Lecture 11

Topics in Development Economics: Education

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Contents

Motivation

On the one hand, the micro labor literature has focused on estimating the monetary returns to an additional year of schooling.

On the other hand, the macro growth literature has investigated whether the level of schooling in a cross-section of countries is related to the countries' subsequent GDP growth rate.

The popularity of estimating returns to education stems from the resulting efficiency, equity and financing implications.

- The rank order of returns to a level or type of education, and a comparison with the returns of alternative investments can assist education policy makers to make informed investment decisions.

The Mincerian Wage Equation:

$$lnW_i = \beta_0 + \beta_1 S_i + \beta_2 X_i + \beta_3 X_i^2 + \epsilon_i$$

where

lnW_i = the natural log of the wage for individual i;

S_i = years of schooling;

X_i = experience;

X_i^2 = experience squared;

ϵ_i = disturbance term.

Micro Literature

The Mincerian Wage Equation:

1. *One crucial feature of the model is that* **time** *spent in school (as opposed to education* **degrees***) is the key determinant of earnings. Why is this measure more convenient, especially if we are looking at estimating the model across different countries?*

Micro Literature

The Mincerian Wage Equation:

1. *One crucial feature of the model is that* **time** *spent in school (as opposed to education* **degrees***) is the key determinant of earnings. Why is this measure more convenient, especially if we are looking at estimating the model across different countries?*
    - Data on years of schooling can be used to estimate a comparable return to education in countries with very different educational systems.

The Mincerian Wage Equation:

This equation has been estimated for most countries of the world by OLS.

- The results generally yield estimates of β_1 ranging from 0.05 to 0.15.
  2. *How should we interpret this?*
- Returns are higher for low income countries, for lower levels of schooling, and, frequently, for women (i.e. where there is scarcity).
- The log-linear relationship also provides a good fit to the data even in countries with dramatically different economic and educational systems.

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- The results generally yield estimates of β_1 ranging from 0.05 to 0.15.
  2. *How should we interpret this?*
     - Ceteris paribus, an additional year spent in school is associated with an increase in earnings by 5%-15%.
- Returns are higher for low income countries, for lower levels of schooling, and, frequently, for women (i.e. where there is scarcity).
- The log-linear relationship also provides a good fit to the data even in countries with dramatically different economic and educational systems.

Micro Literature

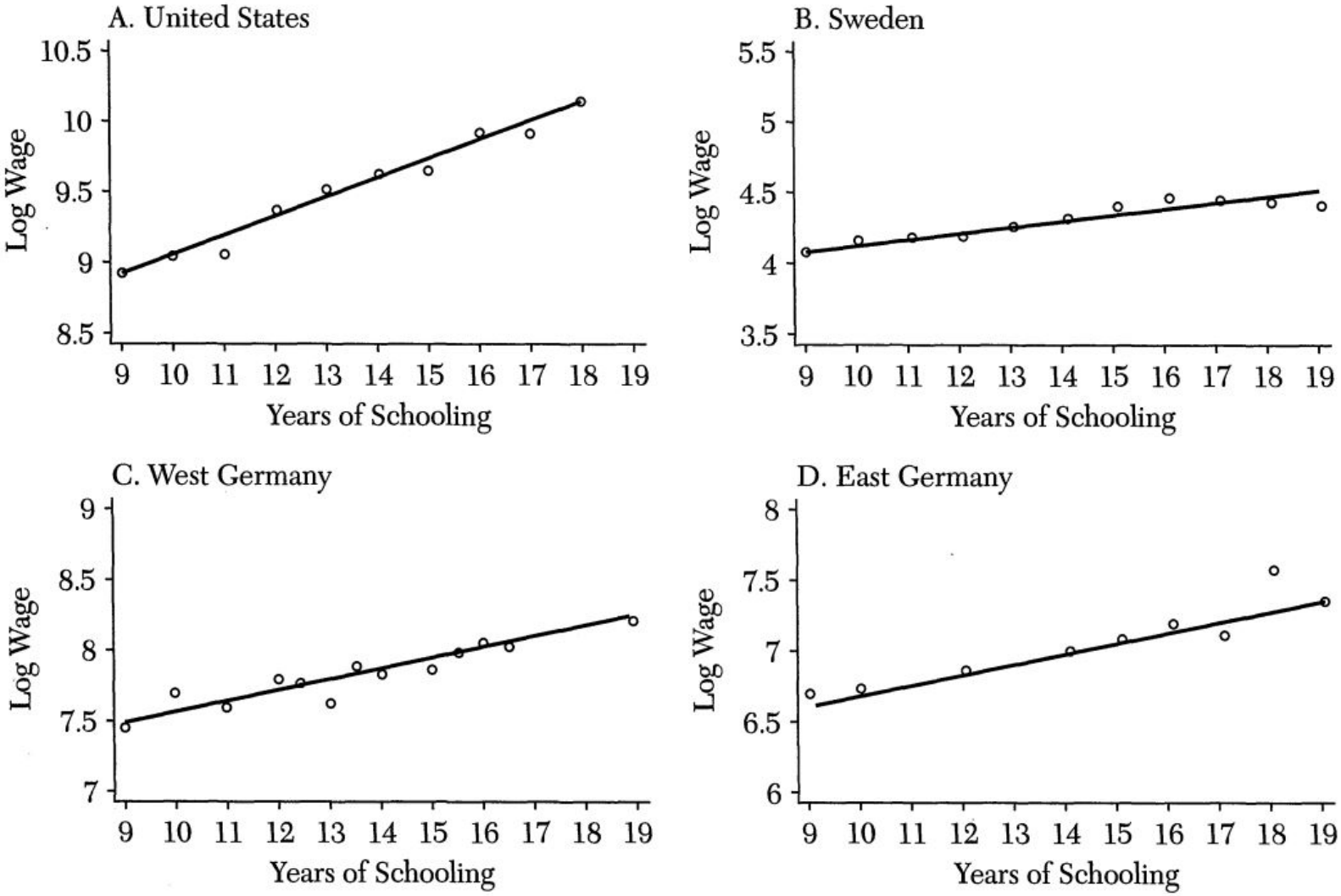


Figure 1. Unrestricted Schooling-Log Wage Relationship and Mincer Earnings Specification

The Mincerian Wage Equation:

3. *What is the problem with estimating this model with OLS?*

The Mincerian Wage Equation:

3. *What is the problem with estimating this model with OLS?*
   - The estimate of the return to education could be biased due to endogeneity:
     - There are other omitted factors that affect earnings and are correlated with years of education: the most important among them is *"ability"*.
     - Education could be measured with error, especially across countries.
     - An additional problem arises in less-developed countries because income is particularly hard to measure when there is a large, self-employed farm sector.
4. *What is the direction of the bias for the coefficient of education?*

The Mincerian Wage Equation:

4. *What is the direction of the bias for the coefficient of education?*
   - For the omitted "ability" bias, we have:
     - Corr (education, ability)>0;
     - Corr (earnings, ability)>0;
       $\Rightarrow$ The bias is positive.
   - For measurement error in education (assuming classical error of measurement):
     - $\Rightarrow$ The bias is negative, called **attenuation bias**

   $\Rightarrow$ The net bias could be negative, zero, or positive depending on which effect dominates.

The Mincerian Wage Equation:

5. *What are the potential ways to solve this endogeneity problem?*

The Mincerian Wage Equation:

5. *What are the potential ways to solve this endogeneity problem?*
   - We could use data on siblings (or better, twins) to difference-out unobserved family characteristics.
   - We could use proxy variables for ability: for example, IQ or parental education.
   - We could use Instrumental Variables method.

Micro Literature

The Mincerian Wage Equation:

6. *Why does education matter for earnings?*

The Mincerian Wage Equation:

6. *Why does education matter for earnings?*
   - Education may increase productivity of the individuals, which leads to an increase in earnings.
   - Education may be signaling ability.
     - Higher levels of schooling are associated with higher earnings, not because they directly raise productivity, but because they certify that the worker is likely to be productive.
     - Education merely sorts workers according to their unobserved attributes: it does not necessarily augment their intrinsic productivity.

Micro Literature

For public policy reasons it is important to distinguish between the *human capital (productivity)* and *screening* hypotheses about returns to education.

- If the only purpose of schooling is to sort prospective employees, then questions arise as to the appropriateness of public investment in the expansion or improvement of schooling.

Social vs. Private Returns to Education

The rate of return to schooling equates the value of lifetime earnings of the individual to the net present value of costs of education.

- For an investment to be economically justified, the rate of return should be positive, and should be higher than the alternative rate of return.
- For the individual, weighing costs and benefits means investing if the rate of return exceeds the private discount rate (the cost of borrowing and an allowance for risk).
  - The costs incurred by the individual are the foregone earnings while studying, plus any schooling fees or incidental expenses incurred.
  - The private benefits amount to how much extra an educated individual earns (after taxes) compared with an individual with less education.

Social vs. Private Returns to Education

The social rate of return includes the society's spending on education.

- *Example:* money spent on renting buildings and professional salaries

The social attribute of the estimated rate of return refers to the inclusion of the full resource cost of the investment

- the direct costs by the government;
- the foregone earnings of students as they invest in their education.

Ideally, the social benefits should include non-monetary benefits of education.

- *Example:* the number of lives saved because of improved sanitation conditions followed by a person because she received more education.
- However, given the scant empirical evidence on the social benefits of education, the social rate of return estimates are usually based on directly observable monetary costs and benefits of education.

Social vs. Private Returns to Education

The social return to education can be higher or lower than the private monetary return.

7. *When is the social return higher than the private return to education?*
8. *When is the social return lower than the private return to education?*

Social vs. Private Returns to Education

The social return to education can be higher or lower than the private monetary return.

7. *When is the social return higher than the private return to education?*
   - The social return could be higher because of externalities from education:
     - If higher education leads to technological progress that is not captured in the private return to that education;
     - If more education produces a reduction in crime and welfare participation or more informed political decisions.
8. *When is the social return lower than the private return to education?*
   - Education could just be a credential, which does not raise individuals' productivities.
   - The social cost of subsidized education exceeds the private costs.
   - In some developing countries, where the incidence of unemployment may rise with education and where the return to physical capital may exceed the return to human capital, increases in education may reduce total output.

Macro Literature

Two issues have motivated the use of aggregate data to estimate the effect of education on the growth rate of GDP.

- The relationship between education and growth in aggregate data can generate insights into endogenous growth theories, and possibly allow one to discriminate among alternative theories.
- Estimating relationships with aggregate data can capture external returns to human capital that are missed in the microeconometric literature.

Macro Literature

Potential channels of the effect of education on economic growth:

- Education increases the human capital inherent in the labor force, which increases labor productivity and thus transitional growth towards a higher equilibrium level of output.
- Education may increase the innovative capacity of the economy, and the new knowledge on new technologies, products and processes promotes growth.
- Education may facilitate the diffusion and transmission of knowledge needed to understand and process new information and to implement successfully new technologies devised by others, which again promotes economic growth.

Macro Literature

Human capital plays different roles in various theories of economic growth.

- In the **neoclassical growth model** (Solow 1956), no special role is given to human capital in the production of output.
- In **endogenous growth models** human capital is assigned a more central role.
  The role of human capital in these models can be divided into two broad categories:
  - The first category broadens the concept of capital to include human capital. In these models sustained growth is due to the *accumulation* of human capital over time (Uzawa 1965; Lucas 1988).
  - The second category of models attributes growth to the existing *stock* of human capital, which generates innovations (Romer 1990) or improves a country's ability to imitate and adapt new technology (Nelson and Phelps 1996). This, in turn, leads to technological progress and sustained growth.

Macro Literature

A typical estimating equation is:

$$\Delta Y_j = \beta_0 + \beta_1 Y_{j,t-1} + \beta_2 S_{j,t-1} + \beta_3 Z_{j,t-1} + \epsilon_j$$

where

ΔY_j = the change in log GDP per capita from year $t-1$ to t;

$S_{j,t-1}$ = average years of schooling in the population in the initial year;

$Y_{j,t-1}$ = log of initial GDP per capita;

$Z_{j,t-1}$ = includes variables such as inflation, capital, or the "rule of law" index.

Macro Literature

There are at least five different ways to interpret the coefficient on the initial level of schooling in this equation:

1. Schooling may be a proxy for steady-state income. Countries with more schooling would be expected to have a higher steady-state income, so conditional on GDP in the initial year, we would expect more educated countries to grow faster ($\beta_2 > 0$). If this were the case, higher schooling levels would not change the steady-state growth rate, although it would raise steady-state income.
2. Schooling could change the steady-state growth rate by enabling the work force to develop, implement and adopt new technologies, again leading to the prediction $\beta_2 > 0$.
3. A positive or negative coefficient on initial schooling may simply reflect an exogenous change in the return to schooling.

Macro Literature

4. Anticipated increases in future economic growth could cause schooling to rise (i.e., reverse causality).
5. The schooling variable may "pick up" the effect of the change in education, which is typically omitted from the growth equation.

Macro Literature

Endogeneity:

- Omitted variables. Schooling might not be the actual cause of growth but, in fact, may just reflect other attributes of the economy that are beneficial to growth.
- Reverse causality. Countries that are growing rapidly have the added resources necessary to improve their schools.

Macro Literature

The empirical macro growth literature yields two principally different findings from the micro literature:

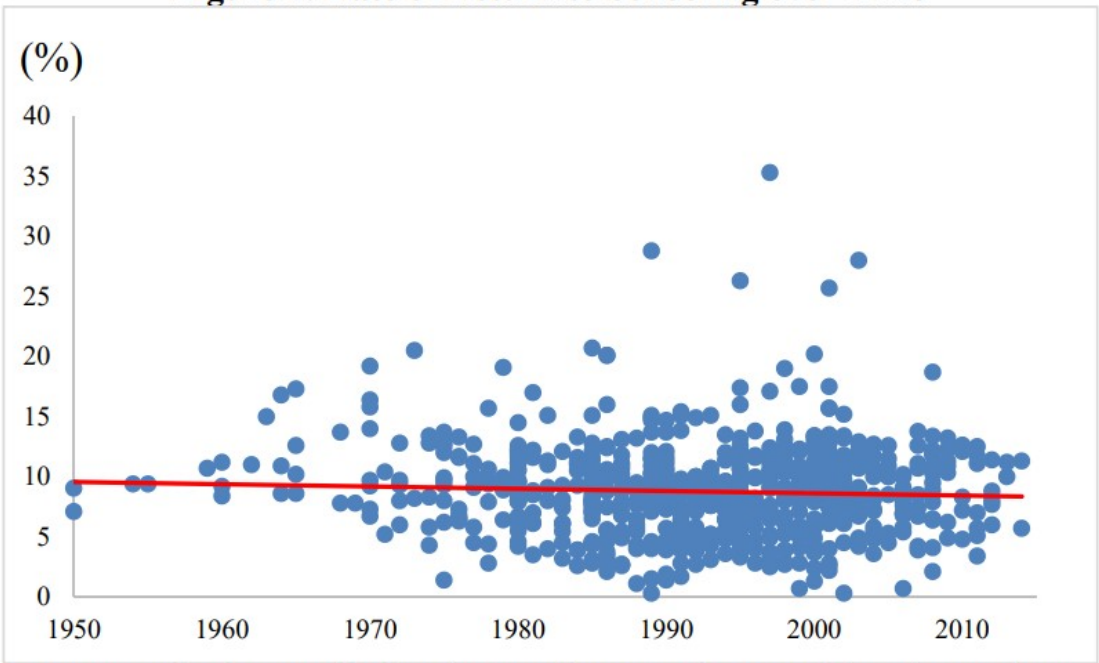
- The initial stock of human capital matters, not the change in human capital.
- Secondary and post-secondary education matter more for growth than primary education.

Results

Mincerian private returns

- Based on 705 estimates, over the years 1950 to 2014, the private rate of return to an additional year of schooling is 8.8 percent.
- The decline over time of the returns to education is very gradual and statistically insignificant.

Figure 1: Rate of Return to Schooling over Time



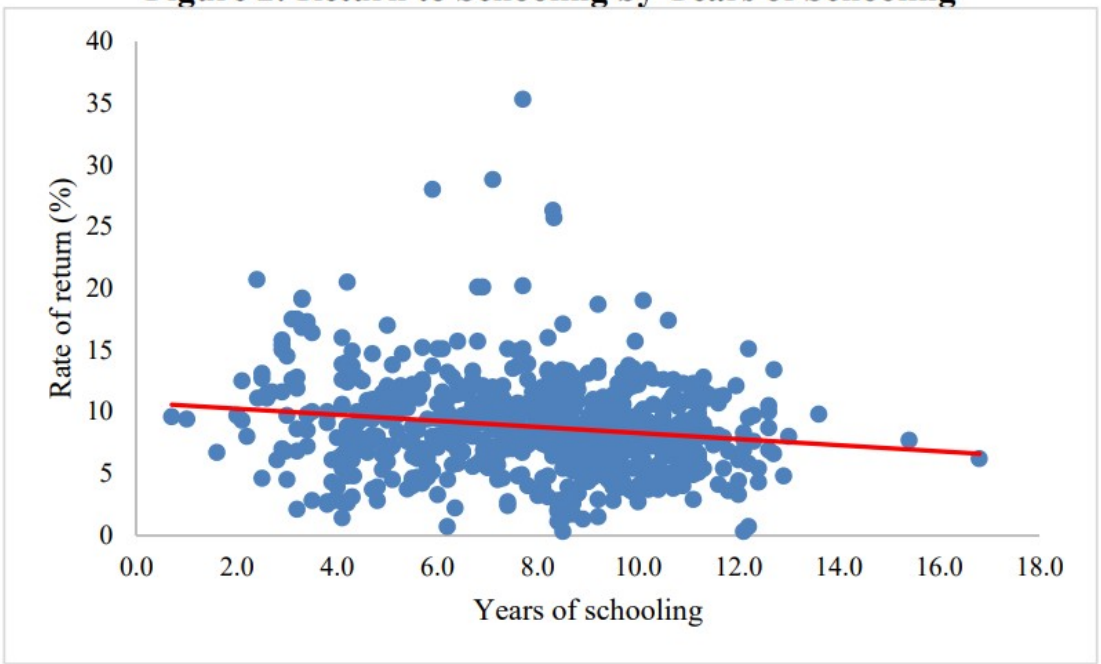
Note: Regressing the overall Mincerian rate of return on the year of the estimate, gives:
Return = 49.611 – 0.020*Year;* R^2=0.003
(t = 1.4)

Results

Mincerian private returns

- There is a very small but statistically significant decline of the returns of about 0.2 percentage points for every additional year of schooling.

Figure 2: Return to Schooling by Years of Schooling



Note: Regressing the overall Mincerian rate of return on the year of the estimate, gives:
Return = 10.749 - 0.246 *S*, $R^2 = 0.027$
(t = 4.4)

Results

Mincerian private returns

- There has been an increase in the returns to schooling since 2000.
- Parsing the sample of estimates into pre- and post-2000 estimates, the returns have increased, albeit at a slower rate relative to the increase in the years of schooling.

Table 1: Years of schooling and returns over time

Period	Mean years of schooling	Overall Mincerian rate of return (%)	Number of studies
Pre 2000	7.8	8.7	511
Post 2000	8.6	9.1	194

Results

Income level and regional differences

- Private returns to schooling are higher in low-income countries by about one percentage point relative to high-income countries.

Table 2: Private Returns to Schooling by Income Group

Country income level	Overall rate of return (%)	Mean years of schooling
Low	9.3	5.0
Middle	9.2	7.0
High	8.2	9.2
World average	8.8	8.0
Notes: Country per capita income levels based on World Bank (2016) classifications in 2015 US$: low = $1045 or less; middle = $1046-$12,735; high = $12,736 or more		

Results

Income level and regional differences

- Disaggregating further by world region, private returns to schooling are highest in Latin America and Sub-Saharan Africa and lowest in the Middle East and North Africa.

Table 3: Private Returns to schooling by region

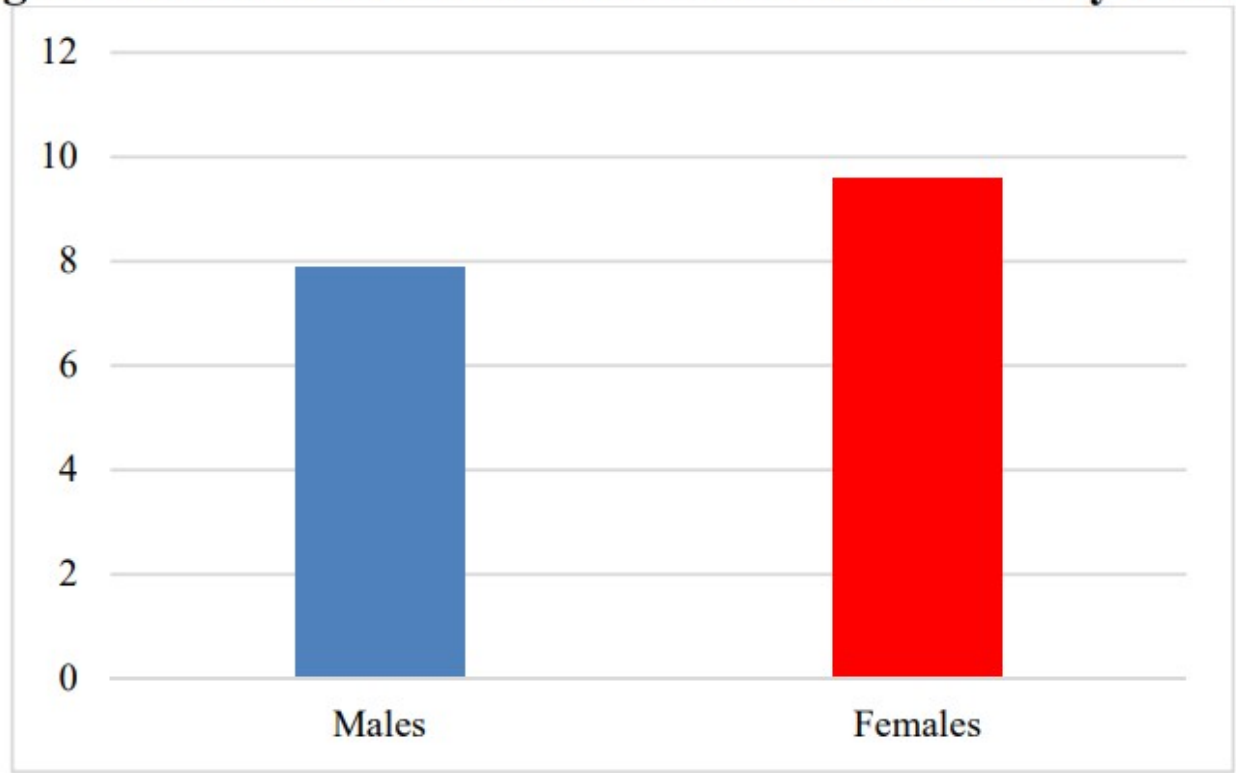
Region	Overall rate of return (%)	Mean years of schooling
Latin America and Caribbean	11.0	7.3
Sub-Saharan Africa	10.5	5.2
East Asia and Pacific	8.7	6.9
South Asia	8.1	4.9
Advanced Economies	8.0	9.5
Europe and Central Asia	7.3	9.1
Middle East and North Africa	5.7	7.5
World average	8.8	8.0

Results

Gender

- The private returns to female education exceed that of males by about two percentage points.

Figure 6: Private Mincerian Returns to Education by Gender

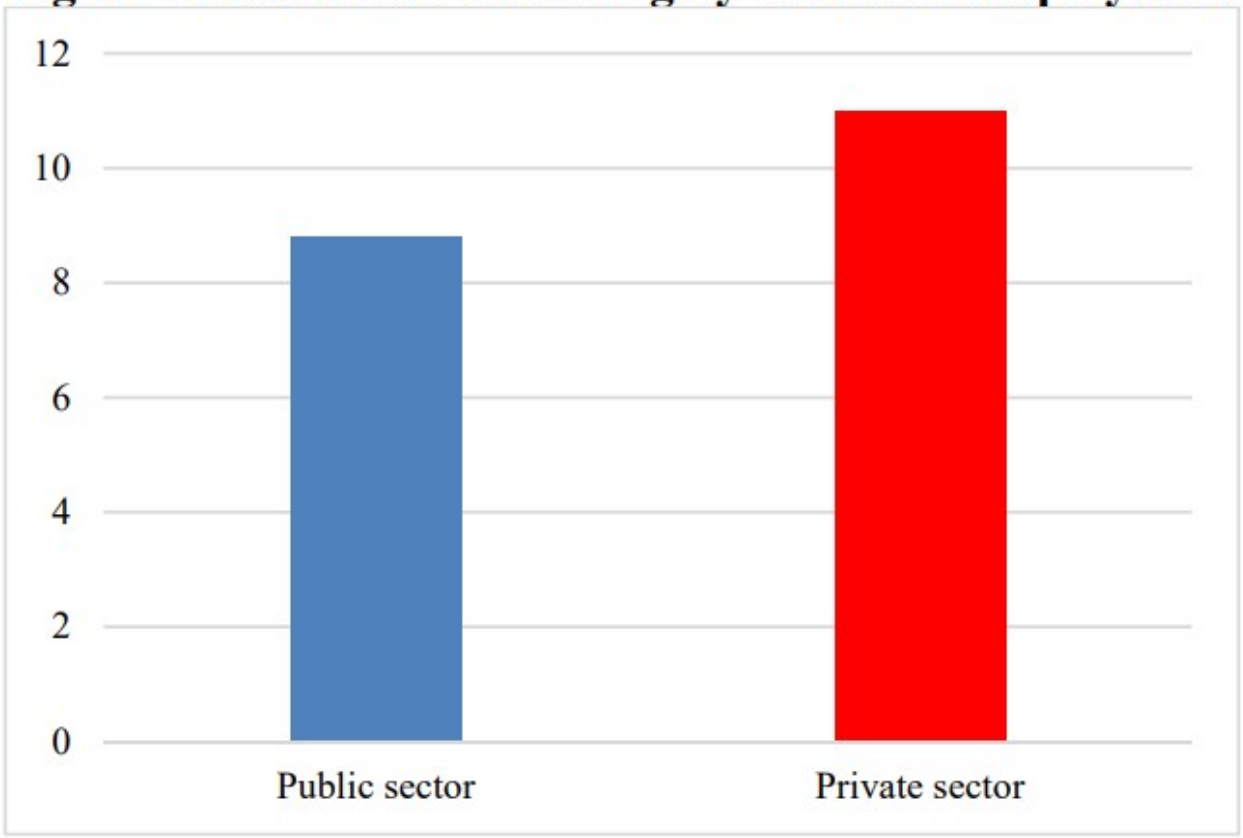


Results

Private sector of employment

- The returns for those working in the private sector of the economy are higher than for those working in the public sector.

Figure 7: Returns to Schooling by Sector of Employment



Results

Full discounting method and social returns

- Based on 166 estimates using the full discounting method, the returns to schooling fall by level of economic development.

Table 4: Returns by income and educational level (%)

	Private			Social		
Per capita income level	Primary	Secondary	Higher	Primary	Secondary	Higher
Low	25.4	18.7	26.8	22.1	18.1	13.2
Middle	24.5	17.7	20.2	17.1	12.8	11.4
High	28.4	13.2	12.8	15.8	10.3	9.7
Average	25.4	15.1	15.8	17.5	11.8	10.5

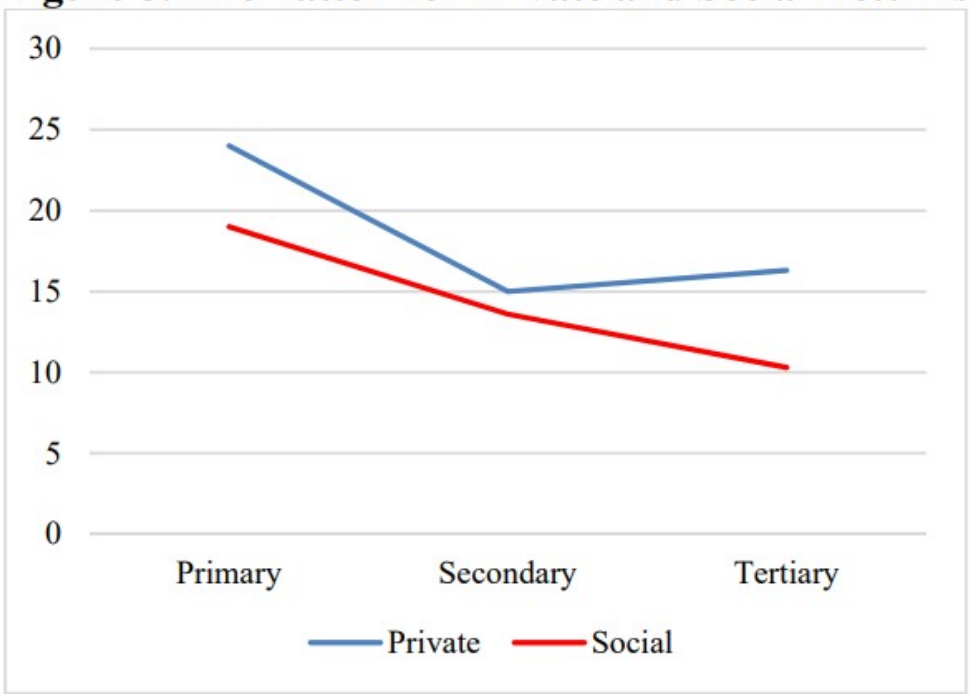
Note: The "high" private return to primary education in high-income countries is due to an outlier 1959 estimate of 65% for Puerto Rico, a country classified as high-income under our current-per-capita income classification system.

Results

Full discounting method and social returns

- The social returns follow the well-known pattern of falling by level of development and level of education.
- Social returns to education are universally lower than private returns because of the public subsidization of education.

Figure 8: The Pattern of Private and Social Returns

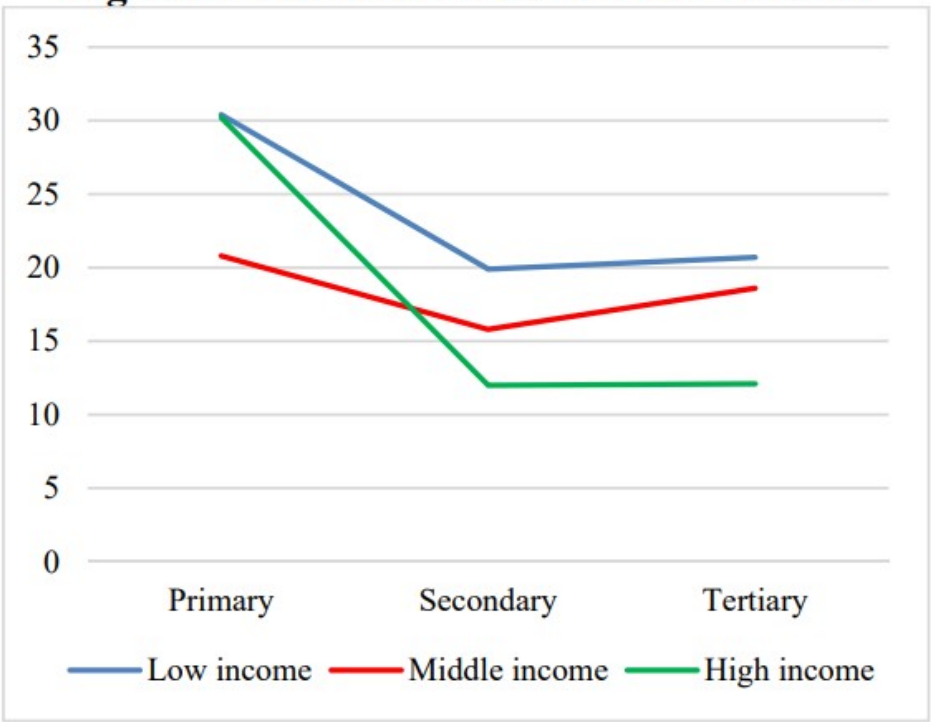


Results

Full discounting method and social returns

- As a rule, returns are higher in lower-income countries relative to higher-income countries.
  - This can be attributed to the relative scarcity of human capital in the two types of countries.

Figure 9: The Structure of Private Returns



Results

Full discounting method and social returns

- As a rule, returns are higher in lower-income countries relative to higher-income countries.
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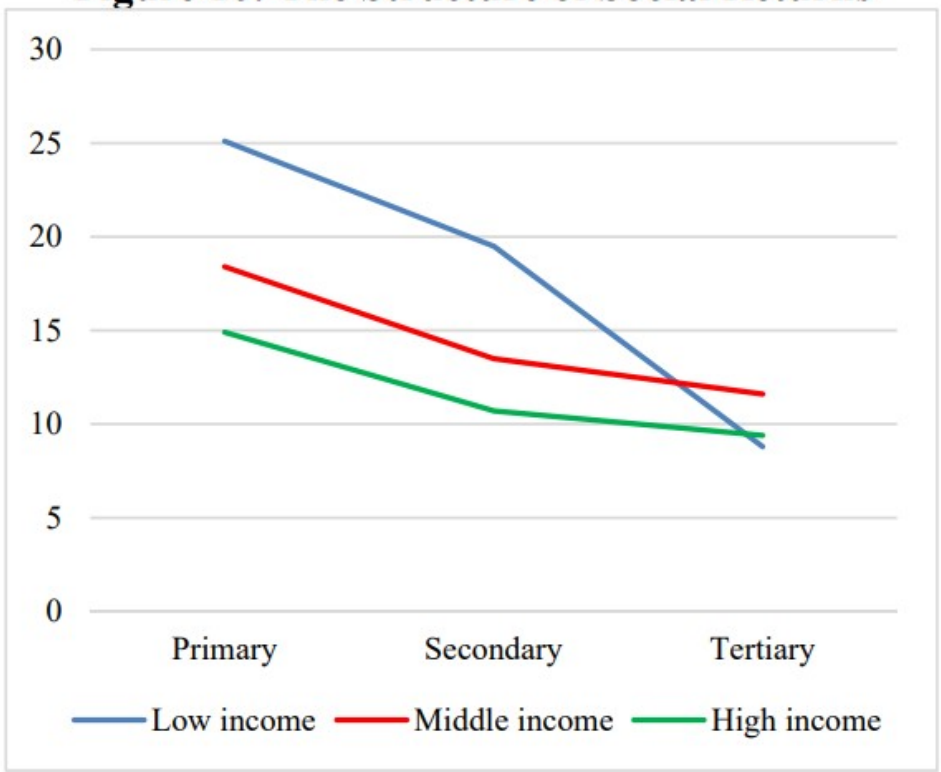
Figure 10: The Structure of Social Returns



Cognitive Skills

The role of improved schooling, a central part of most development strategies, has become controversial because expansion of school attainment has not guaranteed improved economic conditions.

1. Developed and developing countries differ in a myriad of ways other than schooling levels.
2. A number of countries - both on their own and with assistance of others - have expanded schooling opportunities without seeing any dramatic catch-up with developed countries in terms of economic well-being.
3. Countries that do not function well in general might not be more able to mount effective education programs than they are to pursue other societal goals.
4. Even when schooling policy is made a focal point, many of the approaches undertaken do not seem very effective and do not lead to the anticipated student outcomes.

Cognitive Skills

What if it is not the education that drives economic growth but rather, cognitive skills?

Cognitive Skills

9. *It is conventional and convenient in policy discussions to concentrate on such things as years of school attainment or enrollment rates in schools rather than on cognitive skills. Why?*

Cognitive Skills

9. *It is conventional and convenient in policy discussions to concentrate on such things as years of school attainment or enrollment rates in schools rather than on cognitive skills. Why?*
    - Years of school attainment or enrollment rates are readily observed and measured.
    - They appear in administrative data and they are published, on a consistent basis in virtually all countries of the world.

But Hanushek and Woessmann (2008) argue that they are very misleading in the policy debates.

Cognitive Skills

Focusing on measures of cognitive skills (such as test scores) has a number of advantages.

- They capture variations in the knowledge and ability that schools strive to produce with their curricula and thus relate to putative outputs of schooling to labor market success.
- By emphasizing total outcomes of education, they incorporate skills from any source - families, schools, ability, and so forth.
- By allowing for differences in performance among students with differing quality of schooling (but possibly the same quantity of schooling), they open the investigation of the importance of different policies designed to affect the quality aspects of schools.
- Recent policy attention to accountability in schools - along with the acceptance of parents that cognitive skills are important outcomes of schools - reinforce giving more attention to test-based measures of cognitive skills.

Cognitive Skills

At the same time, the test score measures of cognitive skills also have disadvantages.

- The tests that are given are undoubtedly narrower than either what is taught in schools or what elements are important in the labor market, including non-cognitive skills.
- Most of the available tests are given at the school level, frequently at the end of lower secondary education, so that they do not directly capture variation in higher education (although they may do so indirectly through their predictive power for obtaining further education).

Cognitive Skills

At the same time, the test score measures of cognitive skills also have disadvantages.

- Even as tests of specific subject matter at the secondary school level, the issue of measurement error in the tests cannot be ignored.
- The tests may suffer from a variety of problems related to the sampling of knowledge in the particular domain, the reliability of questions, and even the impact of test taking conditions on scores.

$\Rightarrow$ The implication is that the estimated effects of cognitive skills will be a lower bound on the impact of improved skills.

Evidence from the International Adult Literacy Survey

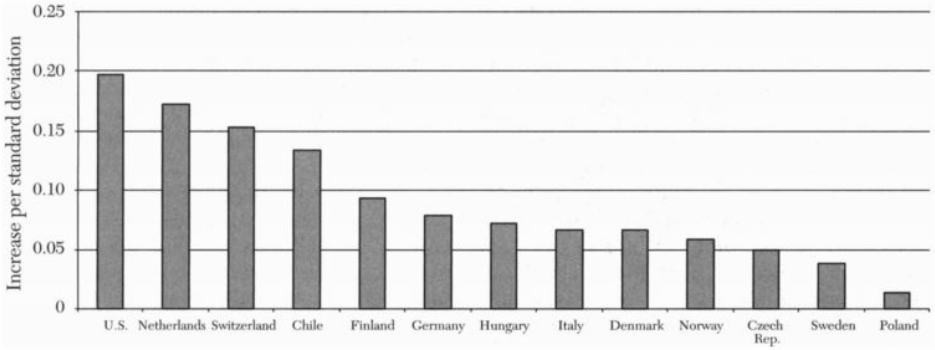


Figure 2. Returns to Cognitive Skills, International Adult Literacy Survey

Source: Hanushek and Zhang (2008).

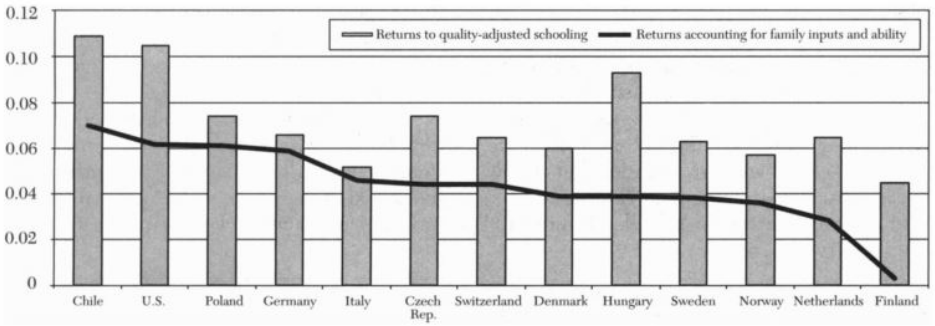


Figure 3. Impact of Controlling for Nonschool Inputs on the Estimated Returns to School Attainment, International Adult Literacy Survey

Source: Hanushek and Zhang (2008).

Cognitive Skills

Evidence from the International Adult Literacy Survey

- Both school attainment and cognitive skills are seen to enter into the determination of individual incomes.
- With the exception of Poland, literacy scores have a consistent positive impact on earnings.

Cognitive Skills

Endogeneity:

- Reverse causality. Most of the cognitive skills tests used in the developed country studies are given at a date before the labor market experiences, eliminating the reverse causation possibility that higher income leads individuals to do things that raise their test scores.
- Test scores inherently have errors in measuring the underlying cognitive domains that are being tested. A portion of this is simply that individuals will obtain somewhat different scores if tested again with the same test instrument or with a different instrument designed to measure the same concepts.

  $\Rightarrow$ *downward bias* in the estimated impact of cognitive skills.

Cognitive Skills

Endogeneity:

- Specificity of the individual tests employed across the underlying research: most work relies on specific subject matter tests at a given level of difficulty.
  $\Rightarrow$ direction of the bias is unclear.
- Individual skills may change between the time of testing and the period of observed earnings, additional error may enter.
  $\Rightarrow$ direction of the bias is unclear.
- Omitted variables that might independently influence earnings but be correlated with cognitive skills.
  Examples: noncognitive skills.
  $\Rightarrow$ direction of the bias is unclear.

Cognitive Skills

Income Distribution

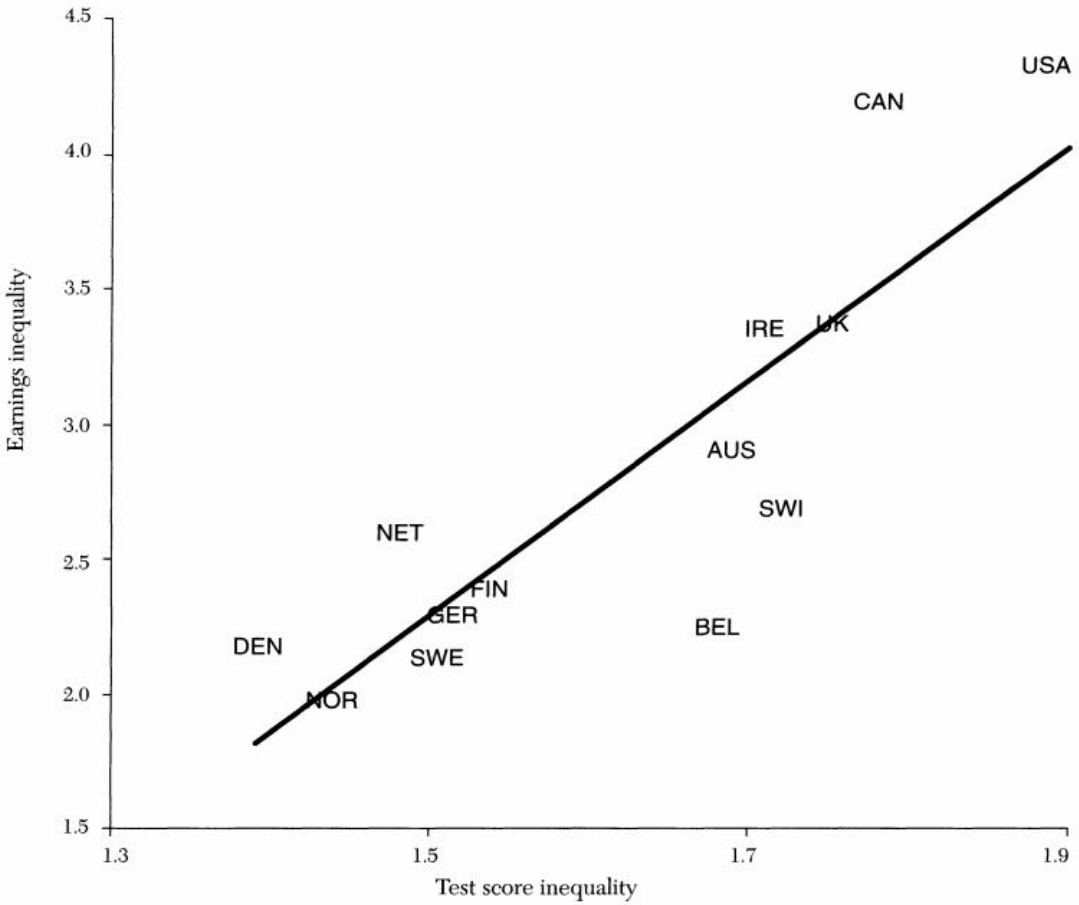


Figure 4. Inequality of Test Scores and Earnings

Notes: Measure of inequality is the ratio of ninth decile to the first decile in both cases; test performance refers to prose literacy in the International Adult Literacy Survey.

Source: Based on Nickell (2004).

- One implication of the impact of cognitive skills on individual earnings is that the distribution of those skills in the economy will have a direct effect on the distribution of income.
- The tight pattern around the regression line reflects a simple correlation of 0.85.

Cognitive Skills and Economic Growth

TABLE 2
EDUCATION AS DETERMINANT OF GROWTH OF INCOME PER CAPITA, 1960–2000

	Dependent variable: average annual growth rate in GDP per capita, 1960–2000			
	(1)	(2)	(3)[a]	(4)
GDP per capita 1960	−0.379	−0.302	−0.277	−0.351
	(4.24)	(5.54)	(4.43)	(6.01)
Years of schooling 1960	0.369	0.026	0.052	0.004
	(3.23)	(0.34)	(0.64)	(0.05)
Test score (mean)		1.980	1.548	1.265
		(9.12)	(4.96)	(4.06)
Openness				0.508
				(1.39)
Protection against expropriation				0.388
				(2.29)
Constant	2.785	−4.737	−3.701	−4.695
	(7.41)	(5.54)	(3.32)	(5.09)
N	50	50	50	47
R^2 (adj.)	0.252	0.728	0.741	0.784

Notes: t-statistics in parentheses.
[a] Regression includes five regional dummies.

Cognitive Skills

Cognitive Skills and Economic Growth

- After controlling for the initial level of GDP per capita and for years of schooling, the test-score measure features a statistically significant effect on the growth in real GDP per capita in 1960-2000.
- Test scores that are larger by one standard deviation are associated with an average annual growth rate in GDP per capita that is two percentage points higher over the whole forty-year period.
- When cognitive skills are added to a model that just includes initial income and years of schooling the share of variation in economic growth explained by the model (the adjusted R^2) jumps from 0.25 to 0.73.

Cognitive Skills

Cognitive Skills and Economic Growth

- Quantity of schooling is statistically significantly related to economic growth in a specification that does not include the measure of cognitive skills, but the association between years of schooling and growth turns insignificant and its marginal effect is reduced close to zero once cognitive skills are included in the model.

  $\Rightarrow$ School attainment has no independent effect over and above its impact on cognitive skills.

Cognitive Skills and Economic Growth

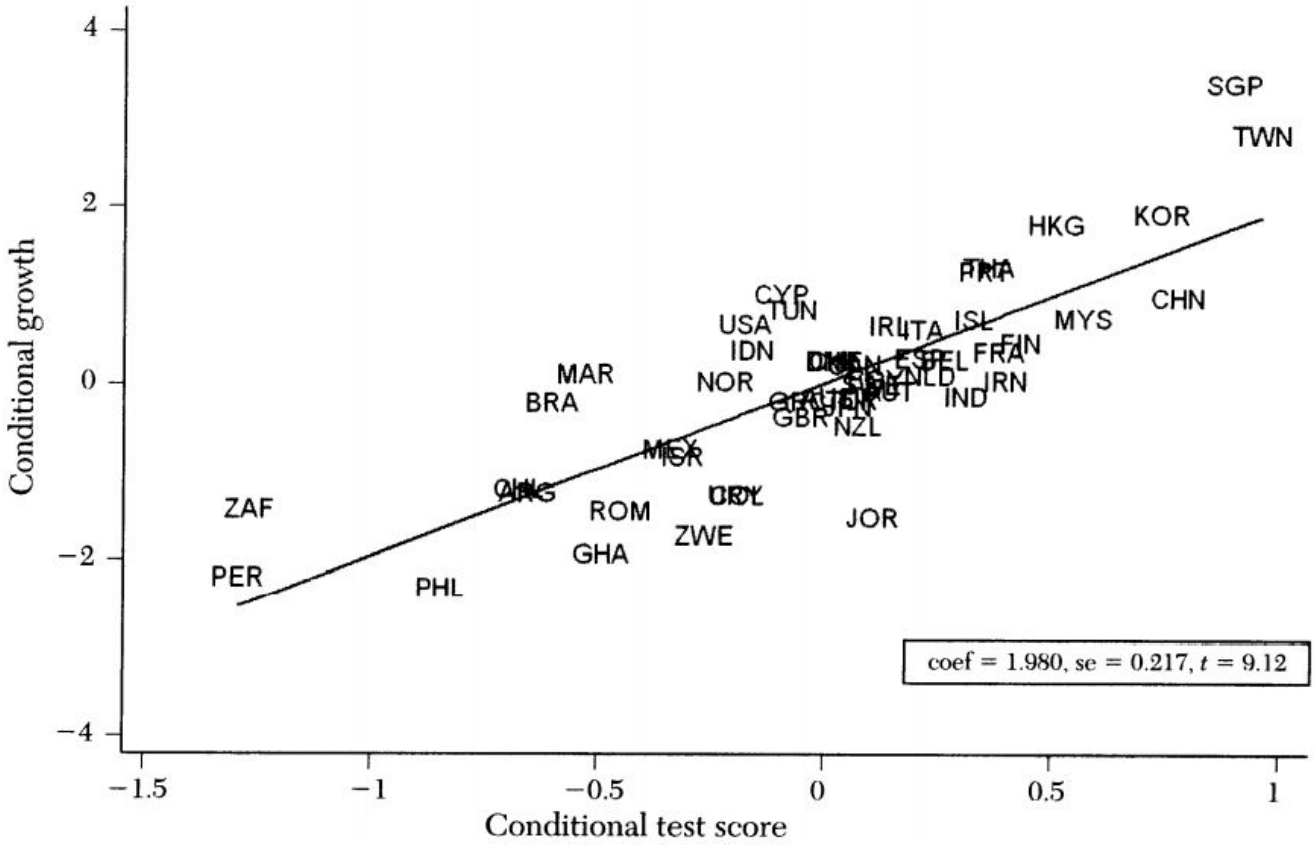


Figure 7. Added-Variable Plot of Growth and Test Scores

Notes: Added-variable plot of a regression of the average annual rate of growth (in percent) of real GDP per capita in 1960–2000 on the initial level of real GDP per capita in 1960, average test scores on international student achievement tests, and average years of schooling in 1960. Author calculations; see table 2, column 2.

Cognitive Skills and Economic Growth

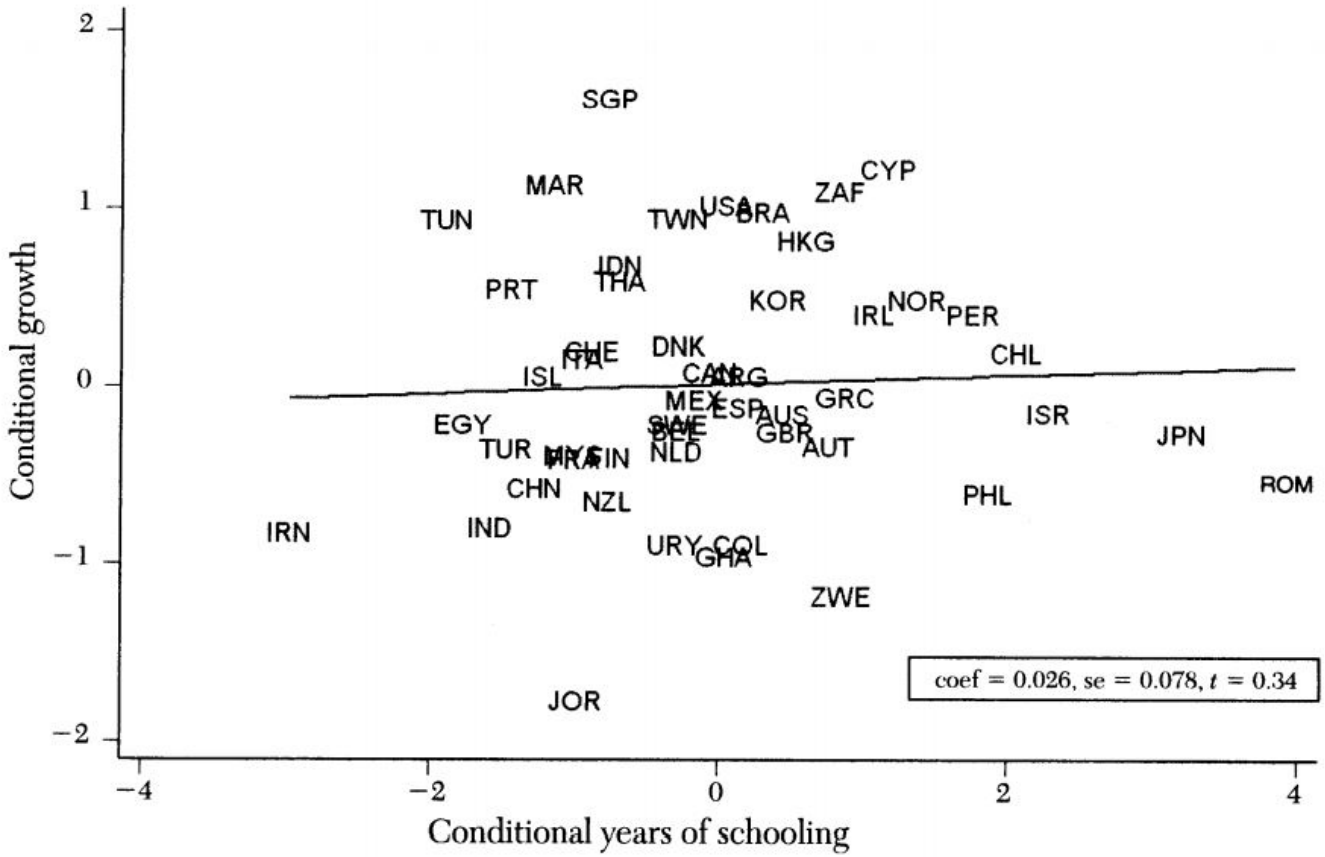


Figure 8. Added-Variable Plot of Growth and Years of Schooling with Test Score Controls

Notes: Added-variable plot of a regression of the average annual rate of growth (in percent) of real GDP per capita in 1960–2000 on the initial level of real GDP per capita in 1960, average test scores on international student achievement tests, and average years of schooling in 1960. Author calculations; see table 2, column 2.

Cognitive Skills and Economic Growth

TABLE 3
EDUCATION AS DETERMINANT OF GROWTH OF INCOME PER CAPITA, 1960–2000: SUBSAMPLES

	(1)	(2)	(3)	(4)
	Developing countries[a]	OECD sample	Low-income countries[b]	High-income countries[c]
GDP per capita 1960	–0.262	–0.301	–0.063	–0.294
	(1.77)	(5.81)	(0.28)	(6.38)
Years of schooling 1960	0.025	0.025	0.006	0.152
	(0.20)	(0.26)	(0.05)	(1.70)
Test score (mean)	2.056	1.736	2.286	1.287
	(6.10)	(4.17)	(6.98)	(5.37)
Constant	–5.139	–3.539	–6.412	–2.489
	(3.63)	(1.96)	(4.52)	(2.86)
N	27	23	25	25
R^2 (adj.)	0.676	0.830	0.707	0.783

Notes: Dependent variable: average annual growth rate in GDP per capita, 1960–2000. t-statistic in parentheses.
[a] Non-OECD countries.
[b] Countries below sample median of GDP per capital 1960.
[c] Countries above sample median of GDP per capital 1960.

Cognitive Skills

Cognitive Skills and Economic Growth

- The effect of cognitive skills is larger in developing countries than in developed countries.
- The effect of test scores is considerably larger in the low-income countries, and the difference in the coefficients is statistically significant at the 5% level.

Cognitive Skills

Distribution of Cognitive Skills and Economic Growth

- *Is it a few "rocket scientists" at the very top of the distribution who are needed to spur economic growth or is it "education for all" that is needed to lay a broad base at the lower parts of the educational distribution?*
- *Does education performance at different points in the distribution of the population have separate effects on economic growth?*

Distribution of Cognitive Skills and Economic Growth

TABLE 4
COGNITIVE SKILLS AND GROWTH: DISTRIBUTION AND INSTITUTIONAL INTERACTION

	Dependent variable: average annual growth rate in GDP per capita, 1960–2000.		
	(1)	(2)	(3)
GDP per capita 1960	−0.287 (5.12)	−0.297 (5.64)	−0.355 (6.03)
Years of schooling 1960	0.022 (0.28)	−0.031 (0.41)	−0.017 (0.22)
Share of students above threshold of 400	2.732 (3.61)		
Share of students above threshold of 600	12.880 (4.35)		
Test score (mean)		0.942 (2.30)	1.494 (4.46)
Openness		0.732 (2.13)	
Test score × openness		1.609 (2.34)	
Protection against expropriation			0.485 (3.00)
Test score × protection against expropriation			0.210 (1.19)
Constant	1.335 (2.97)	3.814 (11.24)	4.617 (16.18)
N	50	47	47
R^2 (adj.)	0.719	0.785	0.781

Note: t-statistics in parentheses.

Cognitive Skills

Distribution of Cognitive Skills and Economic Growth

- When the share of students above the two thresholds are added jointly in the growth model, both turn out to be separately significantly related to economic growth.
- Both education for all and the share of absolutely top performers seem to exert separately identifiable effects on economic growth.
- Openness and cognitive skills not only have significant individual effects on economic growth but also significant positive interaction.
- The effect of cognitive skills on economic growth is significantly higher in countries that have been fully open to international trade than in countries that have been fully closed.

Institutions, Cognitive Skills, and Growth

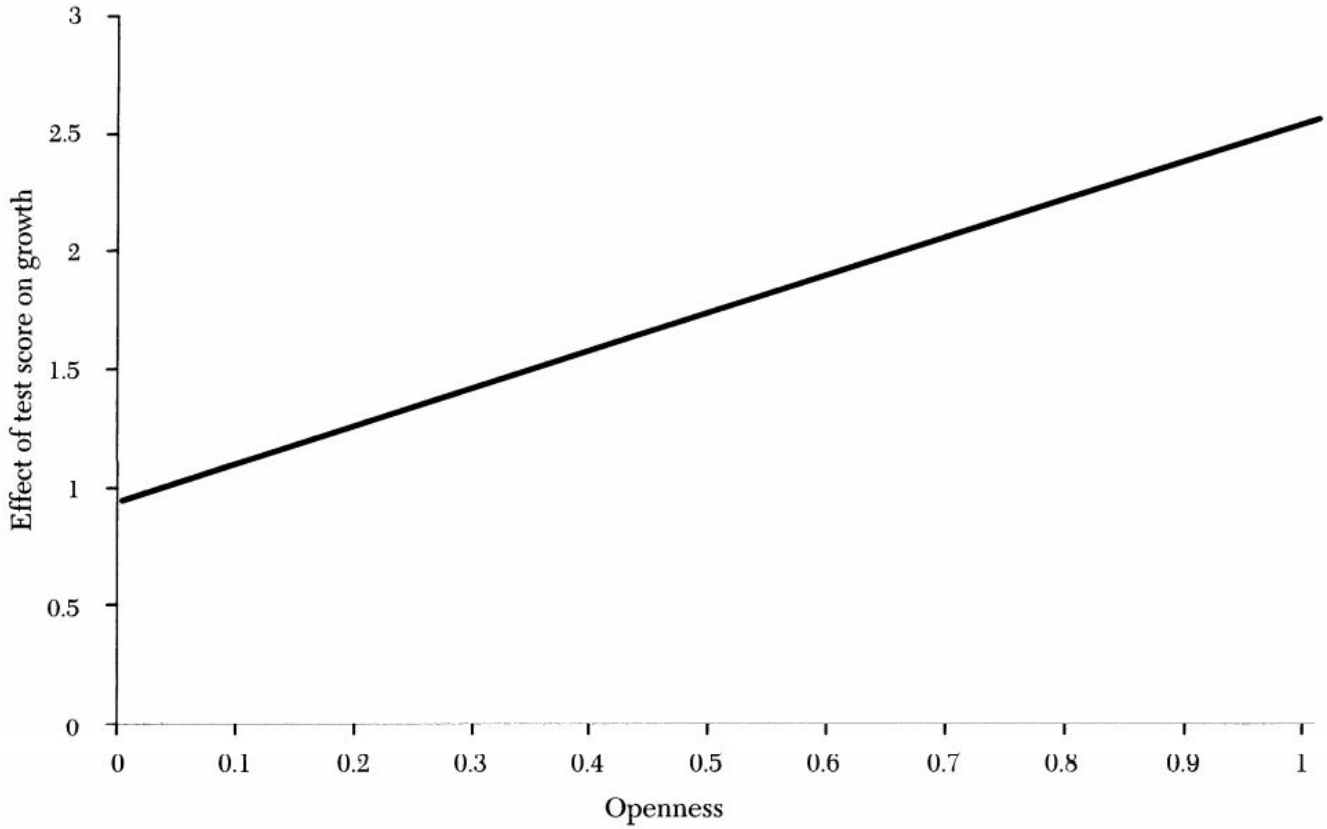


Figure 9. The Effect of Cognitive Skills on Growth Depending on Openness

Notes: Estimated effect of average achievement test scores on the average annual rate of growth of real GDP per capita in 1960–2000, depending on the degree of openness to international trade of a country. Author calculations; see table 4, column 2.

Cognitive Skills

Institutions, Cognitive Skills, and Growth

- Both the quality of the institutional environment and the level of cognitive skills seem important for economic development.
- Furthermore, the effect of cognitive skills on economic growth seems to be significantly larger in countries with a productive institutional framework, so that good institutional quality and good cognitive skills can reinforce each other in advancing economic development.
- Thus, the macroeconomic effect of education depends on other complementary growth-enhancing policies and institutions.

The Implications of Improved Cognitive Skills

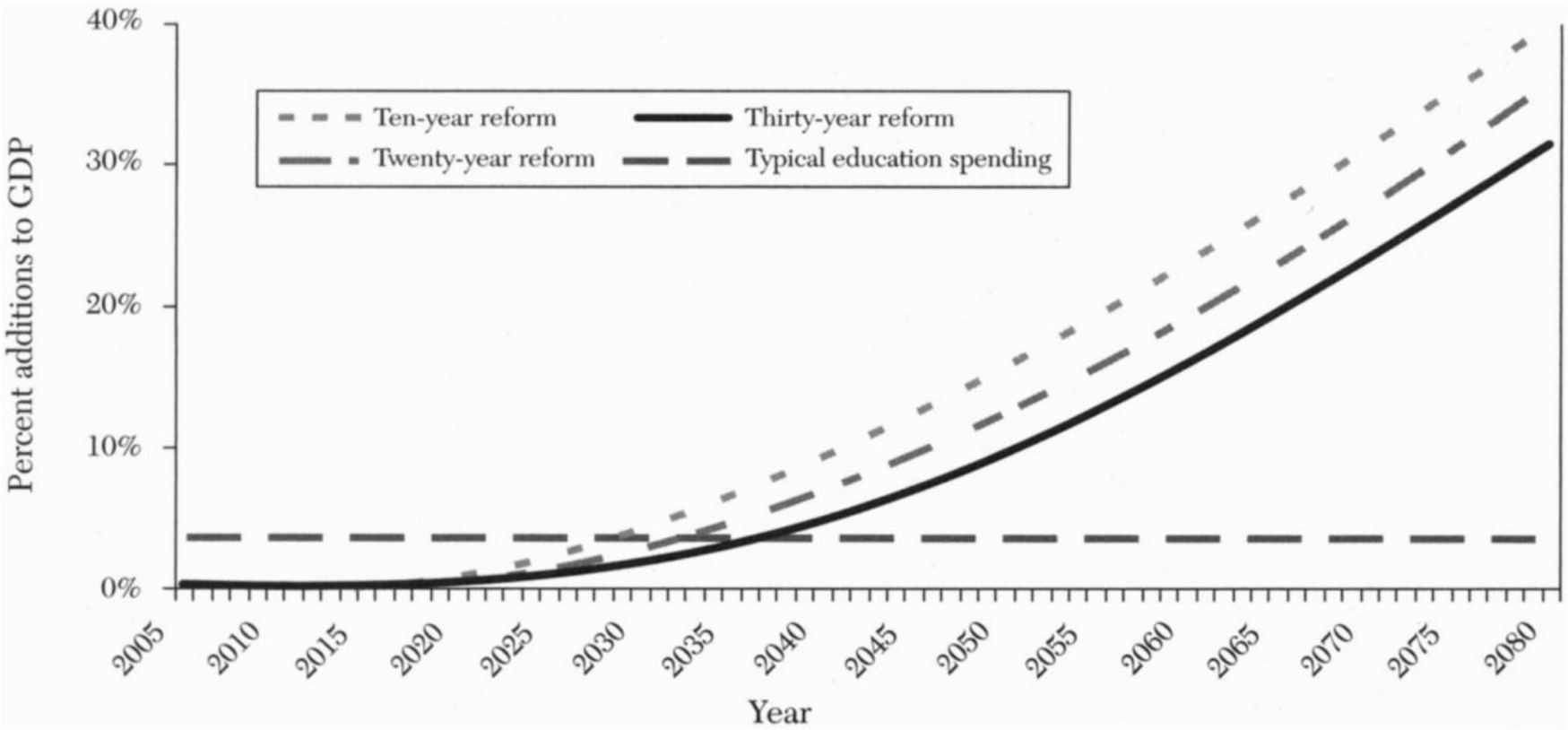


Figure 10. Improved GDP with Moderately Strong Knowledge Improvement (0.5 s.d.)

Cognitive Skills

The Implications of Improved Cognitive Skills

- For any magnitude of achievement improvement, a faster reform will have larger impacts on the economy, because the better workers become a dominant part of the workforce sooner.
- A twenty-year plan would yield a GDP that is 5% greater in 2037 (compared with an economy with no increase in cognitive skills).
- A thirty-year reform program would yield more than 5% higher real GDP by 2041.
- Over a seventy-five year horizon, a twenty-year reform yields a real GDP that is 36% higher than would be with no change in cognitive skills.
- At the same time, while the rewards are large, they also imply that policies must be considered across lengthy time periods and require patience - a patience that is not always clear in national policy making.

Where Does the Developing World Stand?

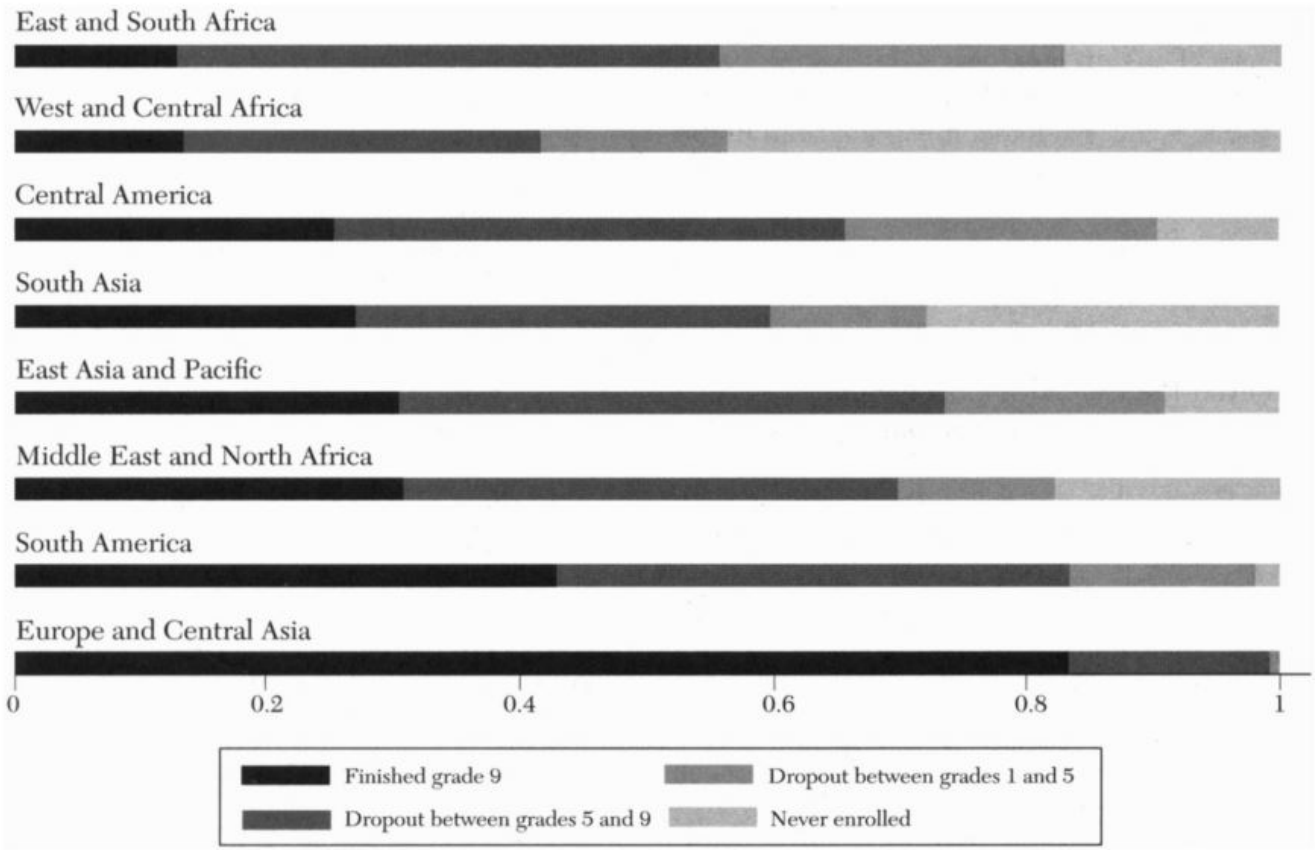


Figure 11. Lack of Educational Attainment in Developing Countries

Note: Based on Pritchett (2004).

Cognitive Skills

Where Does the Developing World Stand?

- While almost all OECD countries have universal school attainment to grade 9, essentially all developing regions are far from that.
- In the average African country in the data, only 13% of each cohort finishes grade 9, and less than 30% in Central America and South and East Asia.
- Even in South America, this figure is only 43%.
- While the pattern of educational attainment varies greatly across countries and regions, the lack of quantitative educational attainment from universal completion of basic education - be it grade 5 or grade 9 - is immense in the majority of developing countries.

Where Does the Developing World Stand?

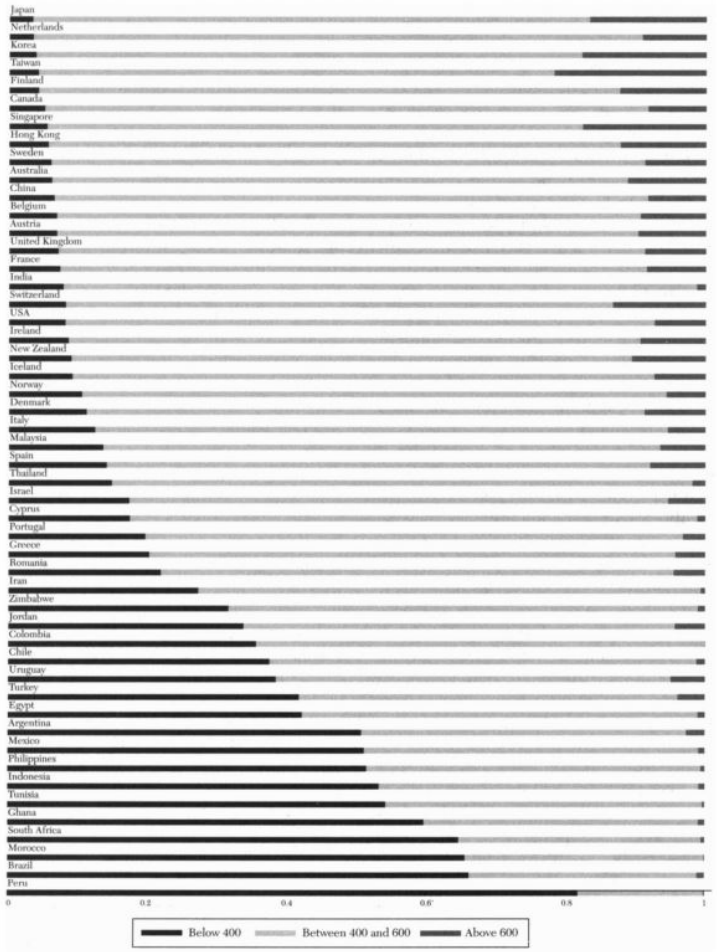


Figure 12. Share of Students below 400 ("Illiterate"), between 400 and 600, and above 600 Test-Score Points, Countries in Growth Analysis

Source: Hanushek and Woessmann (forthcoming), based on several international tests; see text for details.

Cognitive Skills

Where Does the Developing World Stand?

- In countries such as Japan, the Netherlands, Korea, Taiwan, and Finland, less than 5% of tested students fall below the literacy threshold of 400.
- By contrast, in many of the developing countries more than half of the tested students do not reach this threshold of literacy.
- The countries with the largest shares of test-taking students who are functionally illiterate by this definition are Peru (82%), Saudi Arabia (67%), Brazil (66%), Morocco (66%), South Africa (65%), Botswana (63%), and Ghana (60%).

Cognitive Skills

Policy Implications:

- Getting the substantial improvements in the quality of schools that are necessary requires structural changes in schooling institutions.
- Simply putting more resources into schools - pure spending, reduced class sizes, increased teacher training, and the like - will not reliably lead to improvements in student outcomes when the overall institutional structure is not changed.
- A candidate for the fundamental failure of current school policy is the lack of incentives for improved student performance.

Cognitive Skills

Policy Implications:

- Three sets of policies can help to improve the overall incentives in schools:
  1. Strong accountability systems that accurately measure student performance;
  2. Local autonomy that allows schools to make appropriate educational choices;
  3. Choice and competition in schools so that parents can enter into determining the incentives that schools face.

Cognitive Skills

Conclusion

1. Cognitive skills have powerful effects on individual earnings, on the distribution of income, and on economic growth.
   - Individual earnings are systematically related to cognitive skills.
   - The distribution of skills in society appears closely related to the distribution of income.
   - Economic growth is strongly affected by the skills of workers.
2. The current situation in developing countries is much worse than generally pictured on the basis just of school enrollment and attainment.
   - Available measures of school attainment indicate that developing countries lag dramatically behind developed countries.
   - International testing indicates that, even among those attaining lower secondary schooling, literacy rates are very low in many developing countries.

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