Economics 101b; Fall 1999; Problem Set 2

Due in class September 21, 1999

1. Consider the production function:

$$\frac{Y}{L} = \left(\frac{K}{L}\right)^{0.5} (E)^{1-0.5}$$

a. Suppose E=1, L=100, and K=64; what is output per worker Y/L?
b. Suppose E=3, L=196, and K=49; what is output per worker Y/L?
c. If both capital K and labor L double, what happens to total output Y? (Not output per worker Y/L, but total output.)
d. Holding E=1, suppose that capital per worker increases from 2 to 4 and then from 4 to 6. What happens to output per worker?

2. Consider an economy in which the depreciation rate is 3% per year, the rate of population increase is 1% per year, the rate of technological progress is 1% per year, and the private savings rate is 16% of GDP. Suppose that the government increases its budget deficit--which had been at 1% of GDP for a long time--to 3.5% of GDP and keeps it there indefinitely.

a. What is the effect of this shift on the economy's steady-state capital-output ratio?
b. What is the effect of this shift on the economy's steady state growth path for output per worker?
c. Suppose that your forecast of output per worker 20 years in the future had been $100,000. What is your new forecast of output per worker twenty years hence?

3. Consider an economy with the production function:

$$\frac{Y}{L} = \left(\frac{K}{L}\right)^{0.5} (E)^{1-0.5}$$

in which the depreciation rate on capital is three percent per year, the rate of population growth is one percent per year, and the rate of growth of labor-augmenting technology is one percent per year.

a. Suppose that the savings rate is ten percent of GDP. What is the steady-state capital-output ratio? What is the value of output per worker on the steady-state growth path written as a function of the level of labor-augmenting technology E?

b. Suppose that the savings rate is fifteen percent of GDP. What is the steady-state capital-output ratio? What is the value of output per worker on the steady-state growth path written as a function of the level of labor-augmenting technology E?

c. Suppose that the savings rate is twenty percent of GDP. What is the steady-state capital-output ratio? What is the value of output per worker on the steady-state growth path written as a function of the level of labor-augmenting technology E?

4. What happens to the steady-state capital-output ratio if the rate of technological progress increases? Would the steady-state growth path of output per worker for the economy shift upward, downward, or remain in the same position?

5. Discuss--that is, write two paragraphs evaluating--the following proposition: "An increase in the savings rate will increase the steady-state capital output ratio, and so increase both output per worker and the rate of economic growth both in the first few years after the savings rate has increased and in the very long run as well."

6. Would the steady-state growth path of output per worker for the economy shift upward, downward, or remain the same if capital were to become more durable--if the rate of depreciation on capital were to fall?

7. Suppose that a sudden disaster--an epidemic, say--reduces a country's population and labor force, but does not affect its capital stock. Suppose further that the economy was on its steady-state growth path before the epidemic. What is the immediate effect of the epidemic on output per worker? On the total economy-wide level of output? What happens subsequently?