.009 (0.010)	0.004 (0.010)	0.009 (0.012)
Teacher Age	-0.001 (0.003)	0.015*** (0.004)	-0.003 (0.001)	0.017*** (0.004)
Teacher Education	-0.004 (0.003)	0.001 (0.004)	0.001 (0.004)	-0.000 (0.005)
Teacher experience	0.004** (0.002)	-0.003 (0.002)	0.003 (0.003)	-0.001 (0.004)
Ln (class size)	-0.041** (0.003)	0.039** (0.002)	-0.032* (0.019)	0.061*** (0.002)
Teacher Training in pedagogy	0.009 (0.006)	0.000 (0.007)	0.004 (0.007)	-0.002 (0.008)
Teacher training in psychology	0.007 (0.005)	-0.011 (0.007)	0.007 (0.006)	-0.009 (0.007)
Class level Reading	-0.000 (0.002)	0.000 (0.002)	-0.002 (0.004)	-0.001 (0.005)
Nb stud with language difficulty	-0.000 (0.001)	-0.002* (0.001)	-0.001 (0.001)	-0.001 (0.001)
Nb stud with Reading difficulty	0.003** (0.001)	-0.003** (0.001)	0.003** (0.001)	-0.004*** (0.002)
Class Reading test score (Mean)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Class Reading test score (Std)	0.000* (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
Class – Index early skills (Mean)	-0.002 (0.017)	0.030 (0.021)	0.006 (0.022)	0.030 (0.027)
Class – Index early skills (std)	-0.033 (0.021)	0.007 (0.025)	-0.019 (0.027)	-0.007 (0.032)
Observations	56614	56614	56614	56614
R <sup>2</sup>	0.012	0.021	0.009	0.028

## Appendix E – Robustness checks

Table E1 - Tests on the Allocation of Teachers to Students – Within School Estimates - PIRLS

	(1)	(2)	(3)
	Teacher experience (years)	Teacher education	Teacher certificate pedagogy
Parent education	.008** (.004)	.003 (.003)	.002 (.002)
Parent financial situation	.004 (.004)	.000 (.000)	.001 (.002)
Reading environment	.001 (.005)	.002 (.004)	.000 (.002)
Parental attitude toward reading	.007 (.005)	.001 (.004)	.001 (.002)
Student age entry-grade	.000 (.006)	.003 (.004)	.001 (.003)
Student female	.003 (.005)	.001 (.004)	-.009*** (.002)
Student immigrant	.012 (.013)	.008 (.010)	-.001 (.007)
Student reading skills at entry	-.000 (.003)	.001 (.003)	-.002 (.002)
Observations	67626	67438	65149

Columns (1)-(3) each report estimates from an OLS regression of the dependent variable listed in the column on the variables listed in the row and school fixed effects. The regressions include one observation per student. Standard errors are clustered at the school level. Independent variables are predetermined parent and student characteristics. Additional control: School fixed effects. Source: PIRLS 2006.

Table E2 - Teaching Practices in Reading - Within School Estimates - PIRLS Grade 4. Robustness Tests with the Entry-Grade Reading Skills at the Student and Classroom Level

PRACTICES	(1)	(2)	(3)	(4)	(5)
DURING AND AFTER READING	Percent of time lecturing to the whole class	Percent of time group activities	Group activities during reading	Group activities after reading	Group activities to help students with difficulty
<b>Outcomes</b>					
(1) Student cooperation	-0.088 (0.055)	0.193*** (0.062)	0.038** (0.017)	0.022** (0.010)	0.050*** (0.018)
N	59140	59140	62983	61711	61591
R <sup>2</sup>	0.01	0.01	0.01	0.01	0.01
(2) Teacher cooperation	0.008 (0.049)	0.007 (0.060)	0.029* (0.016)	0.018** (0.009)	0.019 (0.016)
N	57012	57012	57744	59437	59356
R <sup>2</sup>	0.01	0.01	0.01	0.01	0.01

Controls: In addition to the controls in Table 5-Panel A, we include entry-grade student reading skills (cubic) and entry-grade class reading skills (cubic in mean and standard deviation). Controls: Student characteristics: Entry-grade Student reading skills (cubic), test scores in reading achievement, age, gender, immigrant, parental education, number of books at home, parental socio economic background. Teacher characteristic: age, gender, education, experience. Class Characteristic: Entry-grade class reading skills (Cubic in Mean + Sd), class size, average and standard deviation in reading test scores. School fixed effects. Robust standard errors clustered at the school level.

\*\*\* p<0.01

\*\* p<0.05

\* p<0.1

## Appendix F. Within classroom estimates from TIMSS

We can use within classroom variation in teaching practices and student beliefs for classrooms in which all students take different classes together. This strategy eliminates all omitted variables linked to selection into classrooms. It also represents another way to control for reverse causality by comparing teaching practices of teachers faced with exactly the same students. Specifically, we estimate an equation similar to (2), but now include classroom fixed effects  $F_l$ :

$$(3) \quad y_{ijc} = \alpha_0 + \alpha_1 TP_{ik} + \alpha_2 X_i^{ST} + \alpha_3 X_{ik}^T + F_l + \varepsilon_{ijc}$$

The estimation is based on TIMSS, with robust standard errors clustered at the classroom level. The majority of students in TIMSS have a different teacher in mathematics and in science. We exploit this variation in teaching practices between these different teachers in the same classroom of students taking different subjects together. To run this analysis, we also need variation in student beliefs with regard to math and science. TIMSS asks specific questions on student attitudes towards each subject. We focus on self-confidence in each subject and positive attitudes towards mathematics and science, respectively. These are not perfect indicators of belief in cooperation, but they are strongly correlated with it. Indeed, the literature on non-cognitive skills shows that attitudes towards school and self-confidence are good predictors of adult social relationships as measured by criminality or weak ties (see Heckman et al. (2012) for an synthesis on the long term effect of the Perry School program; and Algan et al. (2012) for an analysis of adult outcomes of an early childhood intervention devoted to social skills). In our database, teaching practices (and the student and parent characteristics in general) have a similar impact on self-confidence and positive attitudes as on beliefs in cooperation with teachers and with other students.

We examine the relative attitudes toward each subject as a function of relative teaching practices of the teachers in that subject. The left hand side variable is the ratio of the index of self-confidence (positive attitudes/like subject) in mathematics to the index of self-confidence (positive attitudes/like subject) in science. The main right hand side variable is the ratio of the incidence of horizontal teaching in mathematics to horizontal teaching in science. We control for all the previous student characteristics and include cognitive scores in mathematics and science, since positive attitudes and self-confidence may be correlated with cognitive performance. We also control for teacher age, gender, and years of experience. All the classroom and school characteristics are captured by the school and classroom fixed effects.

Columns 1 and 3 of Table F show the effect of the ratio of horizontal teaching practices in math and science on the ratio of self-confidence (positive attitudes) in these subjects. The coefficients are statistically significant at the 5 percent level and have the expected signs. More horizontal teaching in math relative to science is associated with higher self-confidence in math

relative to science. For the sake of comparison, Columns 2 and 4 show the within-school estimates. The coefficient is not significant for self-confidence and its size is lower for like subjects compared to the within classroom estimate. This would suggest that the bias, if any, in the within schools estimates leads to an underestimation of beneficial effects of horizontal teaching practices. Since looking at ratios could generate outliers that can bias our regressions, we have re-estimated Table F excluding the top and bottom 5 percent values of the ratio. The results are unchanged.

Table F - Within Classrooms Estimates: Relative Attitudes towards Math and Science - TIMSS Grade 8

	Self-confidence in math / Self-confidence in science		Like math / Like science	
	(1) Within Classroom	(2) Within School	(3) Within Classroom	(4) Within School
Work in groups in math / Work in groups in science	0.0145** (0.069)	0.020 (0.019)	0.119** (0.033)	0.058* (0.033)
Observations	62079	62079	62189	62189
R <sup>2</sup>	0.01	0.01	0.01	0.01

Controls: Classroom fixed effects. Student characteristics: age, gender, immigrant, parental education, number of books at home. Teacher characteristic: age, gender, experience. Robust standard error clustered at the classroom level.

\*\*\* p<0.01

\*\* p<0.05

\* p<0.1