

## Supervision 2 Economic Growth

### Short questions (250 words max)

1. Plutarchia has a GDP of \$100 billion and an aggregate wage bill of \$60 billion. Over the last 10 years, real GDP growth has been 10% per year, and the growth rates of capital and labor 10% and 5%, respectively. The share of labor income in GDP has been roughly constant.
  - (a) Propose an aggregate production function to describe the economy of Plutarchia and motivate your choice.
  - (b) Use the growth accounting framework to compute total factor productivity growth in Plutarchia.
2. For 98 countries from 1960 to 1997, the growth rate of GDP per capita shows little relation to the level of initial GDP per capita. Explain whether this could be consistent with the neoclassical model of economic growth of Solow and Swan.
3. What is the main difference between the Solow growth model and the AK growth model? What does this difference imply for the sources of long-run growth? [Tripos 2009]

### Problems

4. The economy of Caribbea suffers from a structurally low standard of living. The World Bank is considering the following two policy options:
  - A** Transfer capital to Caribbea to double the amount of capital per worker.
  - B** Encourage Caribbeans to double their savings rate.

Assume that Caribbea has a closed economy that is described by the Solow growth model. The production function equals  $Y = K^{1/2}L^{1/2}$ , the savings rate  $s$  10%, the depreciation rate  $\delta$  9%, population growth  $n$  1%, and there is no technological progress.

- (a) Derive the fundamental equation of motion of capital per worker,  $k \equiv K/L$ , and use it to compute the initial steady state level of the capital stock  $k_0^*$ .
- (b) Derive the golden rule level of capital,  $k_{gold}^*$ .
- (c) Explain the effect of policy option A using the Solow diagram. What is the new steady state  $k_A^*$ ? Explain how policy option A affects the level of consumption per worker and economic growth over time.

- (d) Explain the effect of policy option B using the Solow diagram. Compute the new steady state  $k_B^*$ . Explain how policy option B affects the level of consumption per worker and economic growth over time.
- (e) Write a brief note (250 words max) to the government of Caribbea and explain which policy option is better, providing intuitive economic arguments.
5. Consider a Solow growth model with a constant population  $N$ , zero depreciation, a constant saving rate  $s$ , and a constant rate of technical progress  $g$ . The production function is:

$$Y = \sqrt{K}\sqrt{\pi AN}$$

where  $Y$  is aggregate output,  $K$  is the capital stock, and  $A$  is the efficiency of labour. The parameter  $\pi$  is a summary measure of policies that prevent adoption of better technologies. We assume that  $0 < \pi \leq 1$ . [cf Tripos 2008]

- (a) Derive the equation for output per effective worker ( $y \equiv Y/AN$ ) and the equation of motion for capital per effective worker ( $k \equiv K/AN$ ):

$$\Delta k = sy - gk$$

- (b) What is the steady state value of capital per effective worker and output per effective worker? Illustrate graphically how the economy converges to the steady state.
- (c) Derive the steady state growth rate of aggregate output. Explain whether it is affected by policies that prevent adoption of better technologies ( $\pi$ ).
- (d) Suppose that the country undertakes a reform that eliminates all policies that prevent adoption of better technologies. What are the effects in the short run and in the long run on i) capital per effective worker and ii) aggregate output? Discuss the practical relevance of your answers.

### Main reading

- Mankiw and Taylor (2014), *Macroeconomics - European Edition*, chapters 8-9.

### Supplementary references

- Blanchard and Johnson (2012), *Macroeconomics*, chapters 10-12.
- De Long (2002), *Macroeconomics*, chapter 5.
- Jones (2014), *Macroeconomics*, chapter 3-5.
- Jones (2002), *Introduction to Economic Growth*, chapters 1-3.
- Lucas (1990), "Why Doesn't Capital Flow from Rich to Poor Countries?", *American Economic Review Papers and Proceedings* 80, May, pp. 92-96.
- Solow (1956), "A Contribution to the Theory of Economic Growth", *Quarterly Journal of Economics* 70(1), February, pp. 65-94 [seminal paper]
- Solow (1994), "Perspectives on Growth Theory", *Journal of Economic Perspectives*, Winter 1994, pp. 45-54.
- Symposium on Distribution of World Income, *Journal of Economic Perspectives*, Summer 1997.
- Temple (1999), "The New Growth Evidence", *Journal of Economic Literature* 37(1), March, pp. 112-156.