

Outsourcing Service Delivery in a Fragile State: Experimental Evidence from Liberia

Mauricio Romero (UCSD)
Justin Sandefur (CGD)
Wayne Sandholtz (UCSD)

Dec 8th, 2017

Empirical Management Conference

How to improve service delivery in fragile states?

- ▶ Give money
 - ▶ Bottleneck imposed by state capacity → Standard development aid is usually least effective in these places (Burnside & Dollar, 2000; Collier & Dollar, 2002)
- ▶ Build state capacity
 - ▶ Hard and slow. Efforts to build stronger institutions often fail (Pritchett & Woolcock, 2004)
- ▶ Outsourcing provision to sidestep “poor governance”
 - ▶ Private management better than public (Bloom & Van Reenen, 2010; Bloom, Sadun, & Van Reenen, 2015)
 - ▶ Contractors have incentives to cut quality on non-contracted/non-monitored processes/outcomes (Hart, Shleifer, & Vishny, 1997)

This paper

- ▶ Evidence from a field experiment across 185 public schools in Liberia

- ▶ Outsource *management* of 93 existing public schools to 8 private organizations

Outsourcing Service Delivery in a Fragile State

Introduction

Context: Low learning & a weak state

The experiment: Private management of public schools

Results

Closing remarks

Outsourcing Service Delivery in a Fragile State

Introduction

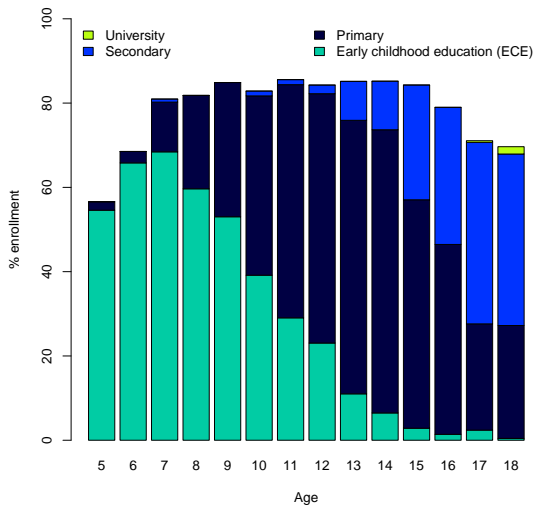
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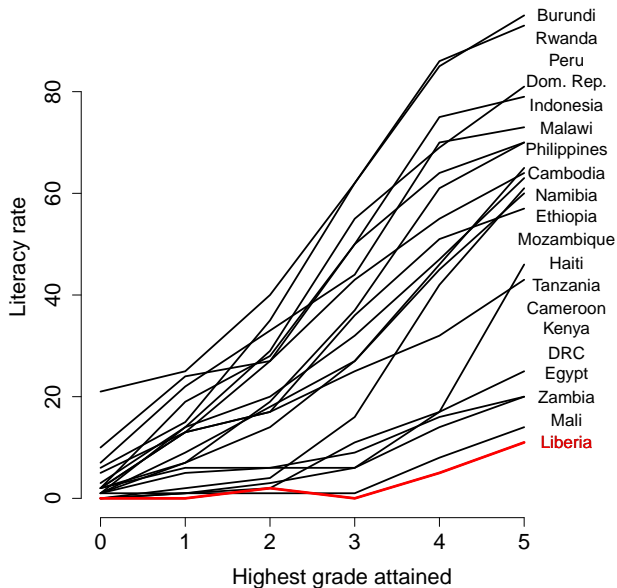
Closing remarks

Low enrollment and backlog of overage children



Note: Authors' calculations based on 2014 Household Income and Expenditures Survey.

Schooling \neq learning



Source: Oye, Pritchett, and Sandefur (2016)

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Tina Rosenberg

FIXES JUNE 14, 2016



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The experiment: Private management of public schools

- ▶ 93
- ▶ free
- ▶ non-selective
- ▶ staffed by teachers on government payroll
- ▶ and managed by 8 private contractors
- ▶ with a \$50 per pupil subsidy

▶ More

▶ How does this compare to other PPPs?

8 Private providers

- ▶ 5 are nonprofit
- ▶ 3 are local
- ▶ 6 were contracted through competitive tender

What do providers do? Depends on the provider...




- ▶ Textbooks/Paper/Notebooks: YMCA/BRAC/MtM
- ▶ Technology (e.g., scripted lessons in tablets): Bridge/Omega
- ▶ Community engagement: MtM/Rising/St Child
- ▶ Teacher training: Rising/MtM/St Child
- ▶ Teacher guides: Rising/MtM/Bridge

▶ More

Experimental details

- ▶ Randomly assign treatment at the school level (matched-pairs)
- ▶ Sample students from enrollment records prior to treatment

Time-invariant characteristics are balanced and attrition is low

- ▶ Time-invariant school characteristics are balanced 
- ▶ Time-invariant student characteristics are balanced 
- ▶ Attrition is below 4% and balanced 

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Test scores

Learning gains varied by provider

Contracting details matter

What explains learning gains?

Closing remarks

Test scores increased by $.19\sigma$

	One year follow-up		
	Difference (1)	Difference (F.E.) (2)	Difference (F.E. + Controls) (3)
English	0.17** (0.08)	0.17*** (0.04)	0.17*** (0.03)
Math	0.17*** (0.07)	0.19*** (0.04)	0.18*** (0.03)
Abstract	0.05 (0.05)	0.05 (0.04)	0.05 (0.04)
Composite	0.17** (0.07)	0.19*** (0.04)	0.19*** (0.03)
Observations	3,495	3,495	3,495

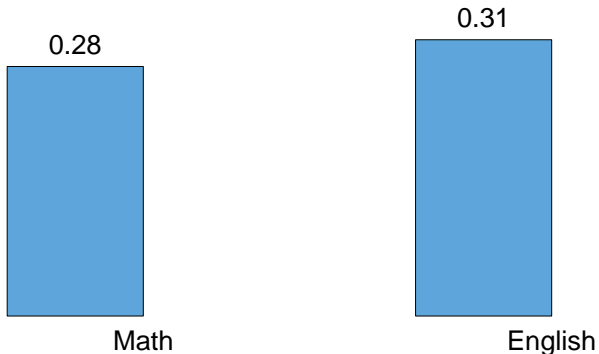
► Teaching to the test?

► First wave

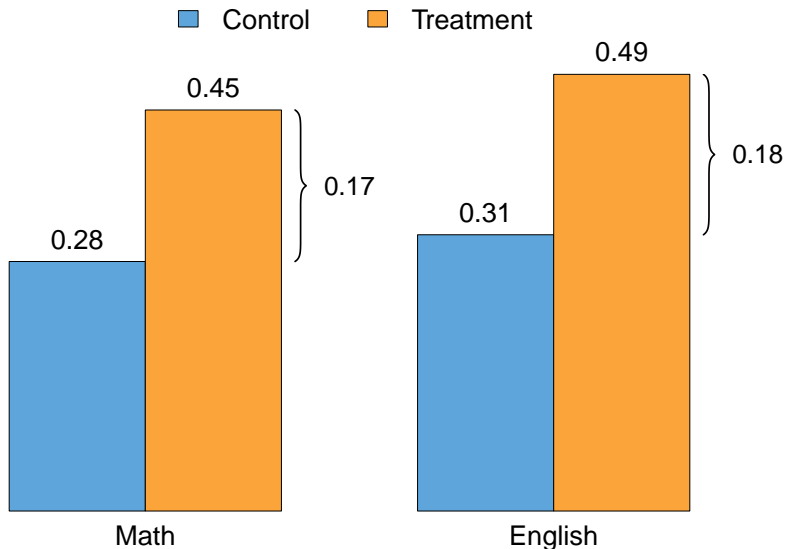
► Timing

“Business as usual” learning is $\sim 0.3\sigma$ per academic year




■ Control



Treatment is roughly ~ 0.62 extra years of schooling



Other outcomes

- ▶ No heterogeneity by student characteristics 
- ▶ No evidence of student selection 
- ▶ No effect on enrollment (more on this soon) 

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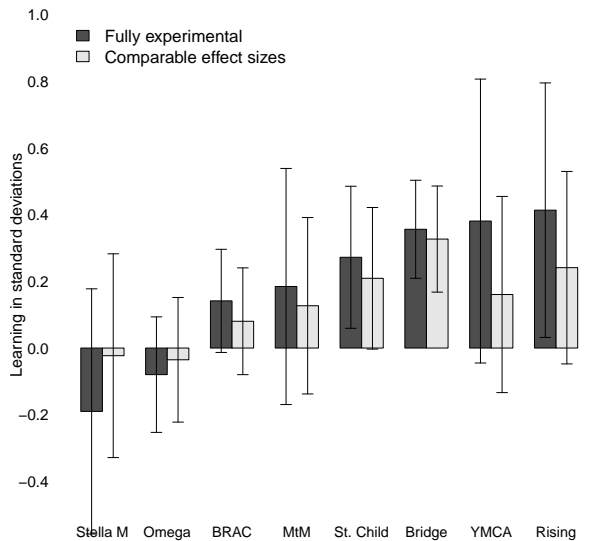
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Learning outcomes by provider



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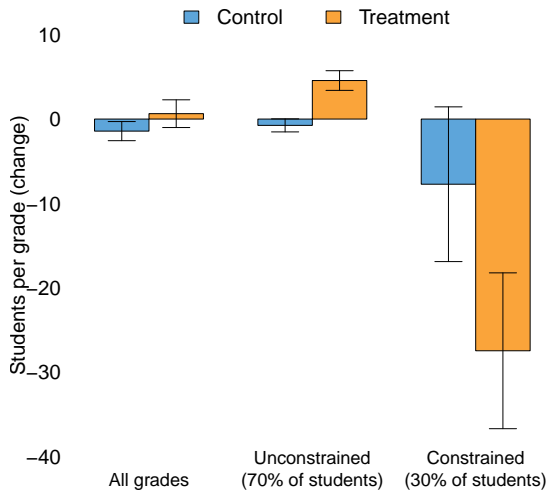
What explains learning gains?

Closing remarks

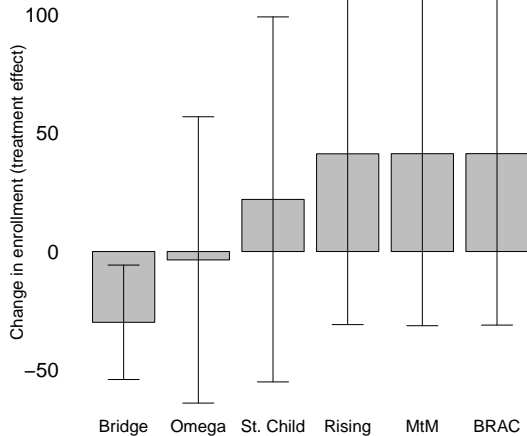
Relevant contract details

- ▶ All contractors allowed to cap class sizes
- ▶ Largest provider bypassed the competitive procurement and negotiated a bilateral agreement
 - ▶ Lump-sum grants (as opposed to per-pupil funding)
 - ▶ Limitations on removing government teachers verbally stipulated (as opposed to written in the contract)

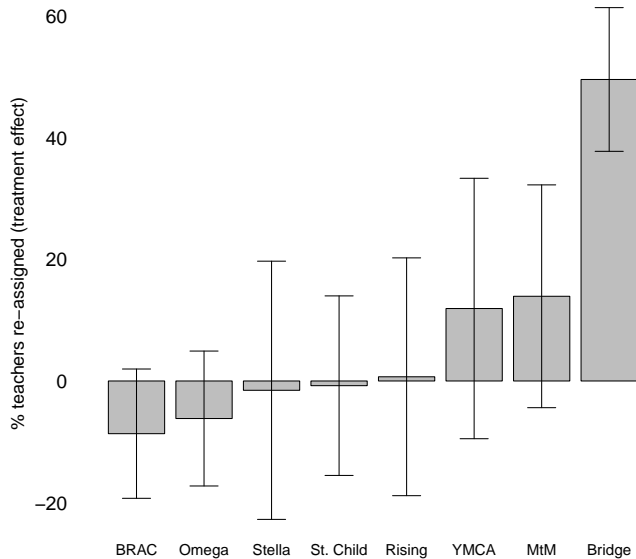
No effect on total enrollment, but in constrained schools enrollment went down



Removing students from schools where class sizes were large



Removing incumbent teachers



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- Test scores

- Learning gains varied by provider

- Contracting details matter

- What explains learning gains?

Closing remarks

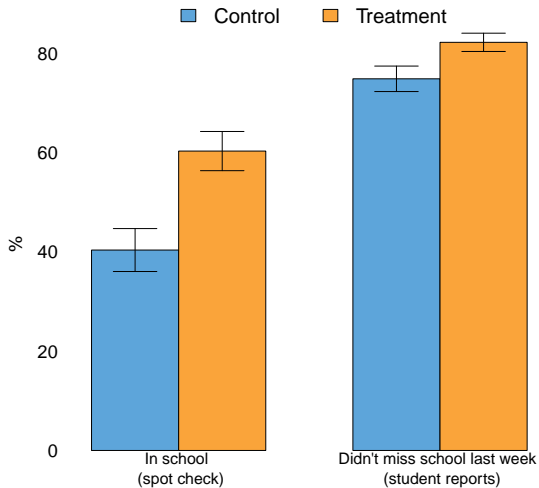
What explains learning gains?

- ▶ What changed? (Experimental)
- ▶ Which changes mattered for learning outcomes?
(Non-experimental)

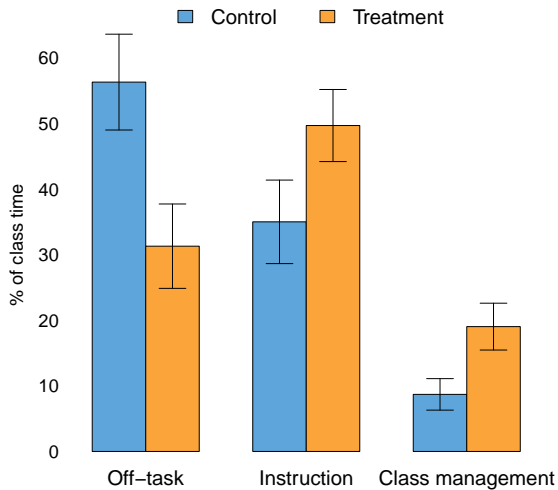
What explains learning gains?

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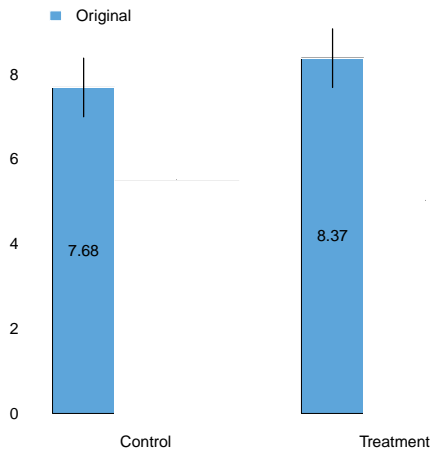
Teachers are more likely to be in school...



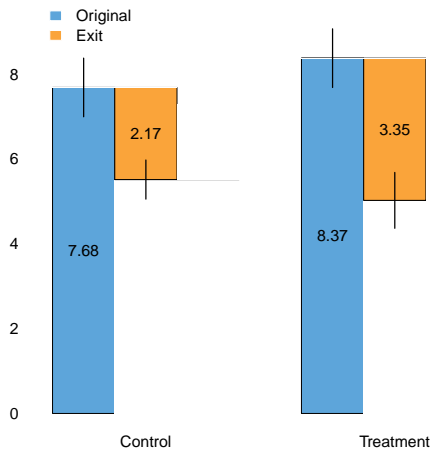
...and quality of instruction is higher



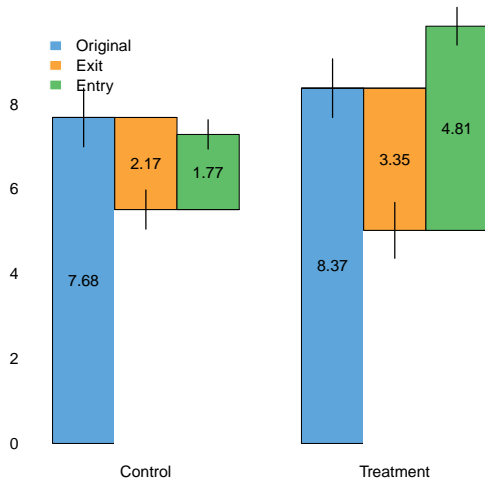
Teachers per school: baseline, entry, and exit



Teachers per school: baseline, entry, and exit



Teachers per school: baseline, entry, and exit



Treatment schools get new teaching graduates

	(1) Treatment	(2) Control	(3) Difference	(4) Difference (F.E)
Age in years	39.09 (11.77)	46.37 (11.67)	-7.28*** (1.02)	-7.10*** (0.68)
Experience in years	10.59 (9.20)	15.79 (10.77)	-5.20*** (0.76)	-5.26*** (0.51)
% has worked at a private school	47.12 (49.95)	37.50 (48.46)	9.62** (3.76)	10.20*** (2.42)
Test score in standard deviations	0.13 (1.02)	-0.01 (0.99)	0.14* (0.07)	0.14** (0.06)



What explains learning gains?

- ▶ What changed? (Experimental)
- ▶ **Which changes mattered for learning outcomes?
(Non-experimental)**

Selected mediators

“Double Lasso” to select relevant controls

Mediator

Teachers' age

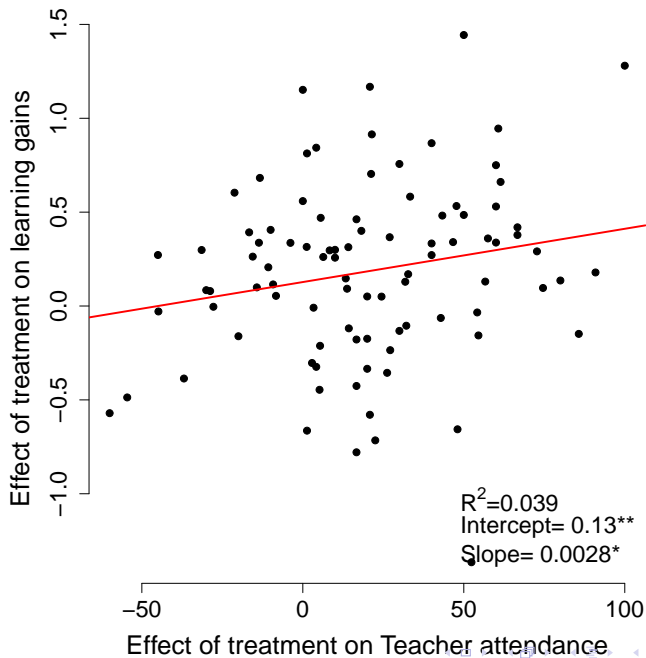
Teacher attendance

Hrs/week

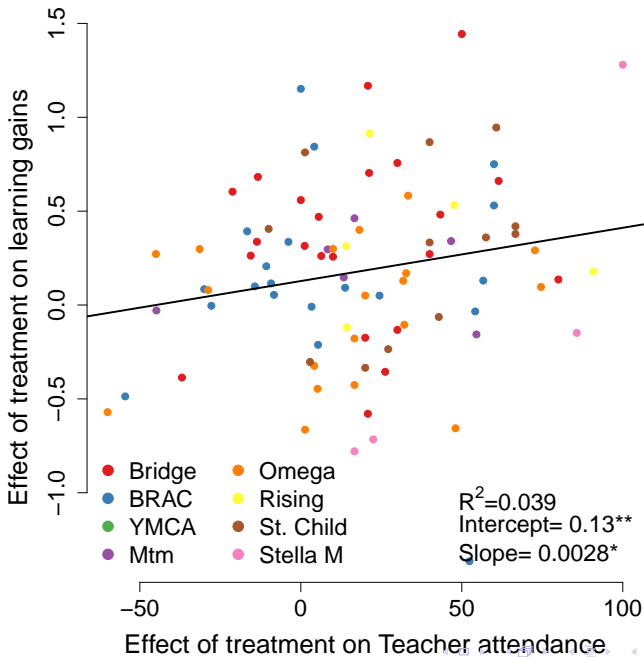
Teachers' Experience

% time management

Where teacher attendance increases, so do test scores



Where teacher attendance increases, so do test scores



Correlation between treatment effects at the match-pair level

Variable	Learning
Teachers' age	-0.37***
Teacher attendance	0.20*
Teachers' experience	-0.16
Hours/Week	0.15
% time management	0.058

▶ DAG

▶ Key assumption

▶ Plot

Material inputs don't matter, teachers do (and so does teacher attendance)

Mediator	% of total treatment effect
Teachers' age	60.82%
Direct	18.97%
Teacher attendance	15.46%
Hrs/week	14.66%
Teachers' Experience	-13.48%
% time management	3.58%

▶ DAG

▶ Key assumption

▶ Plot

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Can outsourcing public education raise learning levels in fragile states?

- ▶ $.19\sigma \sim 0.62$ extra years of schooling
- ▶ Highest performing = 0.26σ , lowest = 0
- ▶ Largest provider unenrolled pupils from schools with large class sizes and removed 74% of incumbent teachers
- ▶ Questions regarding contracts/procurement
 - ▶ Broad statements about PPP may be simplistic
 - ▶ Managing/contracting providers requires some state capacity
 - ▶ Contracts are incomplete and subject to regulatory capture
 - ▶ Mission alignment (Besley & Ghatak, 2005)
 - ▶ Competition requires active encouragement

Thank you

- ▶ Gracias
- ▶ Asante Sana
- ▶ Merci
- ▶ Obrigado
- ▶ Grazie

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Extra tables

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Extra tables

PSL and traditional public schools

	Control schools	PSL treatment schools
Management		
Who owns school building?	Government	Government
Who employs and pays teachers?	Government	Government
Who manages the school and teachers?	Government	Provider
Who sets curriculum?	Government	Government + provider supplement
Funding		
Primary user fees (annual USD)	Zero	Zero
ECE user fees (annual USD)	\$38	Zero
Extra funding per pupil (annual USD)	NA	\$50 + independent fund-raising
Staffing		
Pupil-teacher ratios	NA	Promised one teacher per grade, allowed to cap class sizes at 45-65 pupils
New teacher hiring	NA	First pick of new teacher-training graduates

▶ Back

	Liberia PSL	South Africa	UK Academy	USA Charters	Punjab PSSP	Punjab vouchers	Philippines vouchers	India RTE	Uganda Secondary
Year started	2016	2016	2001	1991	2016	2006	2005	2012	2007
# Schools	93	7	5,000	7,000	500	1,700	c. 6,000	91,000	800
# Students	27,000	6,000	2million+	2.7million	c. 50,000	500,000	c. 1million	c. 1.7mill	440,000
Type	Contract Mgmt	Contract Mgmt	Contract Mgmt	Contract Mgmt	Contract Mgmt	Voucher	Voucher	Subsidy	Subsidy
No fee?	✓	✓	✓	✓	✓	✗	✗	✓	✗
Non-profit?	✗	✓	✓	-	✓	✗	✗	✓	✗
Non-selective?	✓	✓	✓	✓	✓	✓	✗	✗	✗
Govt teacher contracts	✓	-	-	✗	✗	✗	✗	✗	✗
Teachers in unions	✓	✓	✓	✗	✗	✗	✗	✗	✗
Accountable for outcomes	✓	✓	✓	✓	✓	✓	✓	✗	✗
National curriculum	✓	✓	✗	-	✓	✓	✓	✓	✓
Govt buildings	✓	✓	✓	-	✓	✗	✗	✗	✗

More public ←  → More private

Source: Ark

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What do providers do? Depends on the provider

- ▶ Textbooks/Paper/Notebook: YMCA/BRAC/MtM
- ▶ Technology (e.g., scripted lessons in tablets): Bridge/Omega
- ▶ Community engagement: MtM/Rising/St Child
- ▶ Teacher training: Rising
- ▶ Teacher guides: Rising/MtM/Bridge

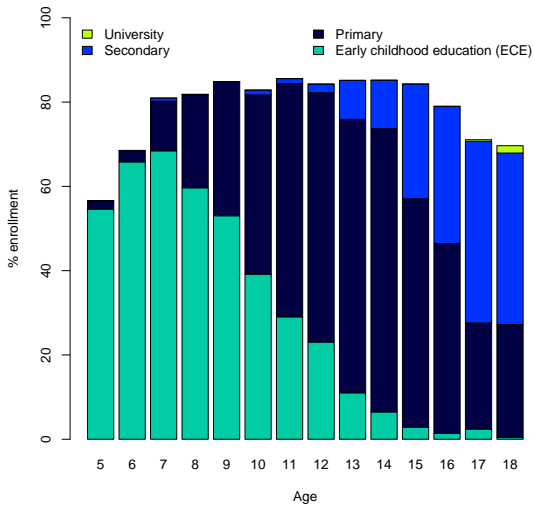
▶ Back

▶ Show me more!

What do providers do? Depends on the provider

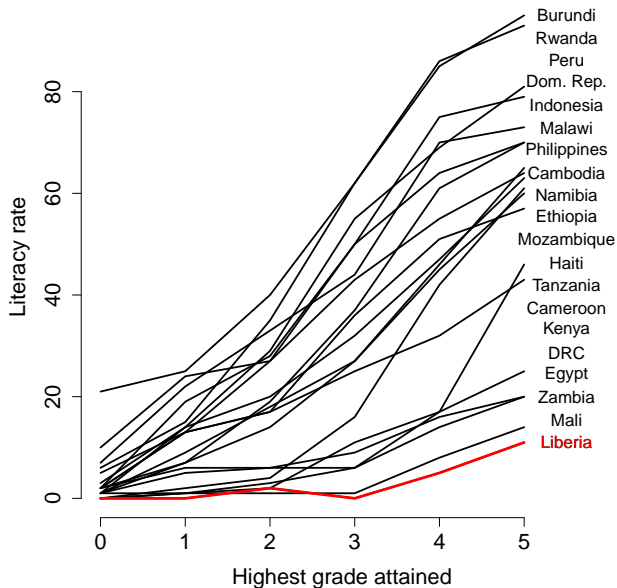
		Provider								
		Stella M	YMCA	Omega	BRAC	Bridge	Rising	St. Child	MtM	
Provider Support	Provider staff visits at least once a week(%)	0	54	13	93	76	94	91	96	
	Heard of PSL(%)	42	85	61	42	87	90	68	85	
	Heard of provider(%)	46	96	100	95	100	100	100	100	
	Has anyone from (provider) been to this school?(%)	42	88	100	94	100	100	99	100	
Ever provided	Textbooks(%)	12	96	73	94	99	71	94	96	
	Teacher training(%)	0	77	62	85	87	97	93	96	
	Teacher received training since Aug 2016(%)	23	46	58	45	50	81	58	37	
	Teacher guides (or teacher manuals)(%)	0	69	75	54	97	94	68	98	
	School repairs(%)	0	12	25	24	53	52	13	93	
	Paper(%)	0	92	30	86	70	97	88	98	
	Organization of community meetings(%)	0	54	27	69	73	87	83	91	
	Food programs(%)	0	8	2	1	1	10	0	17	
	Copybooks(%)	4	65	30	92	18	97	94	91	
	Computers, tablets, electronics(%)	0	0	94	0	99	3	3	2	
	Most recent visit	Provide/deliver educational materials(%)	0	4	45	17	18	26	29	50
		Observe teaching practices and give suggestions(%)	0	19	45	81	65	45	74	85
		Monitor other school-based government programs(%)	0	0	7	5	10	6	18	9
Monitor/observe PSL program(%)		0	12	23	11	13	13	35	65	
Monitor health/sanitation issues(%)		0	8	9	2	5	0	10	28	
Meet with PTA committee(%)		0	12	8	10	7	0	21	41	
Meet with principal(%)		0	12	54	36	38	6	51	63	
Deliver information(%)		0	12	36	16	8	6	16	35	
Check attendance and collect records(%)		42	23	43	56	39	19	66	70	
Ask students questions to test learning(%)		4	4	24	33	18	58	44	43	

Net primary enrollment in 2015 was 38%



Note: Authors' calculations based on 2014 Household Income and Expenditures Survey.

Schooling \neq learning



Source: Oye, Pritchett, and Sandefur (2016)

Test scores increased by $.19\sigma$

	One year follow-up		
	Difference	Difference	Difference
	(1)	(F.E.) (2)	(F.E. + Controls) (3)
English	0.17** (0.08)	0.17*** (0.04)	0.17*** (0.03)
Math	0.17*** (0.07)	0.19*** (0.04)	0.18*** (0.03)
Abstract	0.05 (0.05)	0.05 (0.04)	0.05 (0.04)
Composite	0.17** (0.07)	0.19*** (0.04)	0.19*** (0.03)
New modules	0.17** (0.07)	0.20*** (0.04)	0.19*** (0.04)
Conceptual	0.12** (0.05)	0.14*** (0.04)	0.12*** (0.04)
Observations	3,495	3,495	3,495

What do providers do? Depends on the provider

		Provider							
		Stella M	YMCA	Omega	BRAC	Bridge	Rising	St. Child	MtM
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Ever provided	Textbooks(%)	12	96	73	94	99	71	94	96
	Teacher training(%)	0	77	62	85	87	97	93	96
	Teacher received training since Aug 2016(%)	23	46	58	45	50	81	58	37
	Teacher guides (or teacher manuals)(%)	0	69	75	54	97	94	68	98
	School repairs(%)	0	12	25	24	53	52	13	93
	Paper(%)	0	92	30	86	70	97	88	98
	Organization of community meetings(%)	0	54	27	69	73	87	83	91
	Food programs(%)	0	8	2	1	1	10	0	17
	Copybooks(%)	4	65	30	92	18	97	94	91
	Computers, tablets, electronics(%)	0	0	94	0	99	3	3	2
	Most recent visit	Provide/deliver educational materials(%)	0	4	45	17	18	26	29
Observe teaching practices and give suggestions(%)		0	19	45	81	65	45	74	85
Monitor other school-based government programs(%)		0	0	7	5	10	6	18	9
Monitor/observe PSL program(%)		0	12	23	11	13	13	35	65
Monitor health/sanitation issues(%)		0	8	9	2	5	0	10	28
Meet with PTA committee(%)		0	12	8	10	7	0	21	41
Meet with principal(%)		0	12	54	36	38	6	51	63
Deliver information(%)		0	12	36	16	8	6	16	35
Check attendance and collect records(%)		42	23	43	56	39	19	66	70
Ask students questions to test learning(%)		4	4	24	33	18	58	44	43

Schools in the RCT are better than the average public school in the country

	(1) RCT (Treatment and control)	(2) Other public schools	(3) Difference
Students: ECE	142.68 (73.68)	112.71 (66.46)	29.97*** (5.77)
Students: Primary	151.55 (130.78)	132.38 (143.57)	19.16* (10.18)
Students	291.91 (154.45)	236.24 (170.34)	55.67*** (12.15)
Classrooms per 100 students	1.17 (1.63)	0.80 (1.80)	0.37*** (0.13)
Teachers per 100 students	3.04 (1.40)	3.62 (12.79)	-0.58** (0.28)
Textbooks per 100 students	99.21 (96.34)	102.33 (168.91)	-3.12 (7.88)
Chairs per 100 students	20.71 (28.32)	14.13 (51.09)	6.58*** (2.38)
Food from Gov or NGO	0.36 (0.48)	0.30 (0.46)	0.06 (0.04)
Solid building	0.36 (0.48)	0.28 (0.45)	0.08* (0.04)
Water pump	0.62 (0.49)	0.45 (0.50)	0.17*** (0.04)
Latrine/toilet	0.85 (0.33)	0.71 (0.45)	0.14*** (0.03)
Distance to MoE (in KM)	153.25 (99.62)	186.99 (106.81)	-33.74*** (10.41)
Observations	185	2,420	2,605

Balance using EMIS data

	(1) Treatment	(2) Control	(3) Difference	(4) Difference (F.E)
Students: ECE	148.51 (76.83)	136.72 (70.24)	11.79 (10.91)	11.03 (9.74)
Students: Primary	159.05 (163.34)	143.96 (86.57)	15.10 (19.19)	15.68 (16.12)
Students	305.97 (178.49)	277.71 (124.98)	28.26 (22.64)	27.56 (19.46)
Classrooms per 100 students	1.21 (1.62)	1.13 (1.65)	0.09 (0.24)	0.08 (0.23)
Teachers per 100 students	3.08 (1.49)	2.99 (1.30)	0.09 (0.21)	0.09 (0.18)
Textbooks per 100 students	102.69 (97.66)	95.69 (95.40)	7.00 (14.19)	7.45 (13.74)
Chairs per 100 students	18.74 (23.06)	22.70 (32.81)	-3.96 (4.17)	-4.12 (3.82)
Food from Gov or NGO	0.36 (0.48)	0.36 (0.48)	-0.01 (0.08)	-0.01 (0.05)
Solid building	0.39 (0.49)	0.33 (0.47)	0.06 (0.07)	0.06 (0.06)
Water pump	0.56 (0.50)	0.67 (0.47)	-0.11 (0.07)	-0.12* (0.06)
Latrine/toilet	0.85 (0.35)	0.86 (0.32)	-0.01 (0.05)	-0.01 (0.05)
Distance to MoE (in KM)	152.64 (100.07)	153.87 (99.70)	-1.23 (14.69)	-1.00 (3.06)
Observations	92	93	185	185

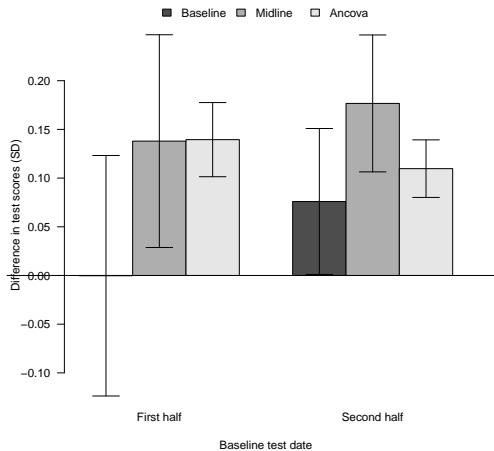
PPP increased test scores by $.19\sigma$

	Baseline		One year follow-up			
	Difference	Difference (F.E.)	Difference	Difference (F.E.)	Difference (F.E. + Controls)	Difference (ANCOVA)
	(1)	(2)	(3)	(4)	(5)	(6)
English	0.05 (0.08)	0.09* (0.05)	0.17** (0.08)	0.17*** (0.04)	0.17*** (0.03)	0.13*** (0.02)
Math	0.08 (0.07)	0.08* (0.04)	0.17*** (0.07)	0.19*** (0.04)	0.18*** (0.03)	0.14*** (0.02)
Abstract	0.04 (0.06)	0.05 (0.05)	0.05 (0.05)	0.05 (0.04)	0.05 (0.04)	0.03 (0.04)
Composite	0.07 (0.07)	0.08* (0.05)	0.17** (0.07)	0.19*** (0.04)	0.19*** (0.03)	0.14*** (0.02)
New modules			0.17** (0.07)	0.20*** (0.04)	0.19*** (0.04)	0.16*** (0.03)
Conceptual			0.12** (0.05)	0.14*** (0.04)	0.12*** (0.04)	0.10*** (0.04)
Observations	3,496	3,496	3,495	3,495	3,495	3,495

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First round of data is “contaminated” by short-run treatment effects

Test scores (all questions)



No effect on total enrollment, but attendance increases

	(1) Treatment	(2) Control	(3) Difference	(4) Difference (F.E)
Panel A: School level data (N = 175)				
Enrollment 2015/2016	298.45 (169.74)	264.11 (109.91)	34.34 (21.00)	34.18* (20.28)
Enrollment 2016/2017	309.71 (118.96)	252.75 (123.41)	56.96*** (18.07)	56.89*** (16.29)
15/16 to 16/17 enrollment change	11.55 (141.30)	-6.06 (82.25)	17.61 (17.19)	24.60* (14.35)
Attendance % (spot check)	48.02 (24.52)	35.20 (25.92)	12.81*** (3.83)	13.43*** (3.16)
% of students with disabilities	0.59 (1.16)	0.39 (0.67)	0.20 (0.14)	0.21 (0.15)
Panel B: Student level data (N = 3,630)				
% enrolled in the same school	80.80 (39.40)	83.34 (37.27)	-2.55 (3.68)	0.84 (2.07)
% enrolled in school	94.20 (23.38)	94.00 (23.76)	0.21 (1.33)	1.28 (0.87)
Days missed, previous week	0.85 (1.41)	0.85 (1.40)	-0.01 (0.10)	-0.06 (0.07)

No effect on total enrollment, but in constrained schools, enrollment went down

	(1)	(2)	(3)	(4)
	Δ enrollment	% same school	% in school	Test scores
Constrained=0 \times Treatment	5.30*** (1.11)	4.12*** (1.39)	1.73** (0.73)	0.15*** (0.034)
Constrained=1 \times Treatment	-11.7* (6.47)	-12.8* (7.74)	-0.0066 (4.11)	0.35*** (0.11)
No. of obs.	1,635	3,628	3,488	3,493
Mean control (Unconstrained)	-0.75	82.09	93.38	0.13
Mean control (Constrained)	-7.73	84.38	94.81	-0.08
$\alpha_0 =$ Constrained - Unconstrained	-17.05	-16.95	-1.74	0.20
p-value ($H_0 : \alpha_0 = 0$)	0.01	0.03	0.68	0.07

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More inputs and more and better teachers

	(1) Treatment	(2) Control	(3) Difference	(4) Difference (F.E)
Panel A: School-level outcomes (N = 185)				
Number of teachers	9.62 (2.82)	7.02 (3.12)	2.60*** (0.44)	2.61*** (0.37)
Pupil-teacher ratio (PTR)	32.20 (12.29)	39.95 (18.27)	-7.74*** (2.31)	-7.82*** (2.12)
New teachers	4.81 (2.56)	1.77 (2.03)	3.03*** (0.34)	3.01*** (0.35)
Teachers dismissed	3.35 (3.82)	2.17 (2.64)	1.18** (0.48)	1.16** (0.47)
Panel B: Teacher-level outcomes (N = 1,167)				
Age in years	39.09 (11.77)	46.37 (11.67)	-7.28*** (1.02)	-7.10*** (0.68)
Experience in years	10.59 (9.20)	15.79 (10.77)	-5.20*** (0.76)	-5.26*** (0.51)
% has worked at a private school	47.12 (49.95)	37.50 (48.46)	9.62** (3.76)	10.20*** (2.42)
Test score in standard deviations	0.13 (1.02)	-0.01 (0.99)	0.14* (0.07)	0.14** (0.06)
Panel C: Classroom observation (N = 185)				
Number of seats	20.64 (13.33)	20.58 (13.57)	0.06 (2.21)	0.58 (1.90)
% with students sitting on the floor	2.41 (15.43)	4.23 (20.26)	-1.82 (2.94)	-1.51 (2.61)
% with chalk	96.39 (18.78)	78.87 (41.11)	17.51*** (5.29)	16.58*** (5.50)
% of students with textbooks	37.08 (43.22)	17.60 (35.25)	19.48*** (6.33)	22.60*** (6.32)
% of students with pens/pencils	88.55 (19.84)	79.67 (30.13)	8.88** (4.19)	8.16** (4.10)

Management improves

	(1)	(2)	(3)	(4)
	Treatment	Control	Difference	Difference (F.E)
% school in session	92.47 (26.53)	83.70 (37.14)	8.78* (4.75)	8.66* (4.52)
Instruction time (hrs/week)	20.40 (5.76)	16.50 (4.67)	3.90*** (0.77)	3.93*** (0.73)
Intuitive score (out of 12)	4.08 (1.35)	4.03 (1.38)	0.04 (0.20)	0.02 (0.19)
Time management score (out of 12)	5.60 (1.21)	5.69 (1.35)	-0.09 (0.19)	-0.10 (0.19)
Principal's working time (hrs/week)	21.43 (11.83)	20.60 (14.45)	0.83 (1.94)	0.84 (1.88)
% of time spent on management	74.06 (27.18)	53.64 (27.74)	20.42*** (4.12)	20.09*** (3.75)
Index of good practices (PCA)	0.41 (0.64)	-0.00 (1.00)	0.41*** (0.12)	0.40*** (0.12)
Observations	92	93	185	185

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Teachers attendance and time on-task increases

	(1) Treatment	(2) Control	(3) Difference	(4) Difference (F.E)
Panel A: Spot checks (N = 185)				
% on schools campus	60.32 (23.10)	40.38 (25.20)	19.94*** (3.56)	19.79*** (3.48)
% in classroom	47.02 (26.65)	31.42 (25.04)	15.60*** (3.80)	15.37*** (3.62)
Panel B: Student reports (N = 185)				
Teacher missed school previous week (%)	17.77 (10.84)	25.12 (14.92)	-7.35*** (1.92)	-7.47*** (1.96)
Teacher never hits students (%)	54.72 (18.73)	48.21 (17.06)	6.51** (2.63)	6.58*** (2.52)
Teacher helps outside the classroom (%)	50.04 (18.22)	46.59 (18.05)	3.45 (2.67)	3.59 (2.29)
Panel C: Classroom observations (N = 185)				
Instruction (active + passive) (% of class time)	49.68 (32.22)	35.00 (37.08)	14.68*** (5.11)	14.51*** (4.70)
Classroom management (% class time)	19.03 (20.96)	8.70 (14.00)	10.34*** (2.62)	10.25*** (2.73)
Teacher off-task (% class time)	31.29 (37.71)	56.30 (42.55)	-25.01*** (5.91)	-24.77*** (5.48)
Student off-task (% class time)	50.41 (33.51)	47.14 (38.43)	3.27 (5.30)	2.94 (4.59)

Lee bounds

	(1) Treatment	(2) Control	(3) Difference	(4) Difference (F.E)	(5) 90% CI Lee bounds
Panel A: Spot check (N = 930)					
% on schools campus	68.15 (46.64)	52.29 (50.00)	15.87*** (4.44)	14.23*** (3.75)	2.51 28.37
% in classroom	50.96 (50.04)	40.96 (49.23)	10.00** (4.77)	10.02** (3.86)	-1.34 24.70
B: Classroom observation (N = 143)					
Active instruction (% class time)	38.12 (28.93)	30.13 (32.11)	7.98 (4.86)	7.62 (4.75)	-4.75 19.92
Passive instruction (% class time)	16.24 (17.18)	12.80 (19.83)	3.44 (2.95)	4.72 (3.23)	-4.93 9.62
Classroom management (% class time)	20.82 (21.06)	10.67 (14.83)	10.16*** (2.85)	10.33*** (3.32)	0.77 16.99
Teacher off-task (% class time)	24.82 (32.65)	46.40 (41.09)	-21.58*** (5.92)	-22.66*** (6.26)	-40.24 -10.32
Student off-task (% class time)	55.06 (31.23)	57.60 (34.87)	-2.54 (5.26)	-5.19 (4.88)	-16.05 12.63
Panel C: Inputs (N = 143)					
Number of seats	20.64 (13.33)	20.58 (13.57)	0.06 (2.21)	0.58 (1.90)	-7.22 5.36
% with students sitting on the floor	2.41 (15.43)	4.23 (20.26)	-1.82 (2.94)	-1.51 (2.61)	-7.48 2.76
% with chalk	96.39 (18.78)	78.87 (41.11)	17.51*** (5.29)	16.58*** (5.50)	9.47 27.85
% of students with textbooks	37.08 (43.22)	17.60 (35.25)	19.48*** (6.33)	22.60*** (6.32)	-1.21 34.87
% of students with pens/pencils	88.55 (19.84)	79.67 (30.13)	8.88** (4.19)	8.16** (4.10)	1.36 20.98

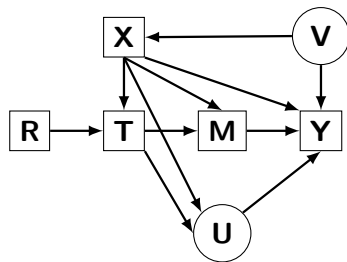
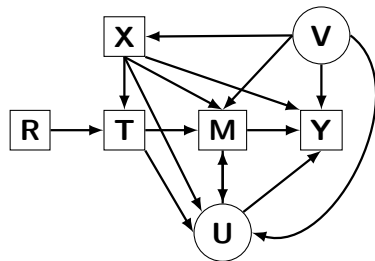
Students and parents like PPP schools more

	(1) Treatment	(2) Control	(3) Difference	(4) Difference (F.E)
Panel A: Household behavior (N = 1,115)				
% satisfied with school	74.87 (19.25)	67.46 (23.95)	7.42** (3.20)	7.44** (3.23)
% paying any fees	48.15 (50.01)	73.56 (44.14)	-25.41*** (4.72)	-25.67*** (3.26)
Fees (USD/year)	5.72 (10.22)	8.04 (9.73)	-2.32** (0.96)	-2.88*** (0.61)
Expenditure (USD/year)	65.55 (74.80)	73.61 (79.53)	-8.07 (6.96)	-6.74 (4.13)
Engagement index (PCA)	-0.11 (0.84)	-0.09 (0.91)	-0.02 (0.07)	-0.03 (0.06)
Panel B: Student attitudes (N = 3,495)				
School is fun	0.58 (0.49)	0.53 (0.50)	0.05** (0.02)	0.05** (0.02)
I use what I'm learning outside of school	0.52 (0.50)	0.49 (0.50)	0.04 (0.02)	0.04*** (0.02)
If I work hard, I will succeed.	0.60 (0.49)	0.55 (0.50)	0.05* (0.03)	0.04*** (0.02)
Elections are the best way to choose a president	0.90 (0.30)	0.88 (0.33)	0.03* (0.01)	0.03*** (0.01)
Boys are smarter than girls	0.69 (0.46)	0.69 (0.46)	-0.00 (0.02)	0.01 (0.01)
Some tribes in Liberia are bad	0.76 (0.43)	0.79 (0.41)	-0.03 (0.02)	-0.03** (0.01)

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Decompose the treatment effect - Mediation analysis

Causal relationships under different models



Under assumption sequential ignorability

Note: Based on Figure 1 in Heckman and Pinto (2015).

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Decompose the treatment effect - Mediation analysis

$$M_{isg} = \alpha_g + \beta_1 \mathit{treat}_g + \gamma_1 X_i + \delta_1 Z_s + u_i \quad (1)$$

$$Y_{isg} = \alpha_g + \beta_2 \mathit{treat}_g + \gamma_2 X_i + \delta_2 Z_s + \theta_2 M_{is} + \varepsilon_i \quad (2)$$

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Key assumption

Sequential ignorability (Imai, Keele, & Yamamoto, 2010)]

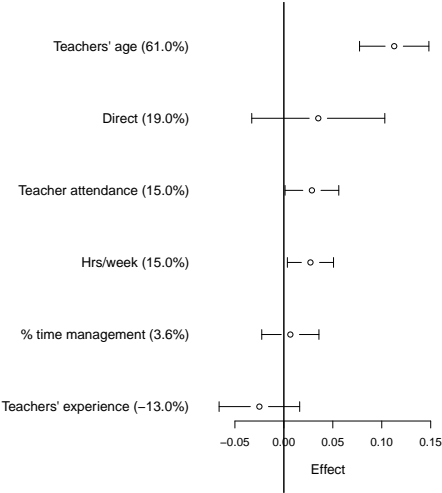
$$Y_i(t', m), M_i(t) \perp\!\!\!\perp T_i | X_i = x \quad (3)$$

$$Y_i(t', m) \perp\!\!\!\perp M_i(t) | X_i = x, T_i = t \quad (4)$$

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Material inputs don't matter, teachers do (and so does teacher attendance)

Direct and mediation effects

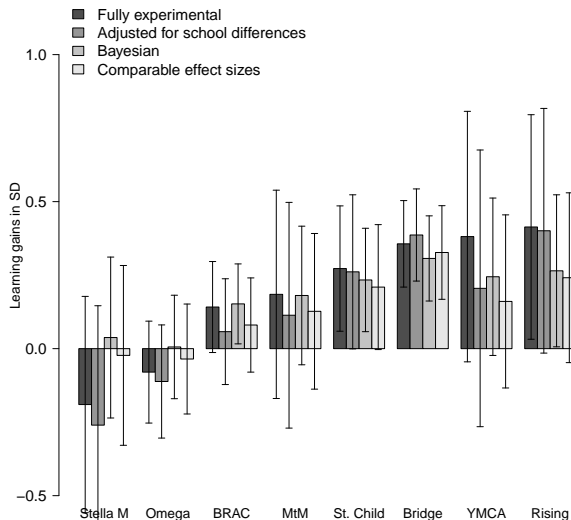


1. How do we allow for differences in context? Adjust for baseline differences

	(1) BRAC	(2) Bridge	(3) LIYONET	(4) MtM	(5) Omega	(6) Rising	(7) St. Child	(8) Stella M	(9) p-value equality
Students	31.94 (27.00)	156.19*** (25.48)	-23.03 (49.01)	35.49 (27.69)	-0.83 (53.66)	31.09 (34.74)	-19.16 (59.97)	-22.53 (59.97)	.00092
Teachers	1.23* (0.70)	2.72*** (0.66)	1.42 (1.28)	1.70** (0.72)	1.16 (1.40)	0.59 (0.90)	1.13 (1.56)	0.76 (1.56)	.66
PTR	-4.57 (3.27)	5.77* (3.09)	-8.47 (5.94)	-5.45 (3.36)	-6.02 (6.50)	2.34 (4.21)	-10.62 (7.27)	-7.29 (7.27)	.079
Latrine/Toilet	0.18** (0.08)	0.28*** (0.07)	0.26* (0.14)	0.25*** (0.08)	0.23 (0.16)	0.22** (0.10)	0.06 (0.17)	0.18 (0.17)	.96
Solid classrooms	0.63 (0.75)	2.81*** (0.71)	2.64* (1.36)	-0.11 (0.77)	1.85 (1.49)	1.59* (0.97)	-1.95 (1.67)	1.30 (1.67)	.055
Solid building	0.28*** (0.08)	0.22*** (0.07)	0.19 (0.14)	0.09 (0.08)	0.26* (0.15)	0.19* (0.10)	0.23 (0.17)	0.23 (0.17)	.84
Nearest paved road (KM)	-9.25*** (2.03)	-10.86*** (1.91)	-7.13* (3.67)	-8.22*** (2.08)	-4.47 (4.01)	-7.13*** (2.60)	-4.56 (4.48)	-7.79* (4.48)	.78

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Learning outcomes by provider



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