The Returns to Education

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Abstract:

As we celebrate anniversaries of seminal works by Psacharopoulos, Mincer, and Becker, it is important to trace the evolution of the returns to education. The 20th century witnessed an educational revolution, with global average years of schooling rising from less than 2 in 1900 to over 7 in 2000. Cost-benefit analyses estimate returns to education, showing an average of 10 percent, higher for women and in lower-income areas. The canonical model suggests individuals respond to returns, influencing educational choices. Social returns to education extend beyond private gains, impacting crime rates, economic growth, and environmental health. The intricate interplay between private and social returns underscores the multifaceted nature of education's impact on individuals and societies.

Introduction

This year – 2023 – marks 50th anniversary of *Returns to Education* by George Psacharopoulos (1973). Next year – 2024 – marks 50th anniversary of *Schooling, Experience, and Earnings* by Jacob Mincer (1974). Next year is also 60th anniversary of *Human Capital*, by Gary Becker (1964, although 1962 was breakthrough article in the *Journal of Political Economy*).

But the history of economic thought in education goes back. Early philosophers such as Aristotle and Confucius recognized the importance of education. Adam Smith is the first economist to discuss schooling. Friedman and Kuznets (1939) used the discounted value of future earnings to explain the incomes of doctors and dentists. We had an early display of age-earnings profiles in the work of Soviet economist Strumilin (1924) who made estimates of the benefits of education based on his analysis of a Leningrad factory. Walsh (1935) estimated the stock of human capital in the United States and the returns to formal schooling of college graduates.

But the history of economic thought in education goes back even farther. We have evidence of wage premiums in the 4th century BC thanks to the writings of Diodorus, Justin, Plutarch, and Arrian, as collected in Kallianiotis (2016). During Alexander's campaign a cavalry officer (ἱππεῖο) earned 220 drachmas a month. At the same time, a skilled worker earned 77 drachmas a month, while an unskilled laborer earned 30 drachmas a month. We also have evidence of skill premiums in colonial Africa (Frankema and van Waijenburg 2023).


Modern history

In modern economic thought, spending on education is widely viewed as an investment in human capital (Becker and Chiswick 1966; Mincer 1974). It is believed that as education increases, then poverty and inequality declines. Schultz (1961) formalized this in his discussion of economic development. From this, human capital theory was born.

The canonical model of human capital predicts one responds to returns, same as any investment (Becker 1964). Causal studies confirm youth respond to signals from expected returns (Abramitzky and Lavy 2014; Armand et al 2019; Boneva et al 2021; Jensen 2010; Kuka et al 2020; Saad and Fallah 2020). Low returns at lower levels of schooling discourage attendance, higher returns at higher levels of education encourage it (Kanjilal-Bhaduri and Pastore 2017). It is important that youth have good information about likely trends in labor market outcomes as they ponder their futures (Pastore 2018; Patrinos 2016).

Education revolution

The 20th century marked an educational revolution, with more people in school than ever before (Figure 1). Over the years, average education levels have significantly risen, from less than 2 years in 1900 to over 7 years in 2000. Projections suggest it will reach 10 years by 2050, a more than five-fold increase in a century and a half (Barro and Lee 2013).
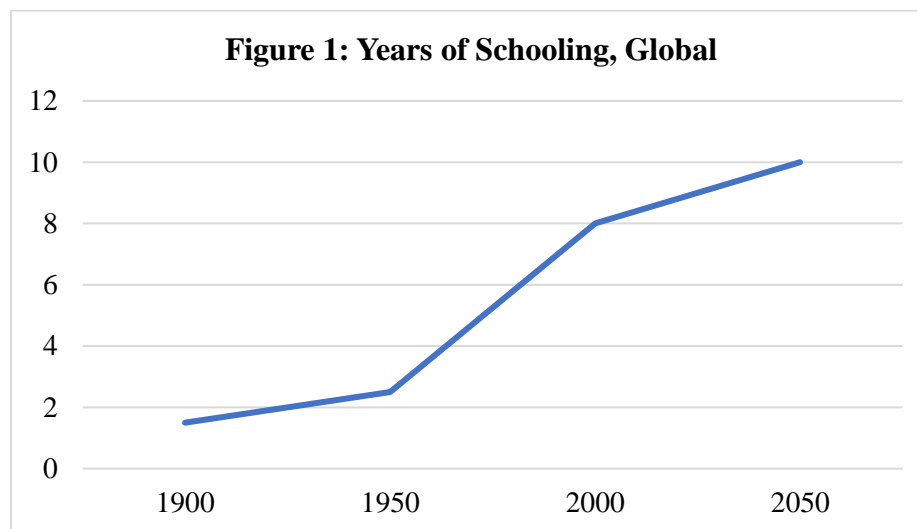
Source: Barro and Lee 2013

Human capital theory

The returns to education are estimated using cost-benefit analysis. The value of lifetime earnings to net present value of costs are calculated. The costs include a student's foregone earnings while studying and any fees paid. The benefits are the extra earnings compared with someone with less education.

The economics of education field views schooling as an investment. The estimation finds that incremental increases in earnings are associated with increases in schooling. Recent research has treated return to schooling as causal parameter (Card 2008), but one which varies across people and level of education.

The idea of treating schooling as an investment that yields internal rates of return comparable to other investments in the economy has proven extremely useful and has led to an unusually coherent body of research that combines theoretical modelling and detailed empirical analysis. Much of the existing empirical work is conducted in the framework of Mincer's (1974) human capital earnings function, which relates the logarithm of earnings to completed schooling – measured in years to reflect the opportunity cost of the investment – and a control for post-schooling experience. In a strict equalizing difference framework, the coefficient of schooling is the internal rate of return to schooling. While there are other ways to estimate the returns to education (Psacharopoulos and Patrinos 2004), the Mincerian human capital earnings function has become a convenient estimation technique. It is usually formulated as:

$$\ln w = f(s,x) = \ln w_0 + \rho s + \beta_1 x + \beta_2 x$$

Where the natural logarithm of wages (w), is a function of schooling (s) and experience (x); the coefficient ρ is rate of return to schooling and β is the return to experience. For populations where most adults participate in the labor market, the Mincerian coefficient is a reasonable approximation of the private returns to an additional year of schooling.

Estimates of the returns to schooling

There are literally thousands of estimates of the returns to schooling. There are several reviews and global compilations of the empirical literature (for example, Banerjee and Duflo 2005; Caselli and Ciccone 2013; Gunderson and Oreopoulos 2020; Harmon et al 2003; Hendricks 2002; Psacharopoulos 1994; Peet et al 2015). Here we will rely on the joint databases compiled from Montenegro and Patrinos (2014) and Psacharopoulos and Patrinos (2018).

The average return to a year of schooling is about 10 percent, usually between 5 and 10 percent. The returns to schooling are higher for women than for men, 10.0-11.6 versus 8.0-9.6 percent. However, when the labor force participation of women is low, as is the case in much of South Asia and the Middle East and North Africa, the Mincerian coefficient will likely over-estimate the wage benefits for women from additional schooling. For women that work in such countries, the returns are a good indicator. In some cases, education promotes the participation of women in the labor force, but not always (Kanjilal-Bhaduri and Pastore 2018), while the returns to education may prompt entry into the labor market (Kingdon and Theopold 2008; Kingdon and Unni 2001).

The returns to schooling are higher in relatively lower income areas and where human capital is scarce (see Figure 2). There are higher returns in countries with less schooling overall, which would be predicted by economic theory.

Figure 2: Returns to schooling by region
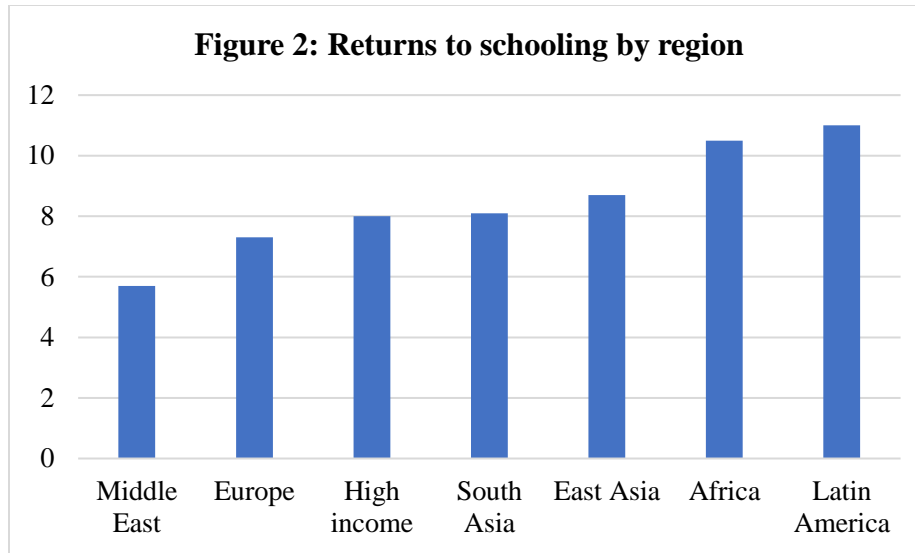
Source: Montenegro and Patrinos 2021

The returns to schooling are higher in lower income countries, compared to high income countries. The returns to schooling are higher for academic/general secondary education than they are for technical/vocational secondary education.

The returns to schooling are high when compared to other potential uses of one's money. For example, the returns to education are higher than housing returns, bank deposit rates, bonds, and even the stock market: 10 percent versus 4.6 percent (The Economist 2018).

The returns to schooling are higher at the tertiary level in every region and in most countries of the world. This shows a high demand for higher order skills.

Demand for schooling

Despite the rapid increase in average years of education of the labor force and growing school enrollments worldwide, the returns to schooling increased in the early years of the 21st century. The rate of return to schooling is a price and, like other prices, it reflects the demand for, and supply of, workers with higher or lower levels of schooling. The increasing returns during a time of increased school levels has suggested a *race* between education and technology (Tinbergen 1974, 1975; Goldin and Katz 2008). Worldwide, this is playing out in terms of the demand for high education. Despite a three-fold increase in higher education supply, the returns are just as high in 2010 as they were in 1970 (Figure 3).

Figure 3: Rate of Return to Higher Education and Higher Education Enrollment (%)
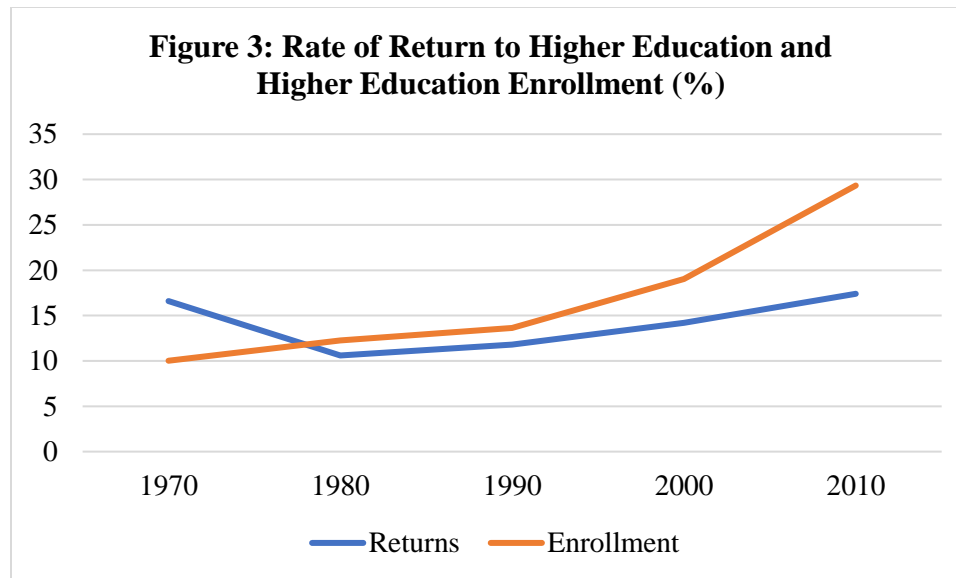
Source: Psacharopoulos and Patrinos 2018

Causal studies

The main estimation issue with private returns to schooling is the possible endogeneity of the schooling decision. That is, whether people with higher ability choose more education. If that were the case, because these people would likely have earned higher wages even if they had not received more schooling, the coefficient on schooling would be biased upwards. Researchers have attempted to clarify whether this is an important concern by comparing the ordinary least squats (OLS) coefficient on schooling with an approach that causally estimates the returns to schooling, usually using the instrumental variable (IV) coefficient in regressions in which years of schooling are estimated with a plausible exogenous shock, which would in principle purge the coefficient of bias (Card 2001; Duflo 2001).

IV estimates frequently surpass OLS estimates, indicating that OLS estimates are not biased upward (Patrinos and Psacharopoulos 2020). This contradicts the conventional understanding of ability bias (Oreopoulos 2006). The method relies on exogenous sources of variation in educational attainment, like changes in compulsory schooling laws. The premise is that schooling returns differ among individuals, and institutional changes impact the educational decisions of specific individuals, not the average person.

Social returns

Billions of dollars from the public coffers are allocated to institutions and individuals with the assumption that a well-educated population contributes to societal well-being. To gauge the effectiveness of this investment, one must assess the social returns of education, measuring its impact on the overall economy. However, quantifying these social returns is a complex task, despite the longstanding economic concept of human capital spillovers. For over a century, there has been conjecture that the societal benefits of education might surpass private gains.

Alfred Marshall (1890) is often quoted as arguing that social interactions among workers in the same industry and location create learning opportunities that enhance productivity:

"...[F]or one new idea, such as Bessemer's[2] chief invention, adds as much to England's productive power as the labour of a hundred thousand men. ... All that is spent ... [in educating the masses] would be well paid for if it called out one more Newton or Darwin, Shakespeare, or Beethoven."

All gain when more are educated. If people gain from having educated people in their neighborhood or metropolitan area, then they receive a social return on the education of others.

Expanding on Marshall's perspective, the literature posits that human capital externalities occur because workers learn from one another, with a greater acquisition of knowledge from those with higher skills. Lucas (1988) proposes that these human capital spillovers could elucidate variations in the long-term economic performance of different countries. The transmission of knowledge and skills through both formal and informal interactions is seen as the mechanism fostering positive spillovers among workers. Recent models further develop this notion, positing that individuals enhance their human capital by engaging in pairwise meetings with more skilled peers, facilitating the exchange of ideas (Jovanovic and Rob 1989).

Others focus on the importance of basic research in fostering technological innovation and productivity, the public good nature of the research and the resulting positive externalities in the form of knowledge spillovers (Arrow 1962; Griliches 1979).

Table 1: Typology of private and social benefits of education

	Private	Social
Monetary	Enhanced productivity of people	Enhanced output of organizations, firms, society
Non-monetary	Improved health, well-being	Social cohesion, well-being, spillovers

Sources: Mingat and Tan 1996; Owens 2004

Measurement and methodology are of primary concern. The wider economic and social effects may include moderation of crime rates, slower population growth, less poverty, economic growth of regions (Lange and Topel 2006), increased tax revenues, cleaner environment, health, health of family members, slower spread of disease (Cui and Martins 2021), two-parent homes, schooling of children, fertility, infant mortality (Pradhan et al 2018), reductions in prejudice and intolerance (Hout 2012), increasing support for civil liberties, participation in civil society and politics (Putnam 2000), support for climate action (Angrist et al 2023) – among others. Table 1 presents a simple typology of the returns to education.

Estimates of productivity externalities based on augmented micro-Mincer earnings regressions range from zero (Acemoglu and Angrist 2001; Ciccone and Peri 2006) to moderate (Rauch 1993; Gennaioli et al 2023) to huge (Moretti 2004).

Moretti (2004) found that high school graduates' wages increased where the proportion of college graduates in the labor market increased and that high school dropouts' wages increased even more in those places. He estimates spillovers from college education by comparing wages for otherwise

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[2] Henry Bessemer (1813-1898) was a prominent British engineer, inventor, and entrepreneur. He developed the first cost-efficient process for the manufacture of steel in 1856, which later led to the invention of the Bessemer converter.

similar individuals who work in cities with different shares of college graduates in the labor force. He instruments with (lagged) city demographic structure and presence of land-grant college. He finds that a percentage point increase in the supply of college graduates raises high school dropouts' wages by 1.9 percent, high school graduates' wages by 1.6 percent, and college graduates' wages by 0.4 percent. The effect is larger for less educated groups.

Rauch (1993) shows that each additional year of city average education can be expected to raise total factor productivity by 2.8 percent. This reflects the productivity benefits from geographic concentration of human capital caused by sharing of ideas.

In the United States, the social returns are estimated to be at least higher than the private returns (Wolfe and Haveman 2002); sometimes the same, in effect doubling the full rate of return to education (Canton 2007; McMahon 2000). Nevertheless, it is an under-researched area that will remain unsettled until more work is done (Deming 2022).

Cui and Martins (2021) conduct a meta-analysis of the social returns to education literature. They analyze over 1,000 estimates from 32 journal articles published since 1993, covering 15 countries of different levels of development. Their results indicate that spillovers slow down with economic development, while tertiary schooling and schooling dispersion increase spillovers; and spillovers are smaller under fixed-effects and IV estimators but larger when measured at the firm level.

Oreopoulos and Salvanes (2011) shows that social returns are positive and high. They argue that perhaps the empirical estimates are too high. They speculate that this suggests people are underinvesting in education and missing out on significant welfare-increasing opportunities. This could be due to low-income families not investing enough due to financial constraints, an unwillingness to borrow, or that they do not know how to obtain aid. Or some young people are short-sighted.

The existence of externalities would imply that we are under-investing in education. Their existence would increase the importance of human capital for explaining variations in earnings. Trillions of dollars in public money are invested in institutions and individuals on the theory that society benefits from having an educated populace. Therefore, it would be good to know that being educated is not only good in its own right – that it also promotes good outcomes for individuals, their communities, and the nation.

Openness, Trade, and the Returns to Schooling

As the level of schooling increases in a country, the wage benefits of schooling decline, all else equal. This is the result of supply and demand (Acemoglu 2003; Psacharopoulos 1989). However, if the demand for skills increases, then the price may increase as well. Increased trade can induce technological change, which in turn can lead to an increase in the demand for skills (Acemoglu 2003). Economic transition can lead to a demand for skills (Flabbi et al. 2008). There does seem to be a growing demand for skills in growing economies, while open economies are witnessing a higher return to schooling (Table 2). We use a panel data set of the returns to education from our database to estimate the determinants of the returns to schooling. When we use country and year fixed effects, we see that having an open economy leads to higher returns, as does more schooling (Table 3). We obtain similar results when analyzing returns to schooling over time for transition countries (Patrinos and Rivera-Olvera 2023). Countries across Eastern Europe and Central Asia are in their third decade of independence. The returns to education in 28 transition and 20 non-transition countries in Europe and Central Asia are analyzed using panel data analysis and

difference-in-difference methods to estimate the impact of transition and EU accession. It is found that the transition from a centrally planned economy to a market economy increases the returns to schooling in post-socialist countries positively and significantly, especially through the EU accession channel.

Table 2: Trade, Growth and Returns to Schooling

Economy	Returns to schooling				Years of schooling
	Overall	Primary	Secondary	Tertiary	
Contracting	10.0	11.7	7.6	14.8	7.9
Growing	10.9	12.3	8.3	17.6	7.2
Closed	10.2	12.0	7.8	15.6	7.5
Open	10.0	11.1	7.5	14.4	9.1

Table 3: Determinants of the Returns to Schooling

Variables	OLS	Random Effect	Fixed Effect
Schooling years	-0.817***	-0.397**	0.815***
	(0.142)	(0.183)	(0.309)
Growing economy	0.579	0.611	0.340
	(0.751)	(0.535)	(0.541)
Open economy	0.078	1.649*	2.876**
	(0.902)	(0.943)	(1.143)
Constant	21.386	17.372	8.143
Observations	267	267	267
R-squared	0.133		0.104
Number of Countries		108	
Country FE			YES
Year FE			YES

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Returns to tertiary education and COVID-19

The ability to deal with disequilibria implies that rates of return to education rise during a crisis (Schultz 1975). The ability to deal with disequilibria implies that the private rates of return to university education rise during a crisis. Educated workers were better at learning new skills and adapting to different work conditions. Research from financial crises of 1990s and late 2000s provides support for Schultz's thesis (Cholezas et al 2013; Fasih et al 2021; Fiszbein et al 2007; Patrinos and Sakellariou 2006). Educated workers can better seek information about job opportunities while less educated workers tend to take lower-paying jobs during a crisis and do not have the ability to switch to better jobs (Autor et al. 2014)

Analyzing the returns to tertiary education in the USA and 14 middle-income countries, using comparable data before, during and after COVID-19, it is shown that the returns increased during the pandemic, and remained higher post-pandemic than it was pre-pandemic (Figure 4). This suggests that higher educated workers have the ability to navigate the crisis and remain employed, while less educated workers tended to lose jobs or take lower paying positions.

Figure 4: The Returns to Tertiary Education over Time

15.0

14.7

14.1

2019   2020   2021
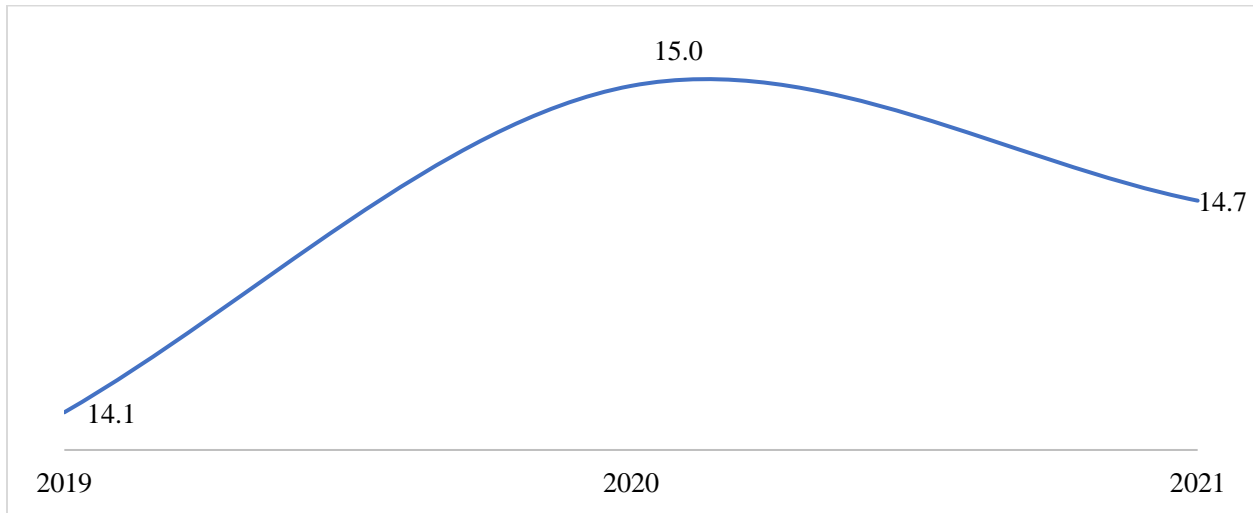
Conclusions and Research priorities

A quick review of the literature shows that there are returns to schooling, and they have remained strong in recent years. In fact, they seem to be increasing in some countries as a result of the crisis. We also see that the relationship between schooling and earnings is causal. We also see that we may be under-investing in education if the social returns are as high as some argue. This is important because while we know how to improve basic education and get more children in school, we may need to do more to further increase enrollments and improve quality.

Looking ahead, it is imperative to delve deeper into understanding the returns to education and unravel the reasons behind certain groups not reaping its benefits. Given the substantial social returns associated with education, the evident under-investment in schooling raises concerns. Identifying groups that are inadequately investing or not engaging in the labor market post-graduation, and devising effective interventions, becomes a crucial focus for both research and policy initiatives. Prioritizing experiments aimed at enhancing schooling, elevating its quality, and maximizing social benefits emerges as another key area of focus.

Table 4: Research Themes in the Economics of Education

	Rate of return	Screening	Externalities	Causal
1960s	X			
1970s	X	X		
1980s	X	X	X	
2000s	X		X	X

Source: Updated with 2000s based on Psacharopoulos 1996

Research themes in the economics of education have evolved over time (Table 4). Going forward, we need to undertake more experiments to increase schooling, improve quality, and social returns. We need to find ways to measure the social returns to education better and more consistently while incorporating the full social benefits.

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