Tutorial 1

Exercise 1: Catching up

In 1995, average GDP per capita is equal to $y_d = 25000$ for developed countries, and $y_u = 1200$ for under-developed ones. The average rate of growth are respectively $g_d = 3\%$ and $g_u = 2\%$.

1) Considering the average growth rate of GDP per capita in under-developed countries, what time would be necessary to reach the average level in 1995 of developed countries ?

2) In 1995, Malaysia had a GDP per capital equal to 4000\$ and a growth rate of $g = 6\%$. Assuming that this growth rate remains constant in the future, how long would it take for Malaysia to catch up the high income countries? How long would it take for $g = 4\%$?

3) What should be the growth rate in under-developed countries to catch up developed one in 20 years ?

Exercise 2: The measure of technological progress: growth and the Solow Residual

We make the assumption that output is given by a Cobb-Douglas production function, that is: $Y_t = A_t F(K_t, L_t) = A_t K_t^\alpha L_t^{1-\alpha}$. We denote by r_t, the real interest rate and w_t the real wage at which respectively capital and labor are payed. We make the assumption that the economy runs under perfect competition.

1. Under perfect competition, firms earn no profit and inputs earn their marginal, that is: $\frac{\partial Y_t}{\partial K_t} = r_t$ and $\frac{\partial Y_t}{\partial L_t} = w_t$. Give the economic reasoning behind this result.

2. Show that α represents what goes to stockholders, that is $\alpha = r_t \frac{K_t}{Y_t}$ and $1 - \alpha = w_t \frac{L_t}{Y_t}$.

3. Show that we can decompose the growth rate of the economy as follows:

$$g_Y = g_A + \alpha g_K + (1 - \alpha)g_L$$

Give an economic interpretation of the g_A term, also known as the "Solow Residual".

4. Take $\alpha = 1/3$ and suppose $g_K = 3\%$, $g_L = 1\%$ and $g_Y = 4\%$. What are the productivity gains in this economy ?