Chapter 3

C Level Questions

1.   Imagine that the production of fishing lures is governed by the production function:
$$y = L^{.7}$$
where y represents the number of lures created per hour and L represents the number of workers employed per hour.

a. Does this production function exhibit constant, decreasing, or increasing returns to labor? How can you tell?

b. Imagine that each fishing lure sells for $24 and that each worker is paid $6 per hour. How much labor is hired by this firm? What is the total output produced by this firm?

c. Imagine now that the government charges a tax on wages of 10% (similar to the structure of the US social security taxes paid by employers). With this new tax in place, how much labor is hired by this firm? What is the total output produced by this firm? What is the effect on employment given an increase in wage taxes?

2.   Consider an economy described by the following equations:

$$Y = 5,000 \qquad\qquad G = 1,000$$
$$T = 1,000 \qquad\qquad C = 250 + .75(Y\text{-}T)$$
$$I = 1,000 - 50r$$

a. In this economy, compute private savings, public savings, and national savings.

b. Find the equilibrium interest rate (r).

c. Now suppose that G rises to 1,250. Compute private, public, and national savings. What is the new equilibrium interest rate?

d. Now suppose that the government increases taxes and government purchases by equal amounts (both G and T equal 1,250). What happens to the interest rate and investment in response to this balanced budget change? Does your answer depend on the marginal propensity to consume? Why?

B Level Questions

3.   Use the production function $Y = K^{.3}L^{.7}$ to answer the following questions:

a. Solve for the equilibrium real wage for an economy with this production function. (Your answer will be a function of K and L).

b. Solve for the equilibrium real rental rate of capital for an economy with this production function.

c. What fraction of total income do workers receive in this economy? Capital owners?

d. Suppose that immigration raises the labor force by 10%. What happens to total output (in percent)? What happens to the real rental rate of capital (in percent)? What happens to the real wage (in percent)? Carefully explain why the changes in the wage and rental rate of capital move in the direction you find.

4.   Consider an economy described by the following equations:

$$Y = 4000 \qquad C = 100 + .9(Y - T) \quad G = 500 \qquad T = 500$$

In our society, a number of different types of investment occur. For instance, residential investment, inventory investment, and business investment are all different types of uses for real goods. Consider a society with two types of investment: residential and business. An equation for each are given below:

$$I_r = 50 - 10r \qquad\qquad\qquad I_B = 50 - 10r$$

where I_r represents residential investment and I_B represents business investment. Remember that total investment is equal to $I_r + I_B$.

a. On the plot below, graph national savings and total investment demand.

b. What is the equilibrium interest rate in this economy? What is the equilibrium level of investment?

c. In March of 2001, President Bush signed into law a tax bill that gives tax credits to businesses which generates increased business investment demand. How will this policy impact the equilibrium interest rate? What will happen to the total quantity each of business investment and residential investment?

d. One flaw with the classical model introduced above is that it doesn't take into consideration the fact that interest rates are positively correlated with government revenues (e.g. during periods of high interest rates, late tax payers pay a greater penalty than during low interest rates). If interest rates positively influence tax revenues, plot the resulting savings and investment curves on a diagram of interest rates and quantity saved.

e. Contrast the effect of the Bush tax credit program on interest rates and total investment when interest rates effect tax revenues and when they don't. Under which scenario do interest rates change more? Why?

A Level Questions
5.   Although the Cobb-Douglas Production function is widely used by economists to describe the production process, certainly some process are not described by this process. For instance, consider the Leontief production function which is defined as $Y = \min(aK, bL)$ where a and b are coefficients and the function min indicates that Y is equal to the minimum of the two arguments in parenthesis. An example of this production process might be the number of pipe fittings produced in an hour. Given $a = 10$ and $b = 10$, hiring one unit of labor and no pipe wrenches (capital), one would produce $Y = \min(10 \times 0, 10 \times 1) = \min(0, 10) = 0$ (because the minimum of zero or ten is zero). Likewise, buying a wrench and no labor also produces zero output: $Y = \min(10 \times 1, 10 \times 0) = 0$. Hiring more wrenches than workers also produces only the amount that the workers can do (in other words hiring the extra wrench does not increase output).
a. Does the Leontief production function exhibit increasing, decreasing, or constant returns to scale?
b. What type of returns to labor does the Leontief production function exhibit?
c. Imagine that $a = 10$, $b = 10$, $w = 5$, $r = 10$, and $P = 20$. Can you find the profit maximizing level of labor and capital to hire?

6.   In most production activities, a large number of inputs are required. This problem asks you to consider a production function that includes two types of workers: skilled and unskilled. The production function is:

$$Y = K^{\frac{1}{4}} L_U^{\frac{1}{4}} L_S^{\frac{1}{2}}$$

where L_U is the number of unskilled workers and L_S is the number of skilled workers.

a. If unskilled workers get paid w_u, skilled workers get paid w_S, capital owners are paid r, and the firm receives price P for each of its goods it produces, write the firm's profit function.

b. Solve for the equilibrium real wage for unskilled workers. What happens to wages unskilled workers earn when capital increases? Why?

c. Solve for the equilibrium real wage for skilled workers. What happens to wages skilled workers earn when the number of unskilled workers increase? Why?

d. Imagine that the firm sells its products for $100 each, owns 1 unit of capital, and pays a $w_U = \$10$ per hour and a $w_S = \$12.5$ per hour. How many unskilled workers does this firm hire? How many skilled workers does this firm hire? How much total output is created?

e. Some activists argue for a more equal wage distribution in the United States at a "living wage." Imagine that the living wage in the above economy was $12.50 per hour and Congress passed a law forcing firms to pay each worker, whether unskilled or skilled, $12.50 per hour. Describe the effects of this legislation on the economy. What happens to total production? What happens to the number of unskilled and skilled workers hired? Why?