Chapter 7. Human Capital: Education

Reference: Weil, Chapter 6.2-6.3

Accumulation of / investment in human capital through schooling / education (cf. accumulation of knowledge)

Table 6.1: Changes in the Level of Education, 1960-2000

		Average Years of Schooling	Percentage of the Adult Population With			
			No Schooling	Completed Primary	Completed Secondary	Completed Higher
Developing Countries	1960	2.05	64.1	17.1	2.5	0.4
	2000	5.13	34.4	43.0	14.8	3.0
Advanced Countries	1960	7.06	6.1	72.9	20.2	3.0
	2000	9.76	3.7	84.6	44.7	13.0
United States	1960	8.49	2.0	78.4	31.0	7.0
	2000	12.05	0.8	94.9	68.1	24.5

Observe: in advanced countries

- live less people with no education
- live more people with higher education

Everywhere education rises over time / in the process of development. Faster increase of education in less developed countries.

Most important cost of education

- opportunity costs
- learning *or* doing

$\rightarrow$ investment in h.c. today $\rightarrow$ returns (hopefully) later.

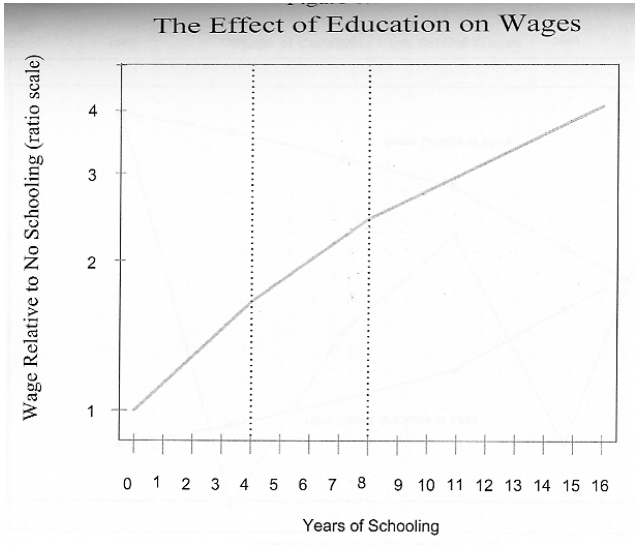
The return of education: increases of wages for one more year of schooling.
Inferred from the data:

- 13.4 % per year for the first 4 years
- 10.1. % for the the next four years
- 6.8. % for every additional year.

Observe: decreasing returns.

Thus, normalizing the wage for no schooling to one,

- return for 4 years of education $(1 + 0.134)^4$
- return for 6 years of education $1.134^4 \cdot 1.101^2$
- etc (see figure).



Recall: capital share of GDP 1/3 (labor share 2/3).

- What's the human capital share?
- How important is education vs. physical capital and "raw" labor?

$\rightarrow$ decomposition of wages for raw labor supply and education needed.

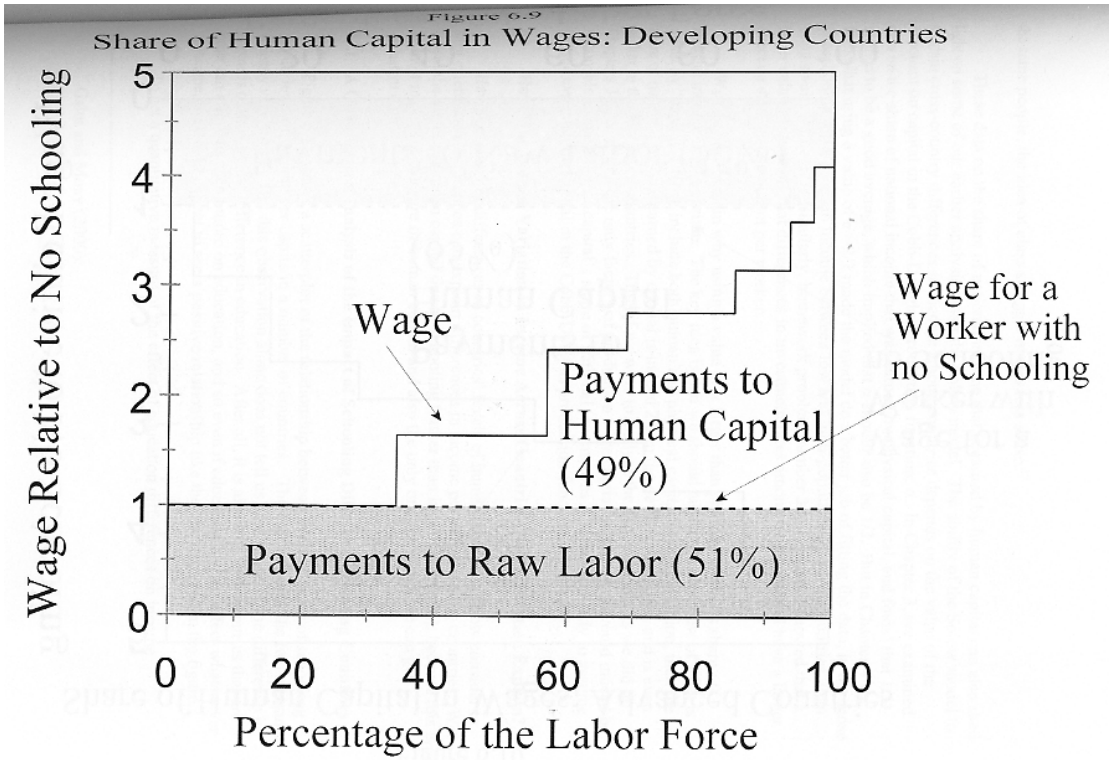
The skill premium:

- A worker with no education gets a wage of 1.
- A worker with 5 years education gets $1.134^4 \cdot 1.101 = 1.82$.
- Fraction of wages attributed to education: $(1.82 - 1)/1.82 = 45\%$.

Redo this exercise for all wage/skill – groups and sum up over the respective fraction of each group of the labor force.

For example, in the aggregate sample of developing countries and 7 skill groups

- 34.4 % of the population have no schooling and earn 1.
- 22.6 % have 4 years of schooling and earn 1.65.
- 11.9 % have 8 years of schooling and earn 2.43 etc (see figure)



- Integrate the areas: total fraction of wages payed to human capital: 49 %.
- And for advanced countries: 65%.

Now, the total labor share was 2/3 implying

- human capital share: $0.49 \cdot 2/3 = 0.33$
- (raw) labor share: 0.33

And for advanced countries:

- human capital share: 43%
- (raw) labor share: 23%

Recall: the neoclassical model performs better when $\alpha = 2/3$.

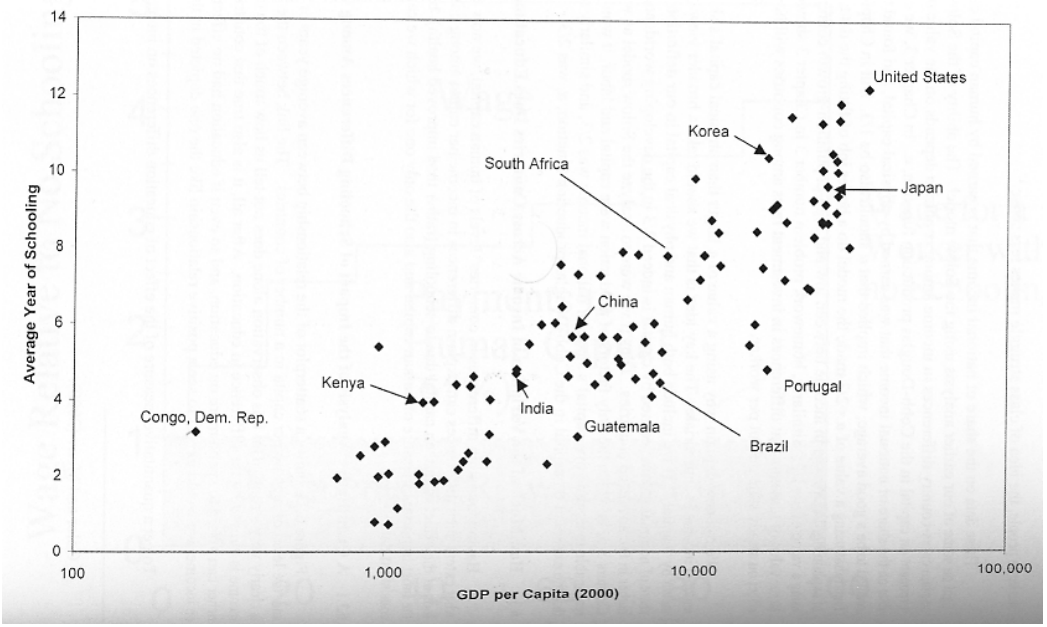
- Define total capital: physical capital and human capital.
- Total capital's share: 2/3 (and even higher for advanced countries).
- A reconciliation of model and (some) stylized facts.

Observe (Weil pp. 166-7):

- The population share of college graduates increases over time.
- Yet the skill premium for a college degree also increases over time (since approx . 1980).
- A contraction to neoclassical theory?

Resolution: skill biased technological change $\rightarrow$ later.

Generally, countries where citizens are on average less educated are poorer.



$\rightarrow$ how much of the cross country variation of GDP can be attributed to education?

The augmented Solow model:

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

h: human capital per worker (average education, taken as given).

Income per capita:

$$\frac{Y}{L} = y = Ah^{1-\alpha}k^{\alpha} \tag{2}$$

Equation of motion:

$$\dot{k} = sAh^{1-\alpha}k^{\alpha} - (\delta + n)k. \tag{3}$$

In a steady-state:

$$sAh^{1-\alpha}k^{\alpha-1} = \delta + n \qquad \Rightarrow \qquad k^* = \left[\frac{sA}{\delta + n}\right]^{1/(1-\alpha)} \cdot h. \tag{4}$$

Thus, income:

$$y = Ah^{1-\alpha}\left[\frac{sA}{\delta + n}\right]^{\alpha/(1-\alpha)} h^{\alpha} = A^{1/(1-\alpha)}\left[\frac{s}{\delta + n}\right]^{\alpha/(1-\alpha)} \cdot h. \tag{5}$$

Implying that for two countries, 1 and 2, that differ only in education of the average worker:

$$\frac{y_1}{y_2} = \frac{h_1}{h_2}. \tag{6}$$

The ratio of per capita income is equal to the ratio of education.

Suppose, average education

- 12 years in country 1
- 2 years in country 2.

Implying

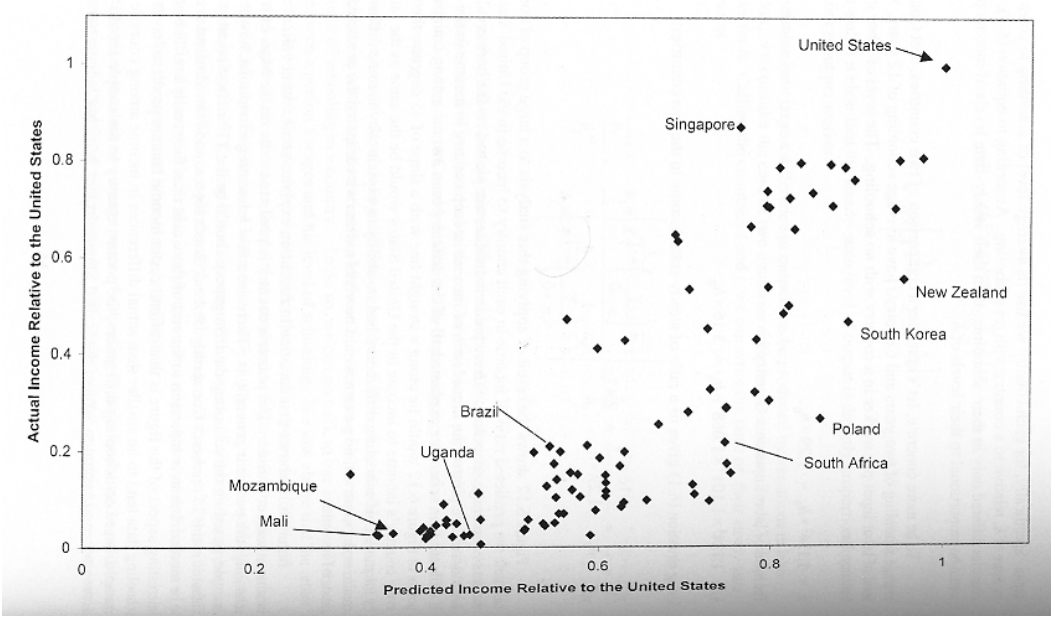
- $h_1 = 1.134^4 \cdot 1.101^4 \cdot 1.068^4 \cdot h_0 = 3.16 \cdot h_0$
- $h_2 = 1.134^2 \cdot h_0 = 1.29 \cdot h_0$

where h_0: innate skills.

So that

$$\frac{y_1}{y_2} = \frac{3.16}{1.29} = 2.47 \tag{7}$$

Applying this analysis to the actual data yields a Figure showing predicted vs. actual income relative to the U.S....



Observe:

- If education explained everything, the dots would be on the "45° line".
- Education explains some of cross country income variation.
- In particular, the poorest countries are predicted to be much richer than they actually are.
- i.e. education explains only little in this case. Why? $\rightarrow$ later

Combine the savings and education exercises.

- Predicted by s Uganda should have 33% of U.S. income per capita.
- Predicted by h it should have 45 %.
- Taken together, it should have $0.33 \cdot 0.45 = 15\%$ of U.S. income.
- Actually it has 3 %.

$\rightarrow$ together both explanations (i.e. factor accumulation) works quite well, but there is still much left to be explained.

Neglected aspects:

- Quality of schooling (in particular teachers
- Externalities: teamwork: education of a person raises productivity of other (less educated) persons. $\rightarrow$ one reasons why education is subsidized.

Taken these into account the model performs better. Yet, there is still much room for explanation: the A $\rightarrow$ Part 2 of this course.