

ECONOMICS 101B; FIRST HOUR EXAM

Six points per lettered answer:

PART 1. Consider a Solow growth model economy with positive labor force growth and positive technological progress that is on its steady-state growth path. Suddenly the level of technology undergoes a sharp, discrete, upward jump. At the same time, the ongoing rate of technological progress then falls to zero.

- A) Diagram the situation, showing *qualitatively* what the old and the new steady-state growth paths are.
- B) Draw a graph sketching out the paths of output per effective worker Y/EL , capital per effective worker K/EL , and consumption per effective worker C/EL (remember: $C = (1-s)Y$).
- C) Draw a graph sketching out the paths of output per worker Y/L , capital per worker K/L , and consumption per worker C/L .
- D) Draw a graph sketching out the paths of output Y , capital K , and consumption C .
- E) At the moment of the shock, how does the capital-output ratio change? Comparing the two steady-state growth paths, how does the capital-output ratio change?
- F) How does this shock affect the speed with which the economy converges to its steady-state growth path?

PART 2. Suppose that we have a standard Solow economic growth model with one difference. Instead of the capital accumulation equation being:

$$dK/dt = sY - \delta K,$$

instead the capital accumulation equation is:

$$dK/dt = (s/p)Y - \delta K,$$

where p is the relative price of capital goods and is another parameter that can change. The idea is that all of a sudden your country can trade with other, more industrially developed countries that are more efficient at making capital goods: machine tools, buildings, roads, computers, et cetera.

Suppose further that the economy's savings rate $s = 20\%$ of GDP, that the labor force growth rate $n = 1\%$ per year, that the depreciation rate $\delta = 3\%$ per year, that the efficiency-of-labor growth rate $g = 1\%$ per year, that the efficiency of labor E_0 is \$20,000 per year, and that the diminishing returns to investment parameter α is $1/2$.

- A) Suppose that the price of capital goods $p_K = 1$. What is the economy's balanced-growth steady-state capital-output ratio?
- B) Suppose that the opening up of world trade with more advanced economies reduces p_K by half, so that the new $p_K = 0.5$. What is the effect of such a reduction in the price of capital on the economy's balanced-growth steady-state capital-output ratio?
- C) Write down an algebraic expression for the steady-state capital-output ratio as a function of the price of capital goods p , the savings rate, the population growth rate, the depreciation rate, and the rate of growth of the efficiency of labor.
- D) Suppose that the economy had been on its balanced-growth path before the sudden drop of 50% in the price of capital. What is the growth rate of output per worker in the first year after the sudden drop in the price of capital?
- E) What is the long-run proportional boost in the level of output per capita that will eventually be created by the opening-up of international trade and the fall in the price of capital goods?
- F) How long after the shock will it take the economy to get "close" to its new steady-state balanced-growth path? (You pick your own definition of "close".)
- G) Why did you pick the definition of "close" that you did?

PART 3. Facts about the world:

- A) On which continent, mostly, are the world's poorest economies located?
- B) Around which ocean, mostly, are the world's richest economies located?
- C) Explain to somebody who has never taken an economics course why it is that modern industrial economies are so rich and why medieval economies were so poor.

D) Explain to somebody who has never taken an economics course why some countries' economies today are fabulously rich and others are desperately poor.