

Development Economics

AEA Continuing Education Lectures

Lecture 5

Education

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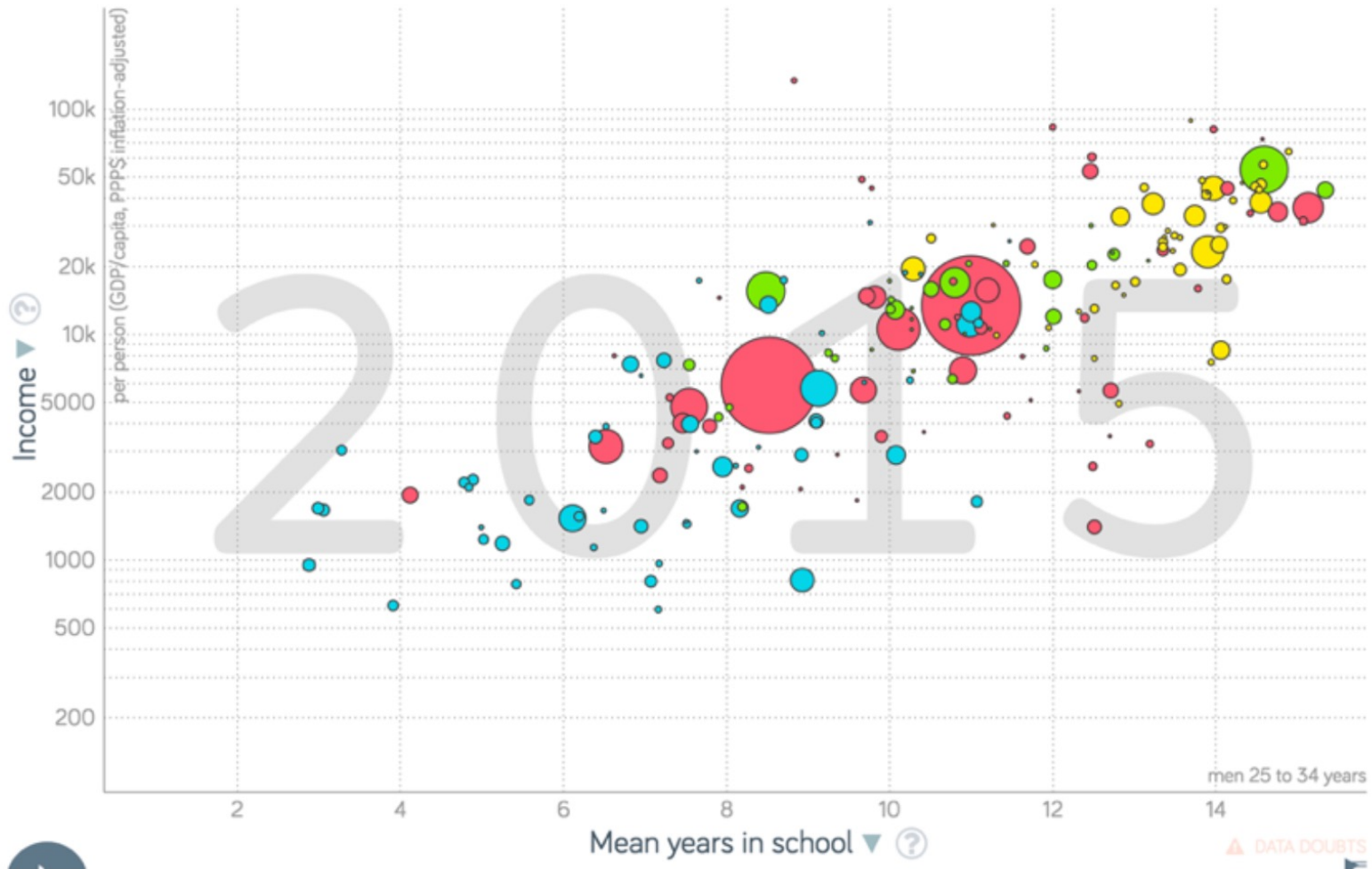
Outline

- **Stylized Facts**
- Returns to Education
 - Traditional measures of human capital
 - Cognitive malleability
- Supply side
 - Teacher performance: Moral hazard, adverse selection, self-beliefs
 - Educational delivery: Technology, tracking
 - Private schools
- Demand side
 - Perceived returns to education
 - Parental beliefs about children

Human Capital

- Many poor countries: education largest discretionary budget item
 - Some African countries: one third of discretionary expenditures
- What are the goals? Conceptions of human capital
 - Years of schooling
 - What you know (problem solving skills)
 - Earnings capacity (productivity)
 - Cognitive ability
 - Civic participation
 - Preferences, attitudes, beliefs (e.g. female empowerment)
 - “Non-cognitive” skills (patience, grit, reliability)

Cross country: GDP/capita and education



Education

Percent of Children in School				
	Female, Age:		Male, Age:	
	7-12	13-18	7-12	13-18
Rural				
Cote d'Ivoire	32.3%	22.8%	45.5%	21.1%
India - Udaipur	60.7%	13.0%	82.6%	24.7%
India - UP/Bihar	51.4%	20.2%	72.1%	51.2%
Indonesia	93.4%	45.9%	82.4%	39.3%
Mexico	94.5%	56.5%	93.5%	38.6%
Nicaragua	67.5%	38.0%	65.4%	27.5%
Pakistan	30.7%	9.2%	64.1%	41.3%
Panama	79.0%	14.6%	85.1%	27.0%
Papua New Guinea	53.0%	33.5%	71.4%	70.9%
Peru	94.2%	64.7%	93.3%	73.7%
South Africa	83.6%	87.5%	80.5%	76.9%
Tanzania	51.2%	53.3%	47.2%	61.4%
Timor Leste	76.6%	89.7%	80.0%	86.8%

- Large expansions in enrollment
 - Numbers likely overestimates

High enrollment, lower attendance

Are all children going to school in India?

Annual Status of Education Report
असर ASER 2014 RURAL
Facilitated by PRATHAM

Enrollment in school

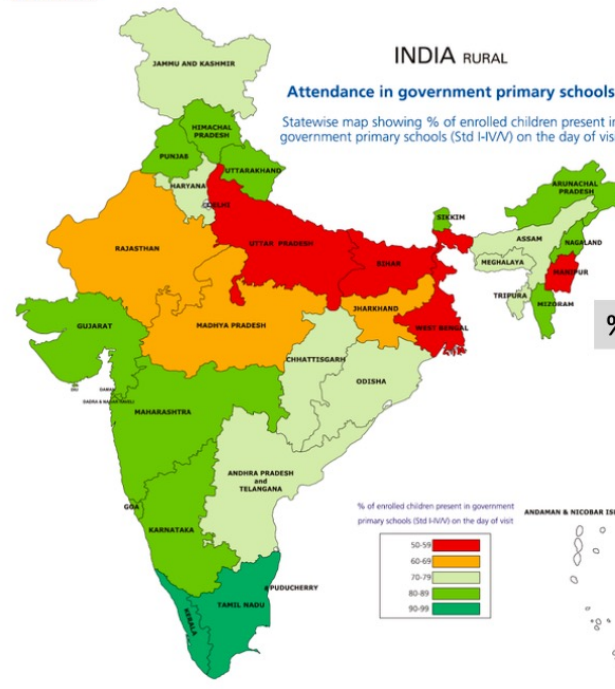
96.7% of children (in the age group 6-14 years) are enrolled in school in rural India.

This is the 6th year in a row that enrollment rates have been 96% or above.

Attendance in school

Visit to a government school on any random day in September, October or November shows that about 71% of enrolled children are attending school on that day.

However there is a lot of variation in daily attendance across states.



% Children present

50-59%

60-69%

70-79%

80-89%

90-99%

Education

- Initial focus
 - Get enrollment up – lots of progress
 - Surveys: lots of people report their kids in school
- Studies give reason for poor learning outcomes
- How do you figure it out?
- The value of data collection – an example

Pratham (ASER) 2010

MATH TEST / गणित SAMPLE(1)

अंक पहचान 1-9	संख्या पहचान 11-99	घटाव	भाग
3 7	65 38	$\begin{array}{r} 52 \\ - 24 \\ \hline \end{array}$ $\begin{array}{r} 76 \\ - 47 \\ \hline \end{array}$	$\begin{array}{r} 6 \overline{) 919} \end{array}$
1 4	92 23	$\begin{array}{r} 48 \\ - 29 \\ \hline \end{array}$ $\begin{array}{r} 75 \\ - 37 \\ \hline \end{array}$	$\begin{array}{r} 7 \overline{) 869} \end{array}$
8 9	47 72	$\begin{array}{r} 46 \\ - 38 \\ \hline \end{array}$ $\begin{array}{r} 31 \\ - 15 \\ \hline \end{array}$	$\begin{array}{r} 5 \overline{) 583} \end{array}$
5 2	56 87	$\begin{array}{r} 65 \\ - 18 \\ \hline \end{array}$ $\begin{array}{r} 23 \\ - 14 \\ \hline \end{array}$	$\begin{array}{r} 3 \overline{) 512} \end{array}$
29 11			
पाँच पुर्रें, जिनमें 4 सही होनी चाहिए।	पाँच पुर्रें, जिनमें 4 सही होनी चाहिए।	दो करो। दोनों ही सही होने चाहिए।	एक कनकाओ जो सही होना चाहिए।

Sample:
Arithmetic
test

Similar tests
developed
in all
languages

Pratham (ASER) 2010

**TABLE 6: CLASS-WISE % CHILDREN BY ARITHMETIC LEVEL
ALL SCHOOLS 2010**

Std.	Nothing	Recognize Numbers		Subtract	Divide	Total
		1-9	11-99			
I	34.2	42.1	18.2	3.4	2.1	100
II	12.1	34.9	36.0	12.8	4.3	100
III	5.6	21.0	36.9	27.0	9.4	100
IV	2.9	11.9	27.8	35.6	21.8	100
V	2.1	7.8	19.8	34.4	35.9	100
VI	1.2	4.5	14.1	30.8	49.3	100
VII	1.0	3.2	11.5	26.5	57.8	100
VIII	0.7	2.2	8.8	21.0	67.4	100
TOTAL	8.2	17.2	22.4	23.7	28.6	100

Pratham (ASER) 2010

**TABLE 4: CLASS-WISE % CHILDREN BY READING LEVEL
ALL SCHOOLS 2010**

Std.	Nothing	Letter	Word	Level 1 (Std 1 Text)	Level 2 (Std 2 Text)	Total
I	34.0	41.1	17.0	4.4	3.4	100
II	12.1	32.4	32.4	13.9	9.1	100
III	6.0	18.8	29.6	25.7	20.0	100
IV	3.1	10.1	19.4	29.3	38.1	100
V	2.2	6.7	12.7	25.1	53.4	100
VI	1.3	4.0	7.6	19.7	67.5	100
VII	1.0	2.7	5.2	15.0	76.2	100
VIII	0.7	1.9	3.2	11.3	82.9	100
TOTAL	8.3	15.9	16.8	18.2	40.9	100

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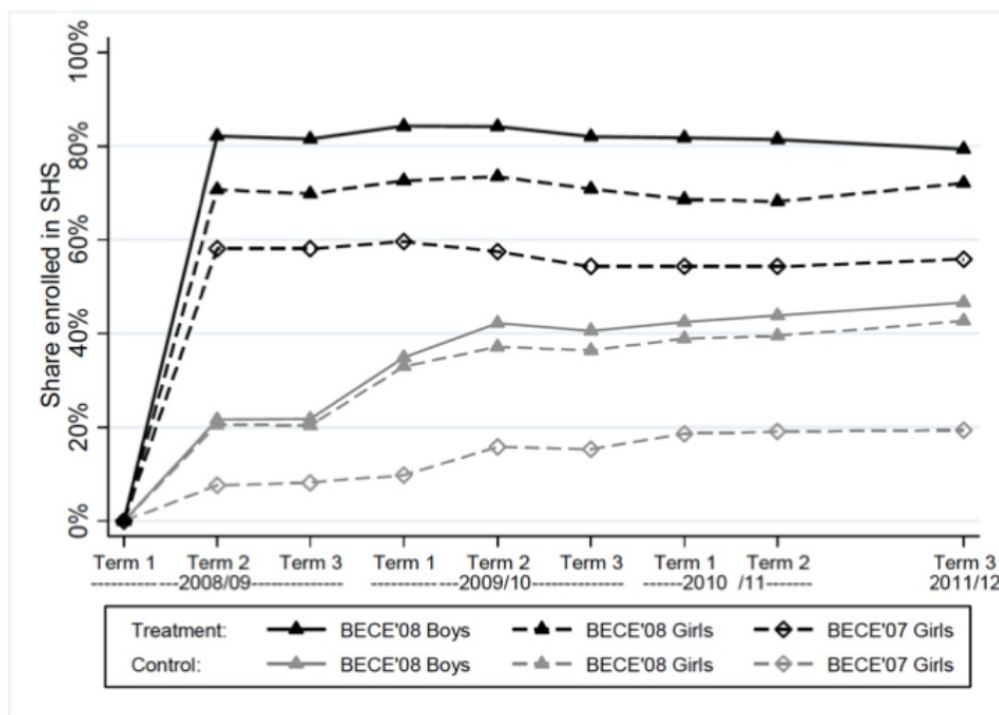
Returns to Schooling?

- Why do we care about this?
- What are the relevant outcomes?
- The challenge of causal inference

Duflo Dupas Kremer

- Scholarships randomly assigned to students who qualified for secondary school on the basis of a competitive test but who had not yet joined (Ghana)

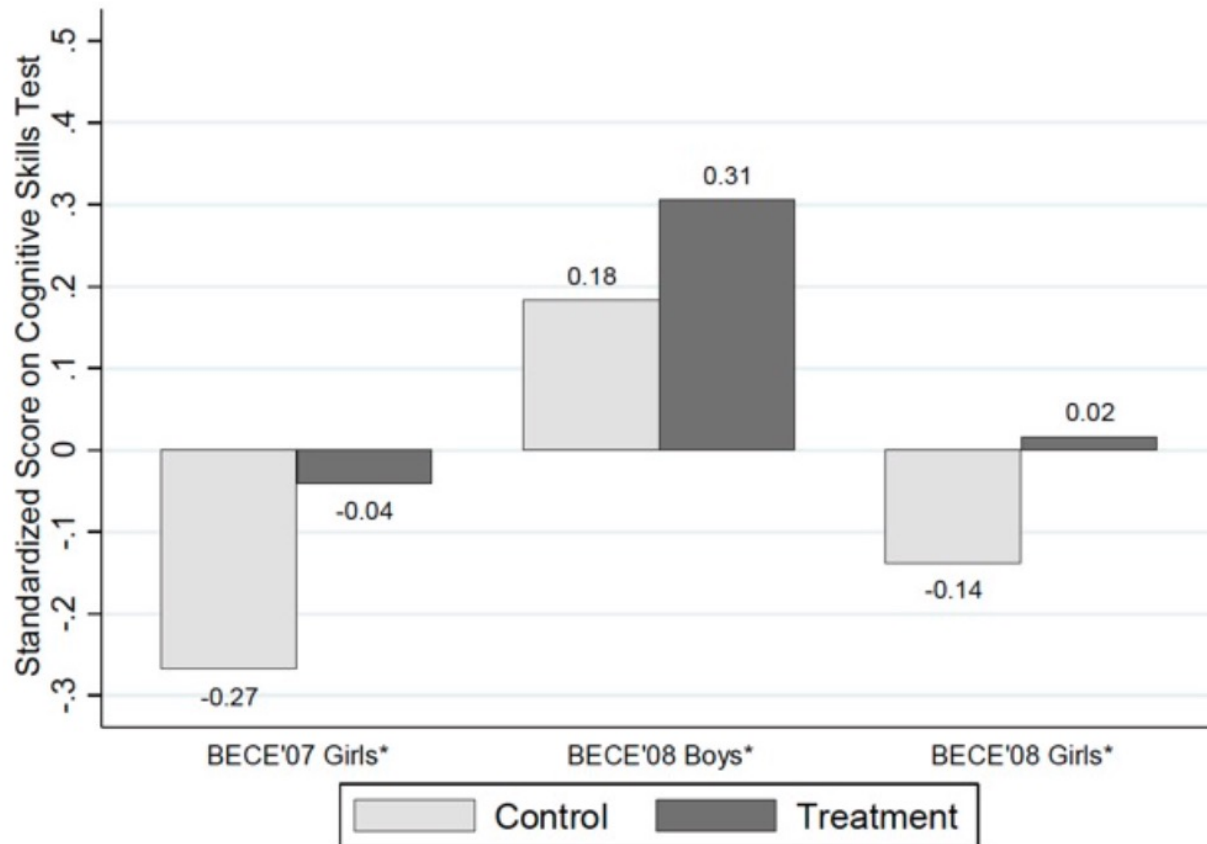
Figure 1: Impact of Scholarship on Share Enrolled in SHS



Duflo Dupas Kremer

Figure 3: Effect of Scholarship Treatment on Cognitive Skills after 5 years (2013)

Panel A. by gender and cohort



Education

Table 6: Labor Market Outcomes

	Combined			Academic Major Admits			Vocational Major Admits		
	All	Female	Male	All	Female	Male	All	Female	Male
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<u>Panel A. Earnings</u>									
<u>Inv. hyperbolic sine earnings (2016)</u>									
Treatment effect	0.308	0.383	0.177	0.019	0.213	-0.269	0.505	0.498	0.482
Standard error	(0.145)**	(0.198)*	(0.197)	(0.227)	(0.311)	(0.310)	(0.187)***	(0.257)*	(0.255)*
Comparison mean	3.214	2.413	4.054	3.143	2.313	4.047	3.263	2.484	4.059
p-value on equality of effects	(5)=(6)=(8)=(9): .211 (2)=(3): .460			(5)=(6): .273			(4)=(7): .099*	(8)=(9): .965	
<u>Log earnings last month if positive (2016)</u>									
Treatment effect	-0.019	0.049	-0.064	-0.059	0.109	-0.177	0.006	0.012	0.005
Standard error	(0.060)	(0.093)	(0.077)	(0.099)	(0.151)	(0.125)	(0.077)	(0.117)	(0.097)
Comparison mean	5.066	4.792	5.251	5.053	4.761	5.252	5.074	4.812	5.250
p-value on equality of effects	(5)=(6)=(8)=(9): .482 (2)=(3): .348			(5)=(6): .144			(4)=(7): .603	(8)=(9): .964	
<u>Positive earnings (2016)</u>									
Treatment effect	0.055	0.063	0.039	0.007	0.028	-0.028	0.088	0.087	0.085
Standard error	(0.025)**	(0.034)*	(0.034)	(0.039)	(0.053)	(0.053)	(0.032)***	(0.044)**	(0.044)*
Comparison mean	0.556	0.441	0.679	0.545	0.424	0.678	0.564	0.452	0.679
p-value on equality of effects	(5)=(6)=(8)=(9): .299 (2)=(3): .610			(5)=(6): .450			(4)=(7): .105	(8)=(9): .980	
<u>Total earnings last month (GHX) (2016)</u>									
Treatment effect	7.656	5.132	6.216	-19.199	-6.732	-38.617	25.921	13.097	36.492
Standard error	(10.993)	(15.176)	(15.068)	(17.283)	(23.815)	(23.722)	(14.244)*	(19.678)	(19.501)*
Comparison mean	134.854	82.022	190.202	136.261	79.106	198.471	133.887	84.090	184.703
p-value on equality of effects	(5)=(6)=(8)=(9): .094* (2)=(3): .959			(5)=(6): .342			(4)=(7): .044**	(8)=(9): .398	

- Increase in earnings: concentrated in vocational training
- Also decreases in fertility for women

Other Estimates

- Duflo – Indonesia school construction
 - Each new school per 1,000 children:
 - Increase in education of 0.12 to 0.19 years
 - Increase in wages of 1.5 to 2.7 percent
- Ozier – RD on passing secondary school admissions exam
 - Barely pass vs. barely fail the secondary school admissions exam
 - Increases secondary school completion by 15 percentage points
 - Shift out of self-employment, into formal employment
 - Decrease in teen pregnancy

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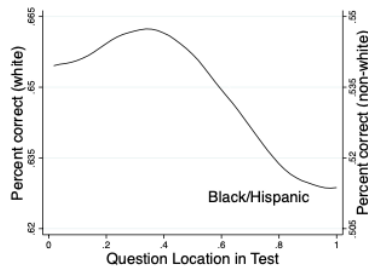
Brown, Kaur, Schofield (QJE 2024)

- Long-held views on how schooling may affect cognition
 1. Learning academic content and skills (e.g. literacy, problem solving)
 2. Capacity to engage in cognition itself (e.g. undertake effortful thinking)
- 2nd possibility: More expansive view of how education shapes general human capital
- Specific feature of schooling: Effortful thinking for continuous stretches of time
- Investigate effects on one particular mental capacity: Cognitive endurance

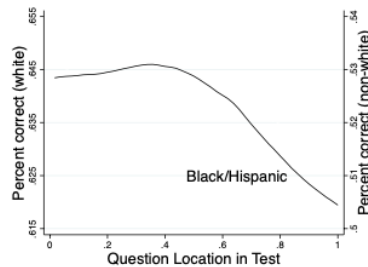
Brown, Kaur, Schofield (QJE 2024)

Motivation: Large declines in performance over time

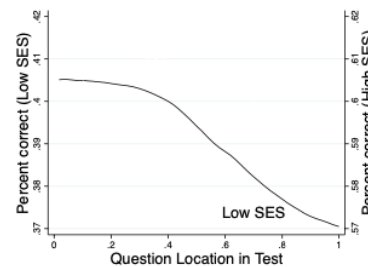
TIMSS Exam



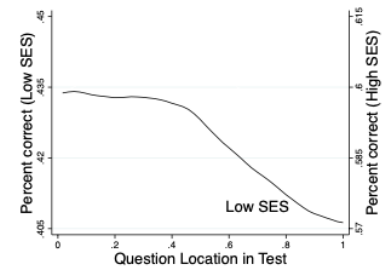
(a) Math (US)



(b) Science (US)



(c) Math (global)



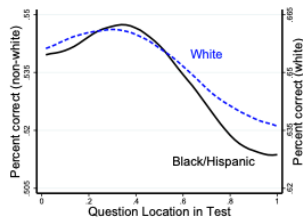
(d) Science (global)

- TIMSS: Administered to 4th graders during school day (36 mins per subject)
- Question order randomized, ample time to finish test (< 2% of students don't finish)
- Performance decline across subjects: 12% globally, 6% in US

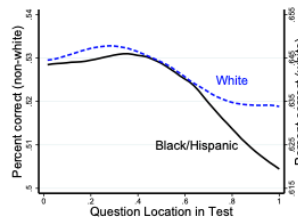
Brown, Kaur, Schofield (QJE 2024)

Systematic SES heterogeneity across tests and subjects

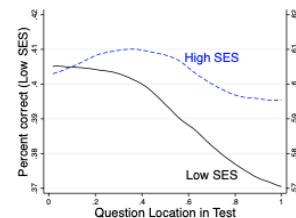
TIMSS Exam



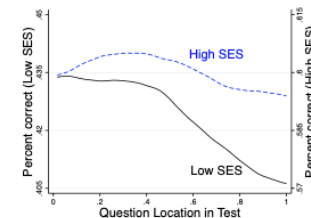
(a) Maths (US)



(b) Science (US)

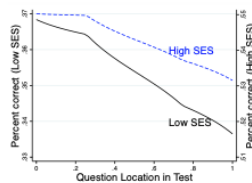


(c) Maths (global)

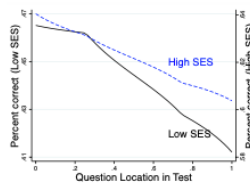


(d) Science (global)

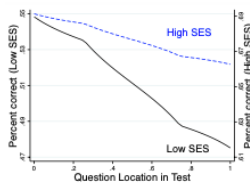
PISA Exam



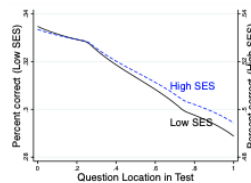
(e) Maths (US)



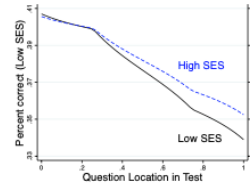
(f) Science (US)



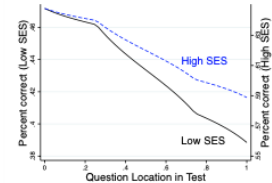
(g) Reading (US)



(h) Maths (global)



(i) Science (global)



(j) Reading (global)

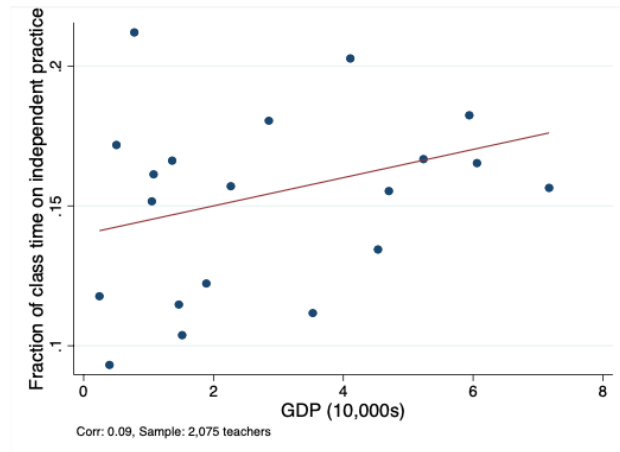
- Large differences: 30-200% more decline among low SES students
- Accounts for 10% of test score gap between Blacks/Hispanics and Whites in the U.S.

Brown, Kaur, Schofield (QJE 2024)

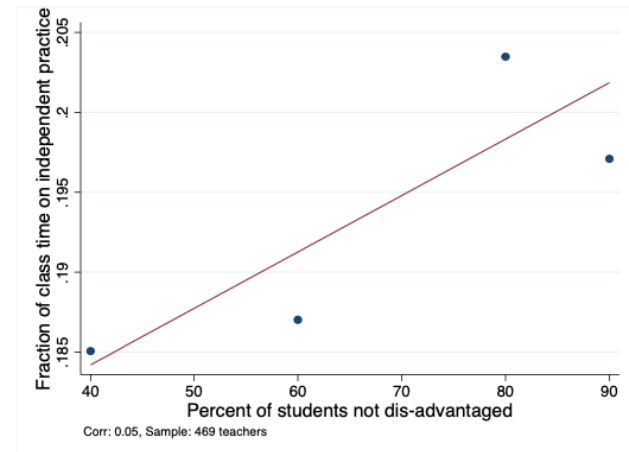
Motivation: Does schooling have relevance for attentional practice?

- Psychology literature: "train" sustained attention by practicing focus
- TIMSS teacher time use survey: do students "practice material on their own"?

Global Sample



US Sample



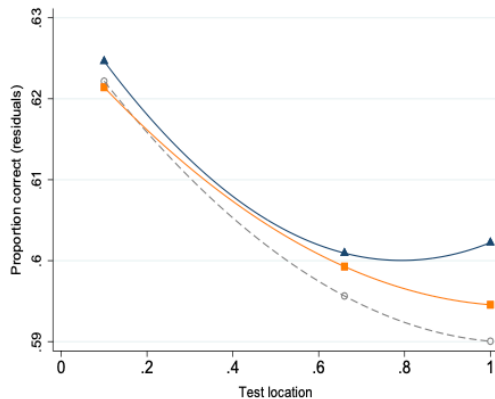
- High income students spend 40% more time in independent practice

Brown, Kaur, Schofield (QJE 2024)

- RCT with private schools in UP, India
- Randomize 8-10 hours of cognitive practice in 20 mins increments
 - Math practice (mimics what good schooling does)
 - Games practice (stronger test: attentional practice, devoid of all content)

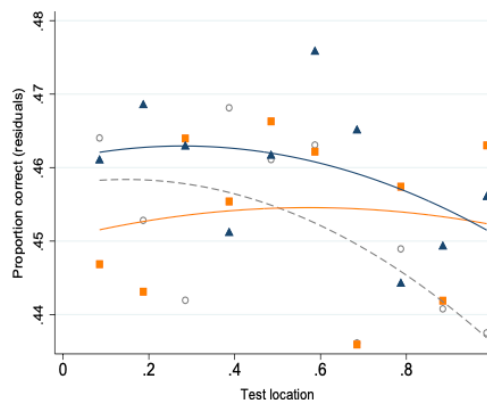
Performance declines

Listening



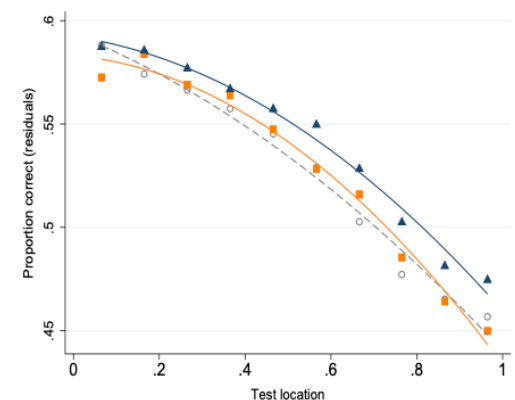
Decline reduction: 17% (pval 0.041)
Quintile 1 effect: -0.0013 (pval 0.845)

Ravens Matrices



Decline reduction: 33% (pval 0.031)
Quintile 1 effect: -0.0050 (pval 0.617)

Math



Decline reduction: 14% (pval 0.014)
Quintile 1 effect: -0.0088 (pval 0.333)

○ Control ■ Games Practice ▲ Math Practice

Brown, Kaur, Schofield (QJE 2024)

- Substantive test score gains on unrelated subjects (recall 8-10 hours)
- Spending time in effortful thinking (devoid of subject content) improves ability to accumulate traditional human capital

<i>Subject:</i>	Dependent Variable: Z-score of Student's Grades				
	All (1)	Non-Math (2)	Hindi (3)	English (4)	Math (5)
Panel A: Pooled Treatment Arms					
Cognitive Practice	0.0897** (0.0348)	0.0923** (0.0386)	0.0989** (0.0393)	0.0919** (0.0407)	0.0849** (0.0377)
Panel B: Disaggregated Treatment Arms					
Math Practice	0.0916** (0.0402)	0.0926** (0.0445)	0.0962** (0.0452)	0.0978** (0.0471)	0.0902** (0.0437)
Games Practice	0.0877** (0.0399)	0.0920** (0.0444)	0.1015** (0.0453)	0.0860* (0.0469)	0.0795* (0.0428)
p-value: Math Practice = Games Practice	0.9232	0.9899	0.9063	0.8013	0.7999
Observations	11320	7539	3780	3759	3781

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Teacher Absenteeism is Huge Problem

Provider Absence Rates by Country and Sector

	<i>Absence rates (%) in</i>	
	<i>Primary schools</i>	<i>Primary health centers</i>
Bangladesh	16	35
Ecuador	14	—
India	25	40
Indonesia	19	40
Peru	11	25
Uganda	27	37
Unweighted average	19	35

Notes: Providers were counted as absent if they could not be found in the facility for any reason at the time of a random unannounced spot check (see text for further detail). In Uganda, the sampled districts

Moral Hazard: Performance Pay

- Muralidharan Sundararaman (JPE 2011): incentivize test score gains

Bonus =

$$\begin{cases} \text{Rs. } 500 \times (\% \text{ gain in average test scores} - 5\%) & \text{if gain} > 5\% \\ 0 & \text{otherwise.} \end{cases}$$

TABLE 3
IMPACT OF INCENTIVES ON STUDENT TEST SCORES
Dependent Variable: Normalized End-of-Year Test Score

	YEAR 1 ON YEAR 0		YEAR 2 ON YEAR 0	
	(1)	(2)	(3)	(4)
A. Combined (Math and Language)				
Normalized lagged test score	.503*** (.013)	.498*** (.013)	.452*** (.015)	.446*** (.015)
Incentive school	.149*** (.042)	.165*** (.042)	.219*** (.047)	.224*** (.048)
School and household controls	No	Yes	No	Yes
Observations	42,145	37,617	29,760	24,665
R ²	.31	.34	.24	.28

- Mbiti: cross-randomize performance pay with cash grants to schools (Kenya)
 - Evidence for complementarity between incentives and resources
- de Ree et al. (QJE 2018): no impacts of *unconditional* salary increase (Indonesia)
 - higher satisfaction, no performance improvement (absenteeism, test scores, etc)

Brown (WP 2023)

- Adverse selection: If payment based on performance, do better teachers select in?
- RCT with large private school chain in Pakistan
- Ask teachers if they would prefer performance pay or flat pay contract
- Teachers with higher value added prefer performance pay
- Teachers have more information about their type than principals → power of self-selection

Table 2: Teacher Value-Added by Contract Choice

	Teacher Baseline Value-Added (in Student SDs)			
	(1)	(2)	(3)	(4)
Chose Performance Pay	0.0485** (0.0207)	0.0450** (0.0207)	0.0452** (0.0218)	0.0387* (0.0221)
Principal Rating of Teacher		0.0210** (0.0104)		0.0202* (0.0105)
Observations	1284	1284	1284	1284
Performance Metric	Objective	Objective	Subjective	Subjective
Control Mean	-0.0283	-0.0283	-0.0284	-0.0284
Control SD	0.349	0.349	0.345	0.345

Jalnidh Kaur (WP 2024)

- Teacher self-beliefs: many perceive low returns to effort

Table 1: *Distribution of teachers' responses to belief statements*

	Strongly Disagree	Disagree	Agree	Strongly Agree
<i>The amount a student can learn is primarily related to family background.</i>				
India	4.46	43.87	49.44	2.23
Ethiopia	4.30	14.45	59.38	21.88
<i>I am very limited in what I can achieve because a student's home environment is a large influence on his/her achievement</i>				
India	2.59	34.81	60.01	2.59
Ethiopia	3.91	32.81	45.70	17.58
<i>Even a teacher with good teaching abilities may not make a difference for many students.</i>				
India	14.10	46.56	35.08	3.93
Ethiopia	10.08	34.11	39.53	16.28

Notes: Data from Young Lives school survey (India and Ethiopia, 2016-17). The surveys covered 281 teachers across 205 schools in India, and covered 271 teachers across 63 schools in Ethiopia. The schools

Jalnidh Kaur (WP 2024)

- Self-beliefs intervention (targeting self-efficacy)
- Large increases in teacher effort, and also student test scores

Table 8: *Treatment Effect on Teachers' In-Class Effort*

	(1) Pooled Index	(2) Materials and Content	(3) Classroom Climate	(4) Engagement	(5) Accessibility	(6) Demeanor	(7) Pedagogical Practices
Treat	0.129** (0.065)	0.120** (0.058)	-0.013 (0.068)	0.189*** (0.055)	0.091 (0.069)	0.057 (0.069)	0.148** (0.061)

Table 11: *Treatment Effects on Student Learning*

	Standardized Math Scores		
	(1)	(2)	(3)
Treat	0.091** (0.045)	0.101** (0.046)	0.094* (0.048)
Pre-mid score	0.768*** (0.017)	0.769*** (0.017)	0.509*** (0.022)
Previous year score			0.436*** (0.022)
Controls	No	Yes	Yes
Strata FE	Yes	Yes	Yes
Observations	6941	6941	6941
R-squared	0.50	0.50	0.57

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Educational Delivery: Technology

- Background:
 - Use technology to supplement learning in classroom
 - One laptop per child: generally perceived as not effective
 - Not enough to put in hardware: software (content) is key
 - Takes pressure off teacher performance, adapt to heterogeneous student skill, practice
- Banerjee, Cole, Duflo, Linden (QJE 2007)
 - Computer-based math games: play in pairs in computer lab
 - 0.47 SD gain in math attainment at end of year
- Muralidharan, Singh, Ganimian (AER 2019)
 - Adaptive computer-based after-school practice
 - 0.6 SD gain in Math, 0.39 SD gain in Hindi
- Brown, Kaur, Schofield (QJE 2024)
 - Adaptive math practice problems during elective / free periods (8-10 hours)
 - 0.09 SD gain in endline math scores

Recall: Heterogeneous Ability within Class

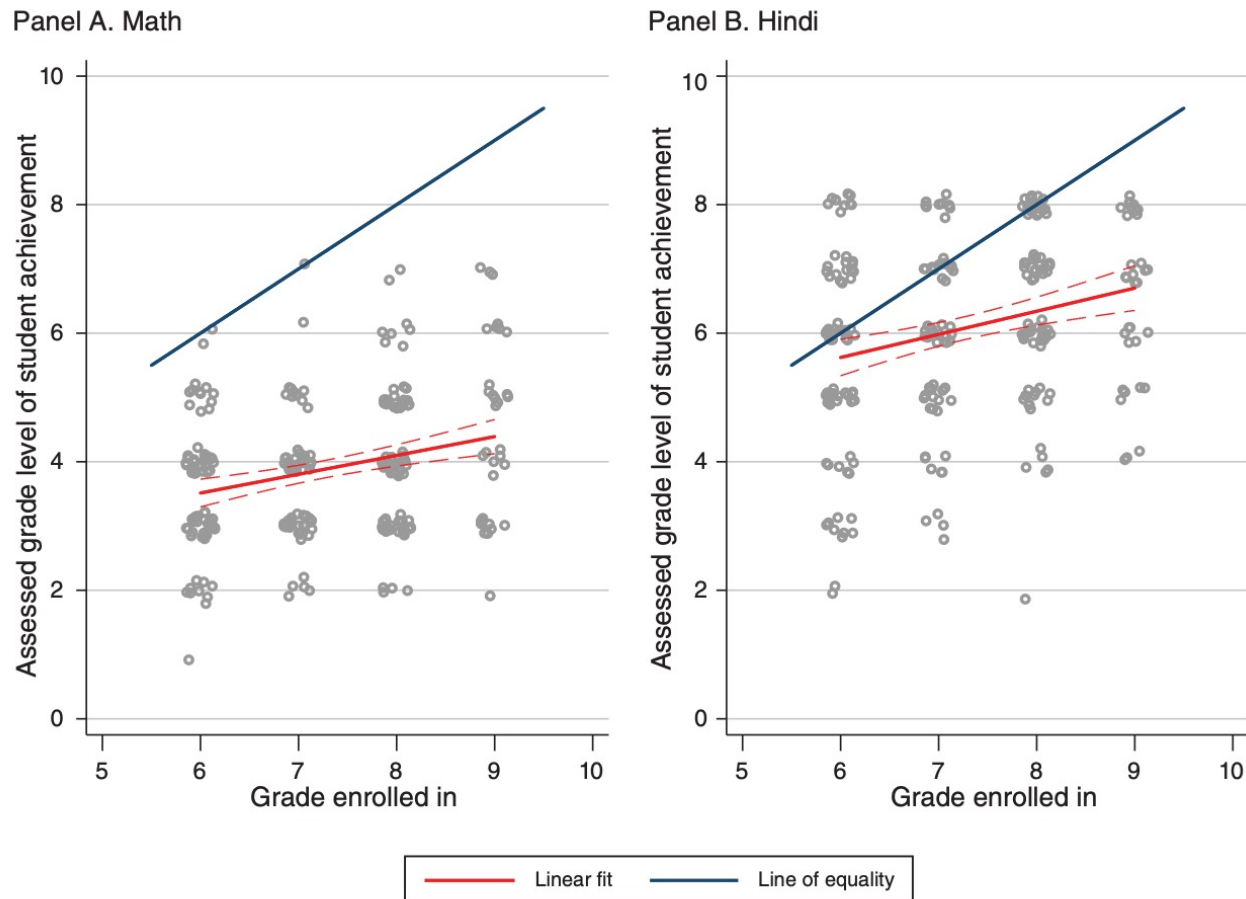


FIGURE 1. ASSESSED LEVELS OF STUDENT ACHIEVEMENT VERSUS CURRENT GRADE ENROLLED IN SCHOOL

Source: Muralidharan et al.

Educational Delivery: Tracking

- Another approach to deal with heterogeneous quality
- Tracking: controversial
 - Allow teachers to target students at their level
 - Remove positive peer effects amongst students
- Duflo, Dupas, Kremer (2011): RCT with primary schools in Kenya

TABLE 2—OVERALL EFFECT OF TRACKING

	Total score				Math score		Literacy score	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Panel A. Short-run effects (after 18 months in program)</i>								
(1) Tracking school	0.139 (0.078)*	0.176 (0.077)**	0.192 (0.093)**	0.182 (0.093)*	0.139 (0.073)*	0.156 (0.083)*	0.198 (0.108)*	0.166 (0.098)*
(2) In bottom half of initial distribution × tracking school			−0.036 (0.07)		0.04 (0.07)		−0.091 (0.08)	

- Policy diffusion: Teaching at the Right Level

Outline

- Stylized Facts
- Returns to Education
 - Traditional measures of human capital
 - Cognitive malleability
- Supply side
 - Teacher performance: Moral hazard, adverse selection, self-beliefs
 - Educational delivery: Technology, tracking
 - **Private schools**
- Demand side
 - Perceived returns to education
 - Parental beliefs about children

Competition and Private Schools

- Wide prevalence of private schools in developing countries
 - Multiple private school options along with public schools
- Andrabi et al. (WP 2023)
 - Randomized provision of grants to government schools in Pakistan
 - Impact of grants: 0.2 SD increase in attainment in government schools
 - Competition effect: 0.2 SD increase in attainment in private schools in same market
 - Concentrated in more competitive local markets
- Andrabi Das Khwaja (AER 2017)
 - Give parents info about school performance in Pakistan
 - Increased test scores by 0.11 SD, decreased private school fees by 17%, increased primary enrollment by 4.5 %
 - Role of asymmetric info and hard institutional environment in poor countries

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Beliefs: Returns to Education

- Low income people may lack information (lack of role models, etc)
- Jensen (QJE 2010): Misperceptions about the returns to education
 - 8th grade boys in Dominican Republic
 - Low perceived returns to secondary school
 - In some schools, tell students average earnings differences by school completion
 - Impacts: 0.25-0.35 additional years of schooling over next four years
 - One of the most cost effective interventions ever! Does it replicate?
- Jensen (QJE 2012): Does education respond to the returns to education?
 - Randomize recruiting services for BPO jobs in Indian villages for 3 years
 - Increases information / salience of job market opportunities
 - Large impacts on women
 - Less likely to get married or have children; enter labor market, increase schooling
 - Report wanting fewer children, and higher desire to work throughout lifetime

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Beliefs: Child Ability

- Beliefs about child ability will affect willingness to invest in education
- Dizon-Ross (AER 2019)
 - Parents have inaccurate beliefs about child performance
 - Clear, digestible performance information: update beliefs
 - Investments: enrollment goes up (down) for high (low) performers; input mix
 - Clever measurement trick: allocation of high school scholarship lottery
- Duhon (WP 2024)
 - Low income parents seem to be too pessimistic about child ability

