Development Economics

Lecture 4: Human Capital

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1 Introduction

In this lecture I will discuss the macroeconomics of "human capital" in development economics. By human capital I essentially mean the ability of a worker to supply productive labor to an employer (wage employment) or herself (self-employment).

Health and **education** are two obvious potential determinants of labour quality, and will be the focus of this lecture.

Could it be that differences in health and education across countris can help explain the vast differences in income and standards of living more generally, across countries?

- I will follow Weil's exposition in Chapter 6 quite closely.

- I will also introduce the following paper:

Kingdon, G. and J. Knight "How flexible are wages in response to local unemployment in South Africa" Industrial & Labor Relations Review, Apr 2006, Vol. 59 Issue 3, p471-495.

Note that this is required reading for the first computer exercise (also note that you may be asked about this paper in the final exam).

2 Health

- Premise of the analysis: Healthy people can work harder and think more clearly than unwell workers. Healthy workers are therefore relatively more **productive**. It is therefore appropriate to say that health is part of an individual's human capital.

- Over the last century, the average level of health has **improved** in the world, for several reasons.
  - Advances in medicine.
  - Better nutrition.

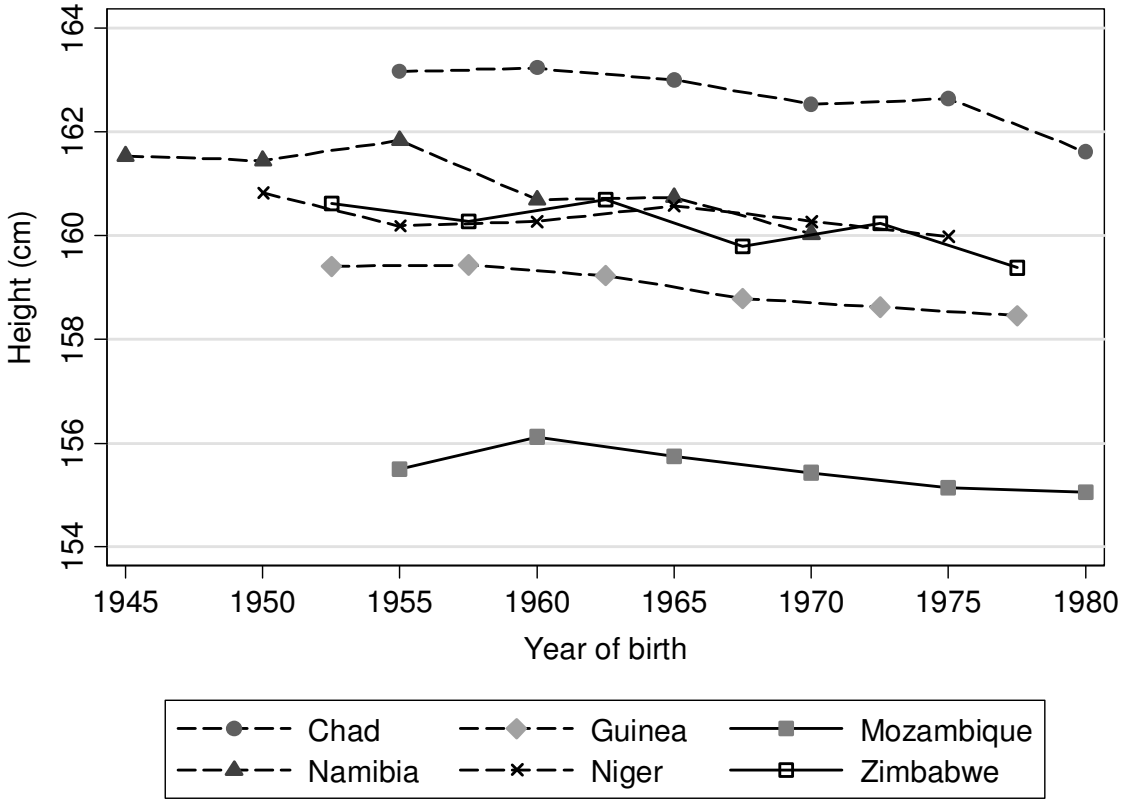
These developments **have led to** higher growth and economic development. But they are also **influenced** by economic development. More on this "chicken-and-egg" issue below.

- One visible effect of improved nutrition in the 20th century is that people have been getting **taller**. In a fascinating study Alexander Moradi, University of Oxford, looks at trends in the average height of the population in Sub-Saharan Africa (SSA) (Moradi, 2006).* For SSA the trend is a little different compared to the rest of the world. Looking at Figures 3-7 in his paper, it seems clear that, for most countries in his dataset, average height has **fallen** since the 1960s. According to the author, this is a direct result of the nutritional status having deteriorated during the last 30-40 years in SSA.

*Moradi, Alexander (2006). "Nutritional status and economic development in sub-Saharan Africa, 1950-1980," Global Poverty Research Group Working Paper GPRG-WPS-046. University of Oxford.

[Have a quick look at the graphs, taken from the Moradi paper; note that this paper is not required reading for the course - however I do recommend it]

Figure 3: Decreasing mean heights



Note: Birth cohorts are based on 5-year age groups (45-49, 40-44, ..., 20-24). The year of birth corresponds to the cohort mean and was assigned to the nearest 2.5-year segment. Cohorts with less than 100 individuals were excluded. All-women surveys, which are representative of the total female population, are in solid lines.

Source: Moradi, Alexander (2006). "Nutritional status and economic development in sub-Saharan Africa, 1950-1980," Global Poverty Research Group Working Paper GPRG-WPS-046. University of Oxford.

Figure 4: Stagnating mean heights

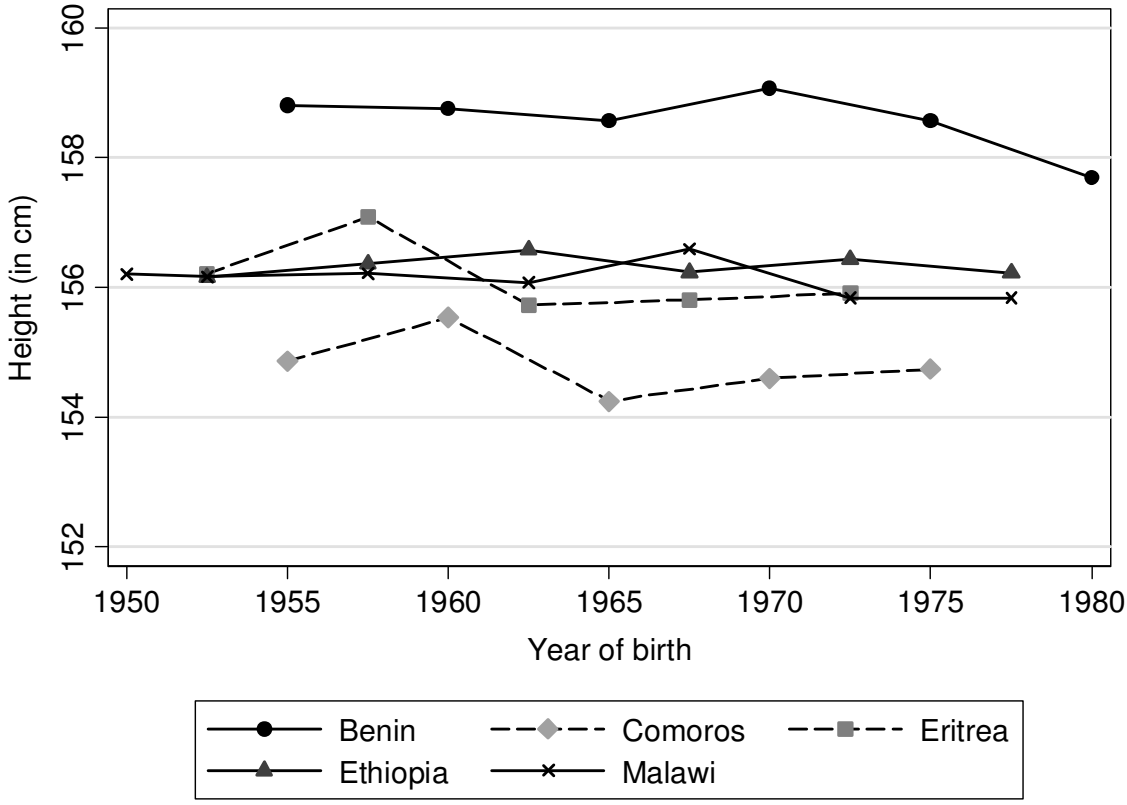


Figure 5: Height trends following an inverted U (1)

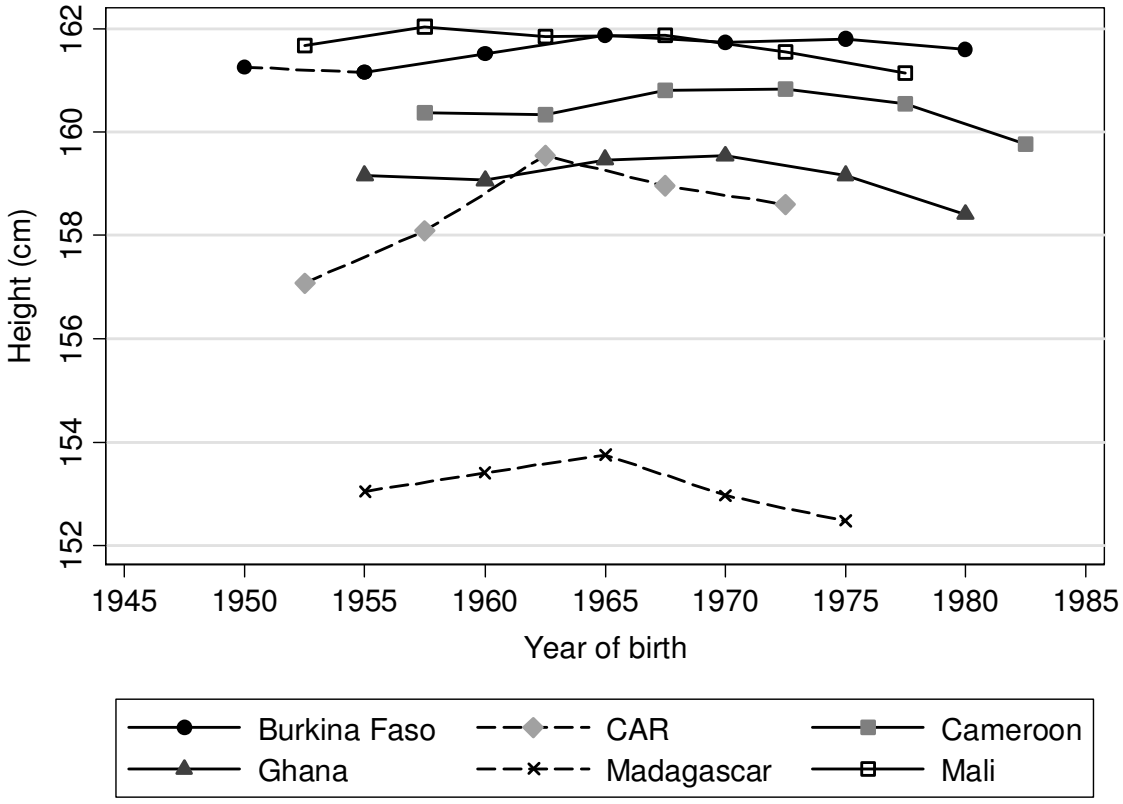


Figure 6: Height trends following an inverted U (2)

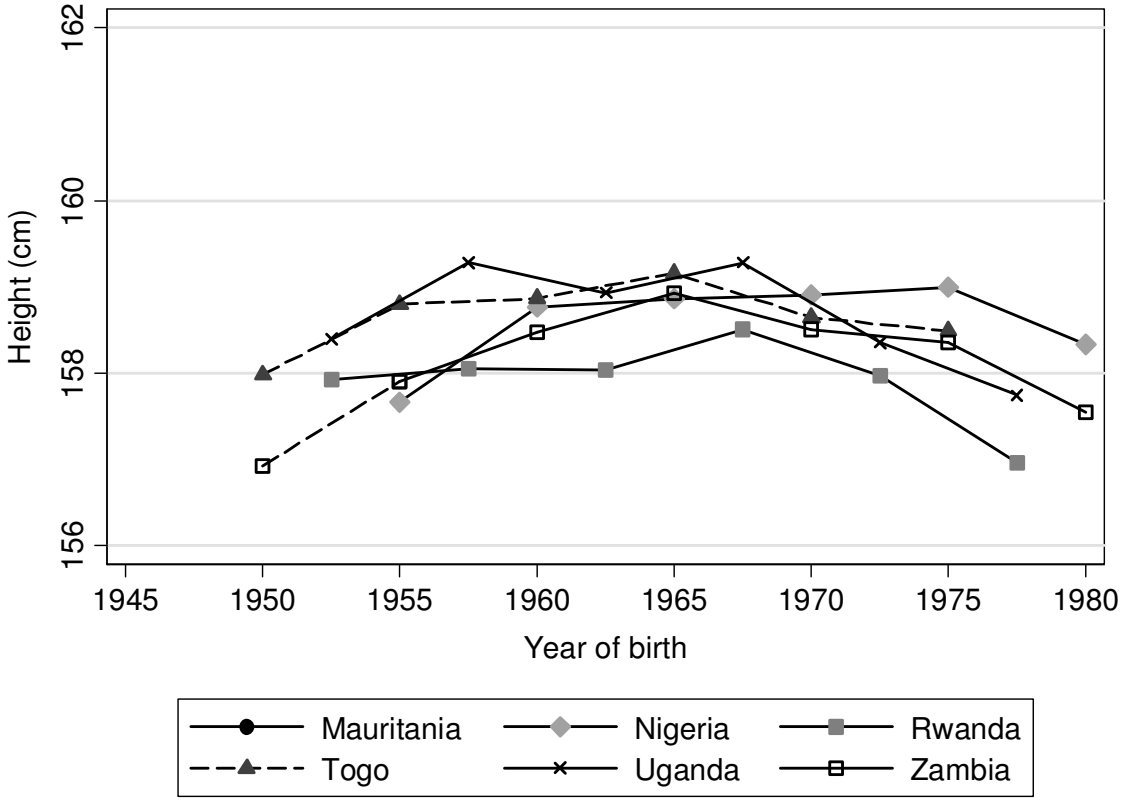
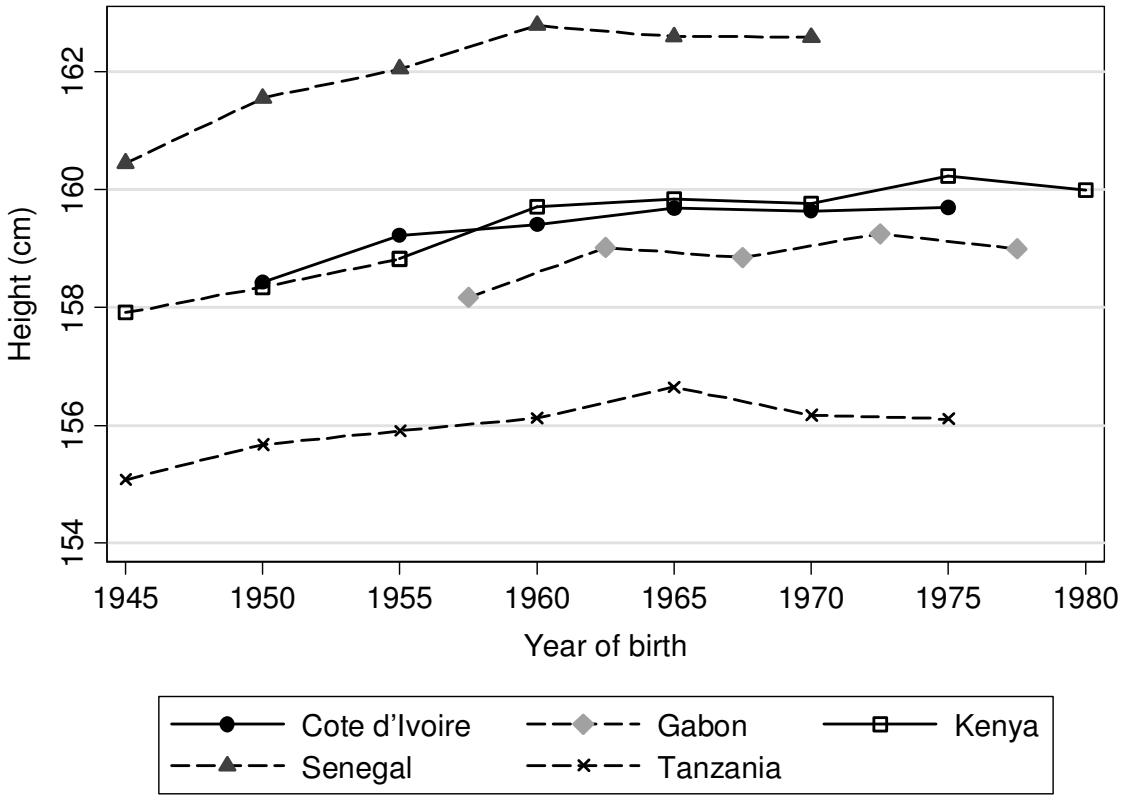


Figure 7: Increasing mean heights



- Two basic reasons why better nutrition raises economic growth:
  - Increased **quantity** of labour supply (more people can enter the labour force)
  - Improved **quality** of labour supply (people can work harder, or think more clearly)

- We can learn from **economic history:** Weil (p. 156) discusses a study by Robert Fogel (economics Nobel laureate), which quantifies the contribution of improved nutrition to economic growth in the UK between 1780 and 1980.
  - In 1780, 20% of the adults were unable to do any work because of malnutrition. In 1980, this was no longer an issue. This change thus

implies that the ratio of output per adult in the population in 1980 to that of 1780 was equal to $1/0.8 = 1.25$. That is, per capita output rose by 25% for this reason alone.

– Fogel also calculated that the amount of work performed by each worker in 1980 was 56% higher than it would have been in 1780, because of calorie intake was much higher in 1980 than in 1780.

– Taken together, these two effects imply that per capita output in 1980 was 1.25 x 1.56 = 1.95 times the level in 1780. This is the effect measured over 200 years. Converting it to an **annual** effect is straightforward:

$$1.95^{1/200} = 1.00334...$$

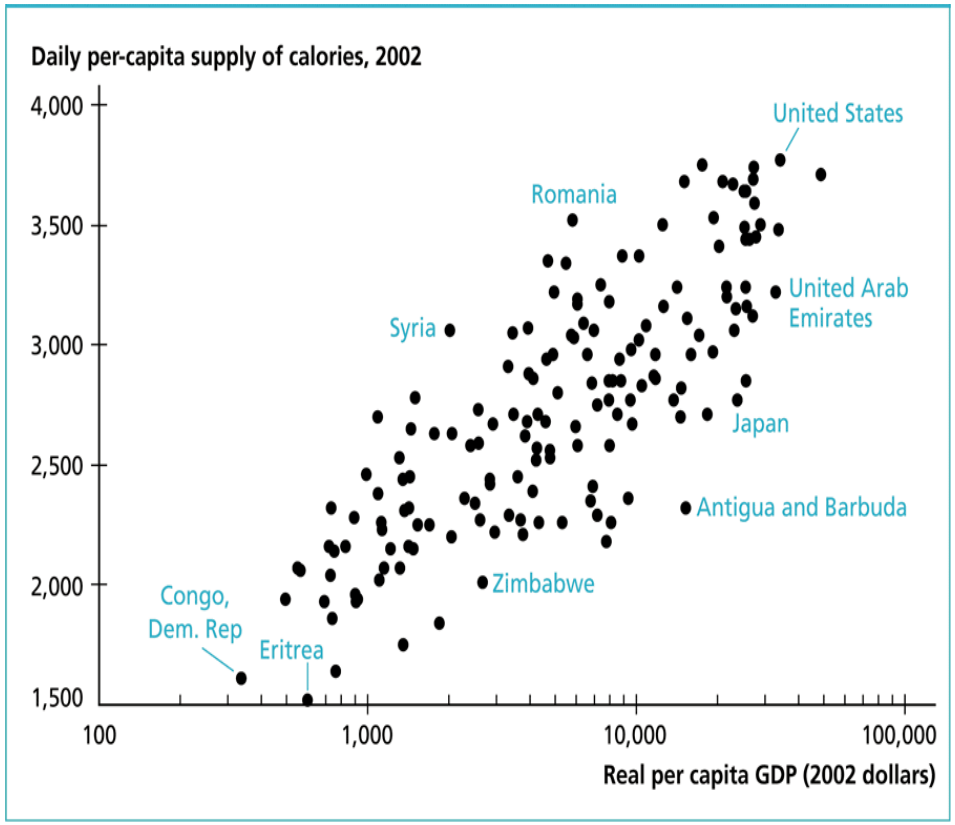
which amounts to 0.33% per year. The average annual growth rate in per capita income in the UK over this period was 1.15%.

  - Improved nutrition was clearly part of the growth process - although we don't really know if it **caused** the growth or if it was **caused by** growth (Weil is not very clear on this point I think - he says "...improved nutrition can be seen as having produced slightly less than one-third of the overall growth in income", suggesting that causality runs from health to income but that is in fact not certain).

- As you know malnutrition is still a big problem in poor countries. Figure 6.1 shows the association between calorie intake and real per capita GDP in the world; Figure 6.2 shows the relationship between life expectancy and per capita GDP (both graphs are taken from Weil's book).

[Fig. 6.1 & 6.2 here]

Figure 6.1: Calorie intake and GDP per capita

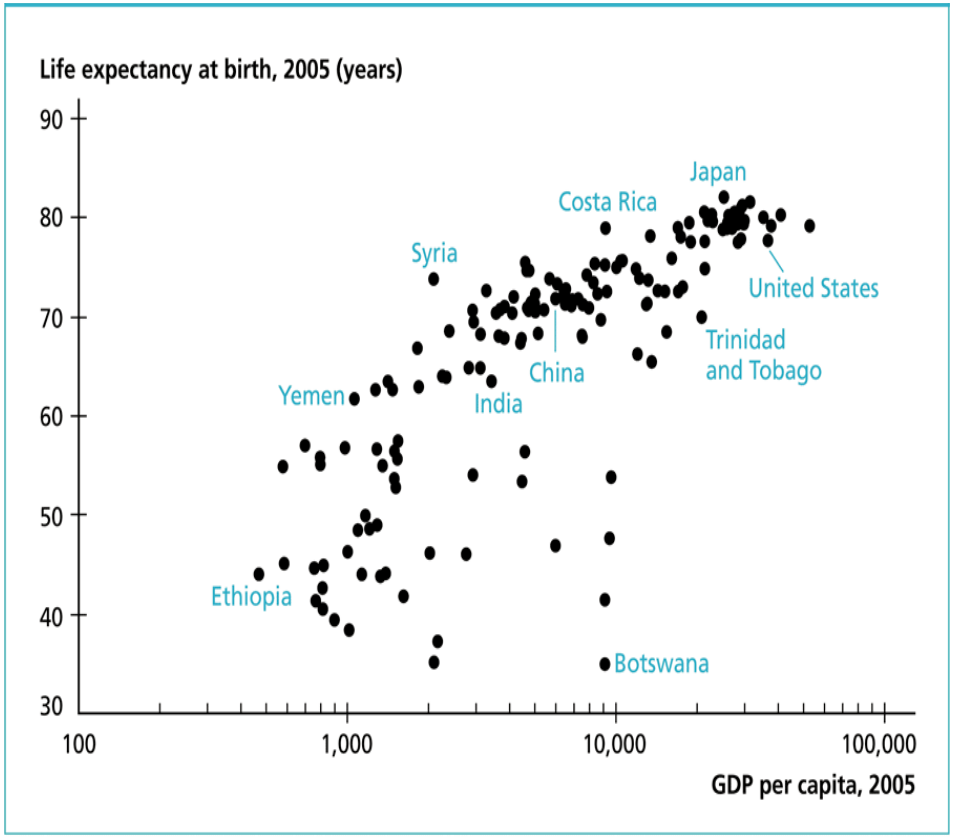


Sources: FAOSTAT database, Heston, Summers, and Aten (2006).

- Three striking insights:

1. Enormous differences in per capita GDP across countries in the world. Note that the horizontal axis is logarithmic (so the distance on the axis between $100 and $1,000 is the same as the distance between $10,000 and $100,000). In the poorest countries per capita GDP is less than $1,000; and in the richest countries it is more than $20,000.
2. Very large differences in average calorie intake across countries in the world. In several countries the average calorie intake is less than half of that in the US.
3. Strong positive correlation between calorie intake and per capita GDP.

Figure 6.2: Life expectancy and GDP per capita



Sources: Heston, Summers, and Aten (2006), World Bank (2007a).

- Insights:

1. Large differences in life expectancy at birth (e.g. compare Botswana & Japan)
2. Strong positive correlation between life expectancy and per capita GDP.

2.1 Health and income: What are the connections?

- We have talked briefly about the **causal effects** of health on income. In doing so, the thought probably occurred to you that richer countries can afford to supply their citizens with better access to health facilities, more effective drugs, more health-related information etc.

- In other words, causality runs...
  - from health to income; **but also**
  - from income to health

- The data presented by Robert Fogel should be viewed in this light. Maybe workers in the UK got healthier precisely because the UK got richer?

- Thus, for understanding the relationship between health and income, you need to recognize that **both are endogenous variables** that depend on each other. I think some simple maths may help to clarify things (this relates to the material in Weil but is actually not in the book).

- Suppose health (h) is a function of income (y) and some other factor u_h (perhaps reflecting the disease environment) as follows:

$$h = \alpha \cdot y + u_h,$$

where α is a parameter measuring the causal effect of income on health. Hence we expect $\alpha > 0$ (and we require $-1 < \alpha < 1$ for the system to be stable).

- Also suppose income is a function of health and some other factor u_y (perhaps reflecting institutional quality) as follows:

$$y = \beta \cdot h + u_y,$$

where β is a parameter measuring the causal effect of income on health. Hence we expect $\beta > 0$ (and we require $-1 < \beta < 1$ for the system to be stable).

- Now consider a positive exogenous shock to health (perhaps because a large number of mosquito nets are handed out to the rural poor in a malaria endemic region). In my little model, this increases u_h. What are the effects on a) health b) income?
  - 1. Direct effect on health. Clearly if u_h increases by one unit (say), then health (h) will increase by one unit. But that is not all.
  - 2. Indirect effect on health. The health improvement feeds into higher income through better health:

$$y = \beta \cdot h + u_y$$

and that in turn increases health further:

$$h = \alpha \cdot y + u_h,$$

because y is going up. That is, we have both u_h and y playing a role here.

- The total effects of the increase of u_h on health and income in this model can be obtained by rewriting the equations in reduced form. Hence, start from

$$\begin{aligned} h &= \alpha \cdot y + u_h \\ y &= \beta \cdot h + u_y \end{aligned}$$

and then plug in the second equation into the first one (this yields the health equation in reduced form); and the first equation into the second one (income equation in reduced form).

- Health equation in reduced form:

$$\begin{aligned} h &= \alpha \cdot (\beta \cdot h + u_y) + u_h \\ h\,(1 - \alpha\beta) &= \alpha u_y + u_h \\ h &= \frac{\alpha}{(1 - \alpha\beta)} u_y + \frac{1}{(1 - \alpha\beta)} u_h. \end{aligned}$$

- The income equation in reduced form is very similar:

$$y = \frac{\beta}{(1 - \beta\alpha)} \cdot u_h + \frac{1}{(1 - \beta\alpha)} u_y$$

- Insights:

  - The effect of the health shock on health is higher than just 1:1 (provided $\alpha \times \beta$ is positive and less than 1 - which is assumed here). This is

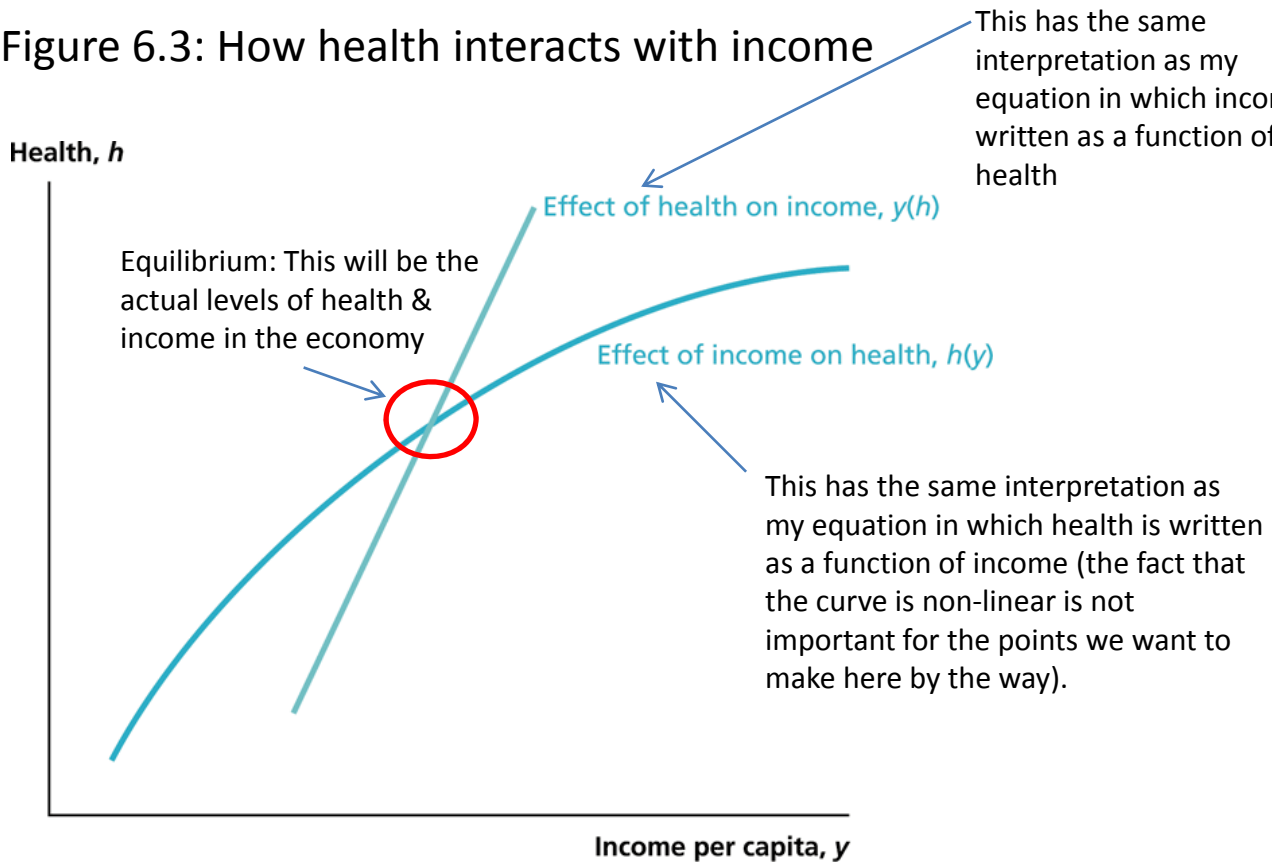
because it impacts on income, an effect that feeds back onto health. This is sometimes referred to as a **multiplier effect**.

  - The health shock impacts causally on income.

- Now let's redo this type of analysis using the diagram shown on p.159 in Weil.

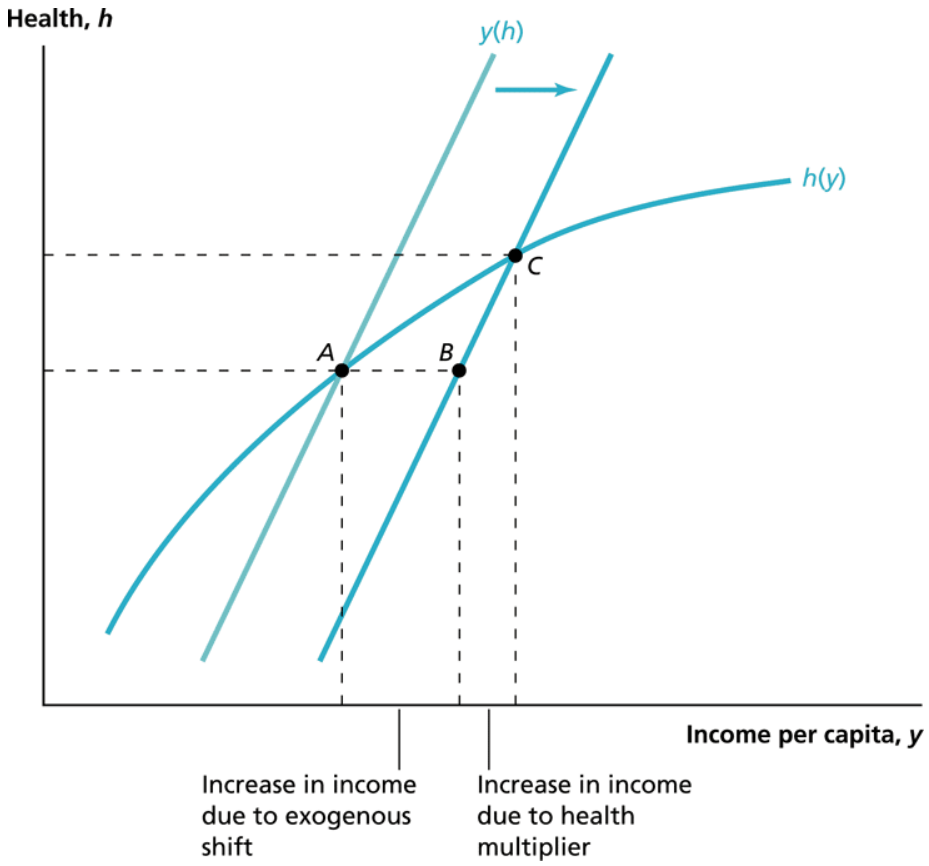
[Figure 6.3 here]

Figure 6.3: How health interacts with income



• Take this to be the starting point. Now consider the effects of an exogenous improvement in income (i.e. one **not** brought about by better health, but by something else – e.g. the discovery of diamonds)

Figure 6.3: How health interacts with income (continued)



- Events unfold as follows

1. From A to B: Direct effect of exogenous income shock on income. No effect on health yet.
2. As income rises, health will improve. This means we will start to move upwards from point B.
3. As we move upwards from B, and health improves, this feeds back into further increases in income. Thus we climb towards point C, which is the new equilibrium.

What would the graph look like if causality **only** runs from health to income? Interpret.

3 Human Capital in the Form of Education

- By far the most researched aspect of human capital in economics is **education**. As you know, more and better schooling is often considered a key driver of growth and development pretty much everywhere.

- Indeed, the level of education has increased substantially over the last 30-40 years.
  - In developing countries average years of schooling **more than doubled** between 1960 and 2000, from 2 to slightly more than 5 years. Still, about a third of the population in developing countries have no schooling - see Table 6.1 in Weil for more striking facts on schooling around the world.