

Tutorial 3:

Exercise 1: Solow Model with Human Capital

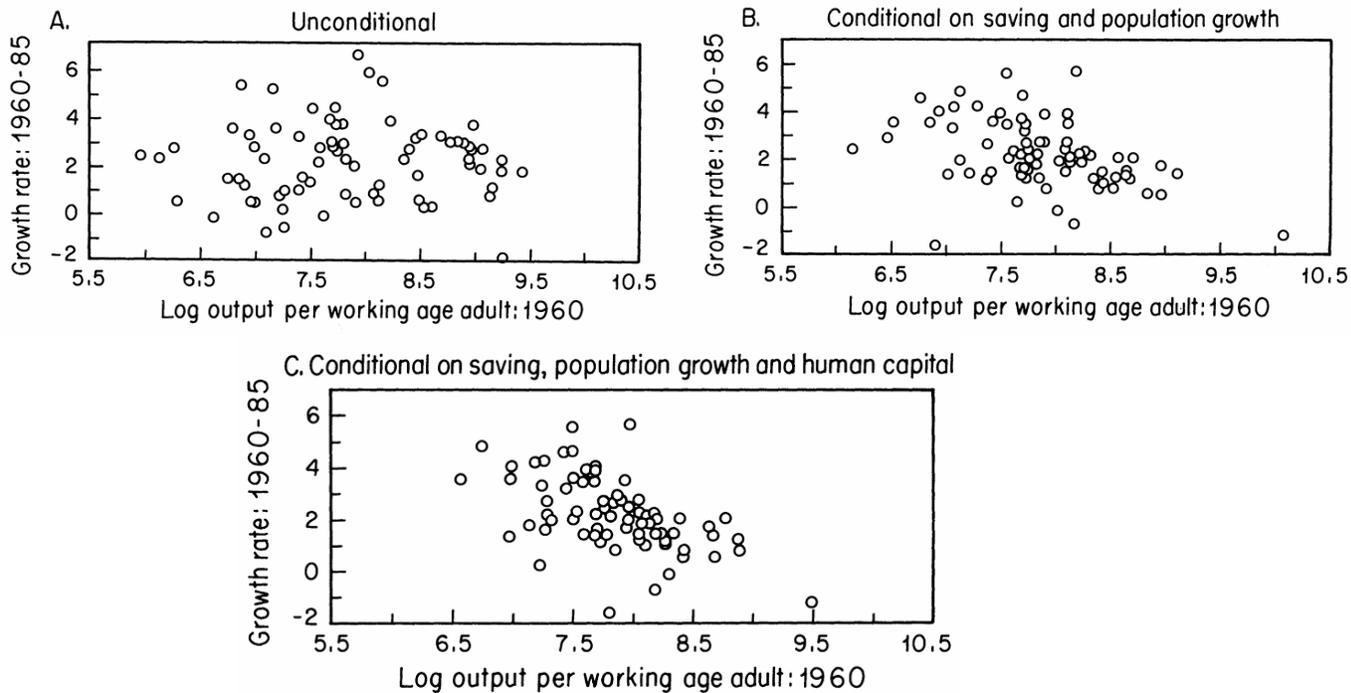
We consider an economy with one representative firm endowed with the following production function: $Y = K^\alpha H^\beta (AN)^{1-\alpha-\beta}$ where α and β are positive constants such that $\alpha + \beta < 1$. Y is the aggregate output, K is the physical capital stock and H the human capital stock. N is the quantity of labor and A a technical progress. N and A are growing at a constant rate: $A_{t+1}/A_t = 1 + a$ and $N_{t+1}/N_t = 1 + n$.

1. What can you say about the production function?
2. We assume that a share s_k of the output is invested in physical capital, and a share s_h is invested in human capital. The depreciation rates of the two stocks are equal to the same value δ . What is the accumulation equation of each stock?
3. We introduce the following variables: $h_t = \frac{H_t}{A_t N_t}$ and $k_t = \frac{K_t}{A_t N_t}$. What is the dynamics of these two variables?
4. What are the (constant) long run values of h and k ? What is the impact of each parameter of the model on these variables? What are the long run dynamics of H_t , K_t and Y_t ?

Exercise 2: Empiric of Economic Growth

For this exercise you are supposed to have read the paper "A Contribution to the Empirics of Economic Growth" (1992) by Gregory Makiw, David Romer and David Weil. More generally, the goal of this exercise is to understand the role of human capital in the augmented Solow model and analyze the concept of conditional convergence using empirical results and graphical evidence.

1. The augmented model predicts an elasticity of income with respect to saving rates higher than in the textbook model. Why does this occur? Support your explanation with insights from the production function that includes human capital.
2. The paper provides a graph with three panels illustrating convergence: Panel A for unconditional convergence; Panel B for conditional convergence accounting for saving rates and population growth; and Panel C for conditional convergence accounting for saving rates, population growth, and human capital. What does each panel reveal about the concept of conditional convergence? (Hint: Why is there no clear evidence of convergence in Panel A, but strong evidence in Panels B and C?)



3. What are the potential policy implications of emphasizing human capital accumulation alongside physical capital investment for economic growth? Discuss the practical implications of these findings for developing countries attempting to "catch up" to richer nations.