

## QUESTIONS FOR REVIEW

1. What determines the amount of output an economy produces?
2. Explain how a competitive, profit-maximizing firm decides how much of each factor of production to demand.
3. What is the role of constant returns to scale in the distribution of income?
4. Write down a Cobb–Douglas production function for which capital earns one-fourth of total income.
5. What determines consumption and investment?
6. Explain the difference between government purchases and transfer payments. Give two examples of each.
7. What makes the demand for the economy's output of goods and services equal the supply?
8. Explain what happens to consumption, investment, and the interest rate when the government increases taxes.

## PROBLEMS AND APPLICATIONS

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.
2. If a 10-percent increase in both capital and labor causes output to increase by less than 10 percent, the production function is said to exhibit *decreasing returns to scale*. If it causes output to increase by more than 10 percent, the production function is said to exhibit *increasing returns to scale*. Why might a production function exhibit decreasing or increasing returns to scale?
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 percent. 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 percent. 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 percent. What happens to total output (in percent)? The rental price of capital? The real wage?
4. Figure 3–5 shows that in U.S. data, labor's share of total income is approximately a constant over time. Table 3–1 shows that the trend in the real wage closely tracks the trend in labor productivity. How are these facts related? Could the first fact be true without the second also being true?
5. According to the neoclassical theory of distribution, the real wage earned by any worker equals that worker's marginal productivity. Let's use this insight to examine the incomes of two groups of workers: farmers and barbers.
  - a. Over the past century, the productivity of farmers has risen substantially because of technological progress. According to the neoclassical theory, what should have happened to their real wage?
  - b. In what units is the real wage discussed in part (a) measured?
  - c. Over the same period, the productivity of barbers has remained constant. What should have happened to their real wage?
  - d. In what units is the real wage in part (c) measured?
  - e. Suppose workers can move freely between being farmers and being barbers. What does this mobility imply for the wages of farmers and barbers?

- c. Compare the old and the new equilibria. How does this policy affect the total quantity of investment? The quantity of business investment? The quantity of residential investment?
12. If consumption depended on the interest rate, how would that affect the conclusions reached in this chapter about the effects of fiscal policy?
13. Macroeconomic data do not show a strong correlation between investment and interest rates. Let's examine why this might be so. Use our model in which the interest rate adjusts to equilibrate the supply of loanable funds (which is upward sloping) and the demand for loanable funds (which is downward sloping).
- a. Suppose the demand for loanable funds was stable but the supply fluctuated from year to year. What might cause these fluctuations in supply? In this case, what correlation between investment and interest rates would you find?
- b. Suppose the supply of loanable funds was stable but the demand fluctuated from year to year. What might cause these fluctuations in demand? In this case, what correlation between investment and interest rates would you find now?
- c. Suppose that both supply and demand in this market fluctuated over time. If you were to construct a scatterplot of investment and the interest rate, what would you find?
- d. Which of the above three cases seems most empirically realistic to you?

- f. What do your previous answers imply for the price of haircuts relative to the price of food?
- g. Who benefits from technological progress in farming—farmers or barbers?
6. (This problem requires the use of calculus.) Consider a Cobb–Douglas production function with three inputs.  $K$  is capital (the number of machines),  $L$  is labor (the number of workers), and  $H$  is human capital (the number of college degrees among the workers). The production function is
- $$Y = K^{1/3}L^{1/3}H^{1/3}.$$
- a. Derive an expression for the marginal product of labor. How does an increase in the amount of human capital affect the marginal product of labor?
- b. Derive an expression for the marginal product of human capital. How does an increase in the amount of human capital affect the marginal product of human capital?
- c. What is the income share paid to labor? What is the income share paid to human capital? In the national income accounts of this economy, what share of total income do you think workers would appear to receive? (*Hint*: Consider where the return to human capital shows up.)
- d. An unskilled worker earns the marginal product of labor, whereas a skilled worker earns the marginal product of labor plus the marginal product of human capital. Using your answers to parts (a) and (b), find the ratio of the skilled wage to the unskilled wage. How does an increase in the amount of human capital affect this ratio? Explain.
- e. Some people advocate government funding of college scholarships as a way of creating a more egalitarian society. Others argue that scholarships help only those who are able to go to college. Do your answers to the preceding questions shed light on this debate?
7. The government raises taxes by \$100 billion. If the marginal propensity to consume is 0.6, what happens to the following? Do they rise or fall? By what amounts?
- Public saving.
  - Private saving.
  - National saving.
  - Investment.
8. Suppose that an increase in consumer confidence raises consumers' expectations about their future income and thus increases the amount they want to consume today. This might be interpreted as an upward shift in the consumption function. How does this shift affect investment and the interest rate?
9. Consider an economy described by the following equations:
- $$Y = C + I + G$$
- $$Y = 5,000$$
- $$G = 1,000$$
- $$T = 1,000$$
- $$C = 250 + 0.75(Y - T)$$
- $$I = 1,000 - 50r.$$
- In this economy, compute private saving, public saving, and national saving.
  - Find the equilibrium interest rate.
  - Now suppose that  $G$  rises to 1,250. Compute private saving, public saving, and national saving.
  - Find the new equilibrium interest rate.
10. Suppose that the government increases taxes and government purchases by equal amounts. 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?
11. When the government subsidizes investment, such as with an investment tax credit, the subsidy often applies to only some types of investment. This question asks you to consider the effect of such a change. Suppose there are two types of investment in the economy: business investment and residential investment. And suppose that the government institutes an investment tax credit only for business investment.
- How does this policy affect the demand curve for business investment? The demand curve for residential investment?
  - Draw the economy's supply and demand for loanable funds. How does this policy affect the supply and demand for loanable funds? What happens to the equilibrium interest rate?