

Lecture notes on education

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Topics

- Big picture on education: myths and facts
- Returns to education
 - Econometric issues
 - Evidence: School building in Indonesia
- School quality
- Cameras in India

Big picture claims: Access

- Oxfam UK: 1 in 4 adults in developing world is illiterate (872 million people)
- 100 million + children not in school (UNFPA)
- 46% of girls in the world's poorest countries have no access to primary education (ActionAid)

- Even if these numbers don't perfectly add up with each other, the problem of access is large.

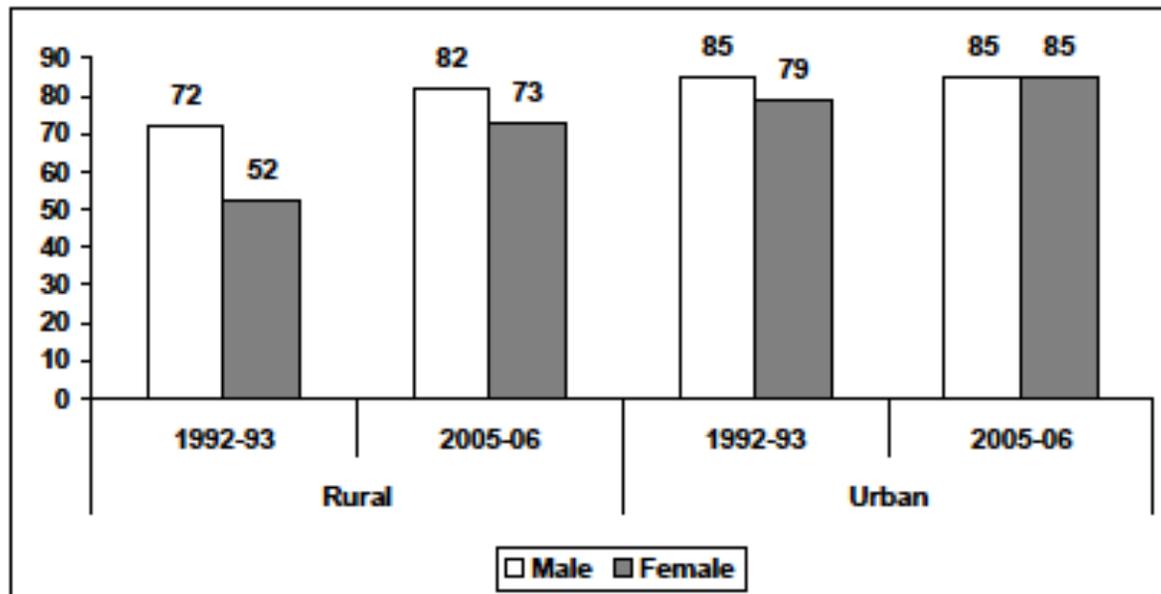
Big picture claims: Impacts and costs

- Young people who have completed primary education are less than half as likely to contract HIV as those missing an education.
 - A silver bullet? A selection problem?
- Education reduces fertility, reduces crime, increases civic engagement...
- Universal primary education would cost \$10 billion per year – half of what Americans spend on ice cream (ActionAid).
- MDG 2: Achieve universal primary education.

PROBE report

- **Public Report on Basic Education for India** (Oxford, 1999)
- **Sept-Dec 1996.**
 - 1376 households in 234 villages in Bihar, Madhya Pradesh, Rajasthan, Uttar Pradesh, Himachel Pradesh.
 - Randomized survey design.
- **Finding:** About 70% of children aged 6-14 enrolled in school.

PROBE report update



Myth: Parents not interested in education

- 98% of parents said it's important for boys to be educated
- 89% of parents said it's important for girls to be educated

Myth: Child labor is biggest block to enrollment

- What did children do on the day before survey?
 - 22% of out of school boys (20% of girls) worked more than 8 hours.
 - 1% of boys and 5% of girls performed wage labor.

Table 4.3 Changing aspirations for girls, 1996-2006

Proportion (%) of parents who wanted their daughters to study up to:	1996	2006
Grade 5 or less	19	6
Grade 8	18	14
Grade 10	20	14
Grade 12 or more	15	14
As long as the child is capable	28	42
As far as possible		10
	100	100

Myth: School is free

- Elementary education:
 - Average cost of sending child to school = 318 rupees (\$6.38, 4/09).

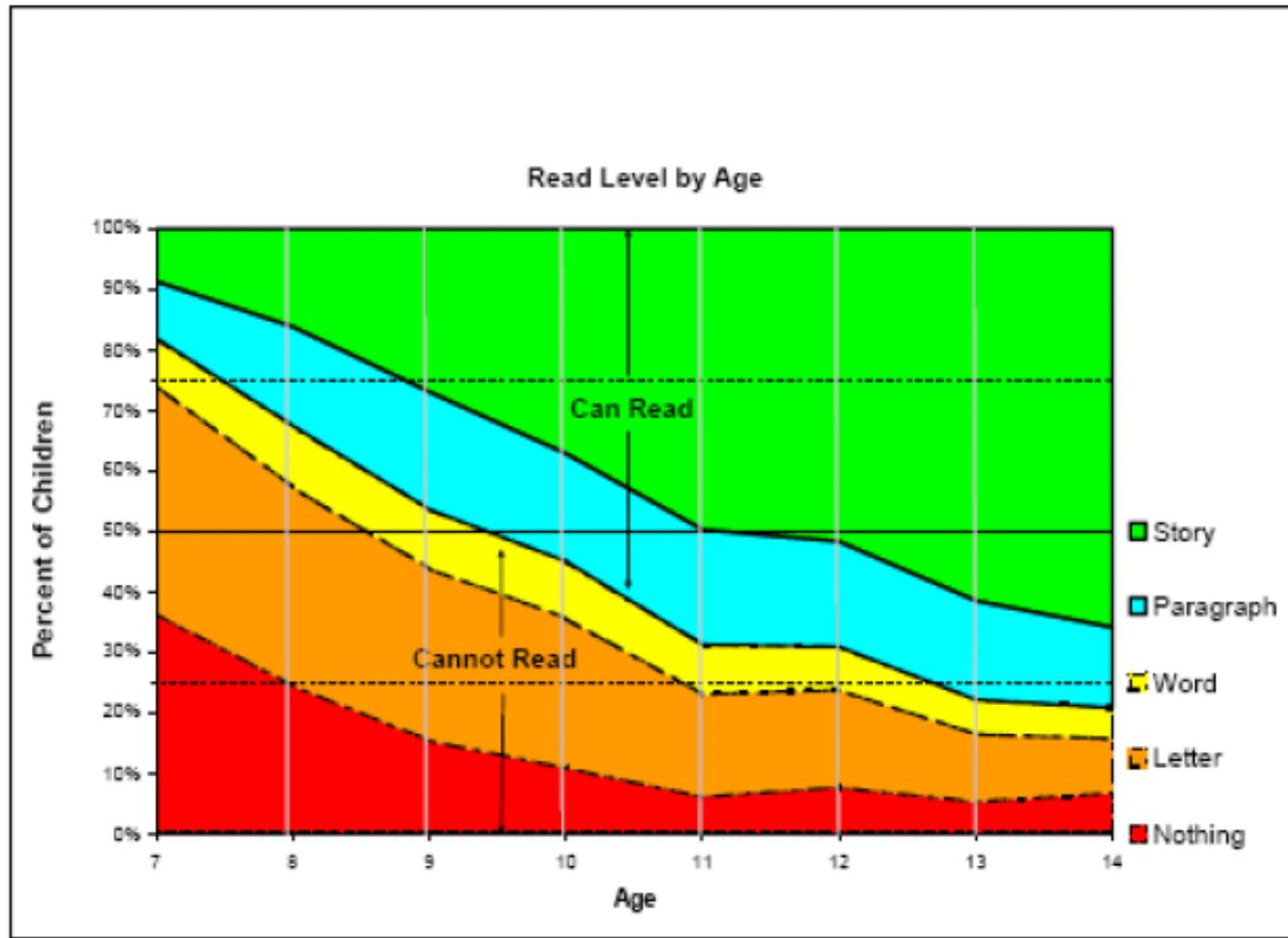
Myth: Need to build more schools

- Yes, but not just that:
 - 26% of schools had no blackboard
 - 67% of schools had no teaching kits
 - 59% of schools lacked adequate drinking water

- Absenteeism:
 - Teachers absent 33% of time
 - Teachers engaged in teaching activities 25% of time
 - Teachers engaged in other activities 42% of time.

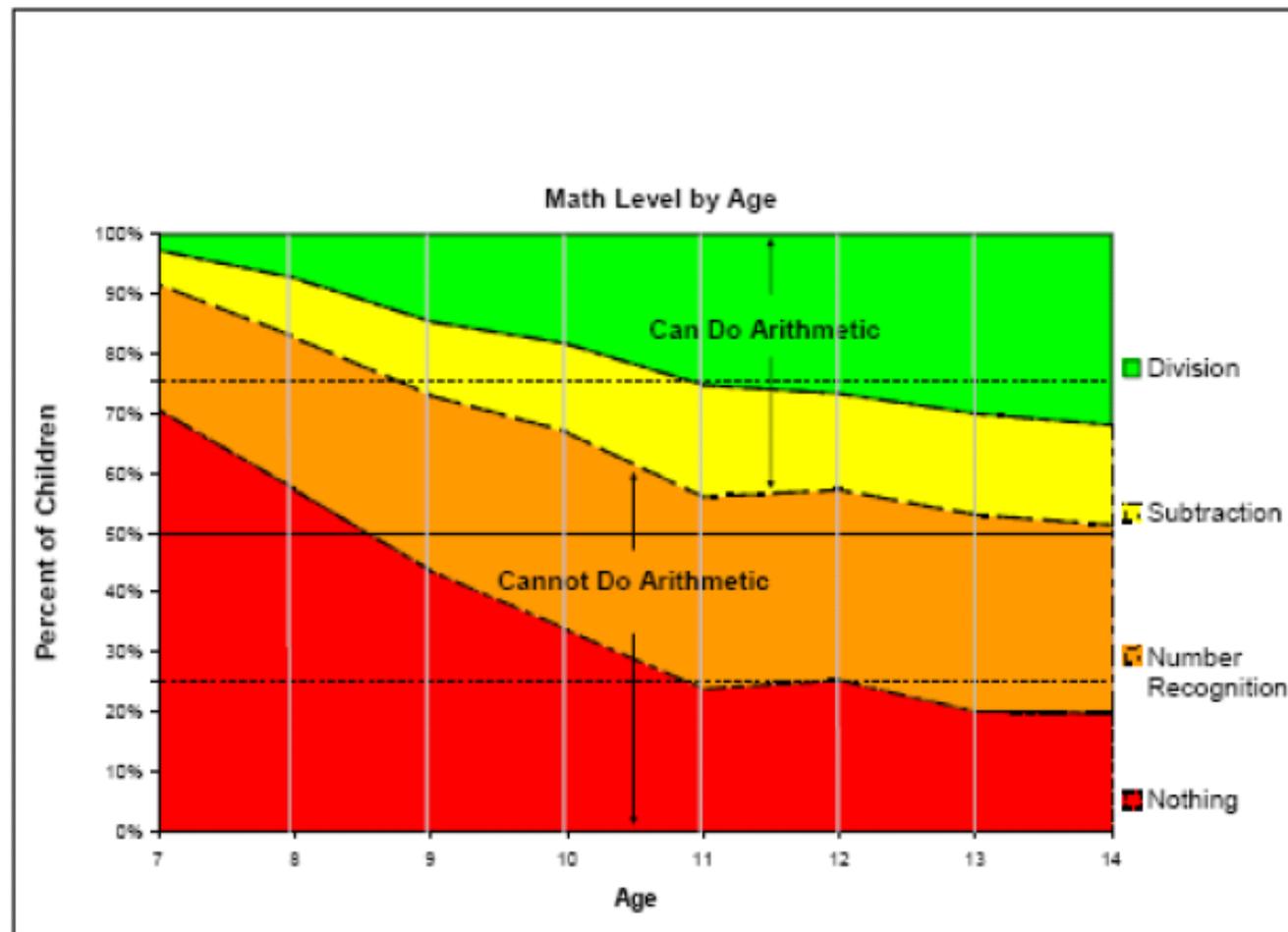
India study: Reading performance

Figure 1



India study: Math performance

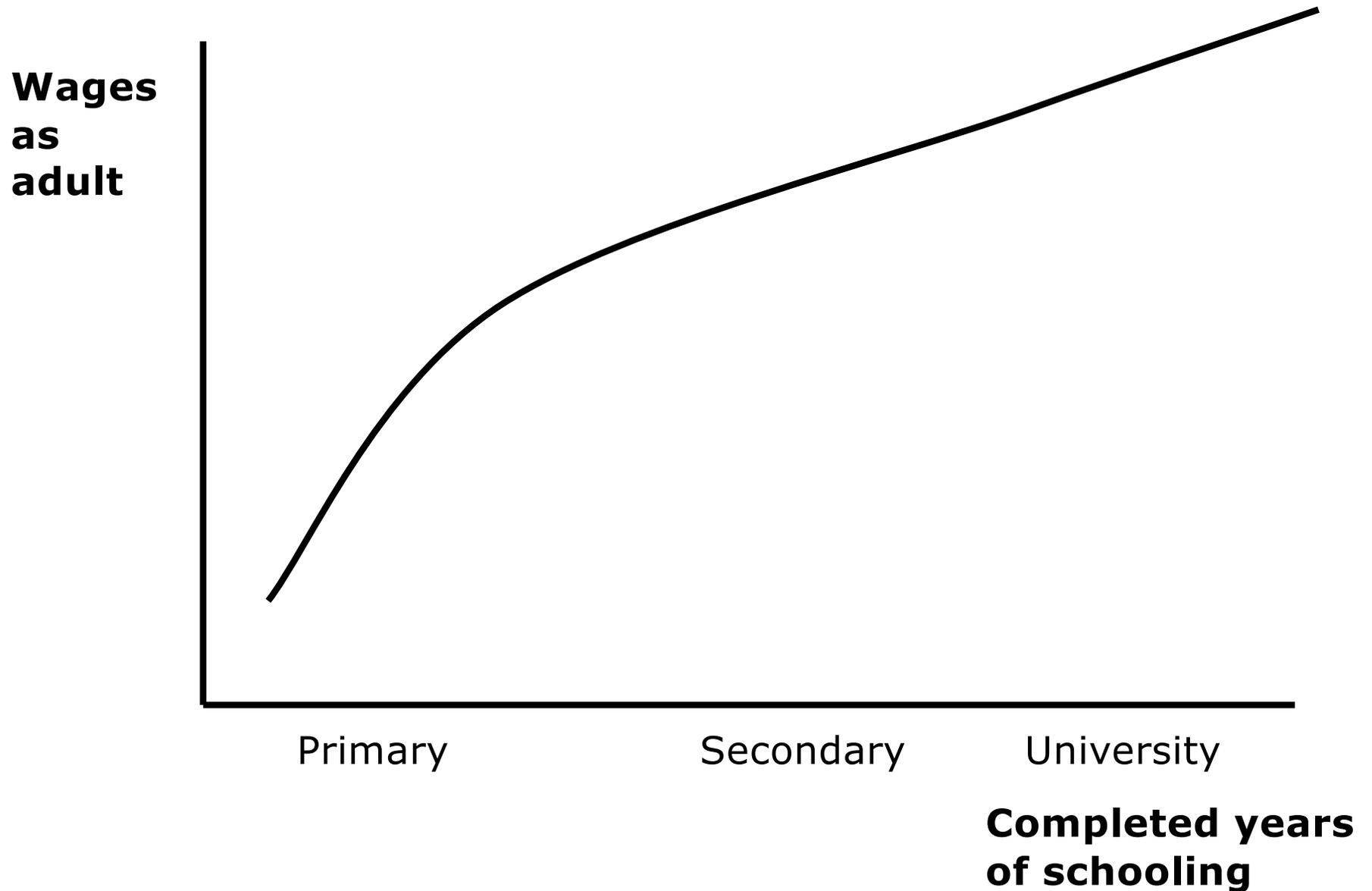
Figure 3



Education as an investment

- It has benefits and costs as does any other investment
- Differences in benefits and costs of education may explain why there are enormous differences in educational outcomes across:
 - The World
 - Across regions in the same country
 - By gender/race/religion/etc.
 - By income levels
 - By urban/rural residence

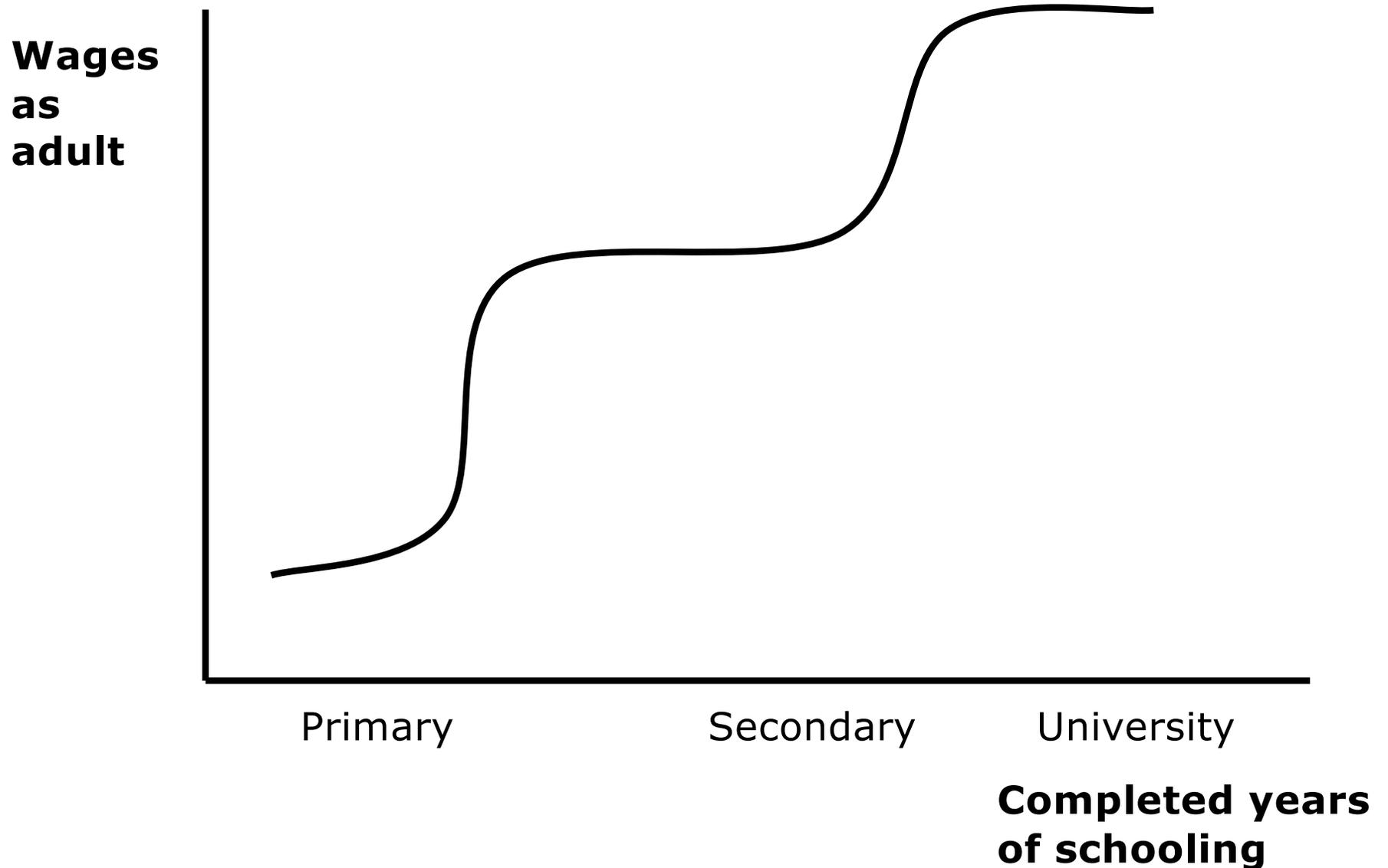
Returns to Schooling



Econometric issues: nonlinear returns

- Returns to schooling are viewed as nonlinear
 - Certain credentials matter
 - Fundamental nonlinearities

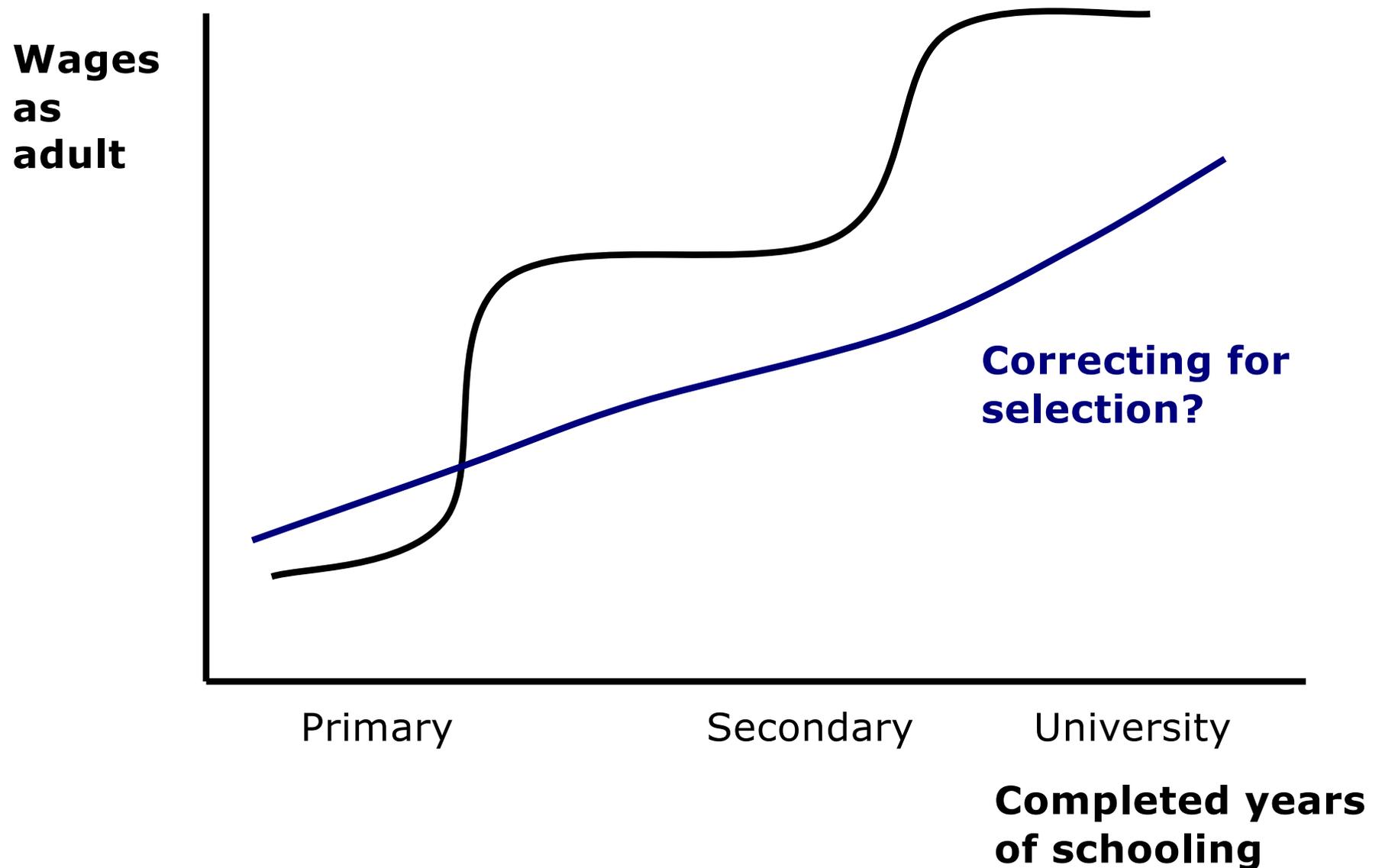
Returns to Schooling: credentials



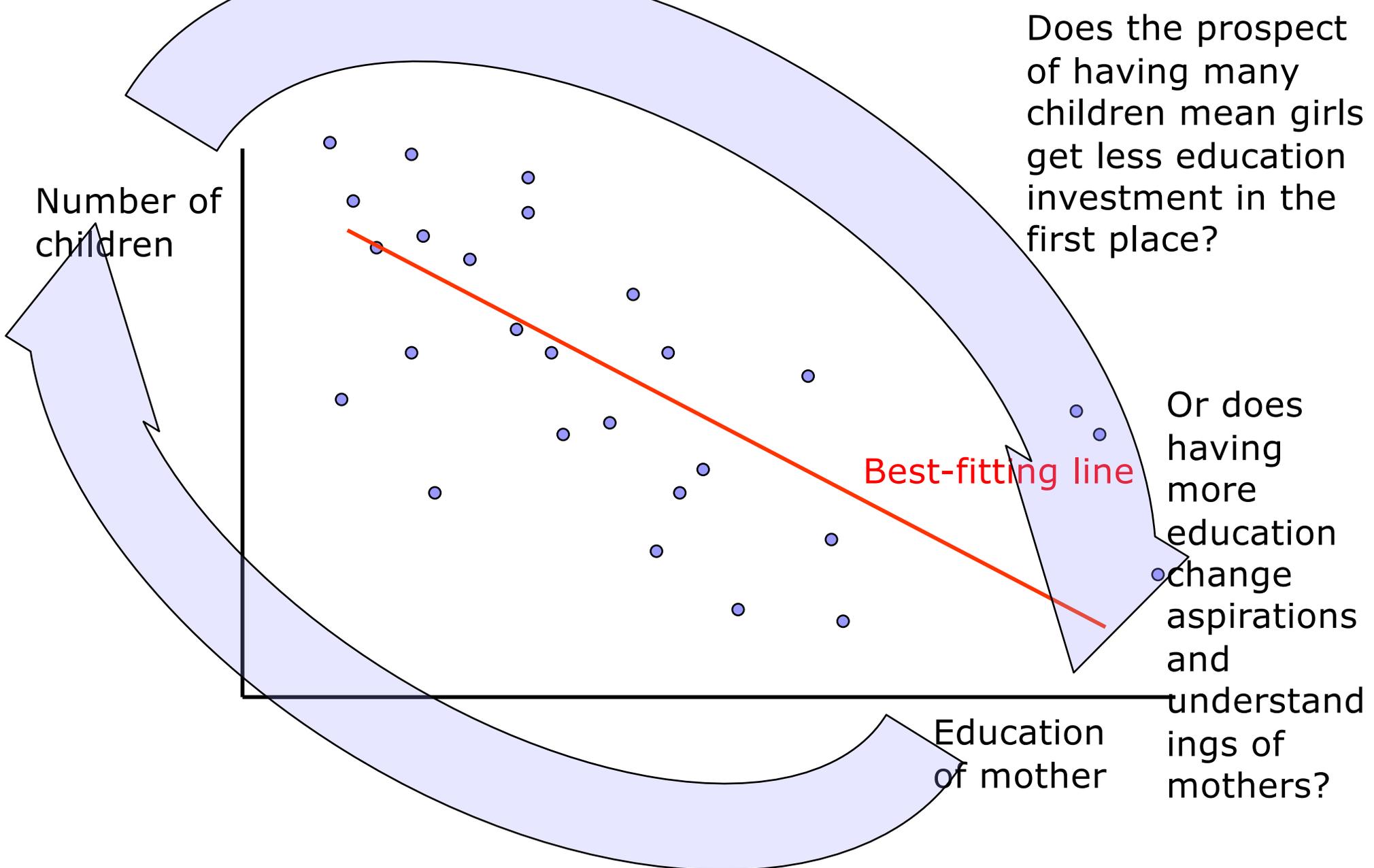
Econometric issues: selection

- Major selection problems: do those who get more education also have unobservably better attributes that raise wages?

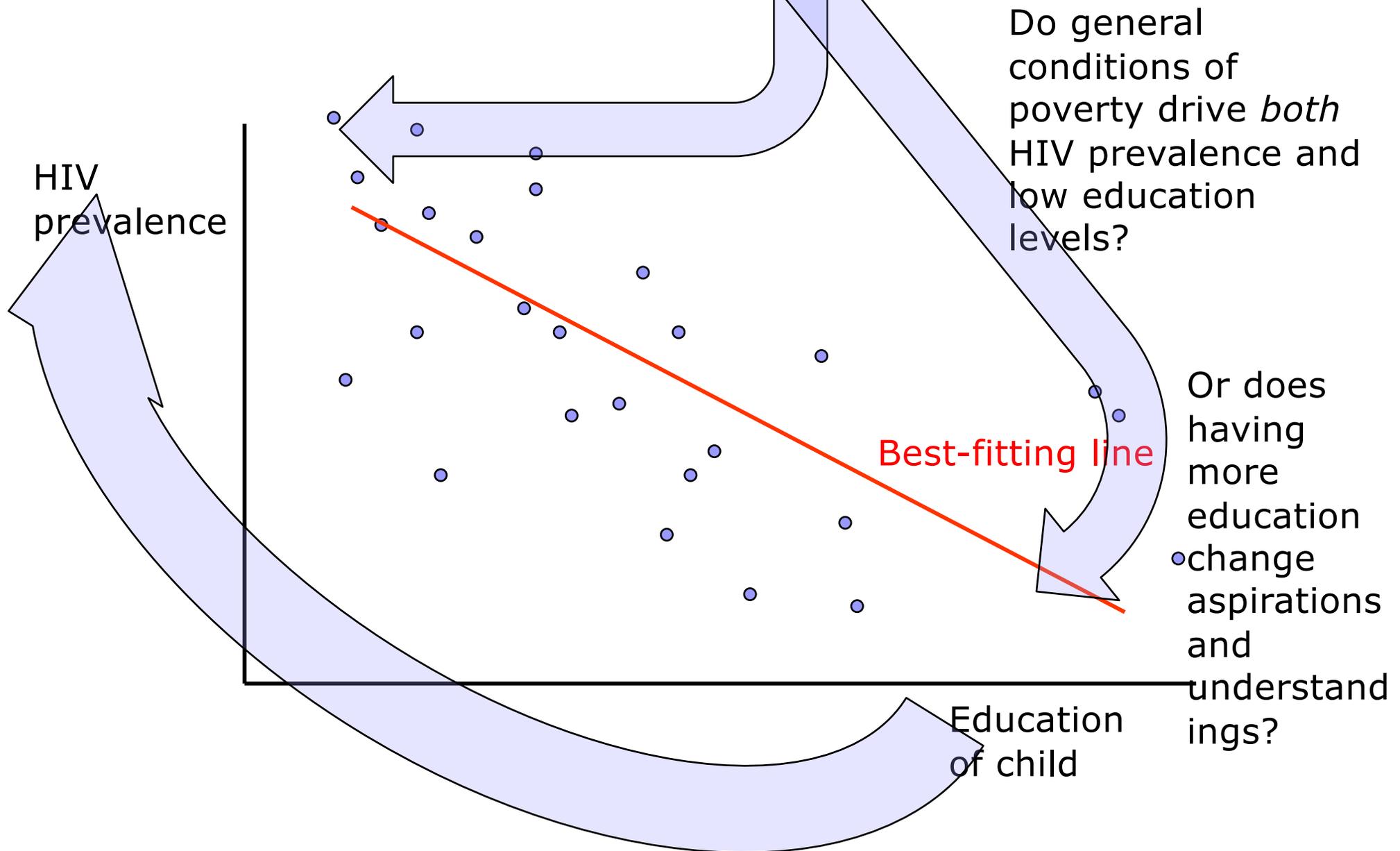
Returns to Schooling: causality



Causation and correlation: population example

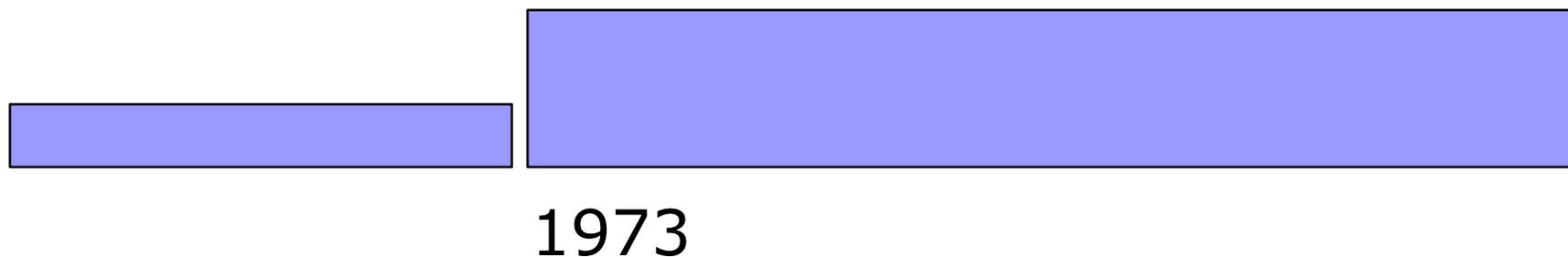


Causation and correlation: AIDS and education



Measuring the returns to education: Indonesia school construction

- Between 1973 & 1978, Indonesia constructed 61,000 primary schools
 - Did this program have an impact on educational attainment?
 - Did this program increase the future earnings of the children?



Difference in differences

	High regions (affected)	Low regions (unaffected)
Age 12-17	Control	Control
Age 2-6	Affected	Control

Change in schooling in high intensity regions
Minus
Change in schooling in low intensity regions
Equals
Effect of program

Program found to increase education by 0.12 to 0.19 years per new school built.

Duflo: differences-in-differences

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THE AMERICAN ECONOMIC REVIEW

SEPTEMBER 2001

TABLE 3—MEANS OF EDUCATION AND LOG(WAGE) BY COHORT AND LEVEL OF PROGRAM CELLS

	Years of education			Log(wages)		
	Level of program in region of birth			Level of program in region of birth		
	High (1)	Low (2)	Difference (3)	High (4)	Low (5)	Difference (6)
<i>Panel A: Experiment of Interest</i>						
Aged 2 to 6 in 1974	8.49 (0.043)	9.76 (0.037)	-1.27 (0.057)	6.61 (0.0078)	6.73 (0.0064)	-0.12 (0.010)
Aged 12 to 17 in 1974	8.02 (0.053)	9.40 (0.042)	-1.39 (0.067)	6.87 (0.0085)	7.02 (0.0069)	-0.15 (0.011)
Difference	0.47 (0.070)	0.36 (0.038)	0.12 (0.089)	-0.26 (0.011)	-0.29 (0.0096)	0.026 (0.015)
<i>Panel B: Control Experiment</i>						
Aged 12 to 17 in 1974	8.02 (0.053)	9.40 (0.042)	-1.39 (0.067)	6.87 (0.0085)	7.02 (0.0069)	-0.15 (0.011)
Aged 18 to 24 in 1974	7.70 (0.059)	9.12 (0.044)	-1.42 (0.072)	6.92 (0.0097)	7.08 (0.0076)	-0.16 (0.012)
Difference	0.32 (0.080)	0.28 (0.061)	0.034 (0.098)	0.056 (0.013)	0.063 (0.010)	0.0070 (0.016)

Notes: The sample is made of the individuals who earn a wage. Standard errors are in parentheses.

Duflo: Education outcomes

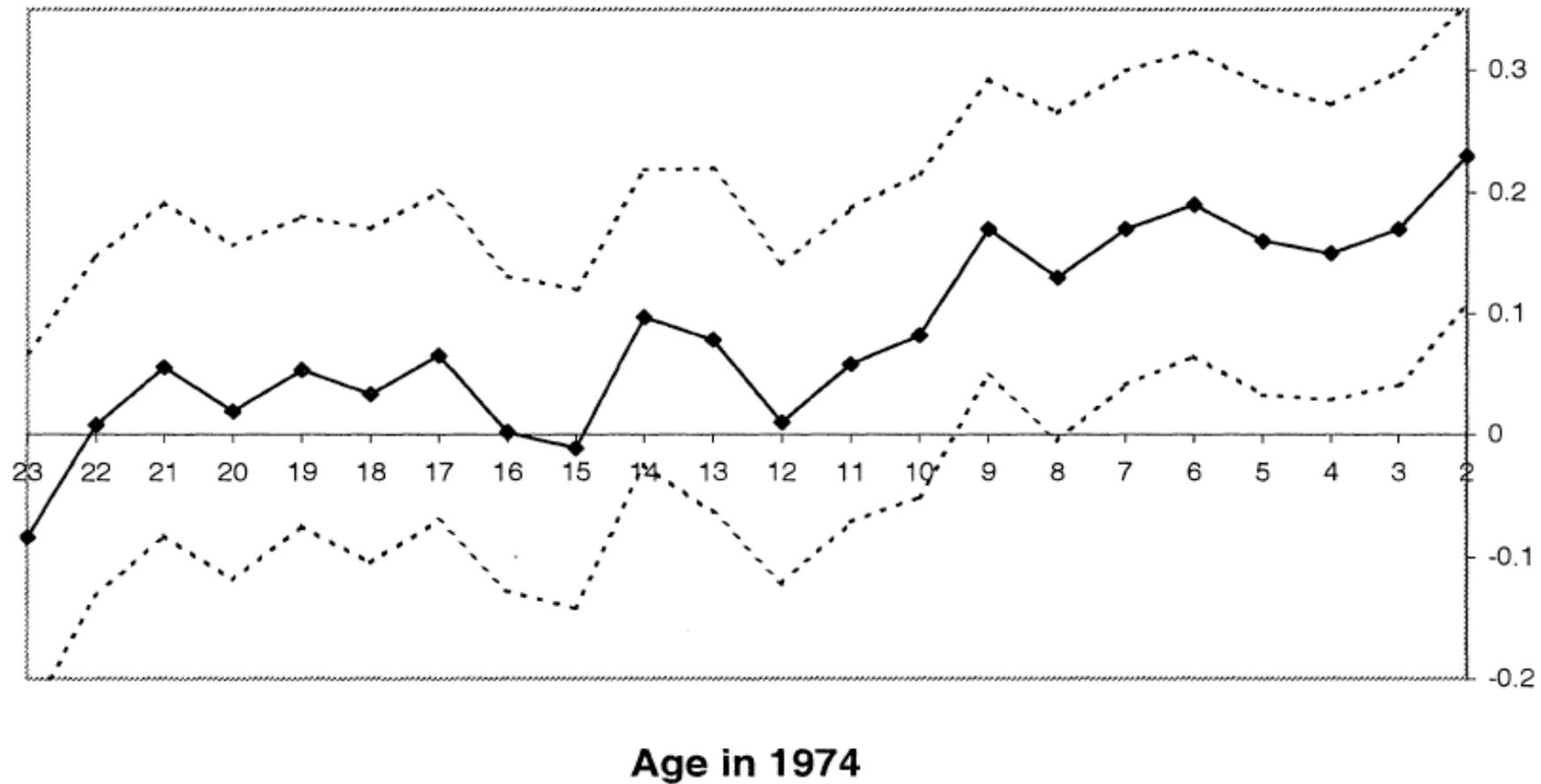


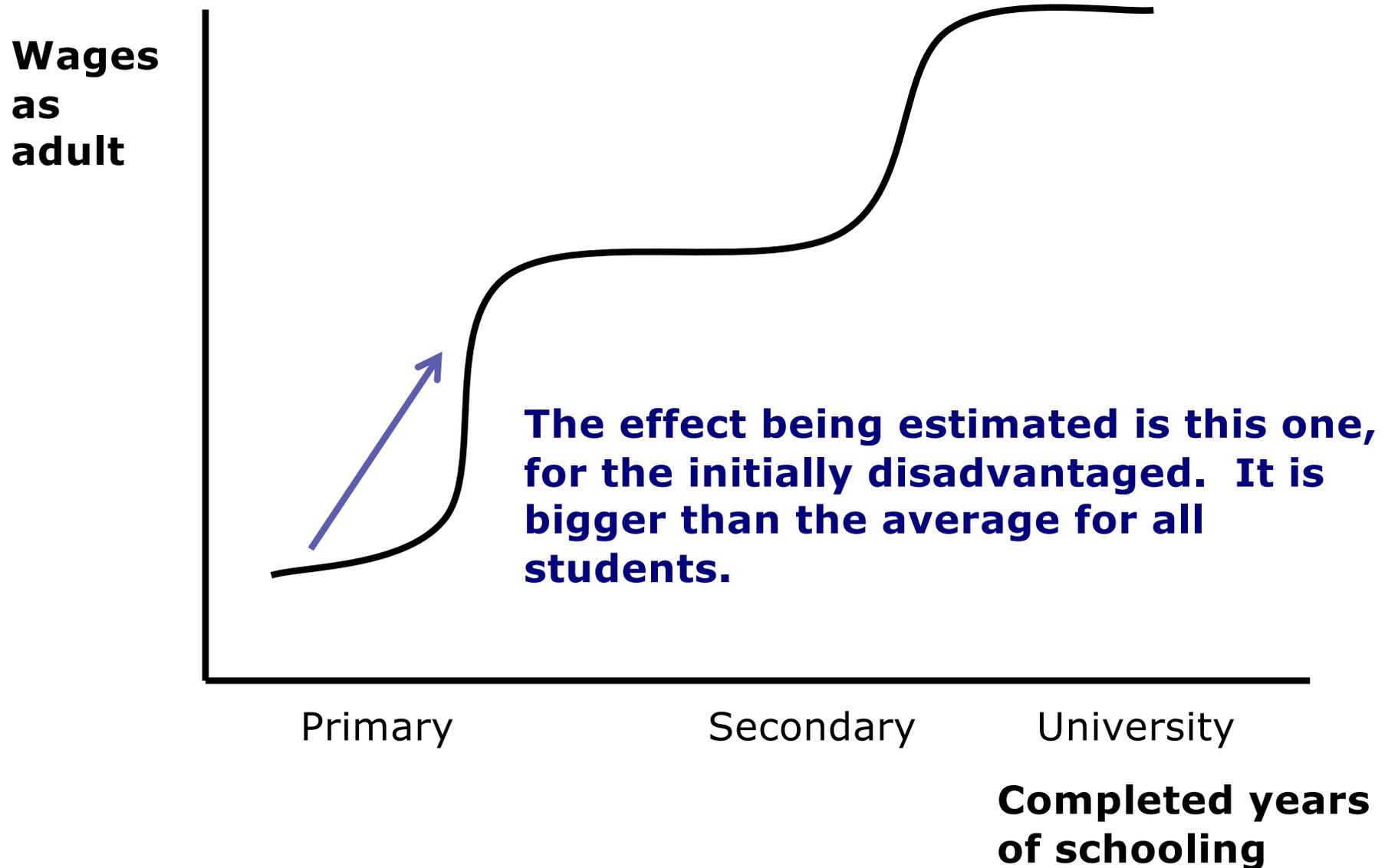
FIGURE 1. COEFFICIENTS OF THE INTERACTIONS AGE IN 1974* PROGRAM INTENSITY IN THE REGION OF BIRTH IN THE EDUCATION EQUATION

Duflo: Wage and education outcomes



FIGURE 3. COEFFICIENTS OF THE INTERACTIONS AGE IN 1974* PROGRAM INTENSITY IN THE REGION OF BIRTH IN THE WAGE AND EDUCATION EQUATIONS

Note that the “average effect” is a particular one, for a particular sample



Methodological issues

- **Assumptions:** Do we believe that the difference in education of the cohorts would have been the same in the absence of the program?
 - **Political Economy:** Maybe the government was also picking high predicted growth areas?
- **External validity:** Is this generalizable to other areas of the world?

School quality

- To reach MDG, there has been a rapid expansion in schooling
 - Tradeoff between quality and quantity
- For example: World Bank Case Study on Peru
 - Peru has made great strides in getting children into school in recent years—in fact, more children in Peru go to school than in many countries of similar income level, says Cotlear.
 - But the goal of greater access to education in the country was achieved, in part, “by lowering the standards, so that what you ended up with was very high levels of coverage, but very poor quality,” he says.

Absenteeism, textbooks

- Teacher attendance is low
 - World Bank survey: 14% in Ecuador; India varied by 15 percent in Maharashtra to 42 percent in Jharkhand; in Bangladesh, 25% of the teachers were absent for at least one of the two visits
- Teaching materials is lacking
 - Kenya: in grades three, four and five, one out of every six students has textbooks in the most important subjects (English and mathematics), while in grades six and seven, about one out of four students has textbooks in these subjects. Very few students have textbooks in other subjects.

What to do?

- How do we improve education?
- This is still an open-ended question with which many social scientists and policy practitioners struggle.
- Relates back to improving institutional quality in general.

School inputs: flip charts and textbooks

- Glewwe, Kremer, et al look at randomization evaluation of most basic educational input: flip charts.
- One of the first randomized evaluations in a developing country context.

Randomized design

Table 3: Sample size and summary statistics for the prospective analysis

Test	Grade	Students tested						Average test score (Percent correct on 4-choice test)			
		Received charts			Did not receive charts			Charts	No charts	Difference	Std. Dev.
		Both distr.	Busia	Teso	Both distr.	Busia	Teso				
Jul-97	8	1,848	1,263	585	1,861	1,357	504	45.5	46.0	-0.5	12.5
Nov-97	8	1,790	1,262	528	1,843	1,420	423	48.7	49.6	-0.9	13.3
Jul-98	8	1,211	1,211	0	1,343	1,343	0	42.7	42.9	-0.3	11.2
Oct-98	8	1,737	1,206	531	1,891	1,370	521	49.5	49.5	0.0	13.0
Jul-98	7	1,734	1,734	0	1,798	1,798	0	37.6	37.5	+0.1	11.3
Jul-98	6	1,664	1,664	0	1,726	1,726	0	37.3	36.9	+0.4	11.4

Results

■ An impressive set of zeros:

Table 4: Prospective estimates of effect of flip charts – single subject multi-test regressions
Dependent variable: normalized test score

Subject	Past perf. Controls	Flip-chart school		Obs.
		Coeff.	Std. Error	
Flip-chart subjects				
Science/Agriculture	No	0.0005	0.0752	20,446
	Yes	-0.0007	0.0591	
Math	No	-0.0201	0.0600	20,441
	Yes	-0.0212	0.0486	
Health Science/Business Ed. (HSBE)	No	-0.0295	0.0728	20,434
	Yes	-0.0276	0.0559	
Geography/History/Civics/Religious Ed. (GHC)	No	0.0018	0.0714	20,450
	Yes	-0.0012	0.0553	
Non-flip chart subjects				
English	No	0.0038	0.0737	20,433
	Yes	-0.0100	0.0576	
KiSwahili	No	0.0110	0.0790	20,448
	Yes	0.0146	0.0737	
Arts/Crafts/Music (ACM)	No	-0.0679	0.0758	20,417
	Yes	-0.0723	0.0589	
Memo:				
Math and Science; grades 6 and 7 in 1998 only	No	0.0508	0.0828	13,836
	Yes	0.0534	0.0655	

Second experiment

- The same authors then tried a randomized assignment of textbooks in Kenya.

Table 2: Availability of Textbooks per Pupil

<i>Program Year</i>	<i>Subject/Grade given textbooks?</i>	School-owned books		Privately-owned books		Total	
		<i>Textbook schools</i>	<i>Compar- ison schools^a</i>	<i>Textbook schools</i>	<i>Compar- ison schools</i>	<i>Textbook schools</i>	<i>Compar- ison schools</i>
1	Yes	0.65	0.04	0.10	0.18	0.75	0.22
	No	0.03	0.03	0.08	0.10	0.11	0.13
2	Yes	0.55	0.04	0.09	0.17	0.64	0.21
	No	0.04	0.03	0.08	0.08	0.12	0.12
3	Yes	0.52	0.11	0.09	0.14	0.61	0.25
	No	0.11	0.09	0.09	0.09	0.20	0.19
4	Yes	0.43	0.10	0.05	0.11	0.48	0.21
	No	0.10	0.08	0.05	0.06	0.17	0.14

Table 4: Impact of Textbook Program on Normalized Test Scores

Dependent Variable	Normalized test score ^{a b}	Normalized test score ^b	Normalized test score minus pretest score ^c	Normalized test score minus pretest score ^c
	(1)	(2)	(3)	(4)
Textbook school	0.023 (0.087)	0.020 (0.104)	0.018 (0.053)	-0.046 (0.071)
Received a textbook				
Region and sex dummies	YES	YES	YES	YES
Years exposed to textbooks	1	2	1	2
Grades	3-8	4-7	3-8	4-7
Observations	24,132	12,663	11,321	7,354

The silver lining

■ Texts work for those with best pre-tests:

Table 8: Normalized Test Scores as a Function of Treatment and Pre-Test Score

Dependent Variable	Normalized test score (year 1)	Normalized test score (year 2)	Normalized test score minus pre-test scores (year 1)
Textbook school	0.060 (0.061)	-0.016 (0.088)	0.021 (0.060)
Pre-test score	0.430*** (0.013)	0.342*** (0.016)	-0.338*** (0.016)
Pre-test*Textbook school	0.057*** (0.018)	0.061*** (0.022)	0.042** (0.021)
Number of observations	11,342	7393	11,321

Teacher absence in rural India

Duflo-Hanna

- Teacher absence is high (40%)
 - Difficult to monitoring teachers
 - Teachers still get paid if do not come to class
 - Teachers often forgo class to work in fields or other type of employment, teachers forgo class to help with community issues, teachers forgo class to attend functions (wedding, funerals, holidays, etc)

Udaipur, Rajasthan

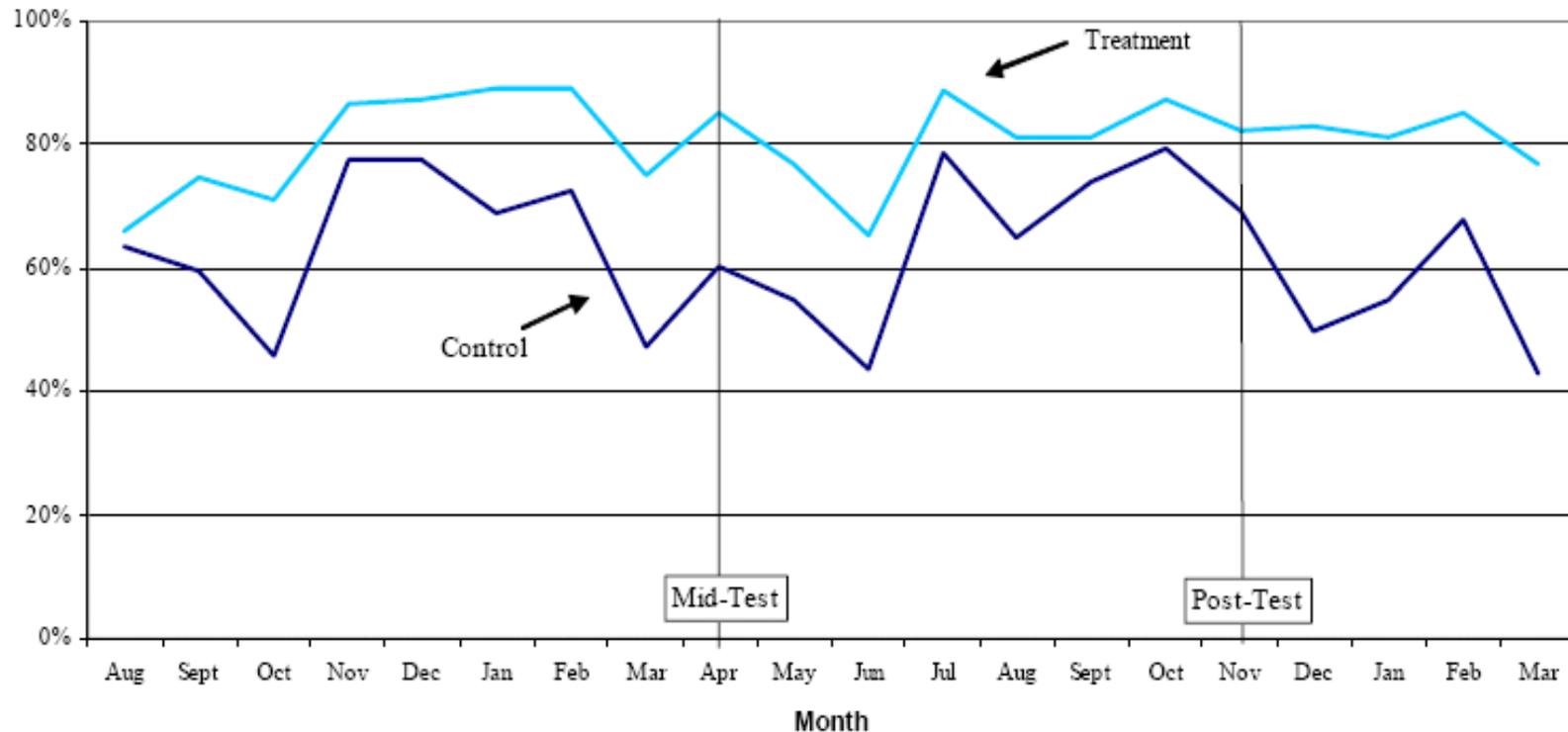


How do you cost-effectively monitor teachers: Cameras



Treatment: 78%, Control 58%

Figure 2: Percentage of Schools Open during Random Checks



We see very little effort diversion toward incentive away from teaching

- Student test scores increased in treatment relative to control group
 - 40% increase in graduation rates
 - Marginal cost of teaching low?

Generalizability

- Can be expanded to non-formal schools
 - Non-formal schools common in most of the developing world
 - India alone, 21 million children, mainly poor children in rural areas, attend NFEs(1997)
 - In Gujarat, one of India's largest states, para-workers comprise 43% of the teaching staff in rural areas
- Is there political will to get this type of program instituted in government schools?

Generalizability

- Would this work in Africa, where much of the recorded absenteeism is due to illness (Das)? [Think about benefits and costs of teachers attending school]
- How does this compare to programs to increase motivation/training of teachers?

Another approach: Pay for performance

- Murlidharan implements a large randomized trial examining whether pay-for-performance can work: incentivize teachers to work harder.
- Bonus pay based on average students' improvement (on average 3% of annual pay).
 - Two variations: group bonuses based on school performance or individual bonuses.
 - 300 schools overall.

Impressive results

Table 2: Impact of Incentives on Student Test Scores				
Panel A: Combined (Math and Language)				
Dependent Variable = Normalized End of Year Test Score				
	Year 1 on Year 0		Year 2 on Year 0	
	[1]	[2]	[3]	[4]
Normalized Lagged Test Score	0.503*** (0.013)	0.498*** (0.013)	0.452*** (0.015)	0.448*** (0.015)
Incentive School	0.149*** (0.042)	0.165*** (0.042)	0.219*** (0.047)	0.224*** (0.048)
School and Household Controls	No	Yes	No	Yes
Observations	42145	37617	29780	24665
R-squared	0.31	0.34	0.24	0.28
Panel B: Math				
Dependent Variable = Normalized End of Year Test Score				
	Year 1 on Year 0		Year 2 on Year 0	
	[1]	[2]	[3]	[4]
Normalized Lagged Test Score	0.492*** (0.016)	0.491*** (0.016)	0.414*** (0.022)	0.408*** (0.022)
Incentive School	0.180*** (0.049)	0.196*** (0.049)	0.273*** (0.055)	0.280*** (0.056)
School and Household Controls	No	Yes	No	Yes
Observations	20946	18700	14797	12255
R-squared	0.30	0.33	0.25	0.28
Panel C: Telugu (Language)				
Dependent Variable = Normalized End of Year Test Score				
	Year 1 on Year 0		Year 2 on Year 0	
	[1]	[2]	[3]	[4]
Normalized Lagged Test Score	0.52*** (0.014)	0.510*** (0.014)	0.49*** (0.014)	0.481*** (0.014)
Incentive School	0.118*** (0.040)	0.134*** (0.039)	0.166*** (0.045)	0.168*** (0.044)
School and Household Controls	No	Yes	No	Yes
Observations	21199	18917	14983	12410
R-Squared	0.33	0.36	0.26	0.30

Group vs. individual incentives

Table 7: Group versus Individual Incentives

Dependent Variable = Normalized End of Year Test Score

	Year 1 on Year 0			Year 2 on Year 0		
	Combined [1]	Maths [2]	Telugu [3]	Combined [4]	Maths [5]	Telugu [6]
Individual Incentive School (II)	0.156*** (0.050)	0.184*** (0.059)	0.130*** (0.045)	0.283*** (0.058)	0.329*** (0.087)	0.239*** (0.054)
Group Incentive School (GI)	0.141*** (0.050)	0.175*** (0.057)	0.107** (0.047)	0.154*** (0.057)	0.216*** (0.088)	0.092* (0.052)
F-Stat p-value (Testing GI = II)	0.765	0.889	0.610	0.057	0.160	0.016
Observations	42145	20948	21199	29780	14797	14963
R-squared	0.31	0.299	0.332	0.25	0.25	0.26

Teaching to the test?

Table 3 : Impact of Incentives by Repeat and Non-Repeat Questions

	Dependent Variable : Percentage Score					
	Combined		Math		Telugu	
	Year 1	Year 2	Year 1	Year 2	Year 1	Year 2
Percentage Score on Non-repeat Questions	0.335*** (0.007)	0.328*** (0.007)	0.256*** (0.007)	0.257*** (0.008)	0.414*** (0.008)	0.397*** (0.007)
Percentage Score on Repeat Questions	0.352*** (0.008)	0.42*** (0.005)	0.252*** (0.007)	0.388*** (0.008)	0.452*** (0.007)	0.468*** (0.007)
Incremental Score in Incentive Schools for Non-repeats	0.030*** (0.009)	0.039*** (0.009)	0.033*** (0.009)	0.046*** (0.010)	0.027*** (0.010)	0.033*** (0.010)
Incremental Score in Incentive Schools for Repeats	0.043*** (0.011)	0.043*** (0.011)	0.042*** (0.013)	0.044*** (0.012)	0.043*** (0.011)	0.041*** (0.013)
Test For Equality of Treatment Effect for Repeat and Non-repeat Questions (F-stat p-value)	0.141	0.584	0.374	0.766	0.076	0.354
Observations	62872	54972	31225	29594	31647	25378
R-Squared	0.24	0.18	0.26	0.23	0.29	0.18

Notes

1. Repeat questions are questions that at the time of administering the particular test had appeared identically on ANY earlier test (across grades)

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 4 : Impact of Incentives by Multiple Choice and Non-Multiple Choice Questions

	Dependent Variable : Percentage Score					
	Combined		Math		Telugu	
	Year 1	Year 2	Year 1	Year 2	Year 1	Year 2
Percentage Score on non Multiple-choice Questions	0.311*** (0.007)	0.311*** (0.007)	0.258*** (0.007)	0.278*** (0.008)	0.364*** (0.008)	0.344*** (0.008)
Percentage Score on Multiple-choice Questions (MCQ's)	0.379*** (0.004)	0.391*** (0.004)	0.227*** (0.005)	0.284*** (0.004)	0.529*** (0.005)	0.497*** (0.005)
Incremental Score on non MCQ's in Incentive Schools	0.028*** (0.009)	0.037*** (0.010)	0.032*** (0.010)	0.047*** (0.010)	0.023** (0.010)	0.027** (0.011)
Incremental Score on MCQ's in Incentive Schools	0.034*** (0.009)	0.042*** (0.009)	0.034*** (0.009)	0.041*** (0.009)	0.034*** (0.011)	0.042*** (0.009)
Test For Equality of Treatment Effect for MCQ's and non-MCQ's (F-stat p-value)+A79	0.168	0.282	0.671	0.341	0.119	0.025
Observations	84290	59520	41892	29594	42398	29926
R-Squared	0.197	0.187	0.213	0.178	0.302	0.289

Teaching to the test?

Table 6 : Impact of Incentives on Non-Incentive Subjects

Panel A: Reduced Form Impact

Dependent Variable : Normalized Endline Score

	Year 1		Year 2	
	Science	Social Studies	Science	Social Studies
Normalized Baseline Math Score	0.215*** (0.019)	0.224*** (0.018)	0.156*** (0.023)	0.167*** (0.024)
Normalized Baseline Language Score	0.209*** (0.019)	0.289*** (0.019)	0.212*** (0.023)	0.189*** (0.024)
Incentive School	0.112** (0.052)	0.141*** (0.048)	0.113** (0.044)	0.18*** (0.050)
Observations	11786	11786	9143	9143
R-squared	0.26	0.31	0.19	0.18

Bottom lines

- Understanding the real returns to education is difficult, but is what we need to know to evaluate policy
- Simple solutions based on economic theories can help improve the quality of education