Estimated Returns to Quality-Adjusted Education

New Evidence from PIAAC
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Returns to Quality-Adjusted Schooling: New Evidence from PIAAC
This paper: Empirical ingredients

Based on internationally comparable data from PIAAC the paper provides estimates of:

- the returns to observed schooling.
- the contributions of schooling to cognitive skills across countries and over time.
- the returns to quality-adjusted years of schooling.
- the direct returns to cognitive skills.
Motivation

Conditional growth

Conditional test score

coef = 1.98, t = 9.12

Source: Hanushek & Woessmann (JEL, 2008)

Conditional growth

Conditional years of schooling

coef = .026, t = 0.34
The importance of human capital

“…most valuable of all capital is that invested in human beings.”

Principles of Economics (1890)
Alfred Marshall
Understanding education as an investment

Backbone of contemporary theory on human capital

(T. W. Schultz, G. S. Becker, J. Mincer)

Human capital is acquired through schooling, training, and learning on the job.

While these activities are costly, they also entail future benefits.

Individuals decide on their human capital investments by weighing benefits and costs.
Idea dates back to the “Dawn of Economics.”

“The improved dexterity of a workman may be considered in the same light as a machine or instrument or trade which facilitates and abridges labour, and which, though it costs a certain expence, repays that expence with a profit.”

Wealth of Nations (1776), Adam Smith
Key implication

➢ If human capital accumulation is an investment, there should be some sort of return on it.

➢ The past 40 years have witnessed a vast number of studies focused on quantifying the benefits of expenditures that can influence the labor market productivity of an individual.

➢ Initially, the concept of human capital was heavily criticized, but now the concept and its importance are widely accepted.
How does one measure human capital?

➢ The empirical literature on the returns to human capital accumulation relies almost exclusively on available quantity-based measures of human capital investment.

➢ Mincer (1970, 1974) argued that a primary motivation for schooling was developing the general skills of individuals and, therefore, that it made sense to measure human capital by the amount of schooling completed by individuals.
Mincerian wage regression

\[ \ln(w) = \alpha + \beta S + \gamma_1 X + \gamma_2 X^2 + \varepsilon \]

... aims at discovering the relationship between market wages, education, and experience.

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More schooling is associated with higher rewards in the US than in any of the other countries.

Estimated return to schooling in the US of around 10%.

Returns are relatively low in Nordic countries known for their compressed wage structure.
Human capital measurement: a controversial topic

➢ While quantity-based measures are readily available and have been shown to be economically relevant, they might still be poor approximations of effective human capital.

➢ “For example, a year of schooling in Papua New Guinea is assumed to create the same increase in productive human capital as a year of schooling in Japan.”

Hanushek and Woessmann (2008, page 629)
Conceptual framework (H&W, 2008)

Wage
\( w = H + \varepsilon \)

Human Capital
\( H \)

PIAAC scores
\( C = H + \mu \)

- quantity and quality of schooling
- family inputs
- individual ability
- other relevant factors…
US skill distribution

US schooling-skill gradient

Conditional PIAAC score

Conditional years of schooling

coef = 0.187, t = 23.23
Contribution of school attainment to cognitive skills

Following Hanushek and Zhang (2009) we estimate schooling-skill gradients for each country/age group combination.

Index measure of the relative contribution of a year of schooling to cognitive skills (relative to the schooling-skill gradient for 24 to 34 year olds in the US).

\[ C_{ikc} = \sum_{a=1}^{5} \beta_{ka} S_{ika} + X_{ik} \gamma_k + \varepsilon_{ikc} \]

\[ \hat{q}_{kc} = \frac{\beta_{kc}}{\beta_{US25-34}} \]
Schooling-skill gradients around the world

➢ Estimates suggest some considerable variation in schooling-skill gradients across countries.

➢ Estimates are large in countries such as the UK, the Czech Republic or Japan.

➢ Substantially lower schooling-skill gradients in Italy, Cyprus, or the Slovak Republic.
Returns to quality-adjusted schooling

\[ \tilde{S}_{ikc} = \hat{q}_{kc} S_{ikc} \]

➢ To quality-adjust schooling we multiply observed schooling with our index measure.

\[ \ln(w_{ikc}) = \delta_1 k \tilde{S}_{ikc} + Z_{ikc} \theta_k + \nu_{ikc} \]

➢ The obtained quality-adjusted schooling measure is then included in a standard Mincerian wage regression.
In most cases the gap in the returns to schooling between the US and other countries becomes smaller.

Some part of the variation in returns to schooling appears to be related to quality-differences in schooling, but a substantial part remains unexplained.
Beyond the standard framework

\[
\ln(w_{ikc}) = \delta_1 k \tilde{S}_{ikc} + \delta_2 k C_{ikc} + Z_{ikc} \theta_k + \nu_{ikc}
\]

➢ PIAAC scores are added directly in the Mincer earnings function.
➢ Allows a direct investigation of how labor markets value cognitive skills.

cognitive skills
1 SD increase in PIAAC scores is associated with an increase in wages from 5 percent in Cyprus and the Czech Republic to 14 percent in the UK and the US. Returns to cognitive skills are strikingly similar in countries with similar cultural background and comparable labor market institutions.
Takeaway

Part of the variation in the returns to schooling may indeed be related to differences in the quality of education systems, but a substantial part remains unexplained.

Remarkable similarities in the returns to cognitive skills in different groups of countries with similar cultural background and labor market institutions.