

IMPROVING EDUCATION OUTCOMES

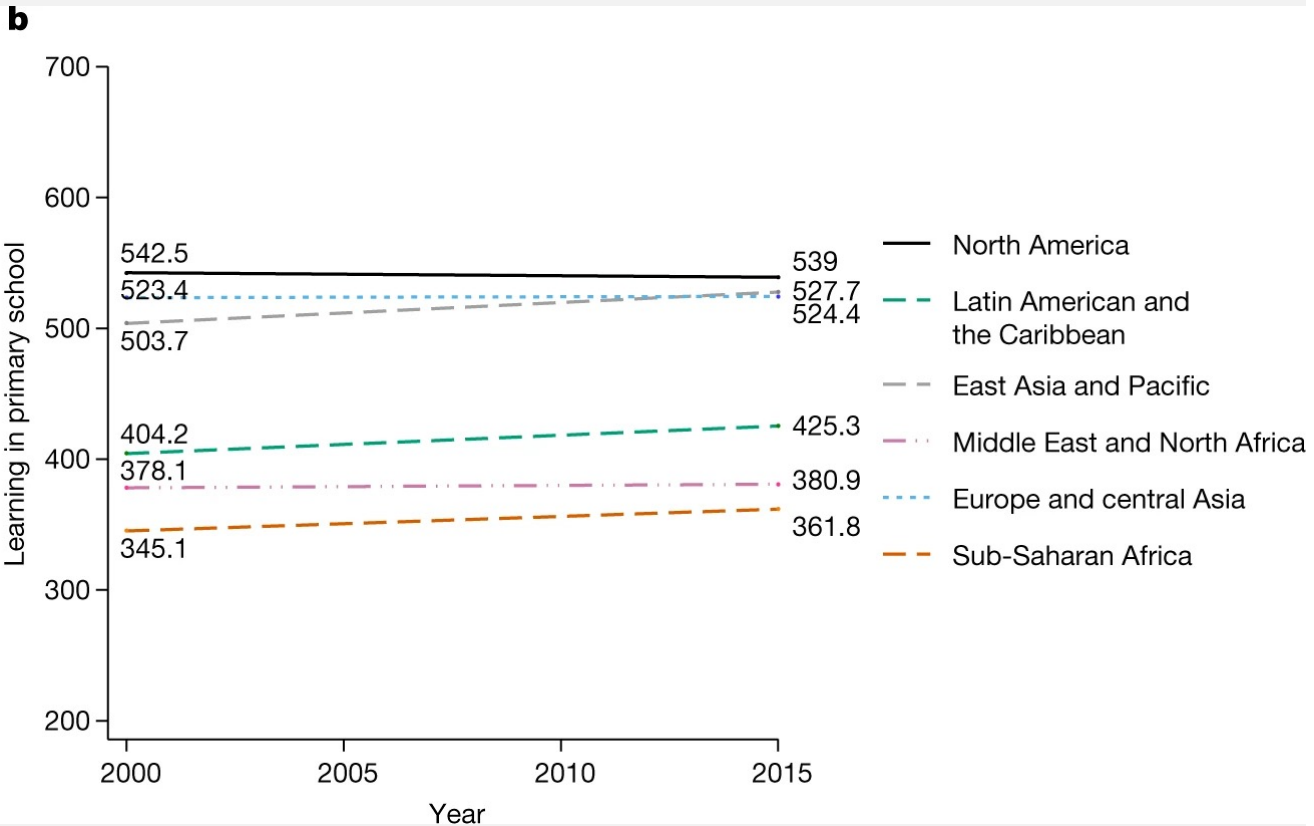
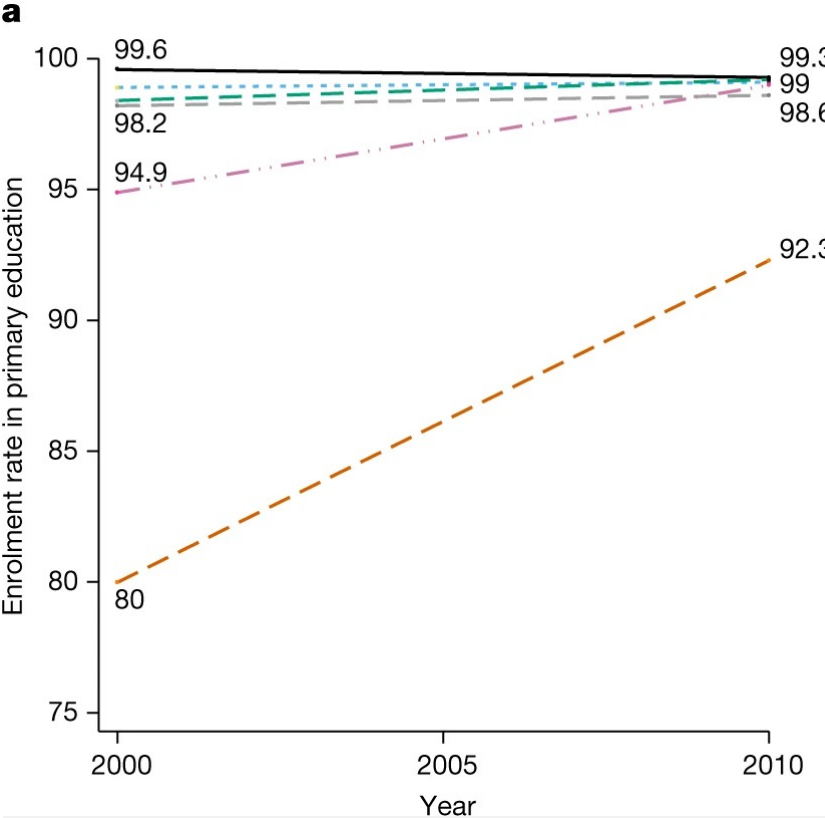
Isaac Mbiti

University of Virginia, BREAD, IZA, JPAL, NBER

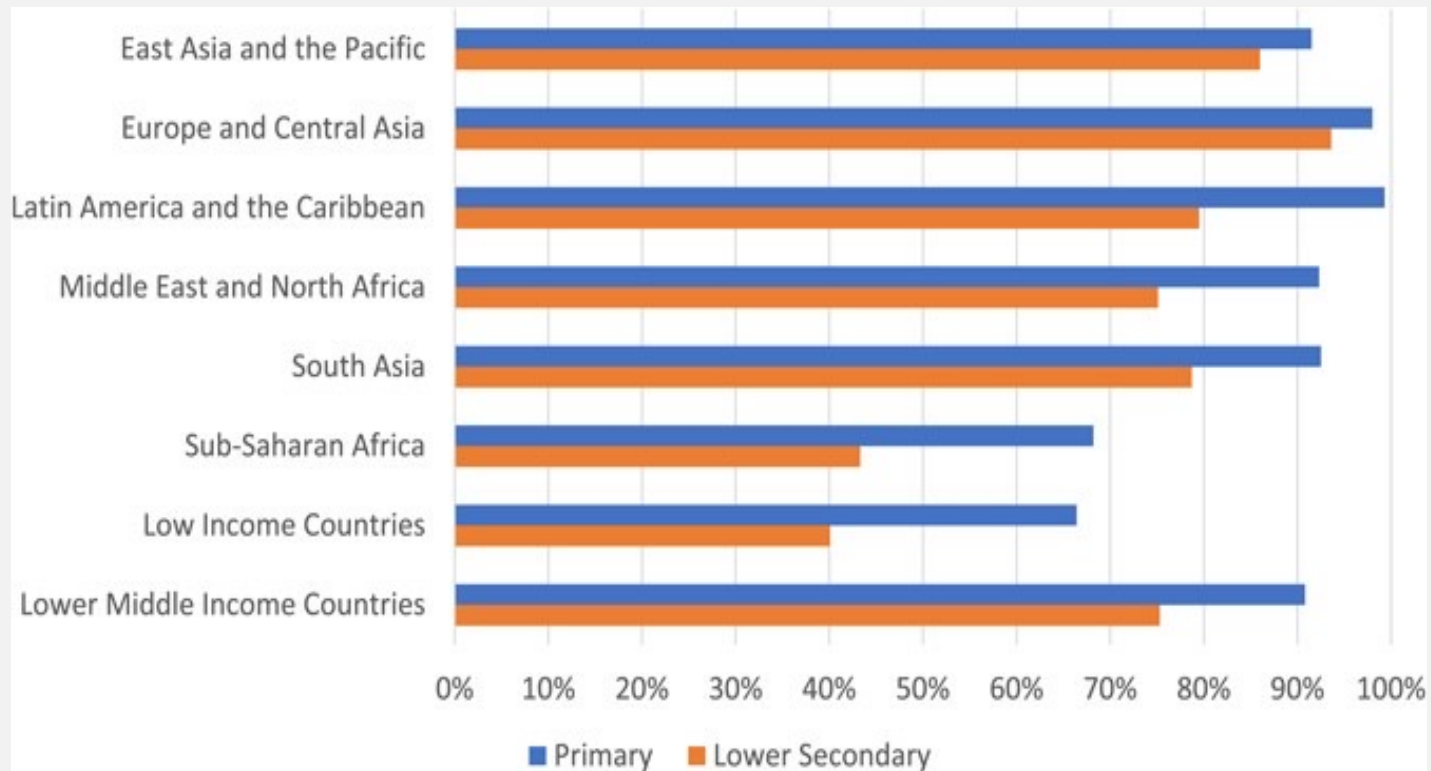
TODAY'S OBJECTIVES

- Understand patterns, trends, and challenges of education in LMIC countries
 - Focus on learning
- Highlight what we have learned from education RCTs
 - Review two case studies
- Discuss open questions

ENROLLMENT HAS INCREASED BUT LEARNING LEVELS REMAIN LOW



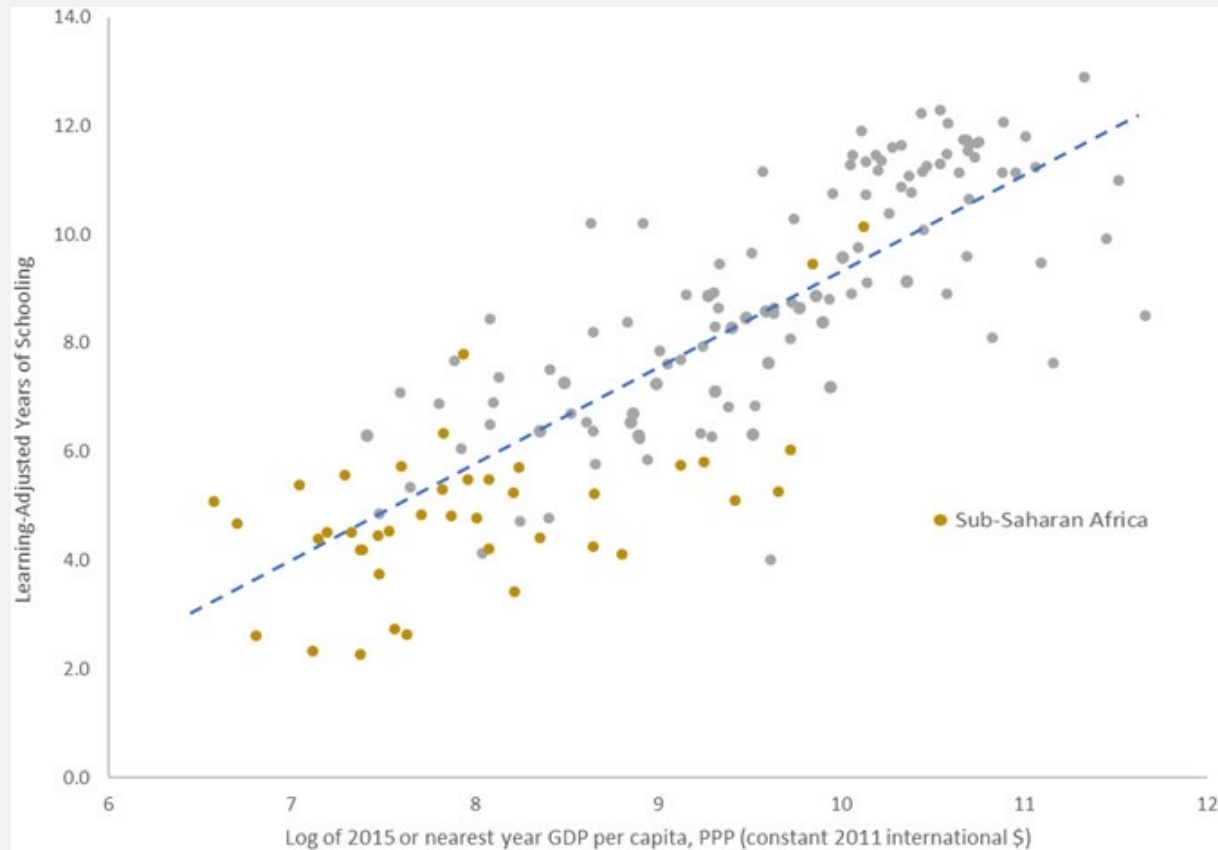
ACCESS TO EDUCATION– SECONDARY ENROLLMENT LAGGING



WB Data on Primary and Lower Secondary Completion Rates

Sources: Evans and Acosta, 2021

LEARNING LEVELS IN POORER COUNTRIES ARE LOW

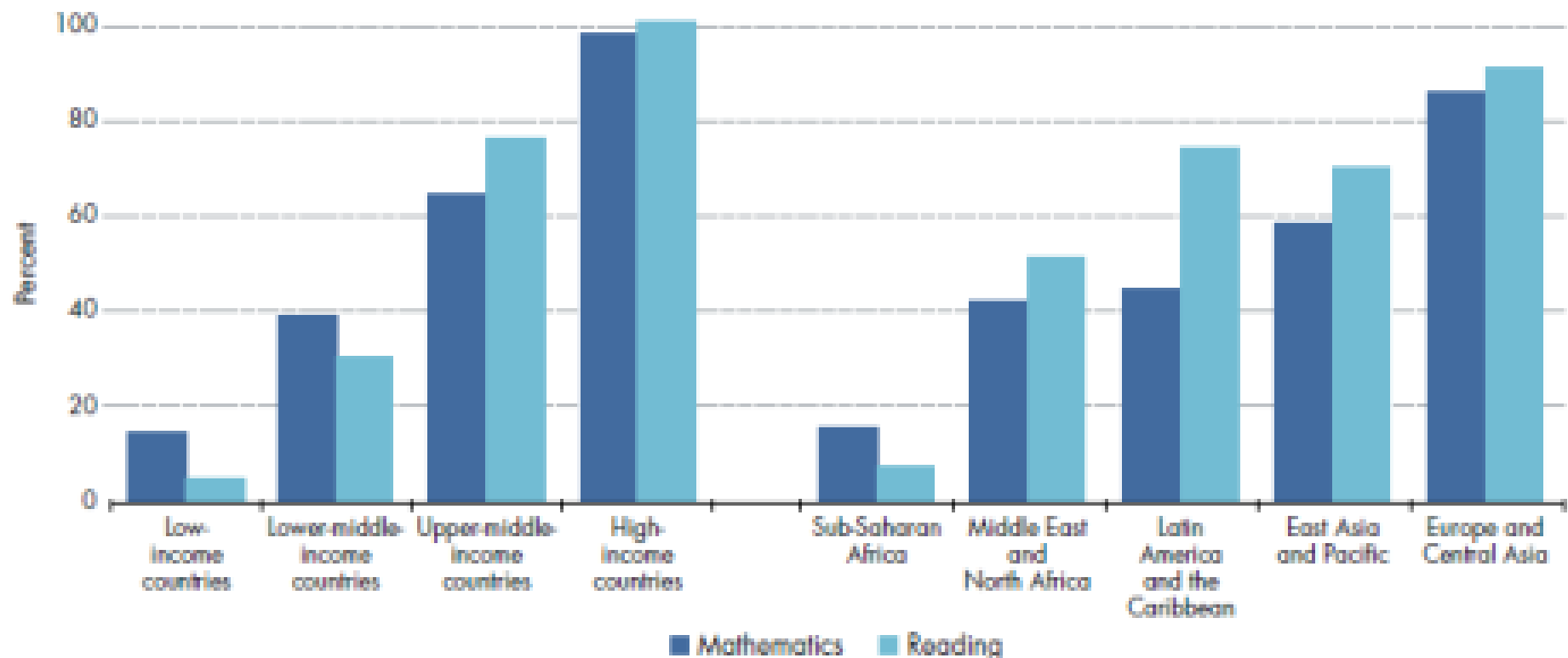


WB data on Learning Adjusted Yrs. of Schooling vs GDP/ Capita

Sources: Evans and Acosta, 2021

Figure O.5 The percentage of primary school students who pass a minimum proficiency threshold is often low

Median percentage of students in late primary school who score above a minimum proficiency level on a learning assessment, by income group and region



Source: WDR 2018 team, using "A Global Data Set on Education Quality" (2017), made available to the team by Nadir Altinok, Noam Angrist, and Harry Anthony Patrinos. Data at http://bit.do/WDR2018-Fig_O-5.

Figure O.1 Shortfalls in learning start early

Percentage of grade 2 students who could not perform simple reading or math tasks, selected countries

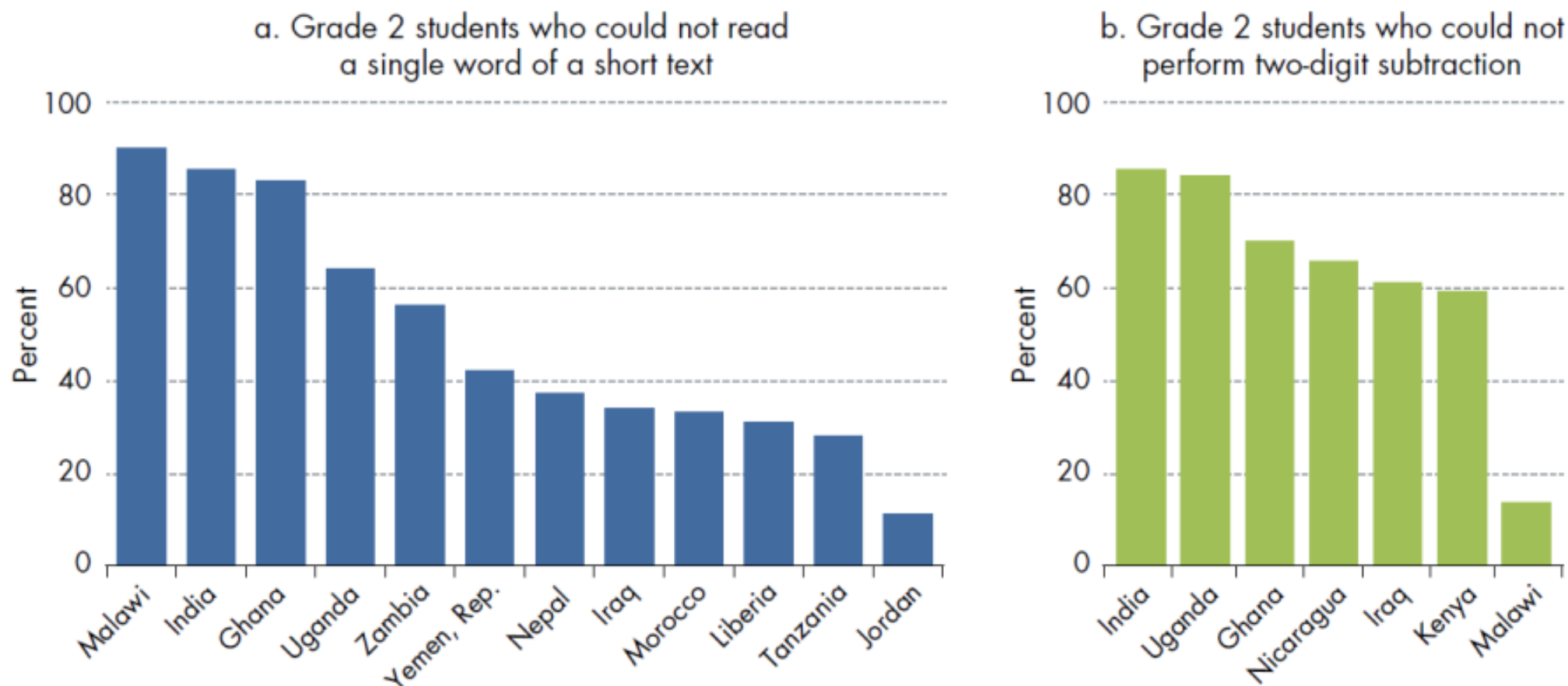
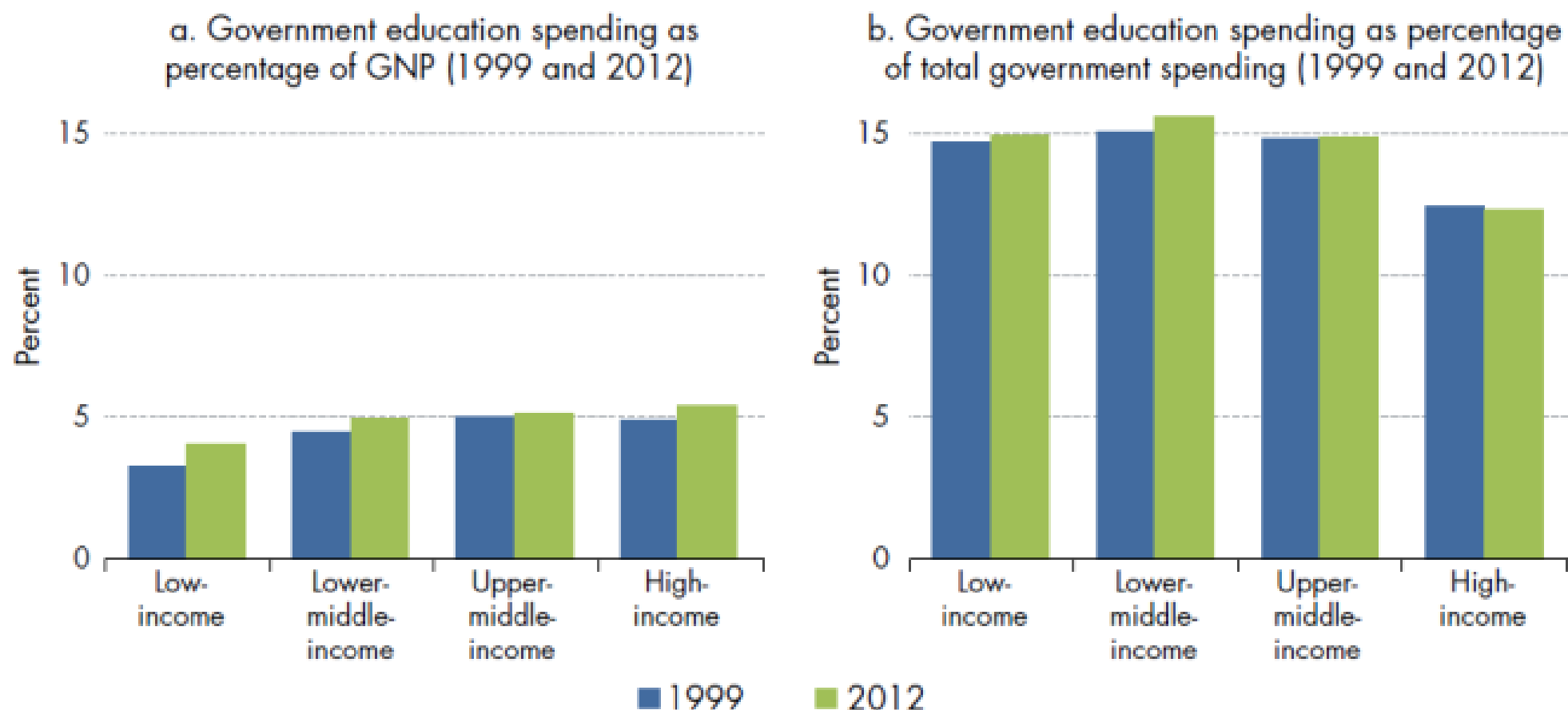
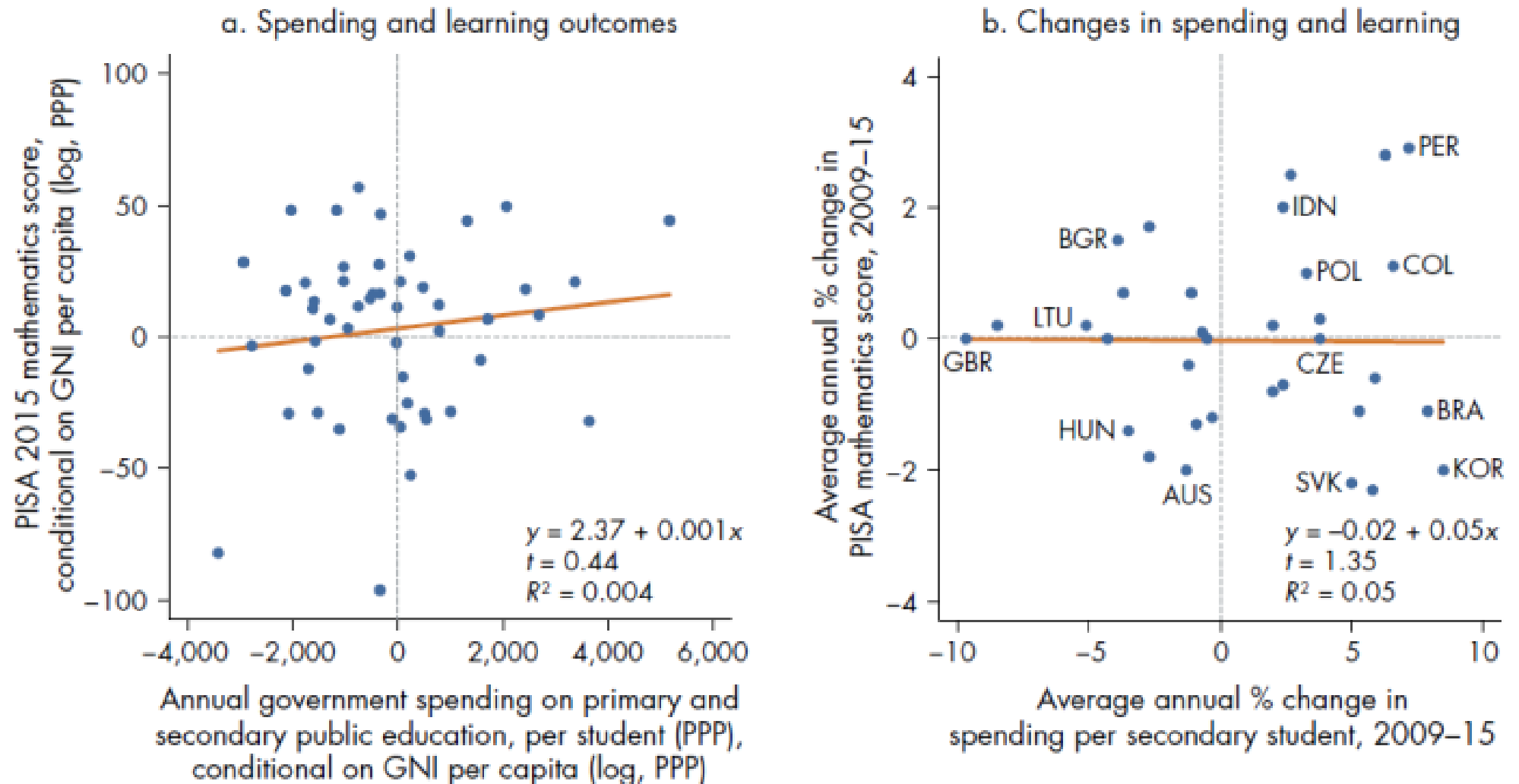


Figure S6.1 Governments devote a large share of their budgets to education



Source: UNESCO (2015). Data at http://bit.do/WDR2018-Fig_S6-1.

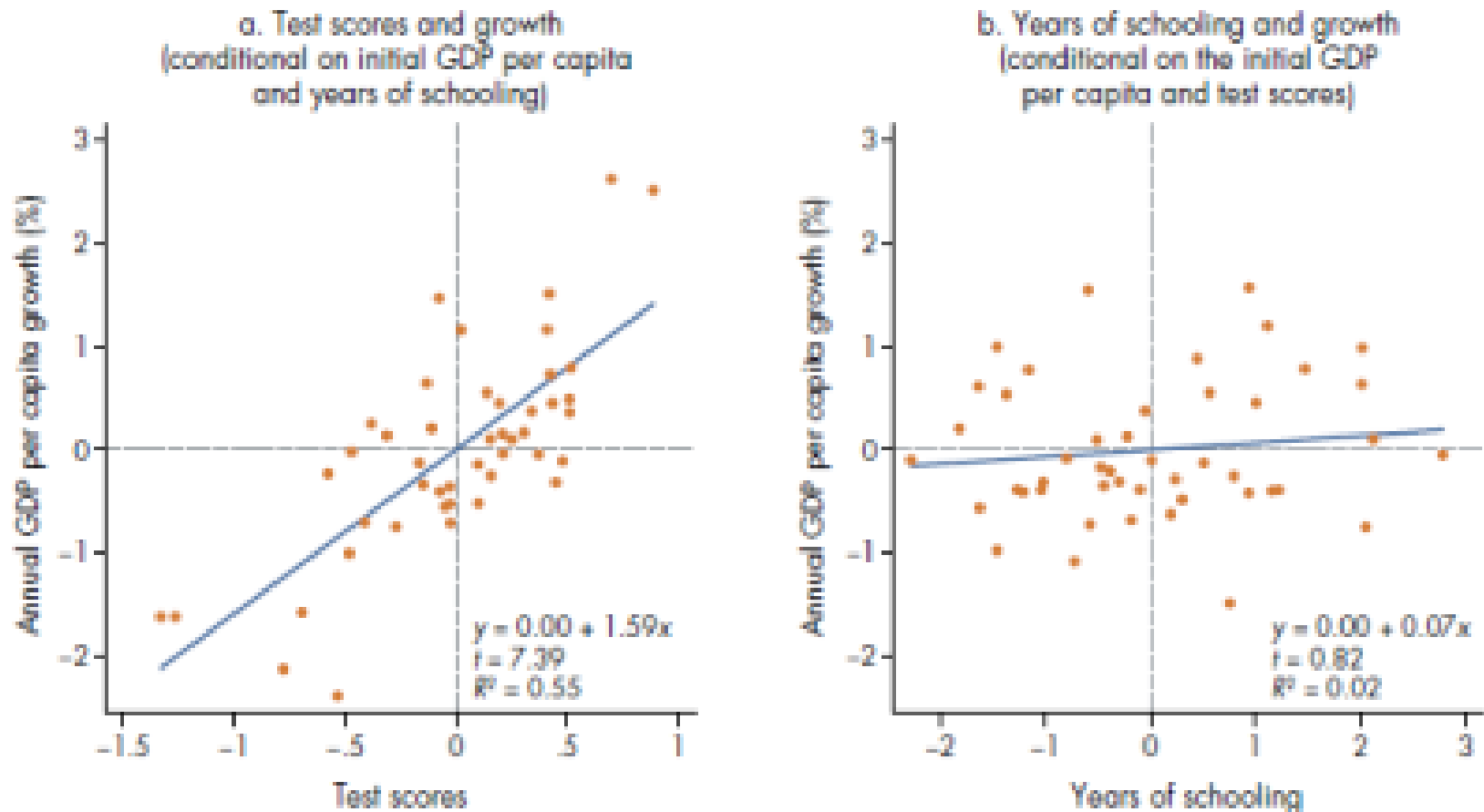
Figure 9.2 Simple associations between education spending and learning are weak



Sources: WDR 2018 team, using data from OECD (2016); UIS (2017); World Bank (2017a). Data at http://bit.do/WDR2018-Fig_9-2.

Figure 1.5 What matters for growth is learning

Annual average per capita growth in GDP, 1970–2015, conditional on test scores, years of schooling completed, and initial GDP per capita



Source: WDR 2018 team, using data on test scores from Hanushek and Woessmann (2002) and data on years of schooling and GDP from the World Bank's World Development Indicators (database), 2017. Data at http://bit.do/WDR2018-Fig_1-5.

DETERMINANTS OF LEARNING: EDUCATION PRODUCTION FUNCTION

- Structure – the Education Production Function (following Todd and Wolpin 2003)
- $A = g(S, F, \mu)$ (suppressing time subscripts)
- A = achievement (test-score), S = school inputs, F = Family inputs, μ = unobserved “ability”, g is the “Technology”
- MP of all inputs in production function is positive
- Examples of school inputs – resources, class size, # teachers, teacher skills, textbooks, peer quality, school management
- Examples of family inputs– books at home, parental encouragement/ help,
- Education policy typical focuses on school inputs

EDUCATION PRODUCTION

Input data from World Bank SDI Data (2011-2016) from selected African Countries

- Textbooks per student:
 - 2-3 students per textbook in Togo, Kenya, Nigeria. Almost 14 per textbook in Uganda
- School has “Min school infrastructure” (electricity, water, sanitation)
 - 23% in Togo, 17% in Nigeria, 40% in Tanzania, ~56% in Uganda and Kenya
- School has “Min Teaching Equip” (blackboard with chalk, pencils and notebooks)
 - 28% in Togo, 49% in Nigeria, 61% in Tanzania, ~95% in Uganda and Kenya

EDUCATION PRODUCTION

Input data from World Bank SDI Data (2011-2016) from selected African Countries

- Grade 4 Pupil teacher ratio (PTR)
 - ~19 in Madagascar and Nigeria, ~ 30 in Senegal and Kenya,, ~ 45 in Uganda and Tanzania
- Education systems still plagued by issues of teacher absence
 - Potentially a reflection of a low accountability environment

EDUCATION PRODUCTION

Teacher Absence

	<i>All</i>	<i>Min</i>	<i>Max</i>
Absence from class	44%	23% (Nigeria)	57% (Uganda)
Absence from school	23%	15% (Kenya, Tanzania survey II)	45% (Mozambique)
Number of teachers	16,543		
Scheduled teaching time	5h 27m	4h 21m (Mozambique)	7h 13m (Uganda)
Time spent teaching	2h 46m	1h 43m (Mozambique)	3h 10m (Nigeria)
Number of schools	2,001		
Orphaned classrooms	33%	24% (Togo)	45% (Uganda)
Number of schools	1,647		

Source: Bold et al 2017

EDUCATION PRODUCTION

Teachers' Content Knowledge: Minimum Thresholds

	<i>All</i>	<i>Min</i>	<i>Max</i>
<i>Subject knowledge: Language</i>			
Teachers with ...			
80% of knowledge equivalent to a 4th grader	66%	26% (Nigeria)	94% (Kenya)
Minimum knowledge for teaching	7%	0% (Mozambique, Nigeria, Tanzania survey I, Togo)	34% (Kenya)
Number of teachers	3,770		
<i>Subject knowledge: Mathematics</i>			
Teachers with ...			
Minimum knowledge for teaching	68%	49% (Togo)	93% (Kenya)
Number of teachers	3,957		

Source: Bold et al 2017

EDUCATION PRODUCTION

Pedagogical Knowledge and Skills

	<i>All</i>	<i>Min</i>	<i>Max</i>
<i>Panel A: Pedagogical knowledge</i>			
Minimum general pedagogy knowledge (% of teachers)	11%	1% (Nigeria)	36% (Tanzania)
Factual text comprehension (score out of 100)	47	23 (Mozambique)	78 (Tanzania)
Formulate aims and learning outcomes (score out of 100)	23	11 (Nigeria)	41 (Tanzania)
Number of teachers	4,799		

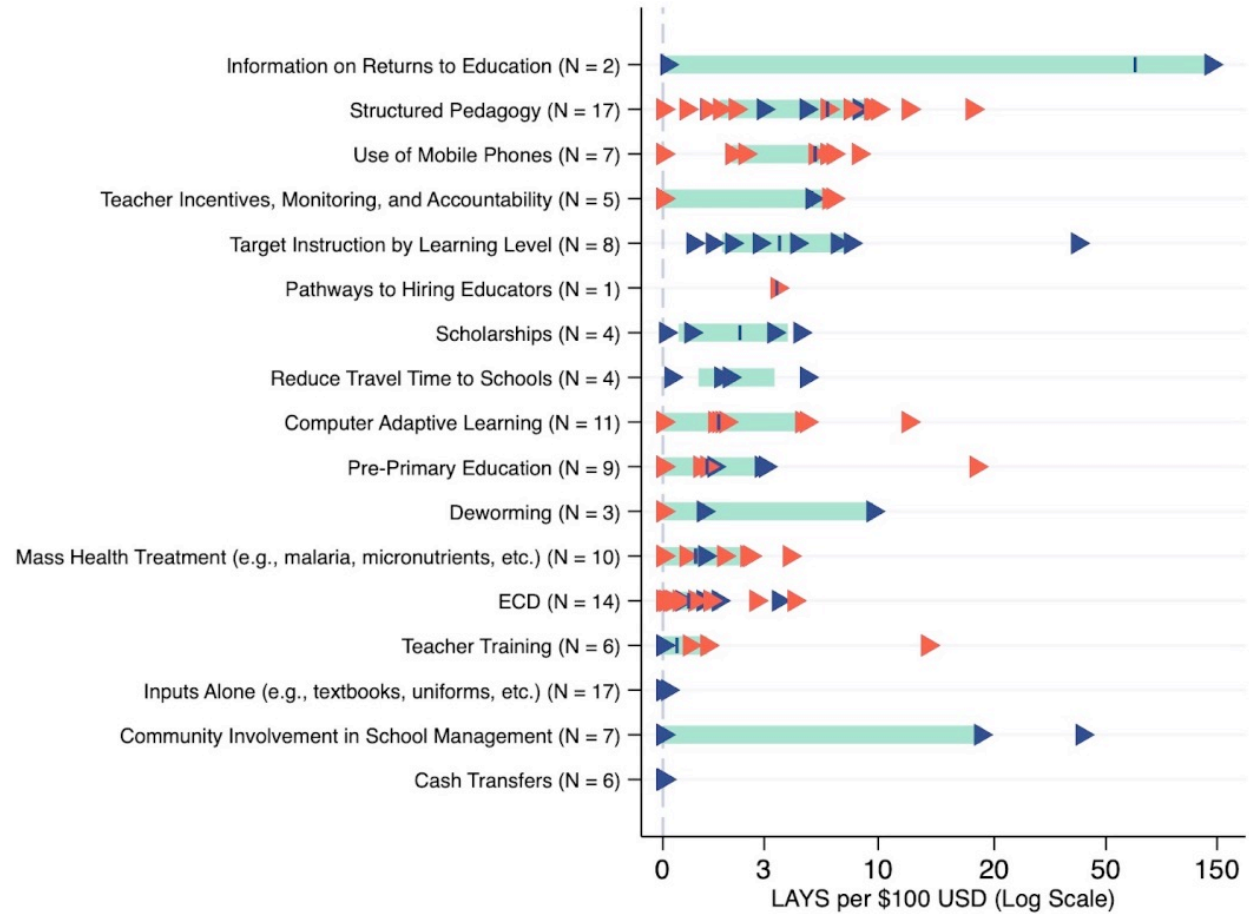
Source: Bold et al 2017

EDUCATION PRODUCTION

- With the basic EPF we might be tempted to think that we can focus on policies that increase input levels to improve learning outcomes.
 - Textbooks, traditional teacher training, computers, cash grants etc.
 - Visible inputs are popular with politicians (e.g., yesterdays policy discussion)
 - Evidence suggests otherwise

EXPERIMENTAL EVIDENCE ON EDUCATION INTERVENTIONS

Learning Adjusted Years of
Schooling per US\$100 by
intervention type

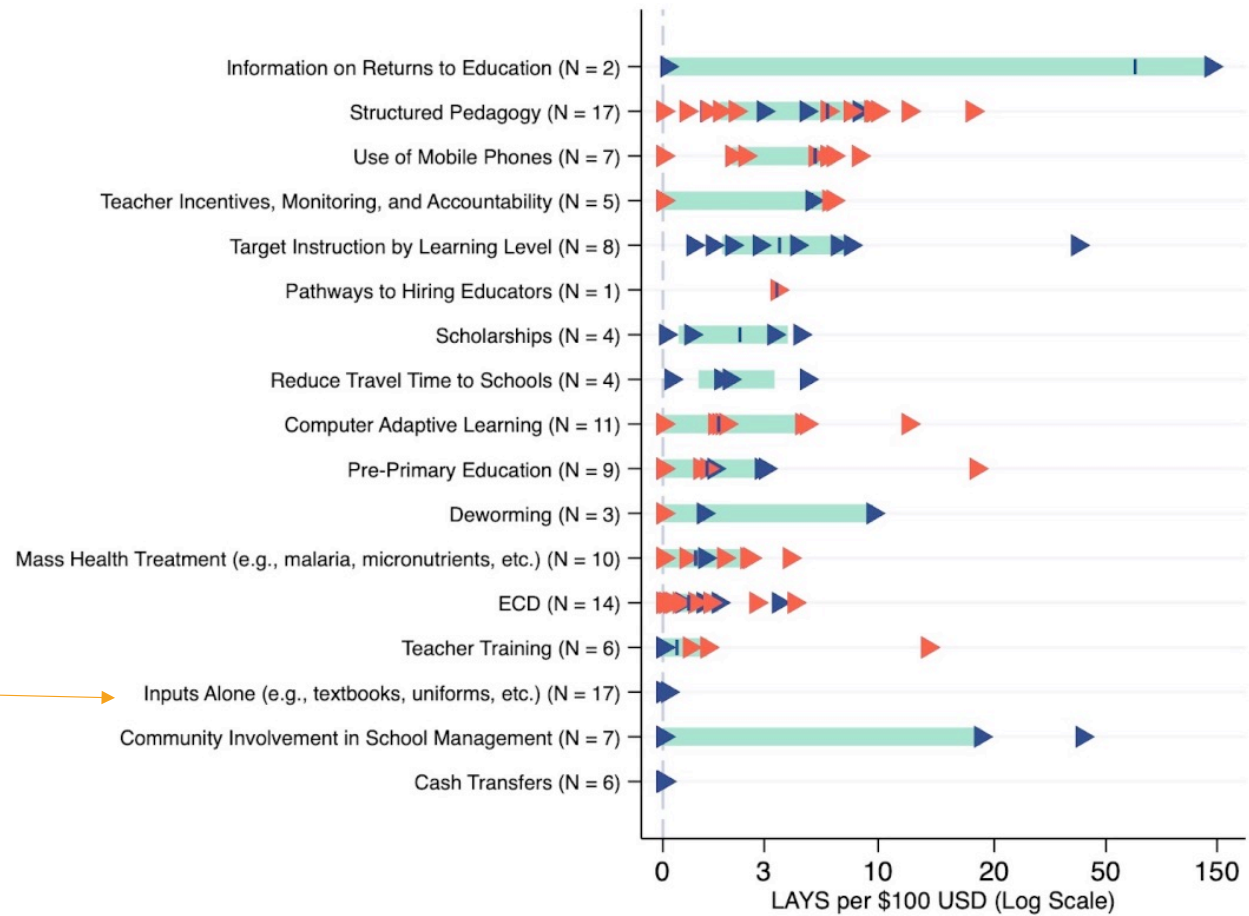


Source: World Bank, 2023

EXPERIMENTAL EVIDENCE ON EDUCATION INTERVENTIONS

Learning Adjusted Years of Schooling per US\$100 by intervention type

- Inputs alone are not effective
- The most promising interventions change what happens in the classroom



Source: World Bank, 2023

EXPERIMENTAL EVIDENCE ON SCHOOL INPUTS EXAMPLES

- Providing Textbooks has little impact on learning
 - Sabarwal, Evans, and Marshak (2014)– textbooks often locked up in storage for “safe-keeping” in Sierra Leone
 - Glewwe, Kremer, Moulin (2009)– textbooks only helpful among the best-performing students in Kenya
- Providing computers (without adequate class integration) has little impact on learning
 - Barerra- Osorio and Linden (2009) in Colombia And Cristia, Ibarrara, Cueto, Santiago, Severin (2017) in rural Peru

School monetary grants (on their own) have little impact on learning

- Das, Dercon, Habyarimana, Krishnan, Muralidharan, Sundararaman (2013) in India and Zambia.
- Mbiti, Muralidharan, Romero, Schipper, Manda, Rajani (2019) in Tanzania
- Anticipated (by parents) grants can crowd-out expenditures on a child’s education.
 - Termed a “behavioral effect”

WHY DO INPUTS (ALONE) FAIL TO RAISE LEARNING?

- Are we focused on the input that is the binding constraint?
- Some constraints might be very difficult to alleviate e.g. teacher content knowledge
 - Might not have the right tools to address the constraint (for a given budget)
- “Behavioral effects” may offset potential improvements
 - Das et al (2013) and Mbiti et al (2019)
- More than one input is binding and there are potential complementarities in inputs.
 - Mbiti et al (2019), Lucas et al (2019)

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CASE STUDY--SCHOOL RESOURCES

Mbiti et al 2019– in one treatment arm, schools receive (per capita) school grants

- At the time school grant policy was TZS 10,000 per pupil per year
- Schools had autonomy on how they could spend money (with some guidelines)
 - Couldn't pay teachers, couldn't use funds for new construction
- Funds from central govt transferred to schools via multiple steps. Resulted in “37% leakage rate” (World Bank 2012)
- Disbursement schedule was not predictable
- The treatment gave schools full amount of CG for two years.
- Large increase in resources: 3x mean (pre-treatment) school expenditure (excluding teacher salaries)

CASE STUDY-- SCHOOL RESOURCES

How much are schools and households spending per pupil?

	(1) Grant exp.	(2) Other school exp.	(3) Total school [(1)+(2)]	(4) Household exp.	(5) Total exp. [(3)+(4)]
Panel A: Year 1					
Grants	8,070.68*** (314.09)	-2,407.92*** (813.88)	5,662.75*** (848.58)	-1,014.96 (1,579.79)	4,647.79*** (1,724.64)
N. of obs.	350	350	350	350	350
Mean control	0.00	5,959.67	5,959.67	28,821.01	34,780.68
Panel B: Year 2					
Grants	6,033.08*** (336.95)	-2,317.74** (1,096.16)	3,715.34*** (1,122.60)	-2,164.18* (1,201.53)	1,585.75 (1,548.42)
N. of obs.	349	349	349	350	349
Mean control	0.00	4,524.03	4,524.03	27,362.34	31,886.37
Panel C: Year 1 + Year 2					
Grants	7,059.29*** (230.64)	-2,367.94*** (688.89)	4,688.04*** (724.91)	-1,589.57 (1,053.64)	3,133.33** (1,241.09)
N. of obs.	699	699	699	700	699
Mean control	0.00	5,241.85	5,241.85	28,091.68	33,333.53

CASE STUDY– SCHOOL RESOURCES

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Mean control	0.00	5,241.85	5,241.85	28,091.68	33,333.53

Yr 1 is unanticipated so no HH response

Yr 2 is expected so HH cut back on spending

Despite this still a large increase in resources

CASE STUDY– SCHOOL RESOURCES

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N. of obs.	699	699	699	700	699
Mean control	0.00	5,241.85	5,241.85	28,091.68	33,333.53

Same
“behavioral
effect” is
documented
in Das et. al
(2013)

SCHOOL RESOURCES

Do Grants Increase Test scores?

	(1)	(2)	(3)	(4)
Panel A: Year 1				
	Math	Swahili	English	Combined (PCA)
Inputs	-0.05 (0.04)	-0.01 (0.04)	-0.02 (0.04)	-0.03 (0.03)
N. of obs.	9,142	9,142	9,142	9,142
Panel B: Year 2				
	Math	Swahili	English	Combined (PCA)
Inputs	0.01 (0.05)	-0.00 (0.05)	0.02 (0.05)	0.01 (0.05)
N. of obs.	9,439	9,439	9,439	9,439

Inputs = grants treatment

Can rule out effects > 0.1 ISD in yr 2

TEACHERS INCENTIVES

- Education systems in LMIC face challenges related to teacher effort (measured by absence) and teacher capacity (content knowledge, pedagogical practices) (Bold et. al, 2019)
- Increasing teacher effectiveness is an important policy challenge
- Teacher effectiveness has important fiscal implications
 - Teacher remuneration accounts for 60% of budget and 3% of GDP (Crawford and Pugatch, 2020)
 - The average teacher in a sub-Saharan African country earns almost four times GDP per capita, compared to OECD teachers who earn 1.3 times GDP per capita (OECD, 2017; World Bank, 2017).
- Teacher (monetary) incentives have been tested in many contexts to address motivation
- Strengthens links between student outcomes and teacher remuneration.
- Potentially adds some level of accountability

TEACHERS INCENTIVES

- Overall, the evidence suggests that performance pay programs can improve learning outcomes, if they are well designed (Imberman, 2015).
- Average effect size for teacher performance pay programs was about 0.1SD (McEwan 2015), with larger effect sizes in settings where other accountability mechanisms were weak (Bruns and Luque, 2015 and Ganimian and Murnane, 2016).
- Incentive programs are more effective when:
 - Individual rather than group incentives (Muralidharan and Sundararaman, 2011)
 - Paired with complimentary inputs (Mbiti et al, 2019 and Lucas et al ,2019)
 - Encourage teachers to focus on broad range of students (Neal, 2011, Lucas et al, 2019, Mbiti et al, 2023)
- At scale, incentives can alter the composition of those that enter teaching profession (Leaver et. al 2021; Brown and Andrabi, 2021)

TEACHERS

- Teacher pedagogy and content knowledge are important inputs
- Content knowledge is associated with student learning
 - Metzler and Woessmann (2012), Bietenbeck, Piopiunik and Wiederhold (2017)
- How can we improve teacher effectiveness given these constraints?
- Structured pedagogy is a promising approach to address this

STRUCTURED PEDAGOGY

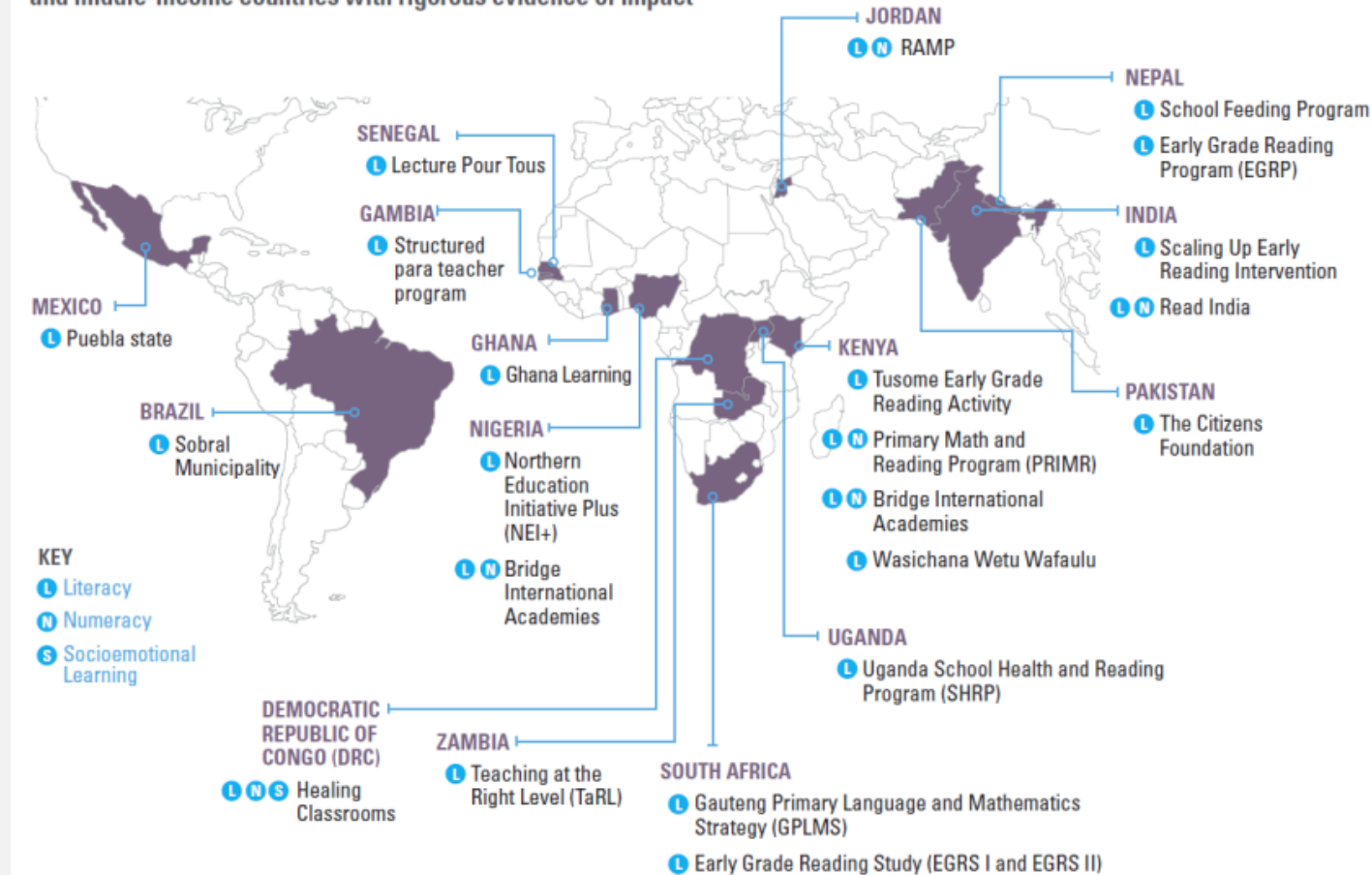
- Various definitions/versions of this.
 - Combination of detailed teacher guides and instructional materials, student textbooks, teacher support (coaching) and mentorship.
 - Teacher guides range from completely scripted to brief list of activities per lesson

FIGURE 6. Continuum of teacher autonomy



STRUCTURED PEDAGOGY

FIGURE 4. Recent, large-scale, structured pedagogy programs in low and middle-income countries with rigorous evidence of impact

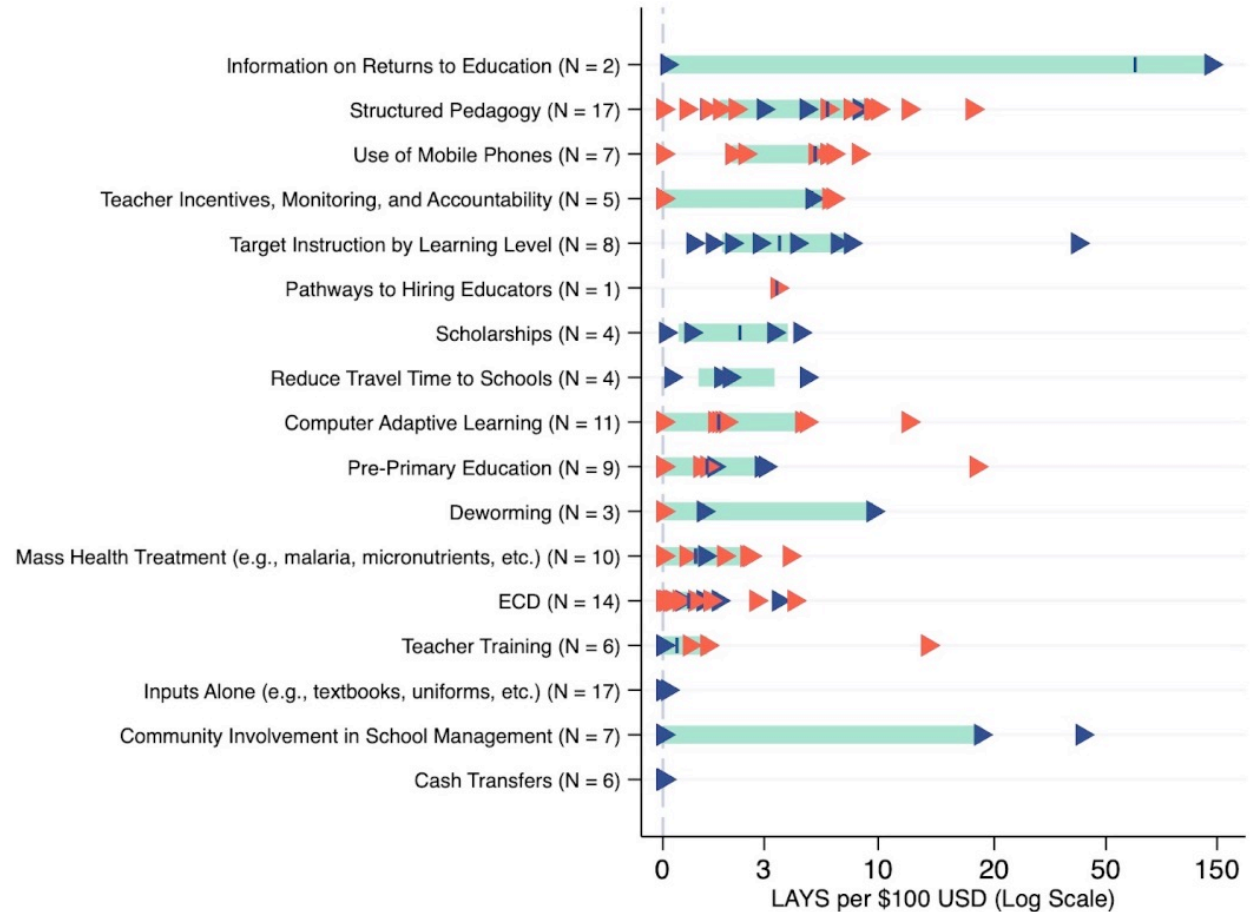


Piper et al. 2020

EXPERIMENTAL EVIDENCE ON EDUCATION INTERVENTIONS

Learning Adjusted Years of
Schooling per US\$100 by
intervention type

Structured pedagogy
categorized as a “best
buy” in global
education (World
Bank, 2023)



Source: World Bank, 2023

STRUCTURED PEDAGOGY

- Reduces teacher costs of coherent lesson planning, course planning over the year
 - Very important in the context of curriculum/ pedagogical reforms
 - Also allows across subject and grade to grade coherence
- Provides a quality floor on teaching
- More detailed scripts can mitigate concerns about teacher pedagogical skill and content knowledge
 - Can be used with untrained teachers (e.g. Eble et al 2021a and Gray-Lobe et al 2022)
 - Allows provision of education in hard to staff areas (e.g. Eble et al, 2021b in Guinea Bissau)

STRUCTURED PEDAGOGY

- Concerns about deprofessionalizing the profession or removing teacher autonomy, especially with fully scripted guides
- Large investments required to develop high quality materials that are aligned and coherent
- How scripted should the guides be?
 - Piper et al (2018) suggest “moderately scripted”
 - Evidence from Gray-Lobe et al (2022) and Eble et al (2021) that fully scripted models can have very large impacts
- Do these approaches work in higher grades?
 - Suggestive evidence from Gray-Lobe et al (2022) that they are more effective in lower grades, although still very effective at higher grades

CASE STUDY– BRIDGE INTERNATIONAL ACADEMIES IN KENYA

Gray-Lobe et al, 2022

- Standardizes pre-primary and primary grade instruction through very detailed lesson plans delivered through tablet computers
- Uses complementary standardized procedures for a range of activities such as teacher monitoring and feedback, financial management, and school construction
- Hires less educated and experienced teachers, pays much lower wages
 - Bridge has high fixed costs and low variable costs → must operate at scale
- Operated over 400 schools serving more than 100,000 pupils in Kenya at the time of the study
- Controversies over child safety, management practices

CASE STUDY– BRIDGE INTERNATIONAL ACADEMIES IN KENYA

Sample lesson guide

Sound Combinations – 5 Minutes

1. Copy as I write.

2. Write on board:

aim
rain
stain
paint
sprain

3. Eyes on me. Scan

4. The letters A - I go together and usually make the sound AY, as in AIM.

5. Say AY. [Signal] AY

6. You will read the words that have letters A-I.

7. Say the sound for the underlined part, then read the word.

8. Touch word 1. What sound? [Signal] AY

9. What word? [Signal] Aim

10. Next word. What sound? [Signal] Ay

11. What word? [Signal] Rain

12. Repeat last 2 lines for each word.

13. Copy as I write.

14. Add to board:

aimless
grain
faint
plains
raining

15. Touch word 1. What word? [Signal] Aimless

16. Touch word 2. What word? [Signal] Grain

17. Repeat last line for each word.

Build Ups – 5 Minutes

18. Clean board and write:

lain

19. Eyes on me. Scan.

20. What word? [Signal] Lain

21. Change word:

plain

22. What word now? [Signal] Plain

23. Change word:

plains

24. What word now? [Signal] Plains

CASE STUDY– BRIDGE INTERNATIONAL ACADEMIES IN KENYA STANDARDIZED MONITORING

LONG TEACHER OBSERVATION: BIG FOUR OBSERVATION

Purpose: Increase pupil performance, by increasing teacher performance.

- This observation evaluates teachers on the Big Four teaching techniques, which were born from in depth research of Bridge's highest performing teachers.
- This observation also evaluates teachers on techniques they learned from training. The Big Four serves as the core

[...] Then, use the rubric on the Manual to give the teacher a score (from 1-10) on each of the Big Four goals. At the end of the observation, write a summary score, and note 1 praise and 1 improvement for the teacher. Possible praises and possible improvements have been provided for you in the Manual.

How does it work?

- Prepare:** Prepare for the observation by selecting a class to observe. Open the teacher guide for that lesson on your teacher computer. NOTE: You must have the teacher guide to do the observation.
- Observe:** Arrive at the classroom at the beginning of the lesson with your teacher computer. First check whether the Prep/Reflection books are filled out. Then using the form, check for the basics: a) is the teacher actively leading the class? b) Is the teacher teaching the right lesson? c) Do all pupils have materials needed to learn for this lesson?

Then, use the rubric in the Manual to give the teacher a score (from 1-10) on each of the Big Four goals. At the end

[...] Depending on the teacher's improvement, tell the teacher a) "Good job, you implemented the feedback!", or b) "Good effort, let's continue to work on this area of improvement" or c) "I did not see you try to implement the feedback"

- Give follow-up feedback:** Immediately after you have finished the follow-up observation, give follow-up feedback. Depending on the teacher's improvement, tell the teacher a) "Good job, you implemented the feedback!", or b) "Good effort, let's continue to work on this area of improvement", or c) "I did not see you try to implement the feedback."

- Enter scores:** Enter observation results into a survey on SurveytoGo via your smartphone, called "KE Academics Long Teacher Observations 2017"

School Head

- Short Teacher Observation twice a day
- Long observation with detailed guidelines on feedback

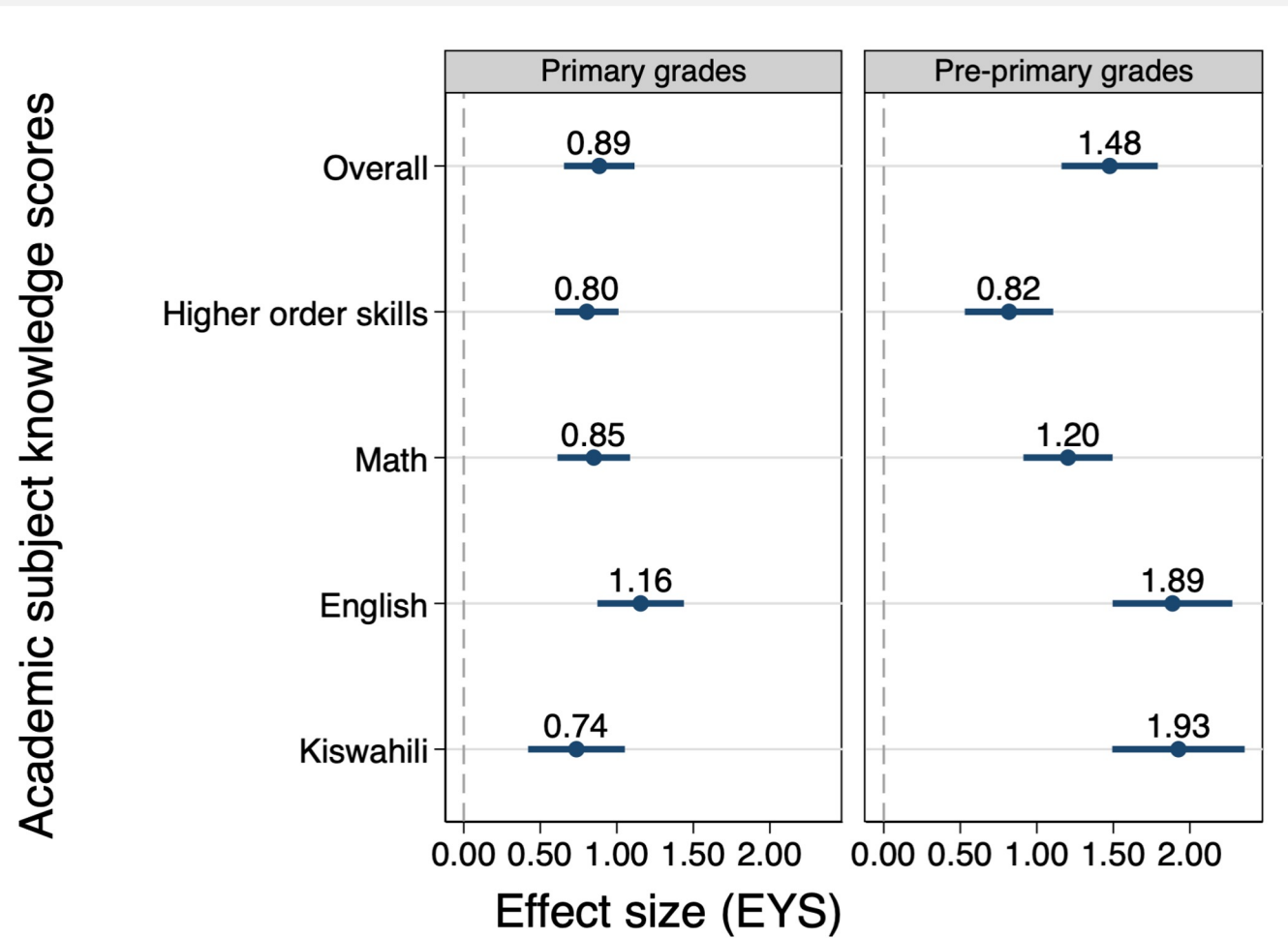
Electronic

- Electronic sign-in/sign-out to monitor teacher attendance
- Monitoring of progress through lesson plans on tablets

Fidelity

- In a survey by Education International, 33 percent of teachers report only adhering to scripts "from time to time"

EFFECTS ON TEST SCORES - EQUIVALENT YEARS OF SCHOOLING



BRIDGE

- Bridge schools provide a bundle- scripts, monitoring, technology (among other things)
- How to “scale-up” this bundle?
- One approach is to adopt some of these practices in public schools
 - Not all can be adopted e.g. hard to scale up using untrained teachers.
- Removing potentially complementary inputs can reduce effectiveness of bundled interventions (Kerwin and Thornton, 2021).
- Scaling/implementing with government can be tricky (Bold et al, 2018)
- Private-Public partnerships with providers such as Bridge can be difficult (Romero, Sanderfur, Sandholtz, 2020)
- Open area of research– what parts of the Bridge bundle can be successfully transplanted in public schools?
 - Does giving Bridge learning materials to public schools work? (e.g., Nigeria and Rwanda)

OPEN QUESTIONS

- **Measurement:**
 - Harmonizing research assessments to enable comparisons across studies
 - Measuring other dimensions of learning and non-cognitive skills
- Implications of the growing private sector
 - Research on education markets by Das, Khwaja and coauthors.
- How to provide quality and affordable early childhood education
- Novel interventions to improve teacher effectiveness (eg Nourani et al, 2023)
- How to improve learning in higher grades (including vocational training)
 - Most research focuses on lower grades
- Addressing the plethora of gender issues across the education system
- Interaction between environment, health, and education
 - e.g. elevated lead levels in children, physical, and mental health