CHAPTER

4

Returns to education in developing countries

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Introduction

Earnings of workers classified by some dimension have been have been at the core of empirical economics since the dawn of the discipline. Up to the middle of the 20th century the main dimensions according to which earnings were classified were sector of economic activity, industry, occupation and formal versus informal sector in developing countries. From about 1960 onwards, following the human capital revolution in economic thought (Becker, 1964; Mincer 1974; Schultz 1961), the educational level of the worker was added as a classificatory variable.

Earnings differentials by level of education reflect the monetary incentives for someone to invest in education. Earnings differentials by education represent the intersection of supply and demand curves for educated labor. Differences in relative earnings between countries reflect a number of factors, e.g. the demand for skills in the labor market, minimum wage legislation, the strength of unions, collective agreements, the supply of workers with various levels of educational attainment, the work experience of workers with high and low levels of schooling, the distribution of employment among occupations and the relative incidence of part-time and seasonal work (OECD, 2017).

The study of earnings by schooling has led to several empirical works testing hypotheses on a great variety of social issues. These include, for example, racial and ethnic discrimination (McNabb and Psacharopoulos 1981; Chiswick 1988; Psacharopoulos and Patrinos, 1994): gender discrimination (Psacharopoulos and Tzannatos 1992; Goldin and Polachek 1987); income distribution (Mincer 1958; Marin and Psacharopoulos 1976); and the determinants of the demand for education (Freeman 1976; Psacharopoulos and Soumelis, 1979; Psacharopoulos 1982). Under certain assumptions, earnings differentials by level of education have been used to identify the sources of economic growth (for example, Denison 1967; Psacharopoulos 1972). But perhaps the application *par excellence* that has used earnings by level of education is the estimation of the rate of return to investment in schooling.

In what follows we give a taste of the returns to education with emphasis on developing countries and compare them to those in advanced

The Economics of Education, Second Edition
https://doi.org/10.1016/B978-0-12-815391-8.00004-5

industrial countries. Section Global estimates provides a review of the returns to education for developing countries. Empirical estimates of the returns to education date from the late 1950s to the beginning of the 21st century. As the number of empirical studies increase, compilations of the rate of returns to education start to emerge in the early 1970s (Psacharopoulos 1973) and have continued to the present (Psacharopoulos and Patrinos, 2018).

Estimation procedures

It is a universal fact that, in all countries of the world, the more education one has the higher his/her earnings. Age-earnings profiles by level of education behave as predicted by the seminal theoretical and empirical work of Mincer (1974), taking the general shape depicted in Fig. 4.1.

Fig. 4.2 shows an actual age-earnings profile for Indonesia.

Based on such data, along with the direct cost of schooling, two types of returns are usually

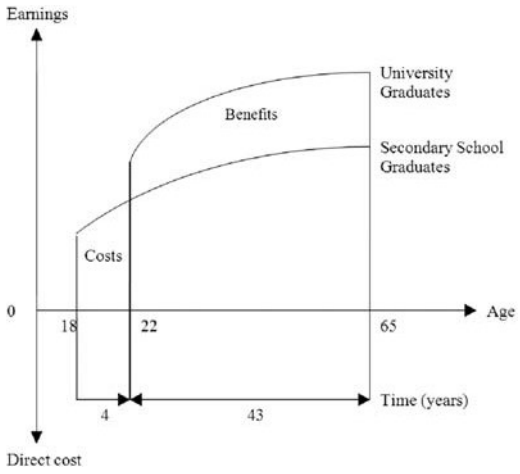

FIG. 4.1 Typical age-earnings profiles by level of education.

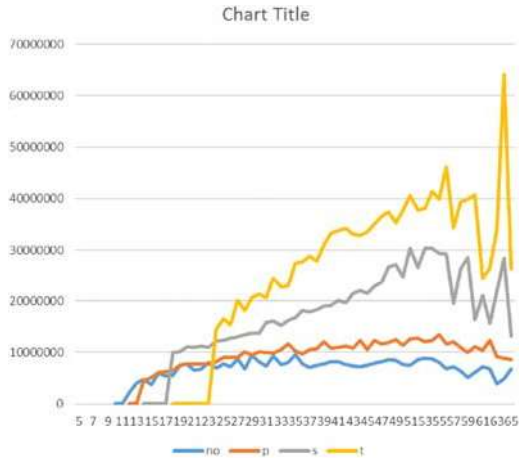

FIG. 4.2 Indonesia age-earnings (*rupiah*) profile by level of education. *Source: Based on Indonesia National Socio-Economic Survey (SUSENAS) 2010.*

estimated, each answering a different question: First, the private rate of return, that compares the costs and benefits of education as incurred by and realized by the individual student who undertakes the investment. Second, the social rate of return that compares costs and benefits from the country-as-a-whole or society's point of view.

The main computational difference between private and social rates of return is that, for a social rate of return calculation, the costs include the state's or society's at large spending on education. Hence, the cost would include the rental of buildings and professorial salaries. Gross earnings (that is, before taxes and other deductions) are used in a social rate of return calculation, and such earnings should also include income in kind where this information is available.

There exists some confusion in the literature regarding the "social" adjective attached to rates of return to investment in education. It has been the tradition in the mainstream economics of education literature to mean by a "social" rate,

a private rate adjusted for the full cost of schooling, rather than just what the individual pays for his or her education. However, a "social" rate should include externalities, that is, benefits beyond those captured by the individual investor, such as lower fertility or lives saved because of improved sanitation conditions followed by a more educated woman who may never participate in the formal labor market.

Traditional social returns to education are called "narrow-social," and returns that include externalities "wide-social." The distinction between narrow and wide social returns is more than theoretical. By adding externalities to the narrow-social returns, one can reach diametrically opposite policy conclusions, for example, if primary and tertiary education have differential externalities, by considering the latter the ranking of profitable education investments could be changed.

Using an appropriate methodology, the above earnings differentials can be used to estimate the returns to investment in education. Most published estimates of the rate of return to schooling rely on the Mincerian earnings function (Mincer, 1974), the most widely used estimation in economics (for a review of the Mincerian earnings function see Heckman, Lochner and Todd 2006; Patrinos, 2016). However, the most correct methodology is what is known as "the full discounting method" that is based on the actual shape of the age-earnings profiles, rather than be smoothed out by an earnings function (Psacharopoulos and Mattson, 1998).

Computationally, there are two main estimation procedures:

(a) The earnings function method

This method, also known as Mincerian, involves the fitting of a function of log-wages (LnY), using years of schooling (S), years of labor market experience (EX) and its square as independent variables. This is called a "basic earnings function." In the semi-log specification, the coefficient on years of schooling can be interpreted as the average private rate of return to one additional year of schooling, regardless of the educational level this year of schooling refers to.

The basic Mincerian earnings function takes the form:

$$\ln Y_i = \alpha + \beta S_i + \gamma_1 EX_i + \gamma_2 EX_i^2$$

Since $\beta = \frac{\partial \ln W}{\partial S} = r$, this is the relative increase in wages following an increase in S, or the rate of return to the marginal year of schooling.

The only costs involved in this case is foregone earnings, so this method estimates only private returns to education.

(B) The full discounting method

The social rate of return to investment in a given level of education is estimated by finding the rate of discount (r) that equalizes the stream of discounted benefits (Y) over time (t) to the stream of costs (C) at a given point in time. For example, in the case of university education lasting four years and a working life of 42 years, the formula is:

$$\sum_{t=1}^{42} \frac{(Y_u - Y_s)_t}{(1+r)^t} = \sum_{t=1}^{4} (Y_s + C_u)_t (1+r)^t$$

where $(Y_u\text{-}Y_s)_t$ is the earnings differential between a university graduate (subscript u) and a secondary school graduate (subscript s, the control group) at time t. C_u represents the direct resource cost of university education (buildings, salaries, etc.), and Y_s denotes the student's foregone earnings or indirect costs.

A key assumption in a social rate of return calculation is that observed wages are a good proxy for the marginal product of labor. This is not necessarily the case when the sample includes civils servants. Hence, the earnings function could be fitted to a sub-sample of workers in the private sector of the economy where wages are more likely to relate to productivity.

Global estimates

The numbers in Table 4.1 are based on a meta-analysis of over 1000 rate of return estimates in over 100 countries. Based on the social calculation, primary education exhibits the highest returns, followed by secondary and higher education.

Since the costs are higher in a social rate of return calculation relative to the one from the private point of view, social returns are typically lower than a private rate of return. The difference between the private and the social rate of return reflects the degree of public subsidization of education. Hence, public subsidy to education is shown to be regressive.

The size of the economic rate of return to investment in education is inversely related to the level of education. Primary education should have been a priority in countries where the coverage at this level is not universal, next comes secondary education and university.

Across world regions, the returns are higher in countries with low educational attainment measured by the mean years of schooling (Table 4.2).

The stylized patterns reported here have been corroborated and reinforced by using the same household survey dataset and Mincerian specification in 139 countries to produce 819 comparable private rate of return estimates (Montenegro and Patrinos, 2014). The returns to schooling are more concentrated around their respective means than previously thought, and the basic Mincerian model used is more stable than may have been expected (Patrinos, 2016).

TABLE 4.1 Returns by educational level (%).

Educational level	Private	Social
Primary	25.4	17.5
Secondary	15.1	11.8
Higher	15.8	10.5
Average	18.8	13.3

Source: Psacharopoulos and Patrinos (2018).

TABLE 4.2 Private Returns to schooling by region.

Region	Overall rate of return (%)	Mean years of schooling
Latin America and Caribbean	11.0	7.3
Sub-Saharan Africa	10.5	5.2
East Asia and Pacific	8.7	6.9
South Asia	8.1	4.9
Advanced economies	8.0	9.5
Europe and Central Asia	7.3	9.1
Middle East and North Africa	5.7	7.5
World average	8.8	8.0

Source: Psacharopoulos and Patrinos (2018).

Low-income countries

Using the database compiled by Psacharopoulos and Patrinos (2018, online Annex 2), we focused on 68 rate of return estimates of a panel of 17 low-income countries between 1965 and 2012.[1]

The average number of years of schooling in low-income countries is 5 years and the overall Mincerian private rate of return 9.3% that is one-half percentage points higher relative to the global average of 8.8%.

Using the full discounting method to estimate the returns to education by educational level, the returns are significantly higher than the global

[1] The countries are Burkina Faso, Burundi, Cambodia, Ethiopia, Eritrea, Gambia, Ghana, Guyana, Madagascar, Malawi, Nepal, Mali, Niger, Rwanda, Sierra Leone, Somalia and Tanzania.

averages, and so is the degree of subsidization of higher education (Tables 4.3–4.5).

As expected, returns are higher in lower income countries where the quantity of schooling is scarcer. The low returns to primary education in upper middle-income countries can be explained by the fact primary education has reached most of the population and there is not a sufficient number of illiterates to serve as control group. It may also mean that given near universal coverage of primary education in these countries there is no much room to further expand this level of schooling. It might instead make sense to increase investment in the quality of primary schooling (Figs. 4.3–4.5).

The returns for those working in the private sector of the economy are higher than for those working in the public sector. The finding lends credibility that, where productivity matters, education is recognized (Psacharopoulos, 1983; Harmon, Oosterbeek and Walker, 2003).

In terms of social returns, these are higher than any plausible social discount rate though lower than private, across all income groups. The social returns to higher education are particularly high, but these are driven by returns in Africa, where the social returns to higher education are 35% in Malawi (Chirwa and Matita, 2009) and 22% in South Africa (Salisbury, 2015) – this of course implies that private returns to higher education are even higher.

TABLE 4.3 Returns to education in low-income countries (%).

Educational level	Private	Social
Primary	25.4	22.1
Secondary	18.7	18.1
Higher	26.8	13.2
Average	23.6	17.8

Note: Based on the full discounting method.
Source: Psacharopoulos and Patrinos, 2018

TABLE 4.4 Returns by gender and sector of employment in low-income countries (%).

Gender	Males	8.4
	Females	9.2
Sector of employment	Private	10.7
	Public	9.1

Note: Based on the Mincerian method.

TABLE 4.5 Social returns to investment in upper secondary school streams, Tanzania.

Curriculum type	Rate of return (%)
Academic	6.3
Technical	1.7

*Source: Data from Psacharopoulos, George; Loxley, William; Psacharopoulos, George*Loxley, William. 1985. Diversified secondary education and development: evidence from Colombia and Tanzania (English). A World Bank publication. Baltimore, MD: The Johns Hopkins University Press. http://documents.worldbank.org/curated/en/243621468241777497/Diversified-secondary-education-and-development-evidence-from-Colombia-and-Tanzania*

Vocational education

Within levels of education, and counter to any intuitive thought, general secondary education is more profitable than vocational education. The reason is that whereas general and vocational secondary school graduates have more-or-less equal earnings after graduation, the vocational track of secondary schools costs about twice that of the general track (see Psacharopoulos, 1987; Psacharopoulos and Loxley, 1985).

In many countries, the wage returns to academic qualifications are significantly higher than the returns to vocational qualifications, government training programs and adult skills training (Blundell, Dearden and Sianesi, 2005; Carneiro and Heckman, 2003; Dearden et al., 2002; Dickerson, 2005).

In a large World Bank follow-up study of students in the technical-vocational curriculum stream of secondary education in Colombia and Tanzania, it was found that the graduates

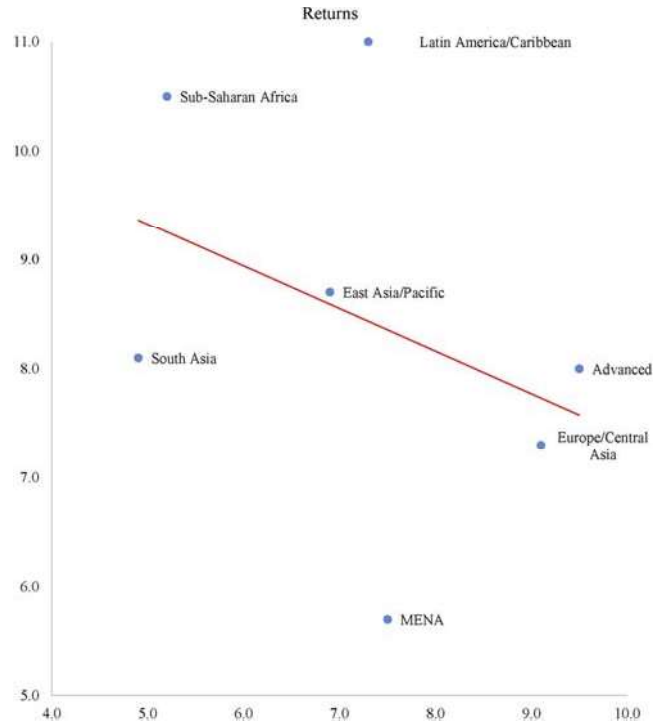

FIG. 4.3 Returns to education and mean years of schooling. *Source: Based on Table 4.2 (Psacharopoulos and Patrinos, 2018).*

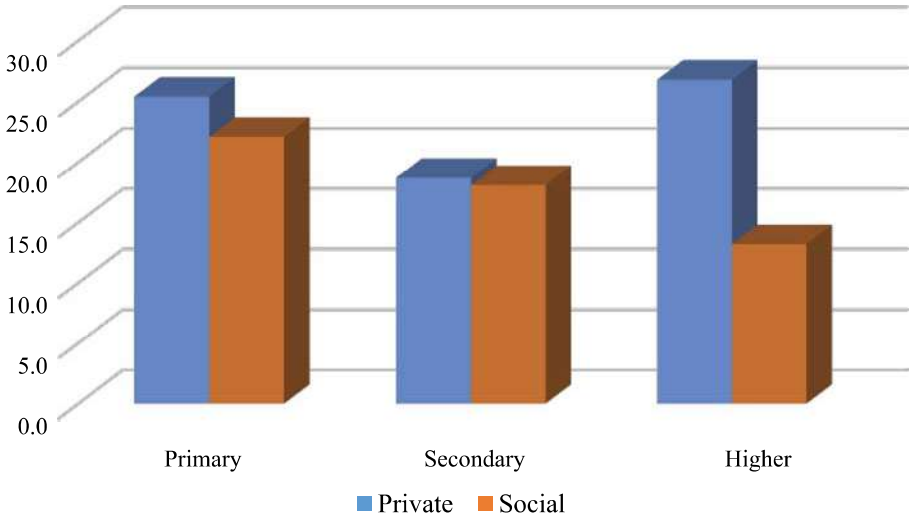

FIG. 4.4 Returns to education in low-income countries (%). Based on the full discounting method. *Source: Psacharopoulos and Patrinos, 2018.*

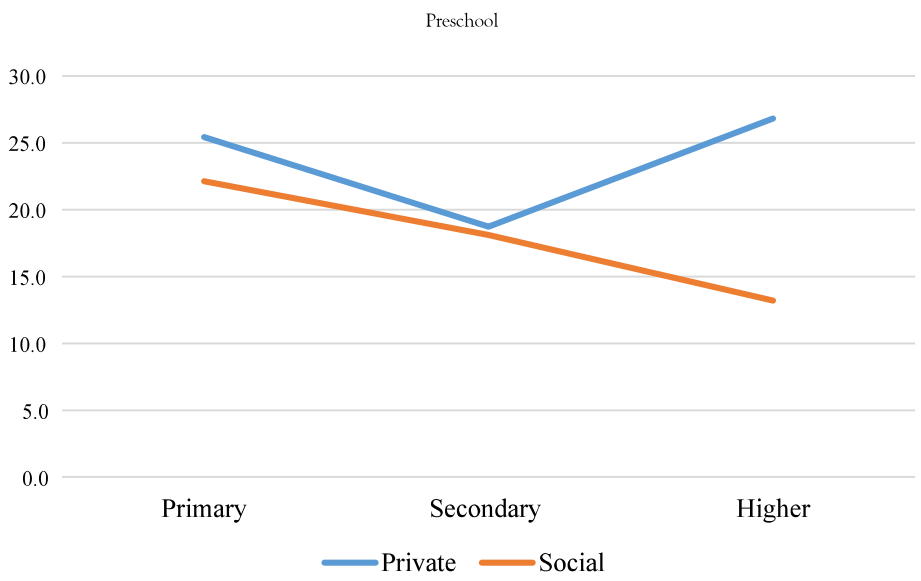

FIG. 4.5 The structure of private and social returns in low-income countries (%). Based on the full discounting method. *Source: Psacharopoulos and Patrinos, 2018*

did not seek or find employment in the sector they studied (Psacharopoulos and Loxley, 1985). It was such finding that made the World Bank change its lending portfolio as late as the 1990s away from secondary vocational schools, an activity the institution had been engaged nearly exclusively since its inception.

Beyond the formal school system, a very robust research finding is that retraining programs for the unemployed are ineffective (Heckman et al., 1999). The costs of such programs grossly exceed the benefits, the latter being measured by the length of time needed for a graduate of these programs to find a job, and by the earnings differential of those who graduated from the program relative to those who did not (Ashenfelter 1986; Ashenfelter and Card 1985; Ashenfelter and Lalonde 1997; Heckman and Hotz 1989).

Preschool

There have been many cost-benefit studies on the effect of preschool on eventual educational attainment, adult earnings and other externalities. A World Bank study documented a long list of benefits associated with preschool education in Brazil, with an estimate of 12.5–15.0% return on the investment. On cost-benefit grounds, preschool is a better investment relative to the Bank's industrial and agricultural projects (World Bank 2001).

An experimental study with a 20-year follow-up of participants in a preschool program in Jamaica found that a preschool intervention increased the average earnings of participants by 42% relative to the control group (Gertler at al. 2013).

Preschool is most effective when targeted to the most vulnerable groups. In an early childhood development project in Indonesia, preschool had an impact on reducing achievement gaps between richer and poorer students (Jung and Hasan, 2014).

A major policy concern, therefore, is the relatively lower returns to education for women at the primary education level in developing economies. It is a major concern because families in poor countries may decide to send sons rather

than daughters to school. The lower returns to females at the primary level in developing countries is puzzling given the fact that the rate of return to years of schooling is two percentage points greater for females than for males in developing countries, as well as transition countries. Dougherty (2005) considers various explanations. The most important involves the detrimental impact of discrimination and other factors that cause women to accept wage offers that undervalue their characteristics. It is hypothesized that the better educated is a woman, the more able and willing she is to overcome the sex handicaps and compete with men in the labor market. He also considers the possibility that part of the differential could be attributable to male-female differences in the quality of educational attainment. Also, women may choose to work in sectors where education is relatively highly valued. The lower return to primary education in developing economies may be evidence of discrimination — such that women need to achieve more schooling in order to garner sufficient wages — or the option value of schooling — that is, since women are likely to perform better, stay in school longer, and experience higher returns for each year of schooling, then the most able go beyond primary schooling, thus depressing the returns at that level.

Turning to the broader picture, the rate of return to education has fallen over the decades, while average years of schooling have risen. The returns to different educational attainments have fluctuated over the years, but it is also clear that amid the fluctuations, there has been a downward trend since the 1980s. The proportions of the population that are secondary educated and university educated have all risen markedly over the decades while the proportion of the population that is primary educated has declined slightly. The rate of return to primary education has fluctuated over the decades. For secondary education, the rate of return has risen until the 1980s. For university education, the private rate of return has declined as the proportion that is university educated increases (Patrinos and Psacharopoulos, 2007).

Causality

It is also worth noting that estimates of the returns on education based on advanced econometric techniques that control for different characteristics come to an average rate of return that is very similar to the global average presented in reviews: 10%. To estimate the true effect of education on earnings, some authors have employed instrumental variables (IV) estimates. A useful instrument should be correlated with schooling, but uncorrelated with unexplained variation in earnings. Various variables on family background are frequently used. However, they are not expected to meet the requirement that they are uncorrelated with earnings (among other possible reasons, due to inter-generational effects).

Recently, information on the costs of schooling and supply-side sources of identifying information, such as various types of education reform, are increasingly sought after as instruments. Costs are important because people make decisions about investing in schooling on perceived costs and benefits. Therefore, loan policies, tuition changes, and distance are possible sources of instruments. Institutional constraints are also important. Therefore, supply-side changes, such as the extension of compulsory school laws or making education facilities more accessible by reducing the distance to school, provide the researcher with the sort of "natural experiment" that allows one to say that the instrument is correlated with schooling but not earnings. One could argue for example that extending compulsory school age results in more people enrolling in school because of the legal change rather than because of their individual ability to generate more earnings. Such instruments will fail if they are corrected with earnings — as is sometimes the case with family

background variables; in other words, the approach will fail when the researcher chooses bad instruments.

The IV estimates are often higher than Ordinary Least Squares estimates, although it is unclear to what extent this is due to measurement error or inadequate instrumentation (see Trostel et al., 2002). There are very few studies for developing countries dealing with the issues surrounding the endogeneity of education and the implications of estimating returns to education from IV. The rate of return estimates from IV are not only different from OLS, they are generally higher. Since the IV estimate is supposed to be the true return, this contradicts the standard ability bias intuition: OLS should be upward biased if higher ability individuals have more schooling. This approach uses sources for exogenous variation in educational attainment, such as institutional changes in the schooling system in the form of changes in compulsory schooling laws (Patrinos and Sakellariou, 2006) and reducing the distance to school (such as school construction projects; see Duflo, 2001) affecting the schooling decision, to estimate a causal return to education. The interpretation (Card, 2001) is that the returns to schooling vary across individuals. Institutional changes affect the schooling decision of a subset of individuals who, otherwise, would not have pursued a higher level of education and not the average individual. Furthermore, individuals affected by such reforms tend to have a higher return to education than the average individual. There is a distribution of returns, and OLS and IV correspond to different weighted averages of this distribution, and OLS can be below IV (see also Heckman & Li 2004; Arabsheibani & Mussurav, 2007; and Sakellariou, 2006).

Cognitive ability

Beyond the returns to increasing the quantity of schooling, recent research has thrown light on the returns to improving the quality of schooling, the latter being measured by the cognitive skill of the student or graduate. Ability, or school quality, matter for earnings attainment (Leuven et al., 2004). Table 4.6 summarizes research results to increasing cognitive skills.

Several important papers over the last decade on establishing causation between education and earnings have made the case for schooling as an investment. It is also clear that there is a need for more evidence on the impact of education on earnings using quasi-, and where

TABLE 4.6 Estimated returns to a standard deviation increase in cognitive skills.

Country	Estimated effect	Source
Chile	0.17	Patrinos & Sakellariou, 2007
Ghana	0.14–0.30	Glewwe, 1996
Ghana	0.05–0.07	Jolliffe, 1998
Kenya	0.19–0.22	Boissiere, Knight, & Sabot, 1985; Knight & Sabot, 1990
Pakistan	0.12–0.28	Alderman, Behrman, Ross, & Sabot, 1996
Pakistan	0.25	Behrman et al., 2008
South Africa	0.34–0.48	Moll, 1998
Tanzania	0.07–0.13	Boissiere et al. 1985; Knight & Sabot, 1990
Average	**0.17–0.22**	

possible, experimental design. Evaluation techniques are usefully applied in analyzing education and earnings, and providing evidence on the effectiveness of projects, programs and reforms. Thus, more research along the lines of Oreopoulos (2006) and others analysis changes in compulsory schooling laws and other reforms is warranted. Such analyses allow one to provide estimates not only for those likely affected by reforms (that is, the local average treatment effect, or LATE), but also estimates that come close to population average treatment effects (or ATE).

Recent research shows that skills — ability and learning outcomes — matter for earnings attainment. Overall, in several countries, a one standard deviation increase in school performance results in about a 12 to 15 increase in earnings. Though more work is needed in this area, clearly learning outcomes are important determinants of earnings. Therefore, a policy priority is to establish empirically which policies and programs lead to learning outcome gains.

Evidence of heterogeneity in the returns to education exists. From the evidence available, in most high-income and middle-income countries, higher returns at the upper ends of the wage distribution have been observed. Overall, in low income countries the returns tend to be higher at the lower ends of the wage distribution. Though more research is needed, such differences between countries could be due to: more job mobility in developed countries allowing individuals to improve their position by changing jobs; scarcity of skills; differential exposure to market forces and the link between pay and productivity; or differential access to quality education or distribution of quality outcomes. What is clear is that average returns to the average individual will not suffice for policy purposes. We need to know more about which interventions are more likely to affect which parts of the distribution, and to establish at the same causality. In the above review, we noted that a major policy concern is the relatively low private rate of return to primary education for women in developing economies.

Conclusions and policy considerations

The empirical returns to schooling literature has proven to be a useful standard. The global average rate of return to schooling, estimated at about 9%, is used as a global benchmark. Empirical evidence on returns on investment in education are a useful indicator of the productivity of education, and they serve as an incentive for individuals to invest in their own human capital.

More research is needed, however, on estimating the social benefits of schooling. After all these years it is still an underdeveloped theme in the literature and remains a research priority. Still, existing evidence suggests that social returns and externalities are likely high.

Disclaimer

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