

Problem Set 2
Due Wednesday, February 10th

1. The following questions pertain to the production function as discussed in class.
 - a. Draw a clear and neatly defined diagram of the production function relating economic activity to employment. Provide an economic explanation of the shape of the curve(s).
 - With each addition to the labor force, or N , output, or Y , increases respectively. However, the graph levels out after a certain point due to the *marginal product of labor concept*, which implies that with each extra form of output, it results in less labor.
 - b. List the endogenous and exogenous variables in this model.
 - Variables in this model contain both endogenous and exogenous variables. Endogenous variables in this model are represented by labor, N , and output, Y . On the other hand, exogenous variables are technology, or A , and capital, or K .
2. A technological breakthrough increases a country's multifactor productivity A by 10%.
 - a. Show how this development affects the graphs of both the production function relating output to capital and the production function relating output to labor.
 - b. Show that a 10% increase in A also increases the MPK and the MPL by 10% at any level of capital and labor. (Here is a hint: What happens to ΔY for any increase in capital, or ΔK , or for any increase in labor, or ΔL)

$$MPK = \frac{\Delta Y}{\Delta K} = \frac{Y_2 - Y_1}{K_2 - K_1}, \text{ for which } \frac{1.1Y_2 - 1.1Y_1}{K_2 - K_1} = 1.1 \left[\frac{Y_2 - Y_1}{K_2 - K_1} \right]$$
 - c. Is it possible for a beneficial supply shock to leave the MPK and the MPL unaffected? Why or why not?
 - It is not possible because the entire production function in this case would have to shift upwards, but it would not be able to change slopes, meaning the graph would begin at a certain set level of production with 0 workers instead of at the normal level of 0 output with 0 workers.
3. How would each of the following affect the current level of full-employment output? Be sure to fully explain your answer.
 - a. A large number of immigrants enter the country.
 - b. Energy supplies become depleted.
 - c. New teaching techniques in the classroom improve the performance of all high school seniors.
 - d. A new law requires some forms of capital the government considers unsafe to be dismantled.

4. An economy has the following production function:

$$Y = 0.2(K + \sqrt{N})$$

Where $k=100$ and $N=100$ in the current period.