

Education Production Functions

Evidence from Developing Countries

EE473



Glossary

- Omitted variable bias
- Selection and attrition bias
- Endogeneous program placement bias
- Measurement error bias

Omitted variable bias

When using regression analysis to estimate the causal impact of factors that affect the variable of interest (in this case, cognitive or noncognitive skills), exclusion of one or more causal factors from the regression may lead to biased estimates of the impacts of the remaining variables in the regression



Selection and attrition bias

When using regression analysis to estimate the causal impact of factors that affect the variable of interest (in this case, cognitive or noncognitive skills), the impact of a variable that also influences which observations (students) are in the data used for the regression may lead to biased estimates.

E.g. A school characteristic that leads to increased learning may also attract new students to a school - If the academic performance of those new students is higher (lower) than the students that were already in the school, the estimated impact of that school characteristic will be overestimated (underestimated)

Endogeneous program placement bias

When using regression analysis to estimate the causal impact of factors that affect the variable of interest (in this case, cognitive or noncognitive skills), estimates of the impact of a variable that indicates which schools participated in some type of program may be biased if that program is deliberately targeted to schools where students are performing particularly well or particularly poorly



Measurement error bias

When using regression analysis to estimate the causal impact of factors that affect the variable of interest (in this case, cognitive or noncognitive skills), the estimated impacts of explanatory variables that have errors in their measurements will be biased, often in the direction of underestimation of the causal effects



Evidence from Developing Countries

- ❖ Basic Facts concerning education in developing countries
- ❖ Review the evidence from those countries on the impact of various education policies on school attainment and learning
- ❖ Glewwe and Kremer (2006) and Glewwe and Miguel (2008)



Education in Developing Countries

- ❖ Primary enrolment rates
- ❖ Secondary enrolment rates
- ❖ Gender disparities in gross primary and secondary enrolment rates

Primary enrolment rates

	<u>Gross enrolment rates</u>				<u>Net enrolment rates</u>	
	1960	1980	2000	2005	2000	2005
World	80	97	104	109		89
Country group						
Low income	65	94	102	111	85	85
Middle income	83	101	110	106	88	93
High income	109	101	102	105	95	94
Region						
Sub-Saharan Africa	40	80	77	96	56	70
Middle East/North Africa	59	89	97	102	84	91
Latin America	91	105	127	110	97	94
South Asia	41	77	98	115	83	86
East Asia	87	111	111	112	93	94
East Europe/Former Soviet Union	103	100	100	113	88	91
OECD (Organization for Economic Cooperation and Development)	109	102	102	102	97	96

Secondary school enrolment rates (percent of students of secondary school age)

	<u>Gross enrolment rates</u>				<u>Net enrolment rates</u>	
	1960	1980	2000	2005	2000	2005
World	29	49	67	71		67
Country group						
Low income	14	34	54	60		44
Middle income	21	51	77	81		69
High income	63	87	101	99		91
Region						
Sub-Saharan Africa	5	15	27	31		26
Middle East/North Africa	13	42	66	75		71
Latin America	14	42	86	78		65
South Asia	10	27	47	52		21
East Asia	20	44	67	73		61
East Europe/Former Soviet Union	55	93	88	92		85
OECD (Organization for Economic Cooperation and Development)	65	87	107	103		93

Gender disparities in gross primary and secondary enrolment rates (2000)

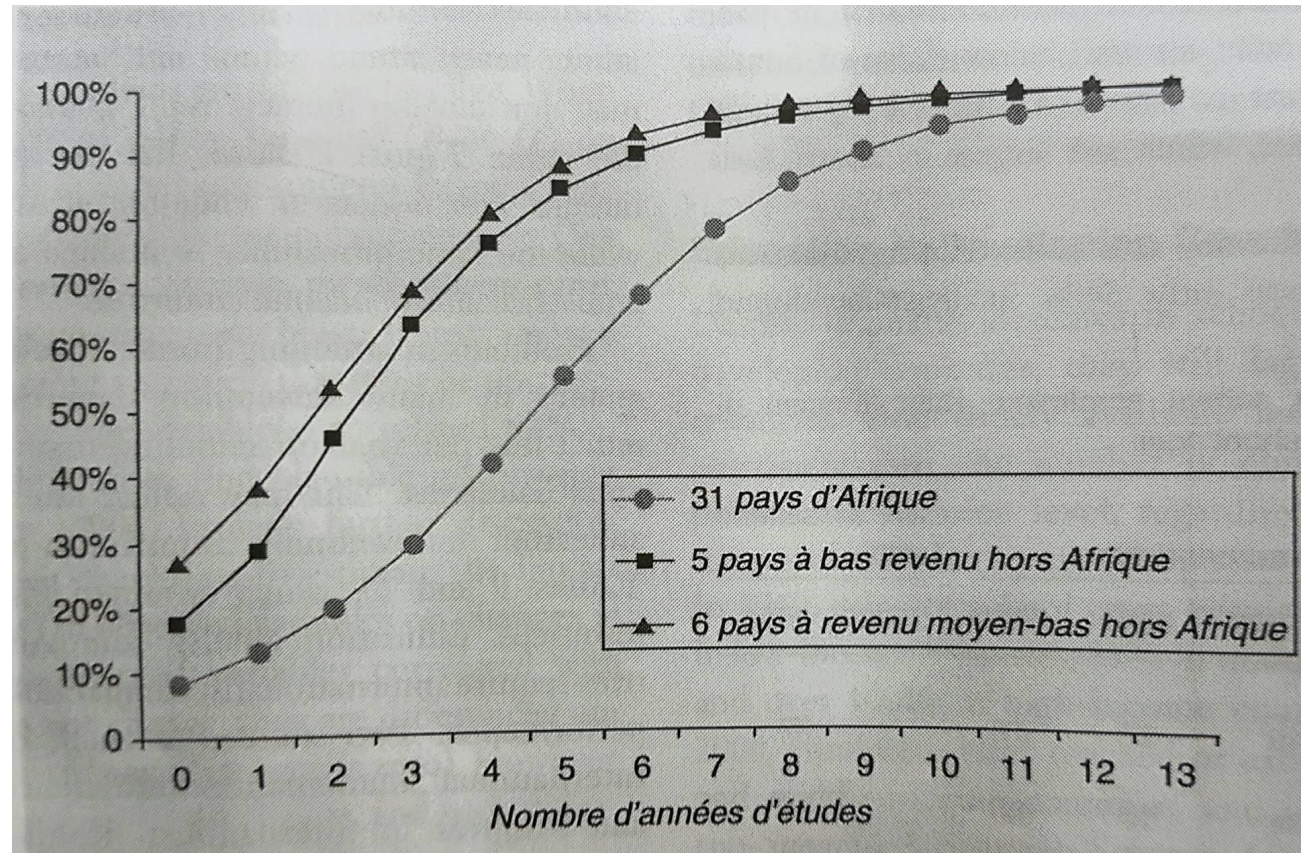
	<u>Primary</u>		<u>Secondary</u>	
	Boys	Girls	Boys	Girls
Country group				
Low income	107	98	60	47
Middle income	112	108	77	78
High income	102	101	100	102
Region				
Sub-Saharan Africa	83	71	29	24
Middle East/North Africa	101	92	71	61
Latin America	129	125	83	89
South Asia	107	90	53	39
East Asia	112	111	73	60
East Europe/Former Soviet Union	100	99	88	89
OECD (Organization for Economic Cooperation and Development)	102	102	106	108

Probability of being literate according to the number of years of schooling (in the 2000s)

Other low income countries: Moldavia, Uzbekistan, Laos, Tajikistan, and Vietnam


Other low- and middle-income countries: Albania, Bolivia, Bosnia, Dominican Republic, Philippines, and Surinam

From Pole de, D. (2007) Les acquisitions scolaires et la production d'alphabetisation de l'école primaire en Afrique : approches comparatives. Note thématique n 2.



Demand Interventions

- ❖ Policies that **raise demand for education increase learning by increasing time in school**
- ❖ This is done by **increasing available household income and/or reducing education costs**
- ❖ **Income transfers** directly raise parental income - Unconditional transfers may increase households' education spending, but such effects may be small
 - ❖ Based on pension reforms, find sizable (unconditional) income effects – Edmond (2006) showed that in South Africa, receiving a generous pension increased enrolment among children living with pensioners
 - ❖ Carvealho (2000) finds similar effects from Brazil's new pension scheme

- ❖ To ensure that income transfers increase enrolment, one could condition them on education choices
 - ❖ **Conditional Case Transfer (CCT) programs** provide transfers to households only if their children are enrolled in, and regularly attending school
 - ❖ Schultz (2004) exploiting the randomized implementation of PROGRESA, estimates that after 3 years it raised children's years of schooling by 0.66 years
 - ❖ While CCT programs appear to increase demand by raising incomes, they really work through prices: CCT programs decrease the price of education
 - ❖ The price becomes negative, parents are paid for enrolling their children
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Policies that directly reduce education price have similar effects

- ❖ Abolishment School fees

- ❖ Voucher

 - ❖ provide poor households funds to enroll their children in private schools

- ❖ Transfer in kind

- ❖ To improve school age children's health


Demand-side policies (Summary of empirical results)

			Impact on enrolment	Impact on learning
Unconditional transfers	Edmond (2008)	South African pension scheme	Yes	Not estimated
	Carvalho (2000)	Brazilian rural pension scheme	Yes	Not estimated
Conditional cash transfers	Schultz (2004)	Progresa, Mexico	Yes	Not estimated
	Maluccio and Flores (2005)	Nicaragua	Yes	Not estimated
	Glewwe, Olinto and de Souza (2004)	PRAF, Honduras	Yes	Not estimated
Conditional transfers in kind	Ravallion and Wodon (2000)	FFE, Bangladesh	Yes	Not estimated
	Vermeersch and Kremer (2005)	Kenya, school breakfast	Yes	Yes
	Kremer et al. (2005)	Kenya, school uniform	Yes	No
Abolition of school fees	School fees Abolition Initiative (2006)	Kenya	Yes	Not estimated
Vouchers	Angrist et al. (2001)	Colombia	Yes	Yes
	Hsieh and Urquiola (2006)	Chile	Yes	No
Health: deworming	Miguel and Kremer (2004)	Kenya	Yes	No

Supply-side Policies

1. Increasing the quantity of schooling services offered
 - ❖ Building new schools
 - ❖ Hiring more teachers
2. Increasing the quality of schooling services
 - ❖ Hiring more teachers
 - ❖ Providing material inputs

Building more schools and/or increasing the capacity of existing schools

- ❖ Reduces households' distance to the nearest school
 - ❖ Long distance reduce enrolment
 - ❖ Filmer (2004) argues that decreasing distance to schools increases enrolment, but not by much
 - ❖ Duflo (2001), using a natural experiment, showed that building new schools increased years of schooling in Indonesia by about 0.15 years
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Hiring more teachers to existing schools' capacity

- ❖ Contract teachers

Additional teachers may raise school quality as well as quantity

- ❖ Banerjee et al. (2007) conducted a randomized evaluation of a program that hired young educated women from the community to teach basic literacy and numeracy skills to children falling behind in India's government schools
 - ❖ The program was very effective, increasing test scores by 0.14 standard deviations after 1 year, and 0.28 after 2 years



Another way to improve education quality is to provide material inputs

- ❖ Two randomized trials, one that provided textbooks and another that supplied flipcharts, were conducted in Kenya
- ❖ Neither textbooks nor flipcharts increased learning except that textbooks raised learning among the best students (Glewwe et al., 2004, 2007)
- ❖ In India, Banerjee et al., (2005) conducted a randomized evaluation to computer-assisted education
 - ❖ Fourth graders were given 2 hours of computer time per week to play games that reinforced mathematics skills
 - ❖ The program increased math scores by 0.47 standard deviations after 2 years
 - ❖ These results persisted for at least 1 year after students finished the program

Supply-side policies (Summary of empirical results)

			Impact on enrolment	Impact on learning
School construction	Duflo (2001)	Indonesia	Yes	Not estimated
Contractual teachers	PASEC (2004)	Mali	Yes	No
	Sy (2007)	Mali	Not estimated	No
Class size	Angrist and Lavy (1999)	Israel	Not estimated	Yes
	Urquiola (2001)	Bolivia	Not estimated	Yes
Teacher incentives	Glewwe, Ilias and Kremer (2003)	Kenya	No	No
Remedial education	Banerjee et al. (2005)	India	Not estimated	Yes
Traditional inputs	Glewwe et al. (2007)	Kenya	No	No
Computer-assisted education	Banerjee, Duflo and Linden (2003)	India	Not estimated	Yes