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A cross-country analysis of human capital distribution with private and social returns

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Abstract

While calculating human capital and its distribution, the literature overlooked the returns to education and considered only average years of schooling. This study addresses the gap by calculating human capital Gini using the returns to schooling from 1970 to 2015 for diminishing and U-shaped returns to education. And analyses the impact of the differences on cross-country human capital and their distribution. Between 1970 and 2015, the divergence between social and private returns has increased significantly. The initial level of human capital inequality plays a significant role in the growth of human capital Gini for both private and social returns. Still, it has a greater impact on developing than developed countries. Thus, significant public and public-private investments are required to provide further access to secondary and tertiary education to reduce economic human capital inequality.

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1. Introduction

Estimating the returns to education and human capital (HC) inequality is a complex and critical task that forms a key foundation of human capital theory (Duflo 2001; Heckman et al. 2006; Krueger 1994; Patrinos et al. 2010, 2014, 2016). Estimating returns also arises due to the interest in knowing the efficiency and equity generated by investment in education. The theory of human capital advances that education investment raises future productivity. However, the trends in return to education indicate a different picture, opposite to what the theory had anticipated. For the last 40 years, human capital literature considered decreasing returns to education, highest for primary and lowest for tertiary education. Social and private returns fall at all levels of education and with countries' per capita income. However, for the past few decades, private returns to higher education have been increasing; the highest return is maintained for low and lower-middle-income countries such as Latin America and the Caribbean (Psacharopoulos &Patrinos 2004; Patrinos 2010). The highest returns are observed for low and middle-income countries, where the gap between demand and supply for skills is relatively lower than in high-income countries.

Due to the rise in demand for tertiary education and the increase in demand for skilled labours, the return to education for tertiary education has been rising for the past several decades (Psacharopoulos & Patrinos 2018; Rabiul Islam et al. 2014; Schündeln & Playforth 2014). Private returns to education are now higher than social returns due to the heavy subsidisation of education, which increases the overall public cost and lowers the private cost of education. The externalities are mostly excluded from the measurement of social returns because of various economic challenges in measuring externalities. Social returns follow well-known falling patterns by level of development and education (Patrinos, 2001). All the previous endeavours to find returns have found that social returns are always less than private return

Social returns to education are frequently incomplete since the current literature mainly emphasises private individual returns and neglects the general social benefits. Social returns such as better societal outcomes, including healthier public health, reduced crime rates, and higher political stability are critical but hard to quantify (Owens 2004; Reenen et al. 2002). If social returns are better approximated, the argument favouring public investment in education would be stronger. For example, the positive externalities of schooling, like improved social cohesion, increased productivity of the workforce, and reduced government spending on the criminal justice and healthcare system, would likely increase the net social return of school programs (Moretti 2004, 2006). With improved estimation of these returns, there might be a greater tendency to invest more in education and design policies that maximise these social returns, especially in underprivileged communities with stronger potential for spillovers. Additionally, if we increase dependence on evidence about social returns, we can enhance cost-benefit analysis and create focused education policies that improve personal outcomes and tackle more general societal objectives (Patrinos et al. 2021).

The uncertainty surrounding the social benefits of education does not undermine their probable importance. However, it underlines the value of further research and enhanced data collection on the longer-term social effects of schooling (McMohan 2004). Precise quantification of social returns would likely present a much higher overall valuation of human capital investment, particularly in education and training. Thus, the assessment will provide a balanced analysis of investment in human capital, as well as the costs and benefits duly accounted for. With positive externalities associated with schooling, private returns underestimate the economic value of schooling (Patrinos et al. 2010). Indeed, at the micro level (dealing with private returns),

education positively affects social areas such as health and wages (Schündeln & Playforth 2014). However, the relationship is puzzled at the macro level (dealing with social returns). The current study focuses on the need to improve the estimation of social returns to inform more effective public policy and investment decisions. Besides, it highlights the contribution of social returns' distribution to achieve equity, especially in developing economies where greater disparities between social and private returns are prominent.

This paper's contribution is threefold: i. Comparing human capital and years of schooling using both returns to education. We find that human capital measured with private returns is higher than social returns for all country-regions corresponding to the same level of education, but the difference varies for different regions. ii. The gap between the two returns has widened over time (between 1970 and 2015), with lower and upper-middle-income countries at the forefront. For these countries, the private and social returns to education, especially tertiary education, are greater than for primary and secondary education and thus create a large divergence between social and private returns. iii. Finally, by calculating HC Gini using social and private returns, we examine β convergence for various country groups, and conclude that low and lower-middle income countries experienced divergence, and this divergence is more prominent in the case of the social returns.

2. Methodology

Calculation of human capital and Human capital Gini Index

This section focuses on calculating human capital Gini using decreasing and U-shaped returns. For human capital calculation, we follow the same specification used by Lim and Tang (2006)

$$hc_i^j = e^{\phi(s_i)};\ \phi(s_i) = \begin{cases} r_1 s_i & if\ 6 \geq s_i \\ r_1 6 + r_2(s_i - 6) & if\ 12 \geq s_i > 6 \\ r_1 6 + r_2 6 + r_3(s_i - 12) & if\ s_i > 12 \end{cases} \quad (1)$$

Where s represents the average schooling years in the population of age 15 and above; r_1, r_2 , r_3 show the decreasing rate of returns (social returns) for 6 years of schooling and above, where r_1, r_2 , r_3 are 0.189, 0.131, 0.108, respectively, as measured by Psacharopoulos & Patrinos (2004). Many studies have assumed that there is a decrease in returns to education (Caselli 2004; Cooper & Cohn 1997; Hall 2018; T. P. Schultz 1975). Social returns consider both private and public spending on education.

However, several other studies reveal that there is a significant reversal in the returns to primary, secondary and tertiary education worldwide (Psacharopoulos & Patrinos 2018; Montenegro & Patrinos 2014; Oreopoulos & Petronijevic 2013). Globally, returns are highest for tertiary education due to rising demand for skilled labourers, followed by primary and secondary schooling; this shows a significant reversal from many previous results. However, most recent estimates rarely distinguish between social and private returns (Schündeln & Playforth 2014; Gerged & Elheddad 2020; Psacharopoulos & Teixeira 2020). Methodologically, private estimates are calculated using the Mincerian earnings function rather than using the full discount method, which can measure both social and private returns (Patrinos & Psacharopoulos 2020; Heckman et al. 2006; Glomm & Ravikumar 1998; Becker & Chiswick 1966).

The traditional concept of diminishing returns with subsequent years of schooling is being challenged due to rapid changes in demand for skills in the labour market (Patrinos et al. 2018). To calculate the HC with U-shaped returns, the value of social returns denoted by r_1, r_2, r_3 in equation (1) is replaced by private returns, R_1= 0.17, R_2= 0.06, R_3= 0.10, borrowed from Patrinos et al., (2016).

We expand the concept of the income Gini coefficient to build the HC Gini index. The latter evaluates the inequality in the distribution of human capital, which includes factors such as education levels, years of schooling and cognitive skills. A high (low) HC Gini indicates that education and skill-building opportunities are highly uneven (even). Since Thomas et al. (2001) introduced the Gini coefficient of education as an extension of the Gini coefficient of income distribution, many researchers have employed the Gini coefficient to measure education inequality (Lim & Tang, 2006; Shukla & Mishra, 2019; Castello-Climent & Domenech, 2021). Using the human capital values calculated in Equation (1), the HC Index (HCI) Gini is computed as follows

$$H\mathrm{CI} = 1/2\mathrm{H}\sum_{j=0}^{3}\sum_{i=0}^{3} n_i\, n_j \left|hc_i - hc_j\right| \tag{2}$$

Where hc_0, = no human capital acquired, hc_1, = average human capital acquired through primary schooling, hc_2, = average human capital acquired through secondary schooling, and hc_3, = average human capital acquired through tertiary schooling, n_0= Population having no schooling, n_1= Population having primary schooling, n_2= Population having secondary schooling, n_3= Population having tertiary schooling, H denotes average years of schooling in the population 15 years or over, i and j represent different levels of schooling. The value 0 indicates perfect equality, whereas the value 1 indicates perfect inequality in schooling. The Gini coefficient satisfies anonymity and population homogeneity in measuring education inequality. It also satisfies education homogeneity (mean independence), which means that inequality measures are not altered when the population education varies by a constant proportion.

We have also computed the growth rate of HCI Gini between 1970-2015 at 5 years' intervals,

$$\text{Growth Rate of HCI Gini} = \frac{(G_t - G_{t-1})}{G_{t-1}} \times 100 \tag{3}$$

where G_t= human capital Gini coefficient at time t and G_{t-1} = human capital Gini coefficient at time $t-1$. The HC Gini growth rate shows whether inequality in a country is rising or falling over time.

3. Data

We use data for schooling from the (Barro & Lee, 2013) education data set from 1970 to 2015 for 134 countries. A 5-year age interval disaggregates the data. The new data set improves on the earlier one by using more information from census data and a better methodology. Improving the data set addresses the measurement issues and concerns (Cohen & Soto 2007).The data on school attainment is collected from census information and compiled by various organisations like UNESCO, Eurostat, and National statistic agencies. They report the distribution of educational attainment in populations over 15 years of age at intervals of 5 years. The classification scheme follows the International Standard Classification of Education by UNESCO, which facilitates comparisons of education statistics across most countries on

uniform and internationally agreed definitions. The social returns to education have been drawn from Psacharopoulos and Patrinos (2004), while private returns are drawn from Psacharopoulos and Patrinos (2016). These returns are comparable because they do not change drastically over time (Lim & Tang 2006). These studies also measure country-specific returns. However, they are constructed under the assumption that the labour market is perfectly competitive and mobile, and employers have perfect information on the quality of workers. These assumptions are regularly tested and make them inappropriate for the disaggregated examination of with-in-country returns (Black et al. 2003; Reenen 2003). Secondly, country-specific data contains enormous measurement errors. In light of these limitations, the world rate of returns is utilised.

4. Results

4.1. Human capital and schooling for social and private returns

The relationship between wage rate and schooling infers returns to education. Both theoretical and empirical evidence exist and state that the returns to education are higher at lower levels of educational attainment while significantly decreasing for higher educational attainment (Trostel 2004). However, several recent studies confirm that this trend is true only for social returns, not private ones (Patrinos et al. 2010, 2014, 2018). In Fig. 1 & 2, we plot schooling versus human capital with private and social returns, respectively. We observe that the highest difference in human capital compared between both returns occurs for North America, Middle Eastern and North African and European & Central Asian countries: social returns are much lower than private returns due to lower social benefits and added extra cost of (Heckman et al. 1999; World Bank 2023; Toutkoushian & Paulsen 2016).

Fig. 1: Average schooling years and human capital using private returns

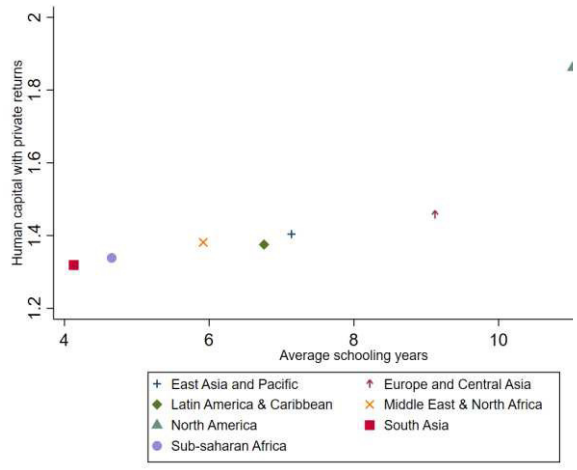
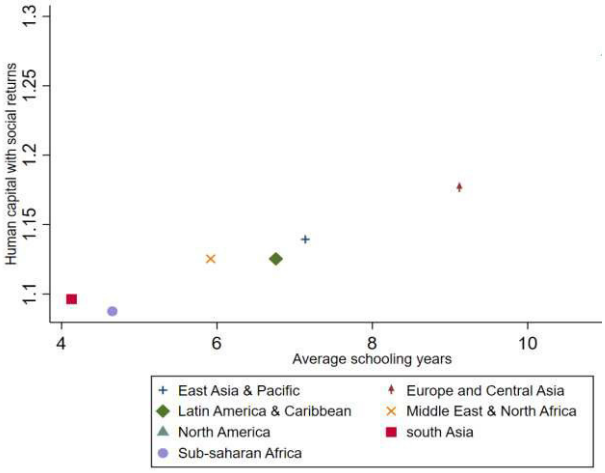


Fig. 2: Average schooling and human capital using social returns



Source: authors' illustration

The difference between the two returns for North America is 0.368, the highest among all the regional groups. On the other side, sub-Saharan countries, although they have low human capital, have the lowest difference in both measures as social returns are higher in these countries. The average return to schooling in sub-Saharan Africa is 12.5% (Patrinos et al., 2016; Table I). For South Asia and the Middle Eastern region, the private rate of return is the lowest

among all regions: 8.1 and 5.7, respectively, which adds an extra burden of social cost on society as social returns are universally lower than private returns. The difference between the returns is lowest for Sub-Saharan Africa, South Asia, Latin America and North African Countries. However, except for Sub-Saharan African countries, the lower difference is caused by lower returns in these regions. Lower private returns in such areas reflect lesser social returns as social costs always far exceed benefits because education has a larger purpose than earnings and returns. Reducing the difference in the returns must not be done at the expense of reducing the absolute levels of returns. This can seriously jeopardise other growth channels, such as gaining equal opportunity in public services such as education and health.

Table I: Private returns to schooling by region

Region	Overall rate of returns (%)	Mean year 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: Patrinos et al. (2018)

4.2. Does the human capital Gini converge?

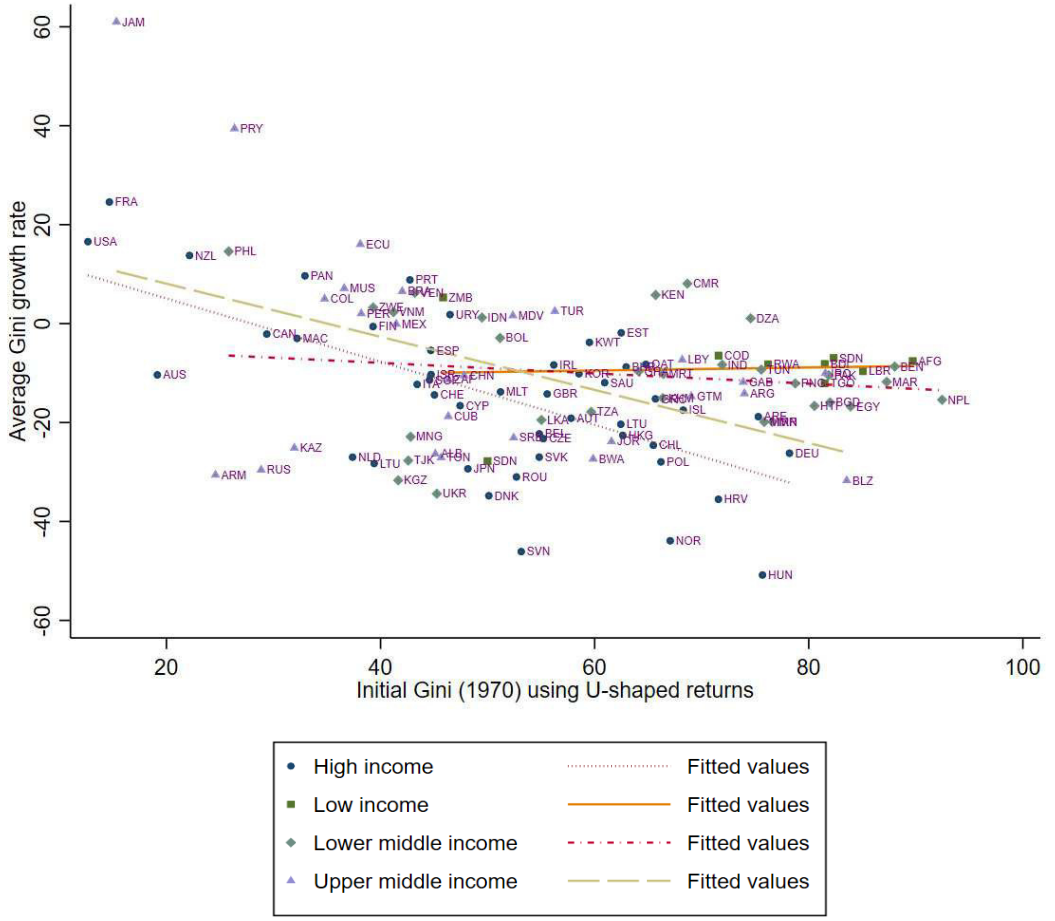
The number of countries experiencing differences in U-shaped (private) and decreasing (social) returns have increased in the last five decades (Table II) due to an increase in demand for higher education compared to other levels of schooling (Tansel 2005; Tansel & Bodur 2012). Thus, to understand which countries have experienced a rise or fall in HC inequality, it becomes critical to observe their performance over time. We now graphically look at the β convergence for different countries. Using Fig. 3 and Fig. 4, we observe that upper-middle-income and high-income countries experience a convergence i.e., higher initial inequality leads to a faster reduction in HC inequality over time. This is true for both social and private returns implying that developed nations more rapidly reach towards greater equalisation of human capital. However, exceptions such as the USA and France show low initial HC Gini but higher inequality growth over time. The intensity of this relationship differs when measured using private versus social returns. For instance, in the USA, the rate of growth of Gini is around 20% with private returns but around 5% with social returns.

Table II: Difference in human capital Gini for U-shaped returns and decreasing returns

Year	(Human capital Gini for U-shaped returns)- (Human capital Gini for decreasing returns) (Number of countries having positive difference)
1970-1979	46
1980-1989	57
1990-1999	72
2000-2009	76
2010-2020	78

Source: authors' calculation

Fig. 3: Initial Gini (1970) and average U-shaped private returns Gini growth rate

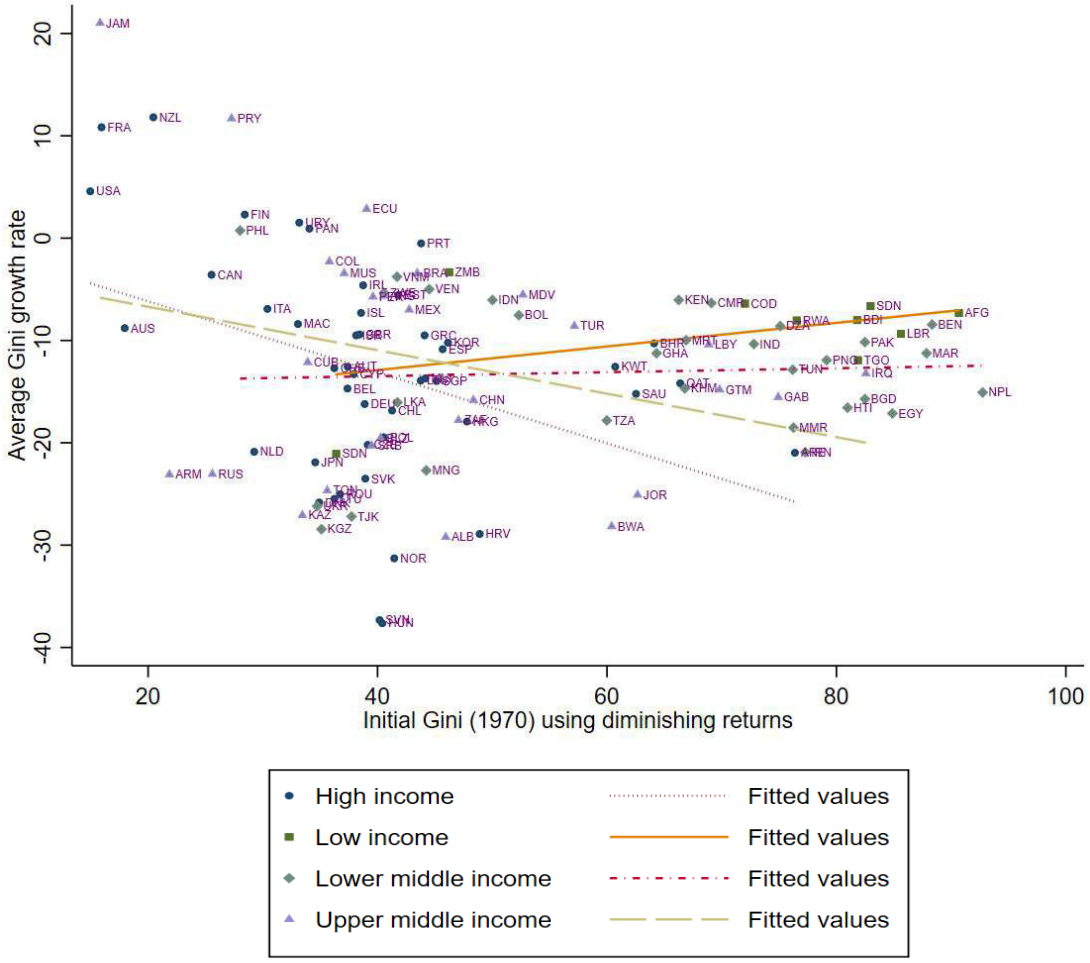


Source: authors' illustration

However, for low and lower middle income countries, the fitted line in Fig. 3 is almost horizontal which implies that for these countries in the last five decades the income inequality growth rate has remained the same. But, in Fig. 4 we observe clear divergence i.e., a rising trend in inequality growth rate i.e., higher initial inequality leads to higher growth of inequality in returns for developing countries which is a perfect projection of the "inequality begets inequality" argument. The steeper slope of social returns over private returns in low and lower

middle income nations can be explained by the difficulty of precisely quantifying the wider social effects of education in these environments. Social returns consider the social gains of education, including enhanced economic productivity, social mobility, and overall improvements to society. However, these wider social payoffs are likewise more difficult to measure in poor countries because of data deficiencies, weak public education systems, and low investment in social programs. As a result, the positive impacts of social returns may be underestimated or not fully captured, leading to a steeper increase in inequality when measured by social returns. In contrast, private returns, which focus on individual benefits such as income and employment opportunities, are more easily measured and often show a more direct correlation to the existing inequality, resulting in a more gradual increase in inequality. Thus, the difficulty in measuring the full scope of social returns (Venniker et al. 2001) in developing countries contributes to the observed steeper incline for social returns.

Fig. 4: Initial Gini (1970) and average diminishing social returns Gini growth rate



Source: authors' illustration

In the last decade, low and middle-income countries went from largely integrated to increasingly fragmented (World Bank 2023) in the form of geopolitical tension, climate change or rapid shifts in labour market conditions, which led to shrinking space for government policy and public expenditure, leading to skewed overall development. It has increasingly become

important to transform the condition of the labour market to increase the returns if developing countries want to catch up with developed countries; failing to do this will result in "the middle-income trap" (World Bank 2006), which is getting worsened due to inequality in returns and its persistence over time (Fig. 4). Escaping the trap necessitates the organising the labour market and returns to education through appropriate government policy and lowering the inequality access to quality education, which eventually will increase returns at both private and social level.

5. Conclusion and Policy Advice

The study aimed to evaluate the relationship between different measures of returns (decreasing and U-shaped) in the literature on returns to education. The evident gap in distribution between social and private returns indicates an unequal distribution of returns. Equality can be achieved by addressing the reasons for differences in returns, such as improving the quality of primary education, which generates the highest social returns for all regions in the world and highest for Asian and sub-Saharan countries, which fall into the low-income category. High private returns direct policymakers to look for opportunities for cost-sharing (to lower high social costs) and innovative financing models. An income contingent loan programme where the current cost of education is covered through the use of future resources- the graduates' future income, can be beneficial to lower the social cost of higher education and secure higher education for talented graduates having lesser economic resources.

Countries' initial inequality in human capital levels has a high significance on the growth rate of human capital inequality. Developed and high-income countries have offset the impact of high initial HC Gini. In contrast, for low and lower middle income countries, a high initial level of inequality has led to a further increment in the growth rate of HC Gini. This relationship is more visible for social returns than private returns.

Private estimates are globally accepted as a variable to decide the benefits of education. However, the broader understanding of social returns, which includes public spending on the cost side and other monetary and non-monetary benefits, is important for policymakers to get the correct return estimate. Correction in estimation can lead to convergence in the private and social returns, which can be a crucial insight for policymakers. As the returns are more accurately measured, social and private returns may likely converge. It will also enhance decision-making for individuals and policymakers. Using private returns, people can only better evaluate the monetary and personal returns on education, e.g., increased income and better job prospects. On the other hand, social return data could be used to design policies to promote greater societal benefits, e.g., economic growth and higher productivity. By weighing these two forms of return, resources may be utilised more effectively to fulfil individual and social needs. This integrated approach fosters a more inclusive and productive schooling system with long-term effects for individuals and society.

Declaration

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