

# Section Chapter 17: Education and Development

## 1 Education

Education and health are intrinsically important as basic needs. They may also be important instruments for development and economic growth—for example, contributing to raising the productivity of labor and quality of entrepreneurship, and hence the levels of wage and income.

Some key questions that arise in studying educational services are:

- **Why are educational services under-provided?**
- **What can be done to improve the level, quality and equity of services?**

One response to the question of under-provision is that education and health have strong **positive social externalities**, and may be **public goods**. Education may have private benefits in the form of better jobs, higher incomes, and a better partner, but it will also help generate more jobs, improve the human capital of one's children, and create better citizens. In addition, the supply of some components of public education (school buildings, textbooks) may have public good aspects. Additionally, it may be that people do not know the true returns to schooling, are liquidity-constrained, or that parents' valuations of the returns to education differ from those of their children.

Responses to the second question require us to understand the supply- and demand-side determinants of educational choices, and to pay careful attention to causality.

### 1.1 Key indicators

**Gross enrollment rate (GER):**  $GER = \frac{\# \text{ children enrolled in given level}}{\# \text{ children who should be at given level by age}} \leq 1.00$

**Net enrollment rate (NER):**  $NER = \frac{\# \text{ children in relevant age group enrolled in given level}}{\# \text{ children in relevant age group}} \leq 1.00$

**Out of school children (OOC):**  $OOC = \text{Number of children of primary school age not in school}$

**Grade completion rate:** Share of children that complete a grade

**Grade retention rate:** Share of children that do not pass to the next grade at end of school year

**Educational Attainment:** Completed years of schooling per adult over 25

**Learning Attainment:** Measure of quality based on standardized testing

## 2 Determinants of the level of schooling

We focus on determinants of the private decision to attend school.

## 2.1 Supply side determinants and empirical evaluations

When assessing the provision of education, we should pay attention to indicators of quantity and quantity, such as: **distance to school**, **hours of instruction**, **teacher attendance**, and **school resources**.

The question is, which of these are important determinants of educational outcomes? The challenge is that education and health outcomes are endogenous to income growth. For impact evaluation, our goal is always to establish a causal relationship, so we need to identify **exogenous** sources of variation.

Table 1: Supply-side determinants of schooling decisions, and related empirical studies

Determinants	Studies	Intervention	Method	Finding
<b>Quantity</b>				
<i>Distance to school</i>	Duflo (2001)	Indonesia, large primary school construction program	DD, comparing affected cohorts vs. older cohorts, in areas with high vs. low construction	Enrollment, years of education, and income increased
<i>Class size</i>	Angrist, Lavy (1999)	Israel, Maimonides rule, no more than 40 children per class	RDD, with a discontinuous change in class size around 40 students	Smaller class sizes increase reading scores
<i>Hours of instruction</i>				
<b>Quality</b>				
<i>Teachers' absenteeism and incentives</i>	Duflo, Hanna, Ryan (2012)	India, monitoring and incentives, pictures with students, compensated based on attendance	RCT, 113 schools	Absenteeism fell, scores increased
	Muralidharan, Sundararaman (2011)	India, rural primary schools, performance bonus for improving average scores	RCT, giving control schools inputs equal in value to bonuses	Incentive schools increased math and language scores
<i>Teachers' level of training</i>				
<i>School resources</i>				
<i>Peer quality effects</i>	Duflo et al (2011)	Tracking in primary schools in Kenya	RCT, 121 schools	Raised scores for all students

**Duflo (2001)** Recall from Chapter 4 the study in which Duflo (2001) looked at primary school construction in Indonesia.

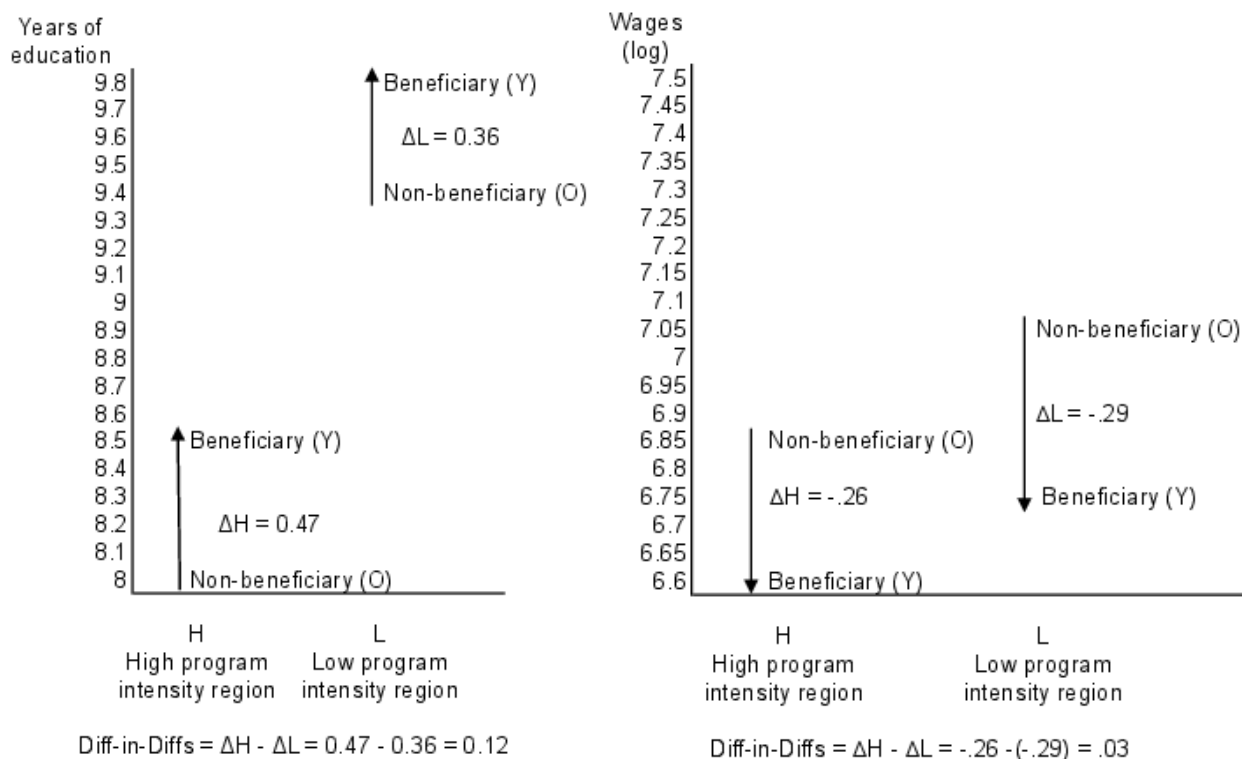
- *Context:* Between 1974 and 1979, one primary school was added for every 500 children ages 5 to 14. School enrollment increased from 69% to 83%. The endogeneity concern is program placement—more schools were constructed in poorer districts. Thus, a simple difference between high-intensity versus low-intensity districts will lead us to compare poorer districts versus wealthier districts.
- *Method: Differences in differences.* The underlying assumption is that the change over time (i.e. between different cohorts) in average years of education would have been the same in both high-intensity

and low-intensity areas of the country if the program had not been implemented. The counterfactual is the change between cohorts in years of education in the low intensity area.

$\Delta H$ : change in years of education in high intensity area

$\Delta L$ : change in years of education in low intensity area

$\Delta H - \Delta L$  : change in years of education attributed to school construction=0.12

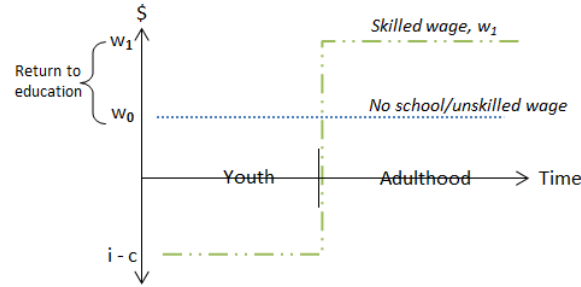


## 2.2 Demand side determinants: modeling education decisions

Education is an individual decision, especially when compulsory schooling is not enforced, based on weighing its costs and benefits. Consider a simple model of the education decision (Magruder 2009).

- Model is based on two periods: in period 1 (youth) can either work or attend school, in period 2 (adulthood) everyone works
- Two levels of wages:  $w_1$  for educated workers and  $w_0$  for uneducated workers
- While in school, students receive intrinsic benefits  $i$ , and pay direct costs  $c$
- Individuals discount future benefits at the rate  $\delta = \frac{1}{1+r} \leq 1$ . We call  $\delta$  the “discount factor”, and  $r$  the “discount rate.”

### Earnings profiles for schooling vs. no schooling



Individuals will decide to go to school in period 1 if discounted lifetime benefits are greater with school than without:

$$\underbrace{i - c + \delta w_1}_{\text{Net gain school}} > \underbrace{w_0 + \delta w_0}_{\text{Net gain no school}}$$

or, equivalently, if:

$$\underbrace{i + \delta(w_1 - w_0)}_{\text{Intrinsic+wage benefits}} > \underbrace{c + w_0}_{\text{Direct+opp cost}}$$

The private decision to go to school depends on the five determinants suggested by this equation. Because of market failures, principal-agent problems, and behavioral failures, schooling decisions may be privately suboptimal in addition to being socially suboptimal due to positive social externalities. These determinants in turn suggest policy instruments that can be used to increase demand for schooling.

1. **Intrinsic value** of education ( $i$ )

Identity, peer networks, culture

2. **Expected returns** from schooling ( $w_1 - w_0$ )

Availability of employment opportunities (employment rate), opportunities to use education for income generation  $w_1$  (in agriculture after a Green Revolution, by successfully migrating to an urban economy), school quality (monitoring and incentives, tracking), complementary assets (such as health/deworming, capital, land, social capital, etc.), information about true returns (Jensen 2010)

Estimates of the return to education vary widely, but are typically around 9% per year in developed countries, and average from 6.7% for males and 9.7% for females in 49 developing countries (Orazem and King 2008).

3. **Direct costs** of schooling ( $c$ )

Influenced by the supply-side aspects of educational services, such as distance to school, free public education, school vouchers

4. **Opportunity cost** of schooling ( $w_0$ )

If the opportunity cost of education increases, demand for schooling falls. Even for child labor, the opportunity cost of education may come from agriculture on the home plot, child labor as a substitute for parent time in producing  $z$ -goods (fetching water, collecting firewood, taking care of younger siblings), or on the labor market. Child labor may be vital during an income shock, thus raising the opportunity cost of schooling, reinforcing the need for safety nets and risk coping mechanisms. Child labor bans may have perverse effects, increasing child labor (Bharadwaj et al 2013).

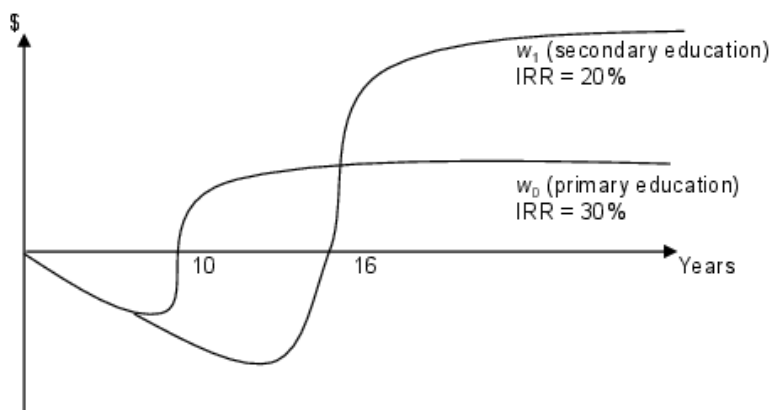
5. **Discount factor** ( $\delta = \frac{1}{1+r}$ )

The higher the discount rate  $r$ , the lower the discount factor  $\delta$ , and the lower the present value of future benefits  $\delta(w_1 - w_0)$  against which costs are compared. Poor have higher discount rate (lower discount factor) because: i) Capital markets fail differentially for the poor, due to lack of collateral, leading to high capital costs; ii) Present consumption may be vital for survival; iii) Parents are decision makers and have shorter time horizons than children.

- (a) An important related concept is the **Internal Rate of Return** (IRR). This is defined as the discount rate or interest rate that equates the net present value of benefits to the net present value of costs. Answers the question, at what discount rate would investing in X (schooling) be just worth it? Solves for the discount rate  $IRR$  such that:

$$\sum_{t=0}^{\infty} \left( \frac{1}{1+IRR} \right)^t \times \text{gains}_t = \sum_{t=0}^{\infty} \left( \frac{1}{1+IRR} \right)^t \times \text{costs}_t$$

An individual's decision rule is thus to undertake a project if the IRR is less than the actual discount rate  $r$ .



- (b) A special case of discounting that may lead to sub-optimal decisions is called **hyperbolic discounting**. Hyperbolic discounting leads to *time inconsistent* preferences that may have important effects on behavior. Procrastination is one example, as we always think it would be a good idea to start our work early—just not today. Tomorrow, we again put off our work, until we are up against the deadline and have no choice.

**Demand-side evaluations**

Of the five determinants suggested by the model, which seem to matter empirically?

- The supply-side studies confirm that there may be important demand-side effects from reducing costs  $c$  (Duflo 2001), and suggest that other supply side factors which improve returns to education  $w_1 - w_0$  (monitoring, incentives, tracking) may also lead to increased levels of schooling.
- In addition, Atkins (2012) confirms that increases in  $w_0$  indeed reduce the demand for schooling and increase dropouts. He studies the impact on schooling of the growth in low-skill employment in manufacturing in Mexico. He uses a rollout design based on the timing of factory openings, comparing

the schooling decisions of younger cohorts who became eligible to dropout after the factory opened vs. slightly older cohorts. For every 20 new jobs, one student dropped out at grade 9 rather than continuing through grade 12.

- Increasing high-skilled opportunities,  $w_1$ , leads to more demand for schooling (Munshi and Rosenzweig 2006; Oster 2010; Atkins 2012). Using an RCT in the Dominican Republic, Jensen (2010) shows that providing information about the return to secondary education increases demand for education.
- CCTs for education are perhaps the most studied example of demand-side interventions. The main effect of Progresa was to increase secondary school enrollment. Effects are heterogeneous: we observe a stronger effect with closeness to school ( $c$ ), education of parents (higher  $i$ ), and the job experience of the father in valuing education. Despite the transfer, a large number do not continue to secondary school. Suggests that returns to education may not be high enough, despite the budget incentive provided by Progresa. While CCTs may be costly compared to CT, the CCT may be more efficient if parents are not fully informed, have higher discount rates than their children, and fail to internalize positive social externalities.

