Education and Health

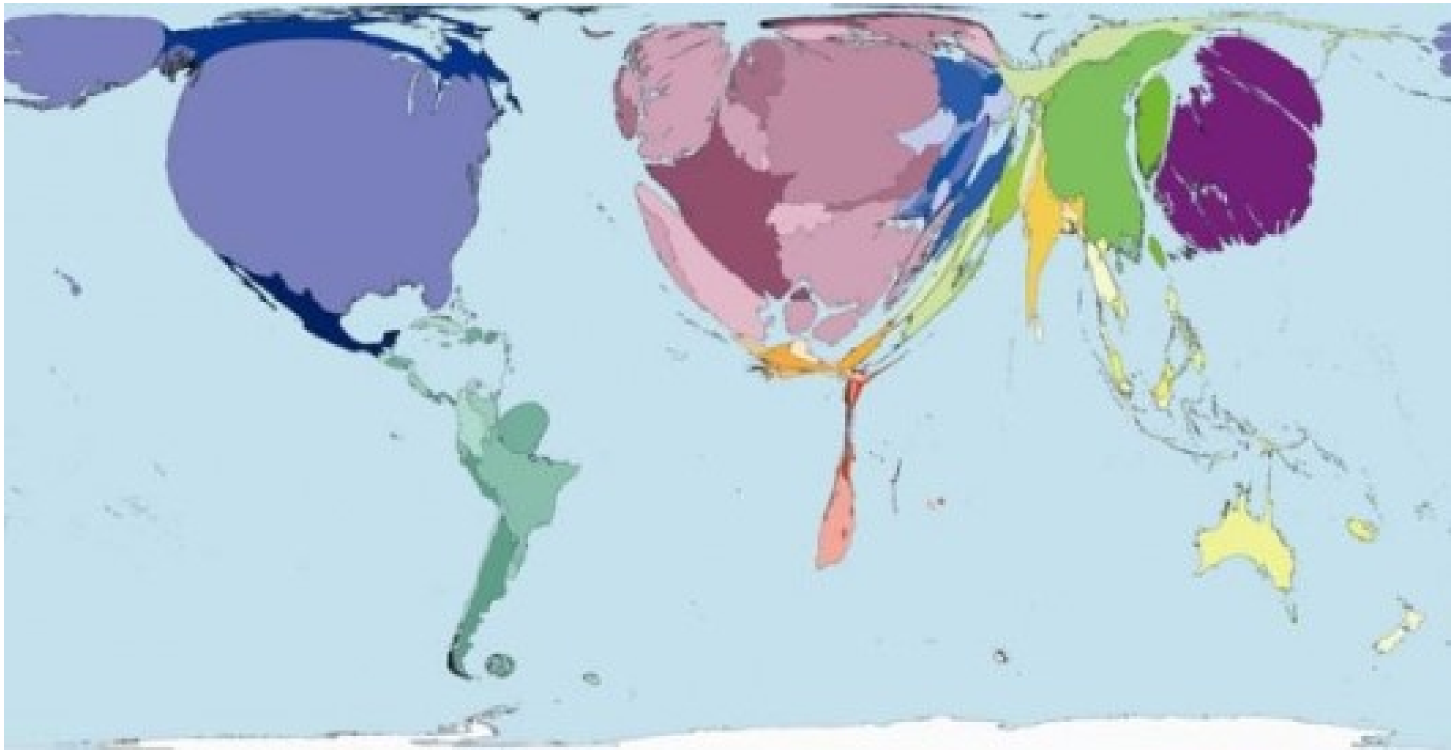
Lê Vũ Quân

David N. Weil (2008), *Economic Growth*, 3rd edition, Pearson Addison-Wesley. Chapter 6: "Human Capital."

World Map

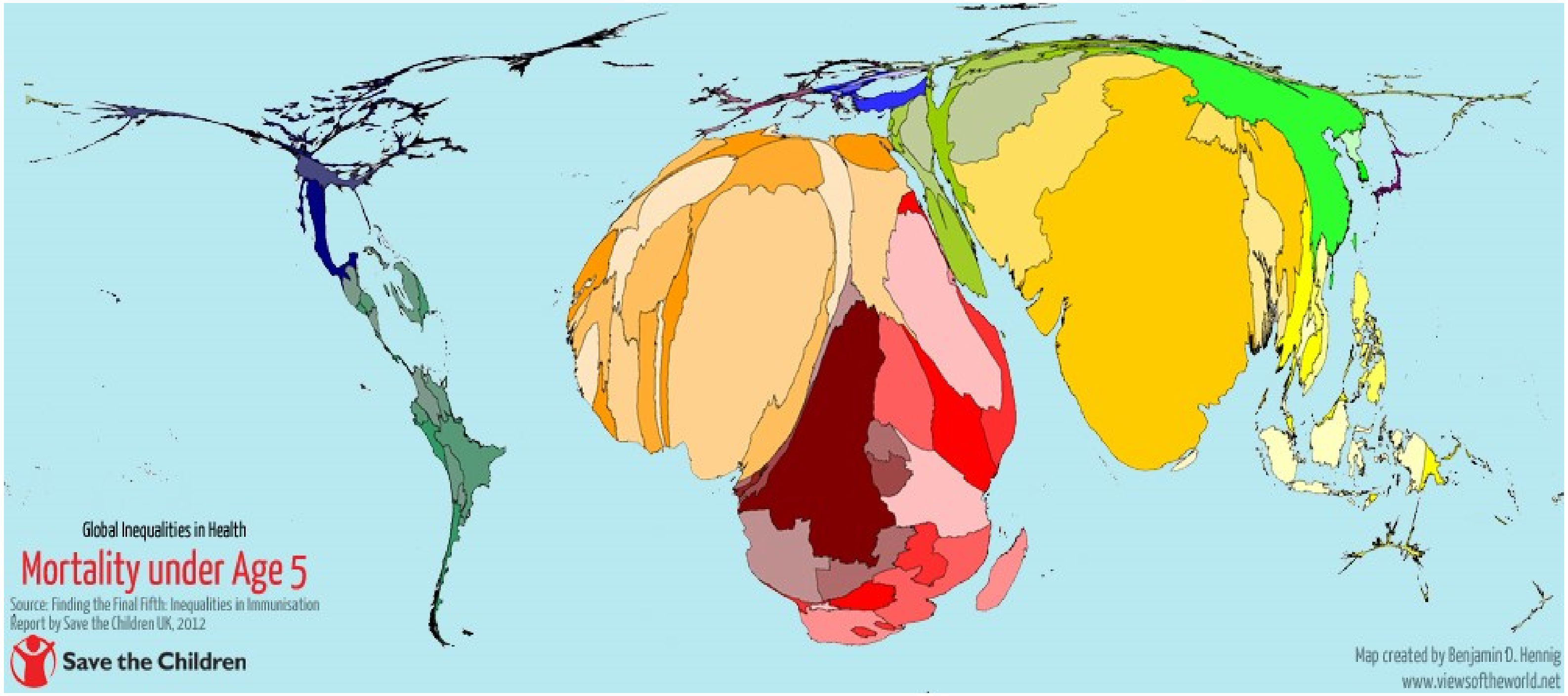
ALASKA (USA)
CANADA
GREENLAND (DENMARK)
ICELAND
UNITED STATES OF AMERICA
MEXICO
COLOMBIA
VENEZUELA
PERU
BRAZIL
BOLIVIA
ARGENTINA
NORWAY
SWEDEN
FINLAND
UNITED KINGDOM
GERMANY
POLAND
BELARUS
UKRAINE
FRANCE
SPAIN
ITALY
TURKEY
RUSSIA
KAZAKHSTAN
MONGOLIA
CHINA
JAPAN
IRAN
IRAQ
SAUDI ARABIA
INDIA
THAILAND
INDONESIA
AUSTRALIA
NEW ZEALAND
ALGERIA
LIBYA
EGYPT
MALI
NIGER
CHAD
SUDAN
NIGERIA
ETHIOPIA
SOMALIA
KENYA
CENTRAL AFRICAN REPUBLIC
DEMOCRATIC REPUBLIC OF THE CONGO
TANZANIA
ANGOLA
ZAMBIA
NAMIBIA
SOUTH AFRICA

World's Health Inequalities

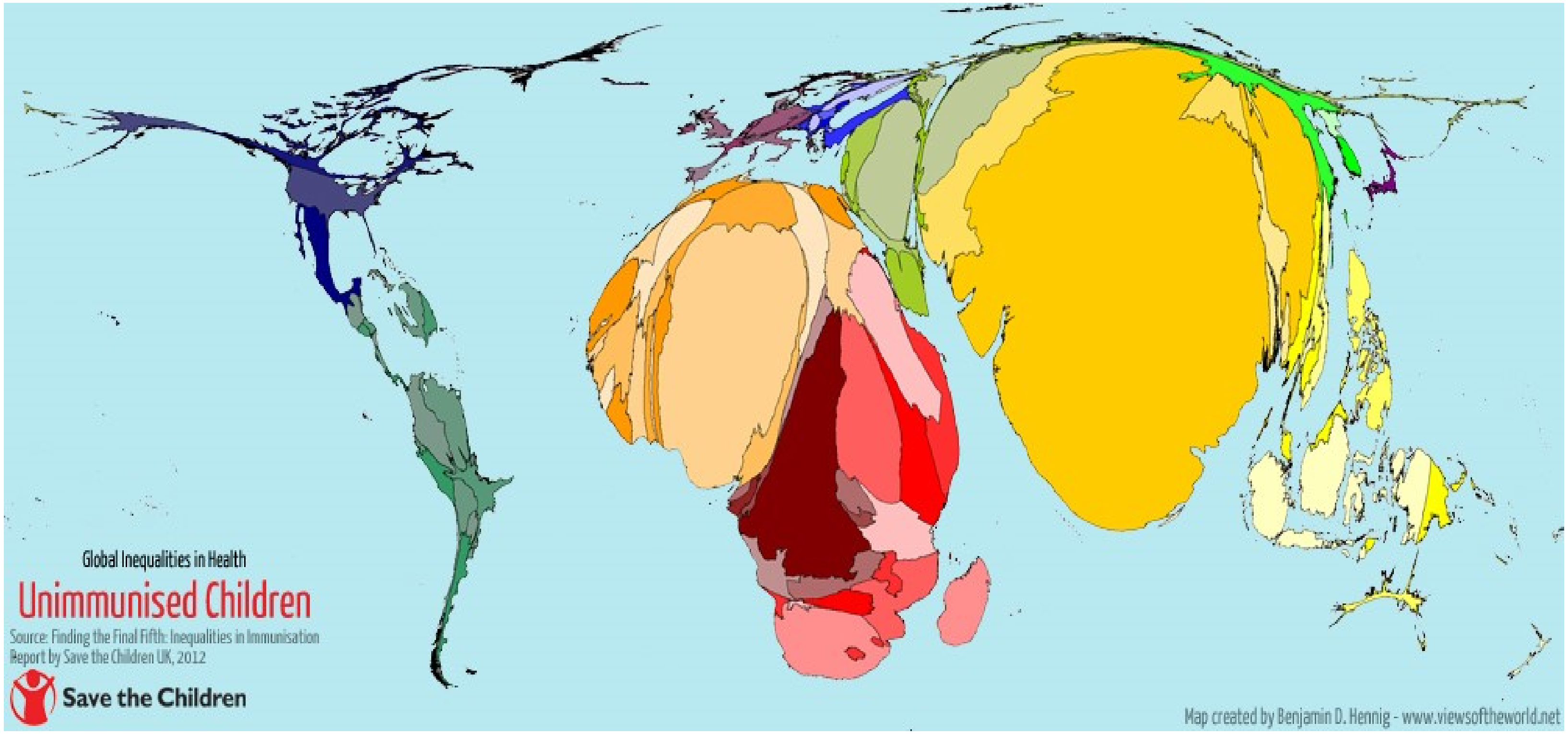


Source: The Open-Access Journal [PLoS MEDICINE]

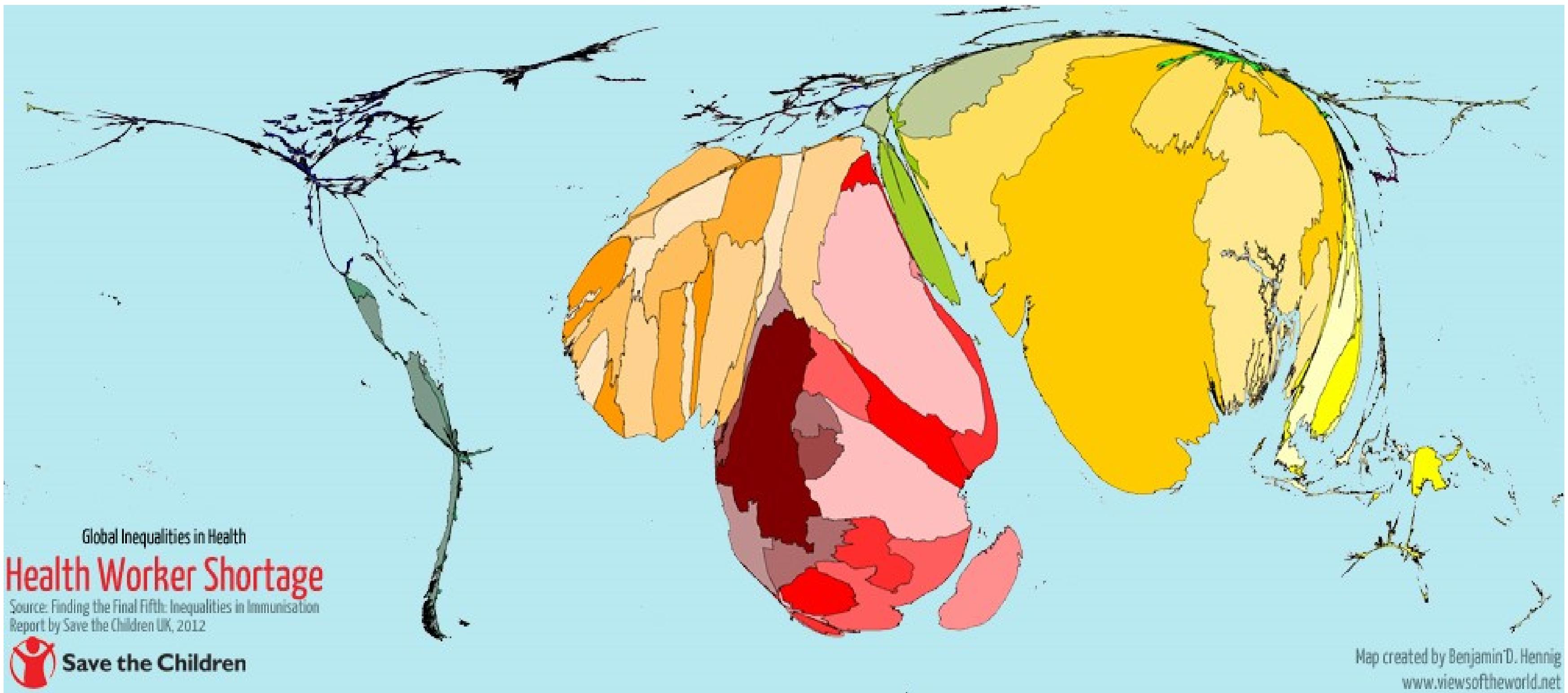
Mortality Under Age 5



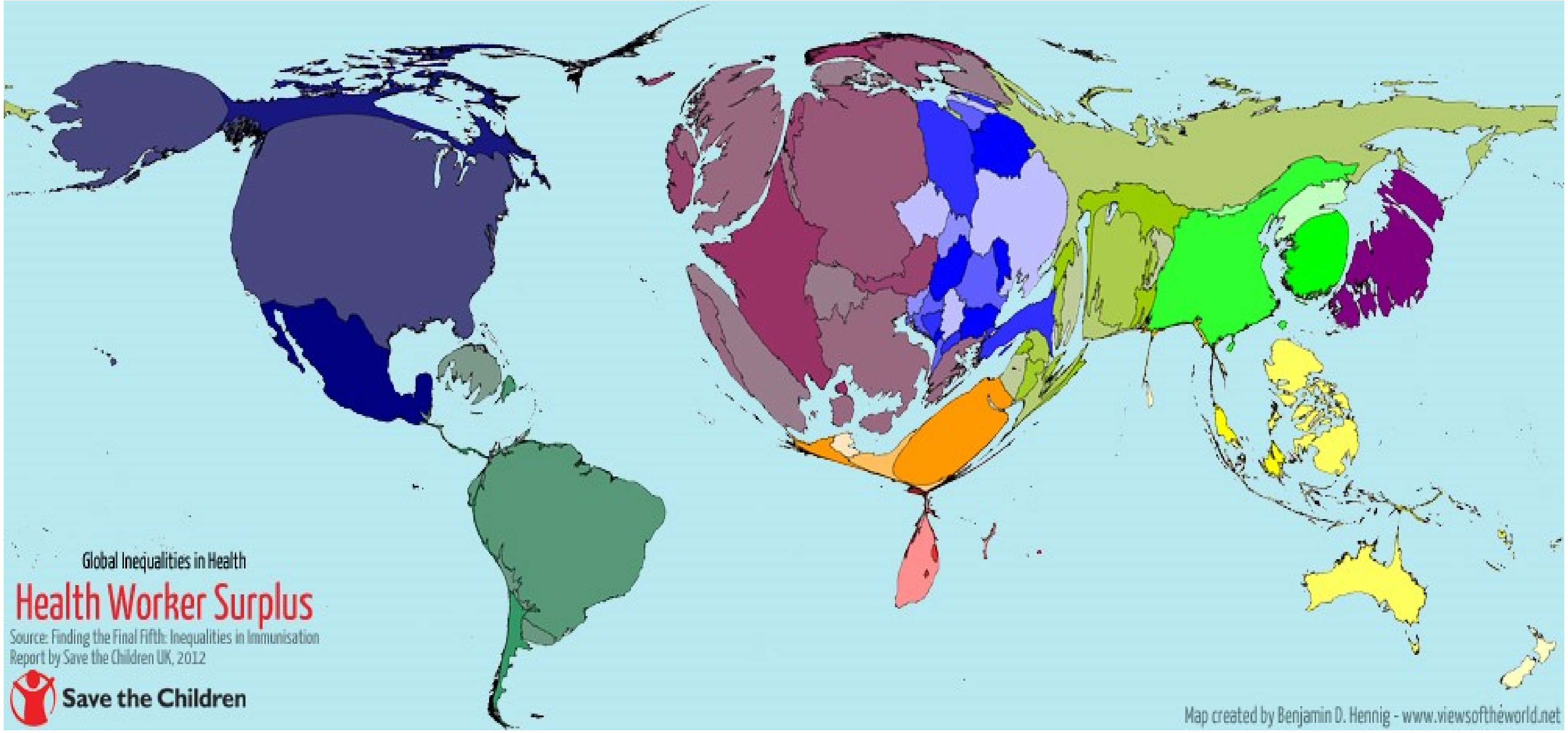
Unimmunized Children



Health Worker Shortage



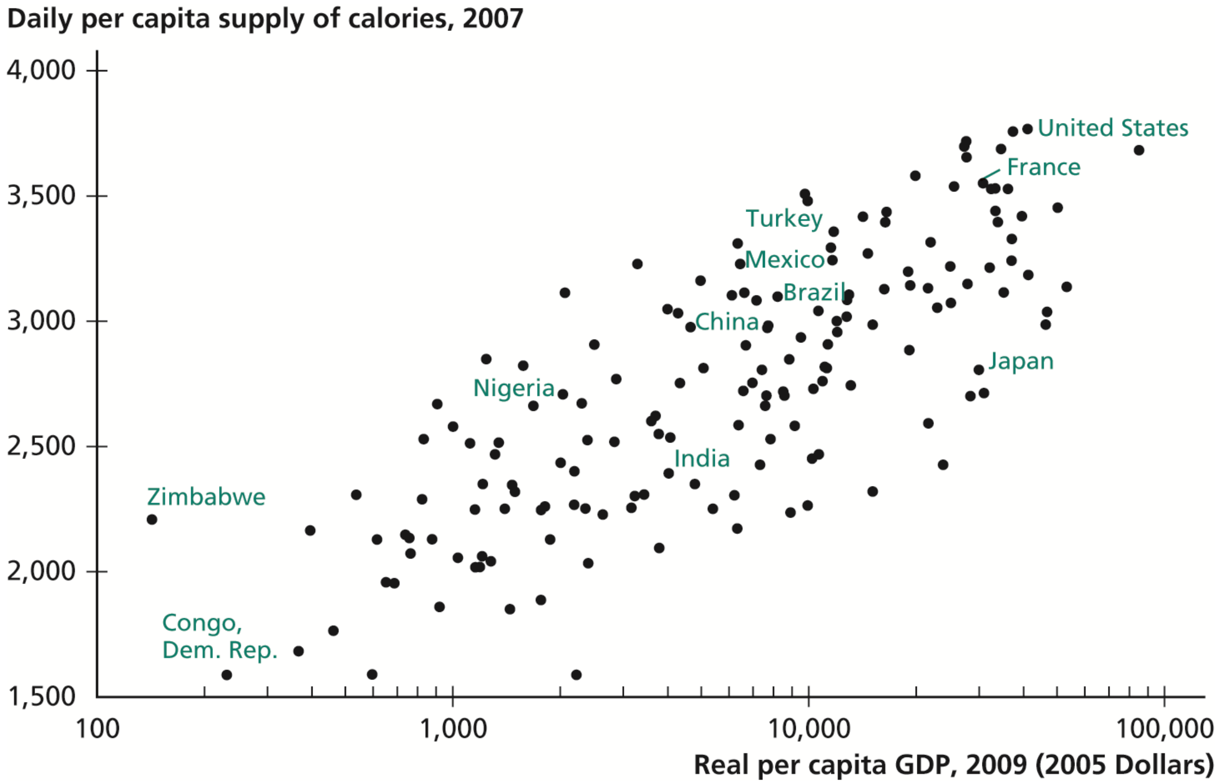
Health Worker Surplus



Human Capital in the Form of Health

- As a country develops economically, the health of its population improves.
- Healthier people can work harder and longer; they can also think more clearly.
- Healthier students can learn better.
- Thus, better health in a country will raise its level of income.

Nutrition versus GDP per Capita



Sources: FAOSTAT database, Heston, Summers, and Aten (2011).

Life Expectancy versus GDP per Capita

Sources: Heston, Summers, and Aten (2011), *World Development Indicators* database.

Bóng Đá và Sức Khỏe

Đội Tuyển Quốc Gia Việt Nam

Đội Tuyển Quốc Gia Hàn Quốc

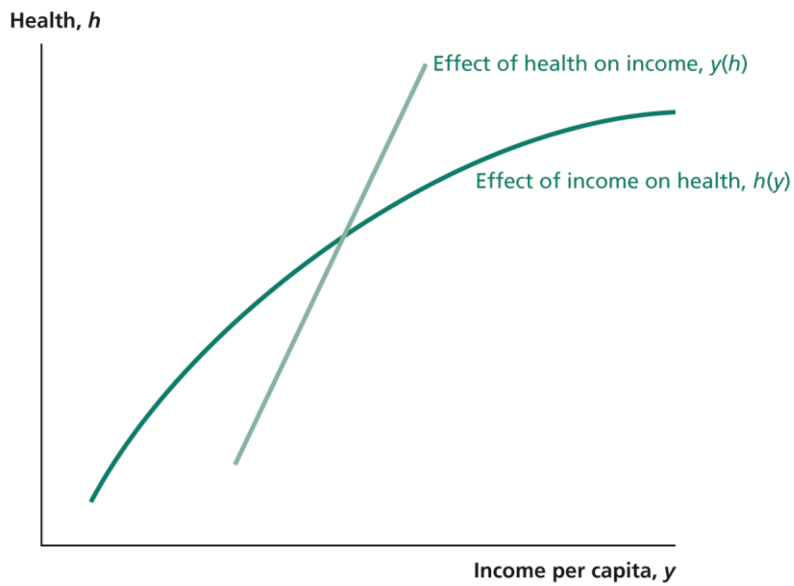
Chiều Cao và Trí Tuệ

“Nhậu nhẹt suốt ngày như thế làm sao phát triển được. Trước đây, người Việt chúng ta không thua kém chiều cao so với người Nhật, Trung Quốc, nhưng nay chúng ta đã lùn hơn kể cả với các nước láng giềng. Quan trọng vẫn là trí tuệ, nhưng nếu một người vừa giỏi giang lại vừa cao to đẹp trai khỏe mạnh thì vẫn hơn chứ”, **Bí thư Đà Nẵng Nguyễn Xuân Anh, 23/3/2016**.

Income and Health

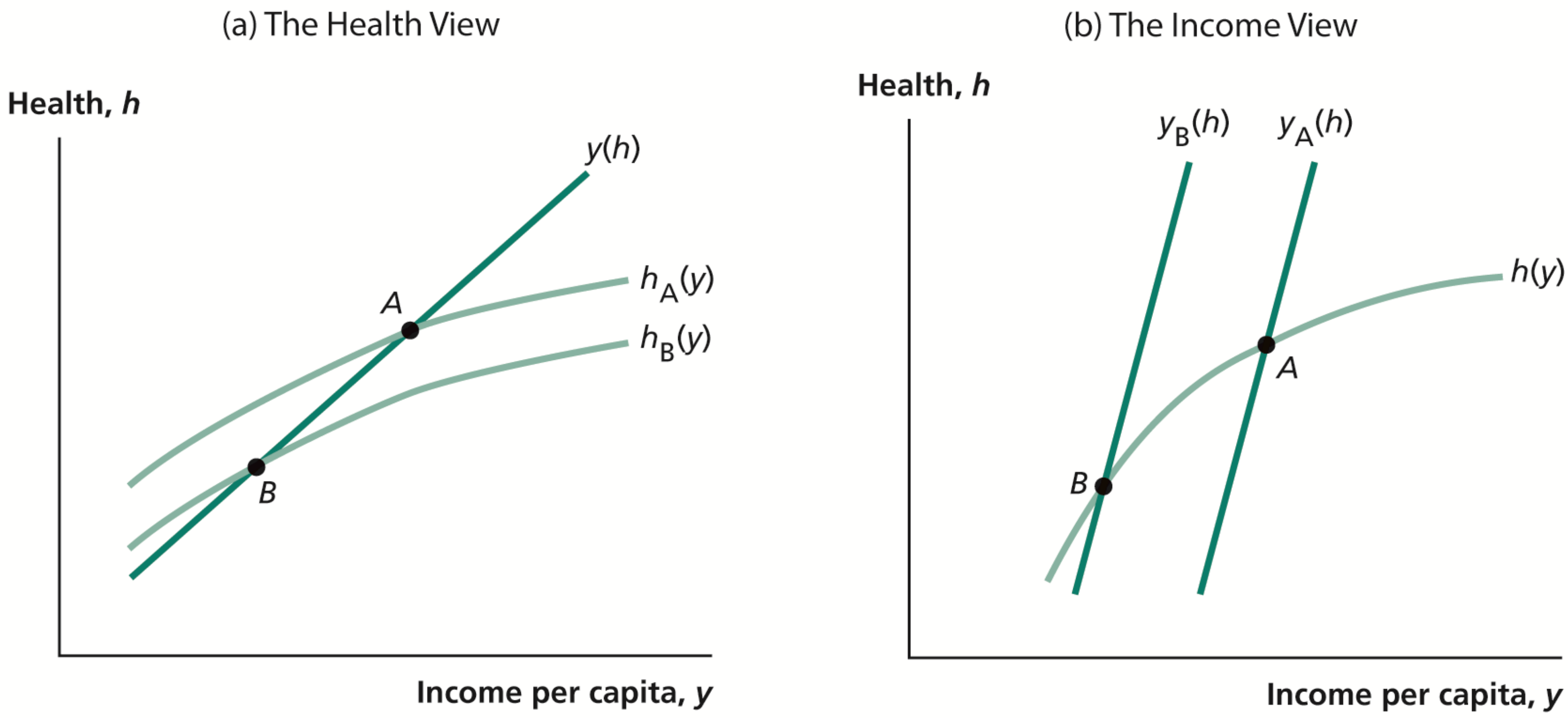
- The average height of South Korean men in their 20s rose 5 cm (2 inches) between 1962 and 1995.
- In South Korea daily calorie consumption per adult male rose from 2,214 to 3,183 between 1962 and 1995.
- GDP per capita in 1962: $103.57; GDP per capita in 1995: $12,403.91 (current US$)

How Health Interacts with Income



- *y(h)* shows the impact of health on the level of output per capita. Higher *h*, workers are able to produce more output.
- *h(y)* shows the impact of income per capita on health. Higher *y* improves health.
- The intersection of the two curves determines the equilibrium levels of income and health.

Health and Income per Capita: Two Views



The Health View

- The "Health View", *h(y),* assumes that all differences between the countries have their roots in the countries' health environments.
- Country A, $h_A(y)$ is higher than the corresponding function in Country B, $h_B(y)$. At any given level of income, Country A has better health than Country B.
- By contract, the two countries are assumed to have the same *y(h)* function, so that for a given level of health, the two countries have the same level of income.
- In equilibrium, the two countries have different levels of income, however, because of their different health environment.

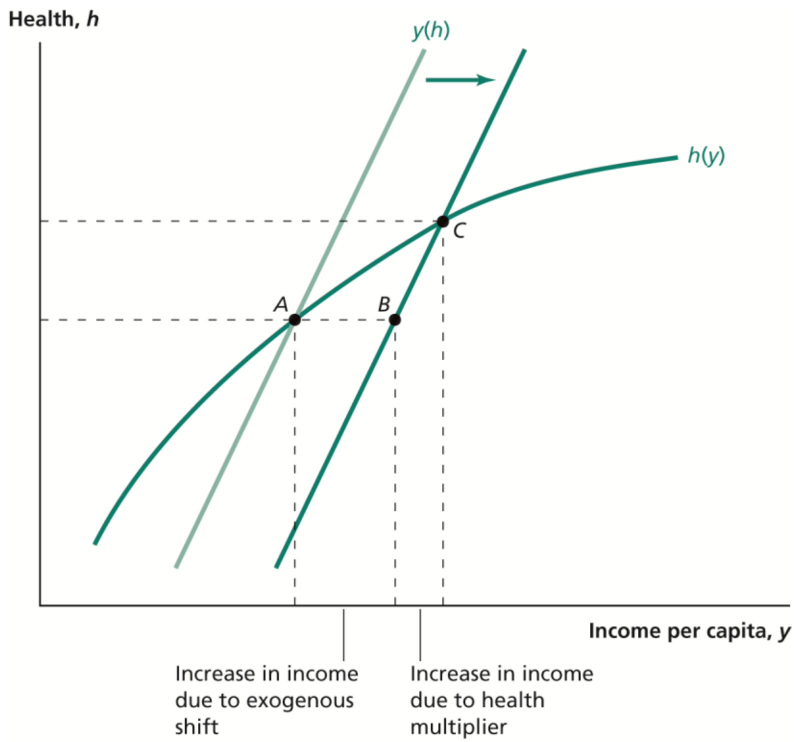
The Income View

- The "Income View" assumes the opposite: that all differences between the countries have their roots in aspect of production that are unrelated to health.
- At any level of health, Country A produces more output than Country B. $y_A(h)$ lies to the right of $y_B(h)$.
- We assume that two countries have the same $h(y)$ function, so that for a level of income, the two countries have the same level of health.
- In equilibrium, the countries differ in both health and income.

Two Schools of Thought

- One school of thought holds that almost all of the relative ill health in poor countries is a result of their being poor. If these countries were to raise their level of income per capita to the level of rich countries, they would have the same level of health.
- The other school of thought holds that there are large differences in the health environment between rich and poor countries that would persist even if the two groups of countries had the same levels of income per capita. Under this view, the poor health environment in poor countries is a cause of their low levels of incomes.

Effect of an Exogenous Shift in Income

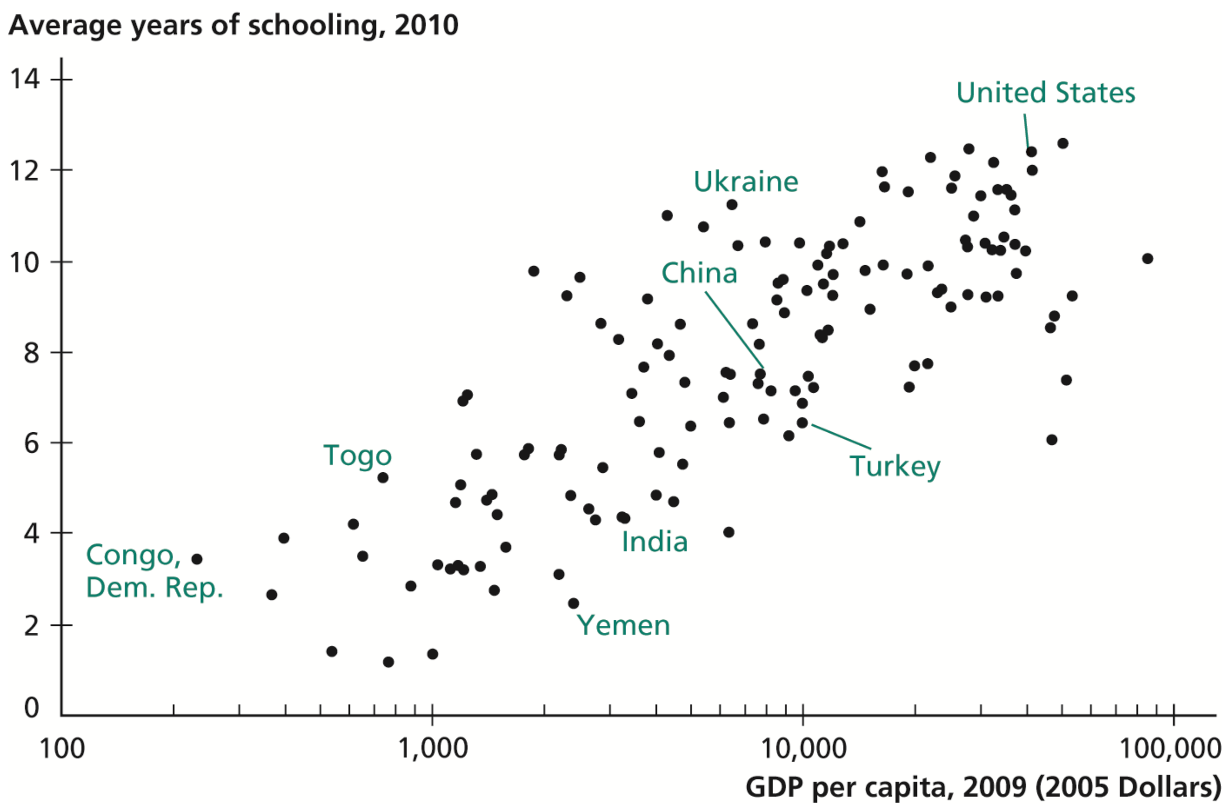


- Suppose that for some exogenous reason (technology), workers of any given health level can now produce more output: A to B.
- The rise in output will improve health, and this improved health will feed back to produce an additional increase in output: B to C ("multiplier" effect.

Human Capital in the Form of Education

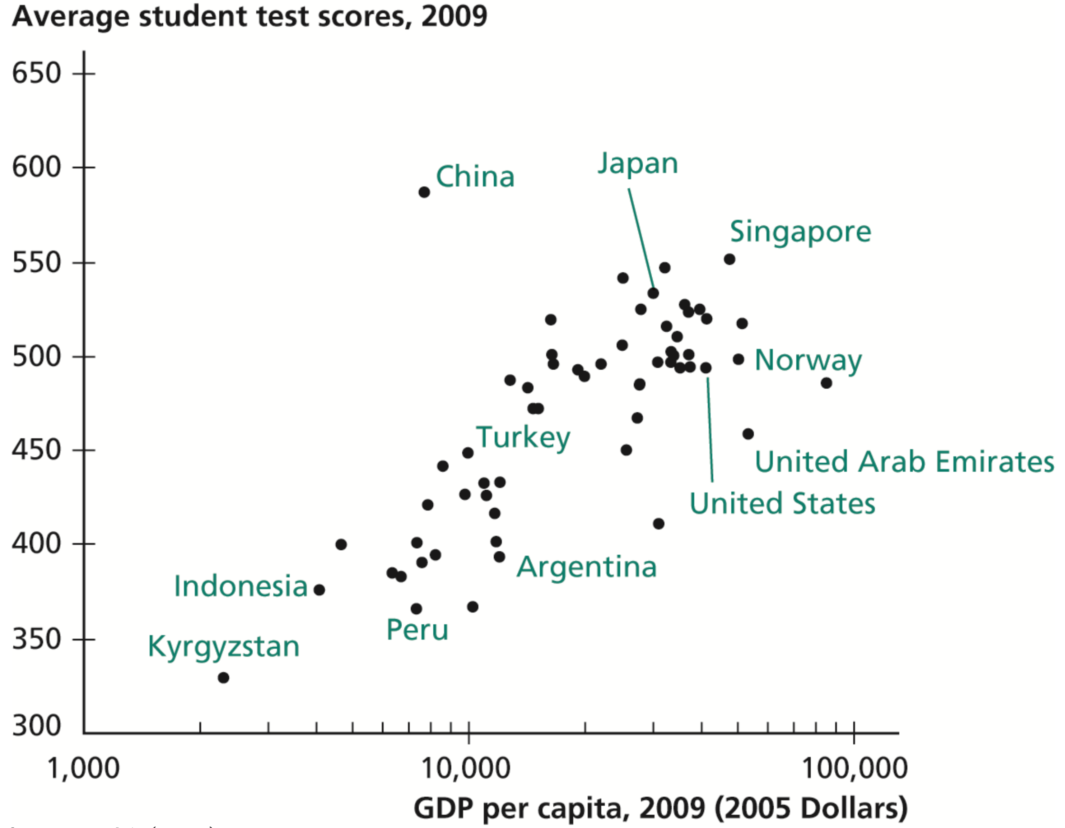
- Education is an investment in building human capital.
- Like investment in physical capital, it can be costly.
- In additional to monetary costs of education, there is a more subtle expense: The opportunity cost of forgone wages.
- In many developing countries, rapid population growth has caused a large fraction of the population to be of school age, so the burden of education spending is particularly large.

Average Years of Schooling versus GDP per Capita



Sources: Barro and Lee (2010), Heston, Summers, and Aten (2011).

Student Test Scores versus GDP per Capita



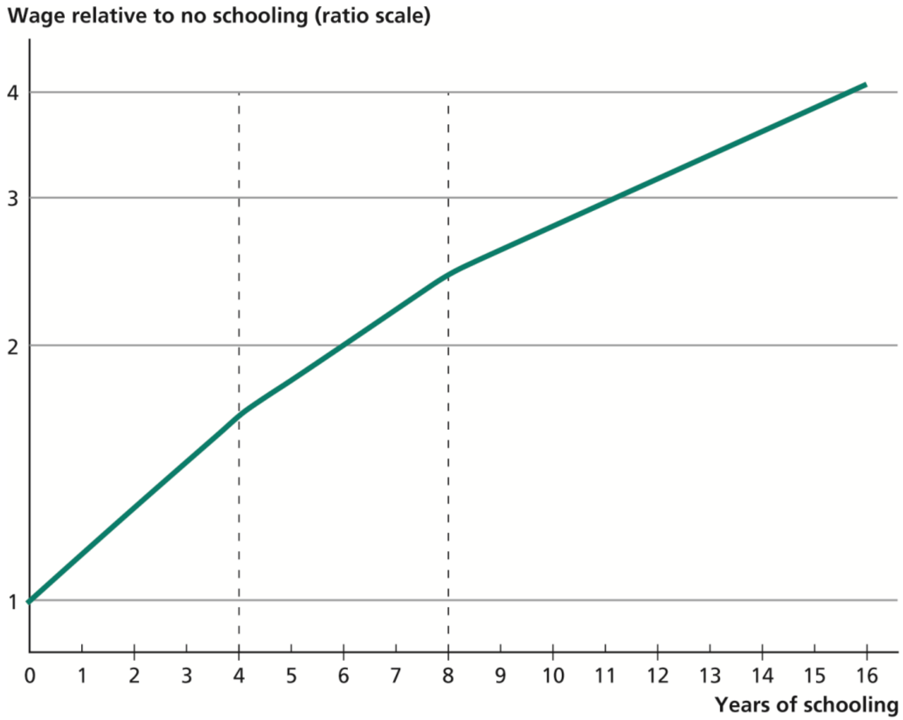
Source: PISA (2009).

Changes in the Level of Education, 1975-2010

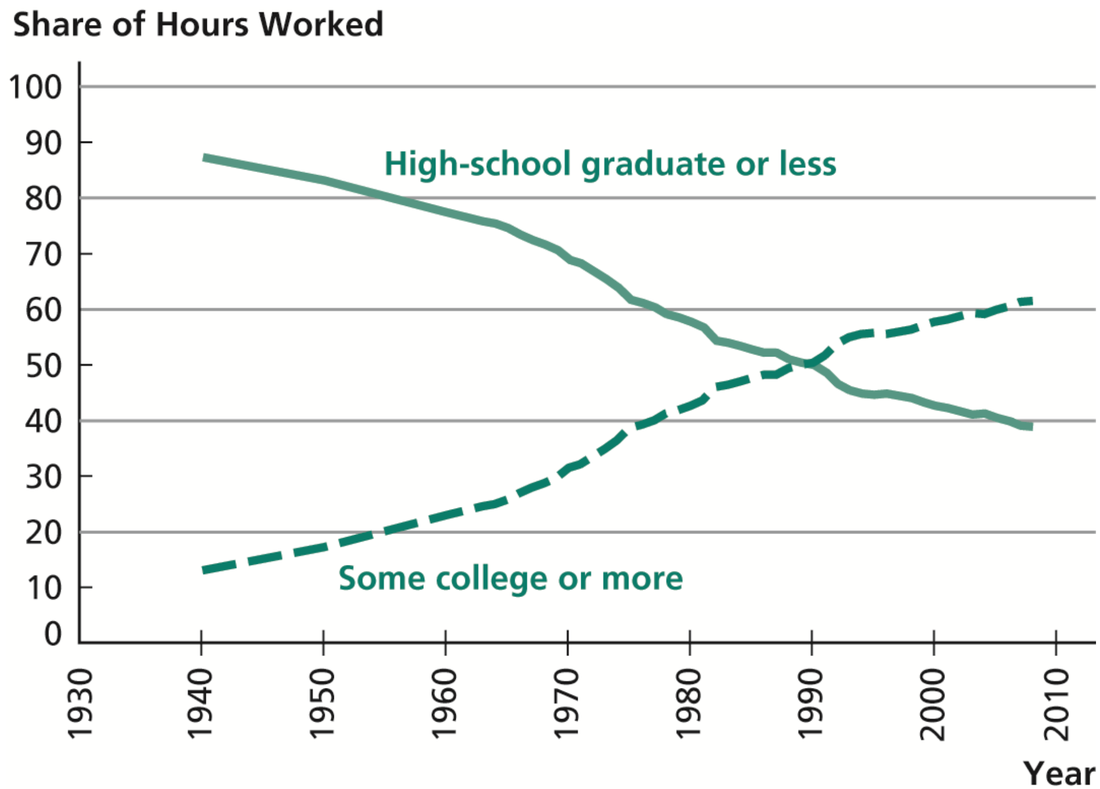
			Percentage of the Adult Population with			
		Average Years of Schooling	No Schooling	Complete Primary Education	Complete Secondary Education	Complete Higher Education
Developing Countries	1975	3.2	47.4	32.9	8.1	1.6
	2010	6.7	20.8	68.8	31.5	5.3
Advanced Countries	1975	8.0	6.2	78.8	34.9	8.0
	2010	11.0	2.5	94.0	63.9	16.6
United States	1975	11.4	1.3	94.1	71.1	16.1
	2010	12.4	0.4	98.8	85.4	20.0

Source: Barro and Lee (2010). Data for population 25+.

Effect of Education on Wages



Share of Hours Worked by Education Level, 1940–2008



Sources: Autor, Katz, and Krueger (1998), Autor, Katz, and Kearney (2008), Acemoglu and Autor (forthcoming).

Ratio of College Wages to High-School Wages

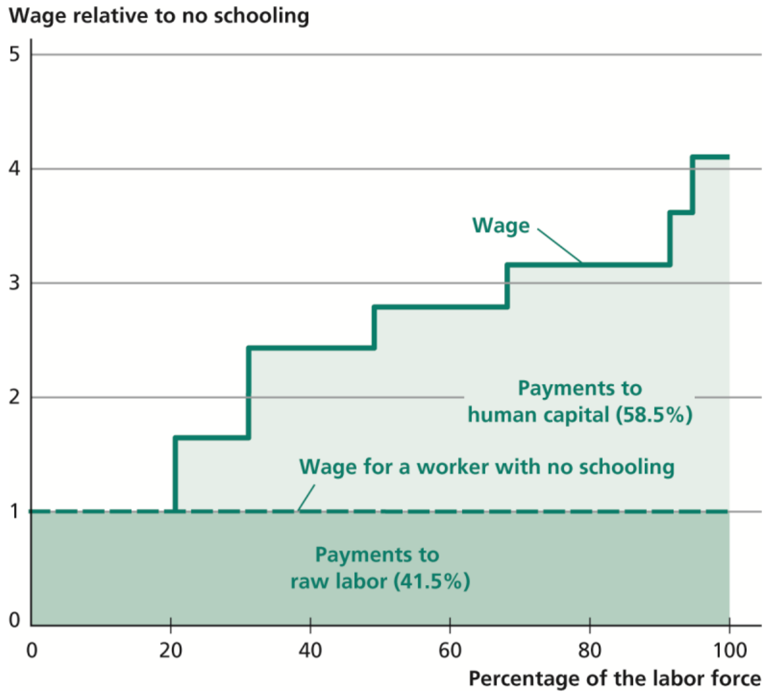
Sources: Autor, Katz, and Krueger (1998), Autor, Katz, and Kearney (2008), Acemoglu and Autor (2010).

Breakdown of the Population by Schooling and Wages

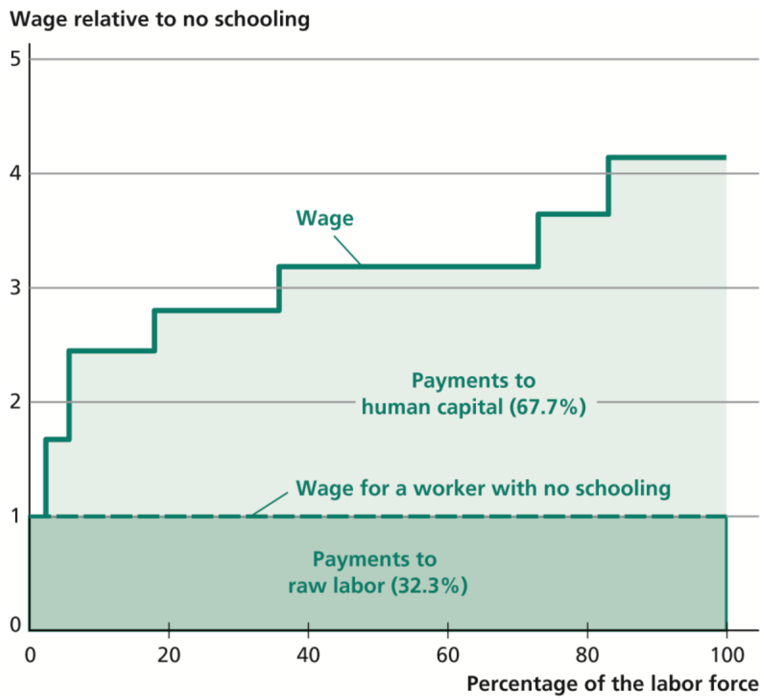
			Percentage of the Population	
Highest Level of Education	Years of schooling	Wage Relative to No Schooling	Developing Countries	Advanced Countries
No Schooling	0	1.00	20.8	2.5
Incomplete Primary	4	1.65	10.4	3.4
Complete Primary	8	2.43	18.0	12.3
Incomplete Secondary	10	2.77	19.3	17.8
Complete Secondary	12	3.16	23.2	37.4
Incomplete Higher	14	3.61	2.9	9.9
Complete Higher	16	4.11	5.3	16.6

Source: Barro and Lee (2010).

Share of Human Capital in Wages in Developing Countries



Share of Human Capital in Wages in Advanced Countries



How Much of the Variation in Income Across Countries Does Education Explain?

- A quantitative analysis of the impact of schooling differences among countries
  - Start with the Cobb-Douglas production function
  - Use the symbol h to denote schooling (human capital)
  - L is the number of workers
  - Total labor input in the country is hL

Production Function with Human Capital

$$Y = AK^{\alpha}(hL)^{1-\alpha}$$

where *A* is a measure of productivity and *K* is capital.

Rearrange the equation:

$$Y = h^{1-\alpha}AK^{\alpha}L^{1-\alpha}$$

Solve for the steady-state level of output per worker:

$$y^{ss} = A^{\frac{1}{(1-\alpha)}}\left(\frac{\gamma}{n+\delta}\right)^{\frac{\alpha}{(1-\alpha)}}$$

Production Function with Human Capital (cont.)

Rearrange the equation:

$$y^{ss} = (h^{1-\alpha}A)^{\frac{1}{1-\alpha}}\left(\frac{\gamma}{n+\delta}\right)^{\frac{\alpha}{(1-\alpha)}}$$

$$= h \times \left[A^{\frac{1}{(1-\alpha)}}\left(\frac{\gamma}{n+\delta}\right)^{\frac{\alpha}{(1-\alpha)}}\right]$$

Production Function with Human Capital (cont.)

To determine how large a difference in output can be produced by variations in labor input per worker, consider the case of two countries:

$$\frac{{y^{ss}}_i}{{y^{ss}}_j} = \frac{h_i \times \left[A^{\frac{1}{(1-\alpha)}}\left(\frac{\gamma}{n+\delta}\right)^{\frac{\alpha}{(1-\alpha)}}\right]}{h_j \times \left[A^{\frac{1}{(1-\alpha)}}\left(\frac{\gamma}{n+\delta}\right)^{\frac{\alpha}{(1-\alpha)}}\right]} = \frac{h_i}{h_j}$$

Production Function with Human Capital (cont.)

Let's consider a comparison of two countries. Let Country *j* have average schooling of 2 years and Country *i* have average schooling of 12 years. Call h_o the level of labor input per worker in a country with no schooling. The level of labor input in Country *j* is:

$$h_j = 1.134^2 \times h_o = 1.29 \times h_o$$

The level of labor input in Country *i* is:

$$h_i = 1.134^4 \times 1.101^4 \times 1.068^4 \times h_o = 3.16 \times h_o$$

$$\frac{{y^{ss}}_i}{{y^{ss}}_j} = \frac{h_i}{h_j} = \frac{3.16 \times h_o}{1.29 \times h_o} = 2.47.$$