Final Exam, SØK2007 Development Economics
Fall 2023

Please answer your answers clearly and show your steps to receive partial credit. Final answers without discussions will not receive credit.

Question 1 (10 points)

What is meant by unconditional convergence? How does this compare to conditional convergence as predicted by the Solow Model?

Question 2 (25 points)

Assume that output per worker in each country is given by the standard Cobb-Douglas production technology, $y = Ak^{\alpha}h^{1-\alpha}$, with $\alpha = 1/3$.The table below provides data on the average annual growth rates (in percent) of output per worker, physical capital per worker, and human capital per worker, all for the 1975–2009 time horizon.

Country	Growth Rate of Output per Worker $\hat{y}$	Growth Rate of Physical Capital per Worker $\hat{k}$	Growth Rate of Human Capital per Worker $\hat{h}$
Cameroon	0.1474	0.929	1.118
China	7.6187	7.8467	1.1213
Luxembourg	3.4987	2.7437	0.2885
Sri Lanka	3.5788	2.8291	0.4136

1. For each of the four countries listed in the table, calculate the average annual growth rates of factor endowments and productivity, i.e. calculate $\hat{F}$ and $\hat{A}$.

2. In which country does factor accumulation (i.e., the combined growth of factor inputs) contribute the most to output growth? Explain your reasoning.

3. In which country does productivity growth contribute the most to output growth? Explain your reasoning.

Question 3 (20 points)

Consider a country described by the Solow model with exogenous technological progress. The aggregate production function is given by $Y = (AK)^{\alpha}L^{1-\alpha}$, where $\alpha = 1/3$. The saving rate is 7% per annum, the depreciation rate is 3% per annum, the rate of population growth is 4% per annum, and the rate of productivity growth (i.e., the growth rate of A) is 6% per annum.

1. Calculate the levels of both capital per *effective* worker and output per *effective* worker in the steady state. [Hint: Be careful! The question is providing you with the growth rate of A, not the growth rate of e as in our lecture notes! Also, the production function here, $Y = (AK)^{\alpha}L^{1-\alpha}$, is slightly different from what you have seen before, since A is associated with K under the same exponent. Think about what the relationship between A and e needs to be, so that the production function can be rewritten as $Y = K^{\alpha}(eL)^{1-\alpha}$.]

2. What is the growth rate of output per worker (i.e., the growth rate of the standard of living) in the steady state?

Question 4 (15 points)

1. Discuss the ways in which technology is similar to other factors of production (like physical and human capital) and the ways in which it is different from these other factors.

2. What are some of the properties of technology that tend to diminish the amount of technological progress that takes place in a given society (by reducing private incentives to engage in R&D)?

3. What sort of policies can the government enact to ensure that the private incentives to invest in R&D are not necessarily reduced?

Question 5 (10 points)

1. What does the Kuznets curve suggest about the relationship between economic growth and inequality?

2. Should governments in developing countries be concerned if inequality goes up during a period of economic growth?

Question 6 (20 points)

Consider the one-country model of endogenous technological progress that we covered in class. Suppose that $L = 1$, $\mu = 5$, and $\gamma_A = 0.5$. [Aside: These numbers are not meant to be realistic, but rather, they are chosen to make the calculations a bit easier. There has certainly never been a country where half of the labor force has been engaged in R&D!]

1. Calculate first the rate at which output per worker is growing in this economy.

2. Now suppose that γ_A is raised to 0.75. How many years will it take before output per worker returns to the level it would have reached had γ_A not been raised from 0.5 to 0.75? [**Hints**: To solve this problem, you'll need to apply the fact that the level of productivity does not change instantaneously, and as such the levels of A just before and just after the increase in γ_A are identical.]