

Assignment: Problem 3.1

- Use the neoclassical theory of distribution to predict the impact on the real wage and the real rental price of capital of each of the following events:
 - a. A wave of immigration increases the labor force.
 - b. An earthquake destroys some of the capital stock.
 - c. A technological advance improves the production function.

Remember $W/P = MPL$, $R/P = MPK$
Explain using graphs.

- a. $MPL \downarrow$, $MPK \uparrow$
- b. $MPL \downarrow$, $MPK \uparrow$
- c. $MPL \uparrow$, $MPK \uparrow$

Assignment: Problem 3.3

- Suppose that an economy's production function is Cobb-Douglas with parameter $\alpha = 0.3$.
 - a. What fractions of income do capital and labor receive?
 - b. Suppose that immigration increases the labor force by 10%. What happens to total output (in percent)? The rental price of capital? The real wage?
 - c. Suppose that a gift of capital from abroad raises the capital stock by 10%. What happens to total output (in percent)? The rental price of capital? The real wage?
 - d. Suppose that a technological advance raises the value of the parameter A by 10%. What happens to total output (in percent)? The rental price of capital? The real wage?

$$Y = AK^\alpha L^{1-\alpha}$$

$$MPK = \alpha AK^{\alpha-1} L^{1-\alpha} = \frac{\alpha Y}{K}$$

$$MPL = (1 - \alpha)AK^\alpha L^{-\alpha} = \frac{(1 - \alpha)Y}{L}$$

- a. Capital share = 0.3, labor share = 0.7
- b. Y increases by $(1-\alpha)(0.1)=0.07$ or 7 %; R/P = MPK increases by 7%; W/P = MPL declines by 3%.
- c. Y increases by $\alpha(0.1) = 0.03$ or 3%; R/P declines by 7%; W/P rises by 3%.
- d. All three rise by 10%.

To answer (b)-(d), study the following:

Take the log of the production function to get $\ln Y = \ln A + \alpha \ln K + (1 - \alpha) \ln L$.

Then take a change in all variables (Y, A, K and L): $\Delta \ln Y = \Delta \ln A + \alpha \Delta \ln K + (1 - \alpha) \Delta \ln L$.

And use that $\Delta \ln X$ is (approximately) equal to percentage change in X.

Thus for (b), $\Delta \ln Y = 0 + 0 + (1 - 0.3)(0.1) = 0.07$ or Y increases by 7%.

Real rental (R/P) is equal to MPK. And $\% \Delta MPK = \% \Delta Y - \% \Delta K = 0.07 - 0 = 0.07$. MPK rises by 7%.

Real wage (W/P) is equal to MPL. And $\% \Delta MPL = \% \Delta Y - \% \Delta L = 0.07 - 0.10 = -0.03$. MPL declines by 3%.

[To obtain the above two lines, use the mathematical form of MPK and MPL in the above and note that α and $1 - \alpha$ are constants.]

You can obtain answers to (c) and (d) in a similar way.

Assignment: Problem 3.7

- The government raises taxes by \$100 billion. If the MPC is 0.6, what happens to the following? Do they rise or fall? By what amounts?
 - a. Public saving
 - b. Private saving
 - c. National saving
 - d. Investment
 - e. Use a graph and explain how the real interest rate will change.

- a. $S_g = T - G$ rises by 100
- b. $S_p = Y - T - C$ T rises by 100, C falls by 60. S_p declines by 40
- c. S rises by 60.
- d. I rises by 60.
- e. The real interest rate falls as the S line shifts to the right.

Assignment: Problem 3.9

- Consider an economy described by the following equations:
 - $Y = C + I + G$
 - $Y = 5,000$
 - $G = 1,000$
 - $T = 1,000$
 - $C = 250 + 0.75(Y - T)$
 - $I = 1,000 - 50r$
- a. Compute private saving, public saving, and national saving.
- b. Find the equilibrium interest rate.
- c. Now suppose that G rises to 1,250. Compute private saving, public saving, and national saving.
- d. Find the new equilibrium interest rate.

- a. $S_p = 750, S_g = 0, S = 750$
- b. $r = 5\%$
- c. $S_p = 750, S_g = -250, S = 500$
- d. $r = 10\%$

- (a) Plug the given numbers and obtain $S_g = T - G = 1000 - 1000 = 0$. For S_p , obtain C first. $C = 250 + 0.75(5000 - 1000) = 3250$. The $S_p = Y - T - C = 5000 - 1000 - 3250 = 750$. $S = 750$
- (b) Use $S = I$ to obtain $750 = 1000 - 50r$. Solve this for r .
- (c) Repeat steps in (a).

Assignment: Problem 3.10

- Suppose that the government increases taxes and government purchases by equal amounts.
 - a. What happens to the interest rate and investment in response to this balanced-budget change?
 - b. Does your answer depend on the marginal propensity to consume?
 - c. (Problem 3.12) If consumption depended on the interest rate, how would that affect the conclusions reached in the above question?

- a. National saving declines as long as $MPC < 1$. The interest rate rises.
- b. If $MPC = 1$, there will be no change in national saving. No change in r .
- c. Use a graph.