This chapter examines how wage rates are determined in competitive labor markets. Suppose that a firm hires workers in a labor market where all of the workers have roughly the same skills. As the firm begins hiring workers, the marginal physical product of labor (the change in output that results from adding one more unit of labor) may increase as more workers are able to take advantage of opportunities for division of labor and specialization. However, beyond some point, additional workers will add smaller and smaller increments to output, reflecting the law of diminishing returns. The marginal physical product of labor eventually decreases because of the law of diminishing returns. The marginal physical product of labor can be converted to revenue by multiplying each worker’s marginal physical product by the price of the output. This gives the marginal revenue product of labor — the addition to total revenue from adding one more unit of labor.

How much labor will the firm hire? The firm continues to hire as long as the marginal revenue product of labor is greater than the wage rate. In a competitive labor market, the firm hiring labor cannot influence the market-determined wage rate. The marginal labor cost — the addition to total labor cost from hiring one more worker — is equal to the wage rate. The firm will stop hiring workers when the marginal revenue product of the last worker hired is equal to the wage rate. Thus, the marginal revenue product of labor is the firm’s demand curve for labor. Each point on the marginal revenue product curve tells us how many workers the firm would hire given a specific wage rate. The firm’s demand curve for labor increases (shifts to the right) when the price of the good being produced increases or when the workers hired have become more productive through, say, an improvement in technology. The industry demand for labor is the sum of the individual firms’ demands for labor.

The labor supply curve is upward sloping. The higher the wage rate, the greater the quantities of labor workers are willing to supply. Shifts in the supply curve of labor occur as a result of changes in alternative employment opportunities, changes in population size, and changes in wealth. The intersection of the industry demand for labor and the supply of labor determines the market wage rate.

Why do wage rate differentials exist? Sometimes these differences in wage rates are geographic. For example, wages in the United States are significantly higher than wages in Mexico. This differential reflects, in part, the fact that workers in America have more capital and more advanced technology than do workers in Mexico. Not surprisingly, Mexican workers have responded to the wage differential by migrating north and American businesses have migrated south to Mexico to take advantage of lower Mexican labor costs. These trends tend to reduce the wage differential over time. Wage differentials will persist if labor and capital cannot move freely. Another reason for persistent wage differentials is noncompeting labor markets. Special talents are required in certain labor markets, so workers without these skills are excluded from competing.

The minimum wage is the source of much debate among economists and politicians. The purpose of the minimum wage is to provide workers who are stuck in low-wage labor markets with a wage rate that provides a decent living. However, the minimum wage acts as a price floor in labor markets and, as such, creates unemployment. Economists hold strong views on the minimum wage issue, but there is no real consensus about whether the gains to employed workers more than offset the losses to unemployed workers.
After studying this chapter, you should be able to:

- Define the **marginal physical product** of labor.
- Give examples of the **law of diminishing returns**.
- Derive the **marginal revenue product** of labor from the marginal physical product of labor.
- Explain why the marginal revenue product of labor is the demand curve for labor.
- Show why the **marginal labor cost** for a firm in a competitive labor market is equal to the wage rate.
- Graph the profit-maximizing level of employment for a firm in a competitive labor market.
- Discuss reasons for changes in the demand for labor.
- Draw a labor supply curve and explain its shape.
- Examine the logic behind the backward-bending supply curve of labor.
- Account for wage differentials.
- Evaluate the impact of minimum wage laws.
- Explain the logic behind **efficiency wages**.
- Understand the argument that competitive wages are ethical.

**Concept Check** — See how you do on these multiple-choice questions.

Think about what units the marginal physical product of labor is measured in as you consider the possible answers to this question.

1. The **marginal physical product** of labor is defined as the
   a. total output of labor divided by the amount of labor employed
   b. the change in total output generated by a change in the amount of labor hired
   c. the change in total revenue generated by a change in the amount of labor hired
   d. the value of the last worker hired
   e. demand for labor

   For this question, remember that the marginal revenue product of labor is equal to the marginal physical product of labor multiplied by the price of the output.

2. The **marginal revenue product** curve for labor slopes downward because
   a. of the law of diminishing returns
   b. as the price of a good decreases, quantity demanded increases
   c. of technological change
   d. the demand curve slopes upward
   e. of minimum wage laws

   Can a firm in a competitive labor market influence the wage rate?

3. In a competitive labor market, the **marginal labor cost** is equal to
   a. the market supply of labor
   b. the firm’s demand for labor
   c. the firm’s supply of labor
   d. the minimum wage
   e. the lowest wage unskilled workers will accept
A minimum wage acts like a price floor in a labor market.

4. If a **minimum wage** is set above the equilibrium wage in a competitive labor market, it will
   a. decrease employment in the labor market
   b. cause workers to offer less along the backward-bending supply curve of labor
   c. increase the equilibrium wage rate
   d. decrease efficiency wages
   e. increase employment in the labor market

People are paid wages that reflect how the market values them in a competitive labor market.

5. The **ethic of wages equal to MRP** is
   a. hard to justify
   b. from each according to his or her contribution, to each according to his or her contribution
   c. from each according to his or her ability, to each according to his or her need
   d. easier to justify than the ethic underlying minimum wages
   e. based on the marginal physical product, not the marginal revenue product

**Am I on the Right Track?**

Your answers to the above questions should be **b, a, c, a**, and **b**. By now you should have thoroughly mastered the use of marginal analysis. Studying labor markets affords us with yet another chance to apply this useful technique. There are a few new terms to learn, and the graphing is a bit different, so we’ll proceed with the key terms quiz and a short graphing tutorial, then it’s time to get to work on some questions.

**Key Terms Quiz** — Match the terms on the left with the definitions in the column on the right.

1. marginal physical product
2. noncompeting labor markets
3. marginal revenue product
4. total labor cost
5. wage rate
6. marginal labor cost
7. law of diminishing returns
8. efficiency wages
9. principal-agent problem

   a. quantity of labor employed multiplied by the wage rate
   b. the change in output from adding one more unit of labor
   c. the price of labor
   d. as more units of a resource are added to production with at least one input fixed, the addition to output eventually declines
   e. either a demander or a supplier in a labor market exercises an undisclosed personal interest or motive that undermines the efficacy of the market
   f. a wage rate higher than the market’s equilibrium wage that a firm pays to decrease turnover and increase productivity
   g. the change in total labor cost from adding one more unit of labor
   h. the change in total revenue from adding one more unit of labor
   i. markets whose requirement for specific skills excludes workers who do not have the required skills

**Graphing Tutorial**

The demand for labor shows how much labor an employer is willing to hire at different wage rates, just as the demand for a good shows us how much of the good people are willing to purchase at different prices. We begin our derivation of the demand for labor with the marginal physical product of labor. Let’s work through a numerical example to see how the marginal physical product of labor is derived and how it is related to the
marginal revenue product of labor — the firm’s demand for labor.

Suppose we have a fishing operation where the number of people working on the fishing boat is related to the quantity of fish produced, as shown in the first two columns of the table below.

<table>
<thead>
<tr>
<th>Workers</th>
<th>Fish Output (lb./run)</th>
<th>Marginal Physical Product (MPP)</th>
<th>Total Revenue (price = $3/lb.)</th>
<th>Marginal Revenue Product (MRP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1,000</td>
<td>1,000</td>
<td>$3,000</td>
<td>$3,000</td>
</tr>
<tr>
<td>2</td>
<td>3,000</td>
<td>2,000</td>
<td>9,000</td>
<td>6,000</td>
</tr>
<tr>
<td>3</td>
<td>6,000</td>
<td>3,000</td>
<td>18,000</td>
<td>9,000</td>
</tr>
<tr>
<td>4</td>
<td>8,500</td>
<td>2,500</td>
<td>25,500</td>
<td>7,500</td>
</tr>
<tr>
<td>5</td>
<td>10,500</td>
<td>2,000</td>
<td>31,500</td>
<td>6,000</td>
</tr>
<tr>
<td>6</td>
<td>11,500</td>
<td>1,000</td>
<td>34,500</td>
<td>3,000</td>
</tr>
<tr>
<td>7</td>
<td>12,000</td>
<td>500</td>
<td>36,000</td>
<td>1,500</td>
</tr>
</tbody>
</table>

Note how fish output changes as more workers are added, all other factors of production held constant. Fish output increases at an increasing rate for the first three workers — 1,000, 3,000, and 6,000 pounds of fish. From the fourth worker through the seventh worker, output increases at a decreasing rate — 8,500, 10,500, 11,500, and 12,500 pounds of fish.

The third column shows the marginal physical product of labor. The marginal physical product of labor is the change in output that results from adding one more unit of labor. The law of diminishing returns is reflected in the declining MPP of the fourth through the seventh worker.

Total revenue is computed by multiplying fish output by the price of fish. These revenues are shown in the fourth column, assuming the price of fish is $3 per pound.

The marginal revenue product is shown in column five. The marginal revenue product is the addition to total revenue generated by the addition of one more worker.

Marginal physical product is plotted in the graph on the following page. Note the upward-sloping segment that reflects the effects of specialization and division of labor. This portion of the curve corresponds to the first three workers. The curve is downward sloping for the fourth through the seventh worker. This reflects the dominance of the law of diminishing returns.
The following graph shows the marginal revenue product of labor. Note that the values for the first two workers have been left out of the graph. That is because the MRP is still increasing for these workers. The demand curve for labor is the downward-sloping portion of the marginal revenue product curve. A firm would never stop hiring workers while the marginal revenue product was still increasing.

The marginal revenue product of labor curve is the firm’s demand curve for labor. This makes sense because the MRP shows how much each worker contributes to total revenue. The firm will be willing to pay for a worker an amount equal to the worker’s contribution to total revenue. How many workers will the firm hire? This depends on the wage rate, which is the same as the marginal labor cost in a competitive labor market. Each worker adds to total cost an amount equal to the wage rate. Suppose the wage rate in this case is $3,000 for a one-month fishing run. This firm will hire 6 workers. That is where the marginal revenue product curve intersects the marginal labor cost. For all the workers hired up to the sixth worker, the MRP is greater than or equal to the MLC. The firm keeps hiring because each of these workers adds more to total revenue than to total cost. What about the seventh worker? This worker adds $1,500 to total revenue and $3,000 to total cost.
The firm won’t hire this worker because its profit would decline if it did.

Finding the profit-maximizing number of workers to hire is very much like finding the profit-maximizing level of output of goods for a firm. Remember, we set output where MR = MC to find the profit-maximizing level of output. Now we are setting MRP = MLC; that is, the marginal revenue product is equal to the marginal labor cost. The marginal analysis is the same.

**Graphing Pitfalls**

A major difference between the marginal cost curves we used to show the change in total cost from producing one more unit of output for the firm and the marginal labor cost curve that we use to show the addition to total labor cost from hiring one more unit of labor is that the marginal cost curve is upward sloping while the marginal labor cost curve is a horizontal line at the market wage rate. A firm in a competitive labor market can hire as much labor as it wants without affecting the market wage rate. Therefore, the wage rate that it pays for labor will be constant, so the addition to total labor cost from adding one more unit of labor is constant too.

You are probably in the habit of drawing a marginal cost curve that is upward sloping by now. Beware! The marginal labor cost curve is horizontal. It shouldn’t be drawn as shown below.

![Graph showing marginal revenue product (MRP) and marginal labor cost (MLC) curves](image)

The marginal labor cost curve for the firm should be horizontal — it’s the supply of labor for the firm — because the firm takes the wage rate set in the labor market and can hire as much labor as it wants without influencing the market wage rate. Don’t let yourself by force of habit draw an upward-sloping marginal labor cost curve!

**True-False Questions** — If a statement is false, explain why.

1. The wage rate, that is, the price of labor, is the same for all firms that hire labor in a competitive labor market. (T/F)
2. The marginal physical product of labor is the change in total output resulting from adding a unit of labor to production. (T/F)

3. The law of diminishing returns explains why adding workers to production doesn’t increase output. (T/F)

4. The marginal revenue product is the addition to total revenue resulting from adding a unit of labor to production. (T/F)

5. The marginal revenue product is the marginal physical product multiplied by the wage rate. (T/F)

6. In a competitive labor market, a firm can hire workers at a wage lower than the equilibrium if it chooses, but cannot hire as many workers as it chooses. (T/F)

7. The marginal labor cost curve for a firm in a competitive labor market is upward sloping. (T/F)

8. A profit-maximizing firm will hire labor as long as the marginal revenue product is greater than or equal to the marginal labor cost. (T/F)

9. An increase in the price of a firm's product causes the marginal physical product curve to shift to the right. (T/F)

10. If the price of a firm's product increases, then its demand curve for labor shifts to the right. (T/F)

11. New technology that makes labor more productive will lower a firm's demand curve for labor. (T/F)

12. The industry demand for labor represents the sum of individual firms' demands for labor at different wage levels. (T/F)

13. The supply of labor reflects both people's preferences between work and leisure and the employment alternatives available in a community. (T/F)

14. Most workers are unwilling to supply larger quantities of labor because their wages are high enough to put them on the backward-bending portions of their labor supply curves. (T/F)

15. Workers tend to migrate from lower-wage areas to higher-wage areas, while industries tend to migrate from higher-wage areas to lower-wage areas. (T/F)
Multiple-Choice Questions

1. Output typically increases at an increasing rate as the first few workers are added to a production process because
   a. they are paid efficiency wages
   b. it is possible to take advantage of opportunities for specialization and division of labor
   c. management can carefully monitor job performance for just a few workers
   d. economies of scale are realized
   e. the first worker has done the most demanding activity by the time new workers arrive

2. When diminishing returns set in,
   a. the marginal physical product of labor increases
   b. the marginal physical product of labor decreases
   c. the marginal physical product of labor is greater than the cost of hiring labor
   d. total output decreases
   e. the marginal labor cost increases

3. The marginal physical product can be converted to the marginal revenue product by
   a. dividing it by the price of output
   b. adding the price of output
   c. multiplying it by the price of output
   d. multiplying it by the wage rate
   e. dividing it by the wage rate

4. When the marginal physical product and the marginal revenue product are graphed, you can see that
   a. no similarities between the graphs exist because they represent different concepts
   b. they converge after the first few workers
   c. they diverge after the first few workers
   d. the MRP curve is equal to the MPP curve multiplied by the price of the output
   e. they are identical

5. The constant marginal labor cost that a firm in a competitive labor market faces means that
   a. it must raise the wage rate to hire more workers
   b. it can increase profit by increasing output
   c. the law of diminishing returns applies
   d. it can hire all the labor it wants without having to raise the wage rate
   e. labor-saving technology cannot influence how many workers the firm hires

6. In a perfectly competitive labor market, a firm is able to
   a. dictate the wage rate it offers workers
   b. hire the most efficient workers first at a higher wage rate than it offers other workers
   c. hire as many workers as it desires at the market wage rate
   d. influence wages if no union is present
   e. hire only a few workers since so many firms compete for them

7. If a firm in a competitive labor market stops hiring labor when the marginal revenue product of labor is greater than the wage rate, the
   a. firm is maximizing profit
   b. firm should hire less labor to increase profit
   c. firm should hire more workers until the marginal revenue product is equal to the wage rate
   d. firm should raise the wage rate
   e. workers should unionize
8. All of the following changes would cause an increase in the marginal revenue product of labor except
   a. an increase in the wage rate
   b. an increase in the capital the labor uses
   c. an improvement in technology
   d. an increase in the price of the product
   e. more education for the labor force

9. If the demand curve for labor decreases while technology is unchanged, the decrease may be explained by
   a. a decrease in the workers' productivity
   b. a decrease in the price of the output
   c. a decrease in the wage rate
   d. an increase in the supply of labor
   e. an increase in industry output

10. The market supply of labor in a perfectly competitive labor market is upward sloping because as the wage rate increases
    a. workers decide to enjoy more leisure time
    b. more workers are willing to supply larger quantities of labor
    c. the opportunity cost of leisure decreases
    d. the marginal revenue product of labor increases
    e. the marginal physical product of labor decreases

11. Expanding employment opportunities in a community are likely to
    a. decrease the prices of most goods
    b. decrease wage rates
    c. shift the demand curve for labor to the right
    d. shift the demand curve for labor to the left
    e. raise prices of most goods

12. If the supply curve for labor is backward bending at very high wage rates, it is an indication that
    a. beyond some point, higher wages made consumption of other goods more attractive than leisure
    b. some people just don't want to work regardless of the wage rate
    c. leisure is always preferred to work
    d. labor productivity is on the rise
    e. workers are willing to sacrifice higher income for more leisure

13. It is unlikely that wage rates would stay much higher in one part of the United States than in another, other things being equal (cost of living, quality of life, etc.), because
    a. capital tends not to move from one region to another
    b. labor tends not to move from one region to another
    c. labor will move to low wage regions and capital will move to high wage regions
    d. laws will be passed to equalize wage rates between regions

14. NBA basketball players earn high incomes for all these reasons except that
    a. professional basketball players work in a noncompeting market
    b. their MRPs are very high
    c. the revenues earned by basketball teams are very high
    d. they work hard and spend long hours practicing as well as playing scheduled games
    e. people are willing to pay high prices for tickets while others enjoy watching games on TV
15. The impact of minimum wages on low-wage earning people is  
   a. to raise their wages and employment  
   b. to shift the demand curve for their labor to the left  
   c. to shift the demand curve for their labor to the right  
   d. to reduce the price ceiling on labor  
   e. dependent on the elasticities of demand for and supply of labor

16. When the labor market for miners is in equilibrium, all the following are true except that  
   a. the quantity of miners demanded equals the quantity of miners supplied  
   b. for miners, \( w = MRP \)  
   c. wage differentials between the market for miners and all other labor markets disappear  
   d. all miners receive the same wage rate, which is equal to the MRP of the last miner hired  
   e. all miners are paid the market wage equal to the marginal labor cost

17. People who earn high wage rates in noncompeting labor markets tend on average to  
   a. be more intelligent than the average worker  
   b. have more experience at their jobs than others  
   c. possess unique skills that shelter them from competition  
   d. benefit from government legislation that limits entry into their field  
   e. be the most mobile workers, that is, most willing to leave a job for a higher wage rate

18. An increase in the minimum wage rate will definitely lead to  
   a. improvement in the lot of low-wage workers  
   b. significant unemployment  
   c. increased employment since many new workers will enter the labor market  
   d. less effort exerted by workers already employed  
   e. an increase in income for workers employed at the new minimum wage

19. An example of a pair of noncompeting labor markets is  
   a. cabbies and chauffeurs  
   b. doctors and chiropractors  
   c. police officers and security guards  
   d. professional landscapers and private gardeners  
   e. major league baseball players and professional tennis players

20. By paying efficiency wages, a firm hopes to  
   a. encourage higher productivity in the firm  
   b. increase turnover to keep the labor force fresh  
   c. drive out its competition  
   d. increase specialization and division of labor  
   e. realize economies of scale in labor resources

The following questions relate to the interdisciplinary, global, and historical perspectives in the text.

21. In replying to the question from Charlie Rose, “Have the songs gotten more political over time, you think?” Bruce Springsteen emphasized that  
   a. his songs are not intentionally political  
   b. his songs are written with a view toward moving his audience emotionally  
   c. he doesn’t understand where his creative spark comes from  
   d. his songs reflect his experience as a child observing his parents in their different worlds of work  
   e. writing songs is hard work and political themes are easier to write about
22. Most economists believe that immigrant labor is good for the United States economy because
   a. people born in the United States have a weak work ethic
   b. the economy needs more labor of all types to fill the available jobs over time
   c. immigrant labor is cheap
   d. immigrants typically work in low-skill jobs that most Americans don’t want anyway
   e. immigrant workers can be paid less than the market wage for their labor

23. The iron law of wages suggests that
   a. workers must unionize in order to raise wage rates
   b. minimum wage laws keep wage levels at sufficiently high level
   c. wages are fixed at subsistence in the long run
   d. as wages increase the quantity of labor supplied will increase
   e. as wages increase, employers will introduce labor-saving technology

24. One argument in favor of limiting the number of low-skilled foreign workers who come to the United States is that
   a. they take jobs that American workers will not perform
   b. many necessary jobs would not be filled in the U.S. economy
   c. wage rates for low-skill jobs would rise and income inequality would decrease
   d. low-skilled foreign workers quickly rise up the economic ladder and take away high-skill jobs from Americans
   e. these workers could be more productive in their home countries

**Fill in the Blanks**

1. Decreases in the _______________ and the _______________ cause decreases in the demand for labor.

2. The law of diminishing returns states that as more and more units of one _______________ are added to production, while ______________ remain unchanged, output will increase by _______________ and _______________ increments.

3. The market supply of labor reflects the _______________ of each individual worker.

4. The wage rate is equal to the _______________, which is the cost of adding a worker to production.

5. A difference in wage rates between two regions will result in movement of labor to the __________ wage region and movement of capital to the _________ wage region, causing wage differences to _______________.

**Discussion Questions**

1. Why do improvements in technology lead to an increase in the demand for labor in a competitive labor market? Doesn't technological change cause unemployment?
2. Why is rapid population growth, coupled with the law of diminishing returns, particularly troublesome for workers in developing countries striving to raise living standards?

3. How do the elasticities of demand and supply of labor affect the impact of minimum wage laws?

4. Discuss the ethics of \( w = \text{MRP} \).

5. How would a policy of open immigration, such as we had during the nineteenth century, affect wage differentials and living standards in the United States today?

Problems

1. Return to the graphing tutorial above. Suppose the price of fish rises to $6 per pound. How does this affect the demand curve for labor and the profit-maximizing number of workers the firm should hire? Fill in the columns for the total revenue and marginal revenue product in the table on the following page and graph the marginal revenue product on the axes provided. If the marginal labor cost stays at $3,000, how many workers will the firm hire?
<table>
<thead>
<tr>
<th>Workers</th>
<th>Fish Output (lb./run)</th>
<th>Marginal Physical Product (MPP)</th>
<th>Total Revenue (price = $6/lb.)</th>
<th>Marginal Revenue Product (MRP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1,000</td>
<td>1,000</td>
<td>6,000</td>
<td>1,000</td>
</tr>
<tr>
<td>2</td>
<td>3,000</td>
<td>2,000</td>
<td>12,000</td>
<td>2,000</td>
</tr>
<tr>
<td>3</td>
<td>6,000</td>
<td>3,000</td>
<td>18,000</td>
<td>3,000</td>
</tr>
<tr>
<td>4</td>
<td>8,500</td>
<td>2,500</td>
<td>22,500</td>
<td>2,500</td>
</tr>
<tr>
<td>5</td>
<td>10,500</td>
<td>2,000</td>
<td>33,000</td>
<td>2,000</td>
</tr>
<tr>
<td>6</td>
<td>11,500</td>
<td>1,500</td>
<td>39,000</td>
<td>1,500</td>
</tr>
<tr>
<td>7</td>
<td>12,000</td>
<td>500</td>
<td>72,000</td>
<td>500</td>
</tr>
</tbody>
</table>

2. Suppose that a minimum wage law is passed for the fishing industry that sets the wage at $6,000 per run. How will the choice of a profit-maximizing level of employment for the firm shown above be affected by the law? What do you predict will happen to employment throughout the fishing industry as a result of the law? Will people employed in the fishing industry be supportive of the law? Discuss.
3. The following table shows the demand and supply schedules in the U.S. and Mexican labor markets for daily laborers.

<table>
<thead>
<tr>
<th>Wage</th>
<th>Q_D (millions)</th>
<th>Q_S (millions)</th>
<th>Wage</th>
<th>Q_D (millions)</th>
<th>Q_S (millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$70</td>
<td>30</td>
<td>70</td>
<td>$40</td>
<td>0</td>
<td>16</td>
</tr>
<tr>
<td>60</td>
<td>40</td>
<td>60</td>
<td>35</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>50</td>
<td>50</td>
<td>50</td>
<td>30</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>40</td>
<td>60</td>
<td>40</td>
<td>25</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>30</td>
<td>70</td>
<td>30</td>
<td>20</td>
<td>16</td>
<td>0</td>
</tr>
</tbody>
</table>

What is the wage differential between the United States and Mexico? What kinds of changes would you expect to occur in both the supply of and the demand for labor in both countries if labor and capital were allowed to move across the borders freely?

**Everyday Applications**

Have you ever worked for the minimum wage? If you have not, you probably know a friend who has. In your experience, does the minimum wage accomplish the goal for which it is intended? That is, does the minimum wage provide a decent living for low-wage earners? Have you or your friends experienced fewer employment opportunities as a result of recent increases in the minimum wage?

**Economics Online**

For more facts on the minimum wage and for other labor-related information, visit the Web site of the Bureau of Labor Statistics (http://stats.bls.gov/).

**Answers to Questions**

**Key Terms Quiz**

a. 4  
b. 1  
c. 5  
d. 7  
e. 9  
f. 8  
g. 6  
h. 3  
i. 2

**True-False Questions**

1. True  
2. True  
3. False. The law of diminishing returns explains why adding more workers will cause output to increase by smaller and smaller increments.  
4. True  
5. False. The MRP = MPP multiplied by the price of the output.
6. False. Firms in competitive labor markets must offer the equilibrium wage rate no matter how many workers they choose to hire.
7. False. The marginal labor cost curve is a horizontal line at the wage rate.
8. True
9. False. An increase in the price of a firm’s product causes the MRP to shift to the right.
10. True
11. False. New technology causes the MPP to increase, which causes the MRP to increase. This is the same as an increase in the demand for labor.
12. True
13. True
14. False. Although the backward-bending supply curve of labor makes logical sense, most workers are on the upward-sloping portions of their labor supply curves.
15. True

Multiple-Choice Questions

1. b  6. c  11. c  16. c  21. d
2. b  7. c  12. e  17. c  22. b
3. c  8. a  13. d  18. e  23. c
5. d  10. b  15. e  20. a

Fill in the Blanks

1. marginal physical product of labor; price of output
2. factor of production; other factors; smaller; smaller
3. opportunity cost
4. marginal labor cost
5. high; low; diminish

Discussion Questions

1. Improvements in technology increase the marginal physical product of workers and, therefore, the marginal revenue product of workers, so firms in competitive labor markets will want to hire more. As long as the market for the goods produced is competitive, the firms will be able to sell their increased output. Therefore, an increase in employment, not a decrease, is associated with an improvement in technology.

2. As population increases, it shifts the supply of labor to the right. Because the demand for labor is downward sloping, the increase in the supply of labor will lower wage rates. The key to raising living standards in developing countries is to increase the demand for labor. This can happen by improving technology (raising the marginal physical product of labor), producing goods whose prices are increasing, and introducing new employment opportunities, that is, new industries.

3. If the supply and demand curves for labor are highly elastic, then a small increase in the wage rate caused by an increase in the minimum wage will create a large increase in unemployment. The more inelastic the supply and demand curves for labor are, the less is the unemployment.

4. The ethical appeal of the perfectly competitive labor market is that workers are paid the value of what they produce. In addition, a perfectly competitive labor market creates a link between effort and reward. The incentive exists for workers to acquire skills and become more productive so that they can earn higher wage rates. Inequality in the income distribution will exist. The phrase, “From each
according to his or her contribution, to each according to his or her contribution,” describes the ethic underlying the wage rates set in competitive labor markets.

5. Because wage rates are higher in the United States than in most countries of the world, wage rates in the United States could be expected to decrease as a result of increased immigration, while wage rates in the countries of emigration can be expected to rise. The impact on living standards is less clear. It may be that with a larger labor supply in the United States, increases in output in all industries would cause prices to fall and give consumers greater access to a wider array of goods. Larger markets might lead to the achievement of economies of scale that didn’t exist before. Living standards in sending countries should increase since these were low-wage countries to begin with. This is a complex question and this answer just scratches the surface.

Problems

1. The completed table and the graph are shown below. An increase in the price of fish increases the marginal revenue product, shifting the demand for labor to the right. Given a marginal labor cost equal to $3,000, the fishing operation will hire 7 workers.

<table>
<thead>
<tr>
<th>Workers</th>
<th>Fish Output (lb./run)</th>
<th>Marginal Physical Product (MPP)</th>
<th>Total Revenue (price = $6/lb.)</th>
<th>Marginal Revenue Product (MRP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1,000</td>
<td>1,000</td>
<td>$6,000</td>
<td>$6,000</td>
</tr>
<tr>
<td>2</td>
<td>3,000</td>
<td>2,000</td>
<td>18,000</td>
<td>12,000</td>
</tr>
<tr>
<td>3</td>
<td>6,000</td>
<td>3,000</td>
<td>36,000</td>
<td>18,000</td>
</tr>
<tr>
<td>4</td>
<td>8,500</td>
<td>2,500</td>
<td>51,000</td>
<td>15,000</td>
</tr>
<tr>
<td>5</td>
<td>10,500</td>
<td>2,000</td>
<td>63,000</td>
<td>12,000</td>
</tr>
<tr>
<td>6</td>
<td>11,500</td>
<td>1,000</td>
<td>69,000</td>
<td>6,000</td>
</tr>
<tr>
<td>7</td>
<td>12,000</td>
<td>500</td>
<td>72,000</td>
<td>3,000</td>
</tr>
</tbody>
</table>
2. Looking at the graph above, a minimum wage law setting the wage rate at $6,000 per run will cause employment to fall from 7 to 6 workers. Employment throughout the fishing industry will be decreased. People in the fishing industry who get jobs at the minimum wage will be supportive of the law. Those who find themselves unemployed by the law may well be opposed to it. Owners of fishing businesses will oppose the law because it is likely to drive up total labor costs and drive down profits.

3. The equilibrium wage in the United States is $50, and the equilibrium wage in Mexico is $30. Therefore, labor will move from Mexico to the United States, causing the labor supply to shift to the right in the United States and to the left in Mexico. On the other hand, capital will flow from the United States to Mexico causing the MRP of labor in the United States to shift to the left and the MRP of labor in Mexico to shift to the right. The impact of these changes is an increase in wage rates in Mexico and a decrease in wage rates in the United States — a reduction in the wage differential between the two countries.

Appendix

Who Earns What?

Appendix in a Nutshell

This appendix is devoted to an analysis of who earns what incomes, who is employed where, and what factors determine people's wages and employment. The "people characteristics" that lie behind specific MRP curves are examined. Characteristic patterns of employment in labor markets are also considered.

Clearly, an important determinant of people's incomes is productivity. Growth in productivity is strongly correlated with growth in real hourly compensation (which translates into the goods and services people take home). Between 1973 and 1995, the slowdown in productivity growth matched precisely the slowdown in the growth rate of real hourly compensation. Between 1995 and 2005, labor productivity grew at a 2.9 percent rate that was matched by the growth rate of real hourly compensation.
Another significant determinant of people’s incomes is education. An overwhelmingly large percentage of managerial and professional people have college degrees. Educational attainment among people in lower-paying jobs, on the other hand, is generally lower.

Race and sex are also determinants of income levels. In 2005, for example, Hispanics earned only about 70 percent of what whites earned in similar occupations. Blacks earned only 77.4 percent of what whites earned in similar occupations. The disparity is, in large part, a reflection of discrimination both past and present. On average, women in similar occupations earned 81 percent of what men did in 2005. These disparities in earnings raise the issue of **comparable worth**, which is the concept that people with comparable skills should receive comparable wages.

At the low end of the income scale, earnings for many people are determined by minimum wages. The period since 1979 has been especially difficult for people earning minimum wages. The real purchasing power of the minimum wage was $6.27 in 1979 and fell to a low of $5.41 in 2008. People earning a minimum wage saw the purchasing power of their earnings decline during the 1990s while the rest of the economy boomed.

**True-False Questions** — If a statement is false, explain why.

1. The data show convincingly that women are systematically paid less than men for similar jobs. (T/F)

2. There is little connection between productivity and earnings for workers. (T/F)

3. The ranks of blue-collar workers are populated by a large percentage of college-educated people who were unable to find white-collar jobs. (T/F)

4. The real purchasing power of the minimum wage fell between 1979 and 2008. (T/F)

5. Comparable worth means that people with comparable skills should be paid comparable wages. (T/F)

**Multiple-Choice Questions**

1. Steady growth in labor productivity in the United States has led to
   a. relatively less capital and more labor employed
   b. a rise in real hourly compensation
   c. a rise in wage rates, but at the expense of employment
   d. the elimination of the minimum wage
   e. the introduction of the minimum wage

2. The strong correlation between those employed in high-paying jobs and those who have finished at least high school suggests that
   a. as wage rates rise, people return for continuing education courses
   b. education is insignificant in determining someone's income-earning potential
   c. uneducated people lack the intelligence for these jobs
   d. education enhances people’s income-earning potential
   e. people without high school diplomas are completely excluded from high-paying jobs
3. The fact that the earnings of black workers are 77.4 percent that of white workers suggests that
   a. current and past discrimination may play a role in the lower wages for blacks
   b. no blacks earn as much as whites
   c. affirmative action has not worked
   d. blacks don’t work for minimum wages
   e. the outlook for higher incomes for blacks is bleak

4. Women's salaries most closely match men's in
   a. managerial occupations
   b. sales jobs
   c. service jobs
   d. precision production jobs
   e. agricultural jobs

5. Between 1979 and 2008, the real purchasing power of the minimum wage
   a. rose steadily
   b. grew at the same pace as productivity
   c. fell from $6.27 to $5.41
   d. dropped because of new entrants to the labor force
   e. rose dramatically due to regular increases in the minimum wage

Discussion Questions

1. List and discuss the factors that most influence people's income-earning potential.

2. Does it follow from the theory presented in Chapter 15 that wages and productivity would change together
   over time in the United States? Explain.

Answers to Questions

True-False Questions

1. True
2. False. The correlation between productivity and earning is almost perfect over the years.
3. False. Most college-educated people work in higher-skill, higher-wage jobs.
4. True
5. True
Multiple-Choice Questions

1. b
2. d
3. a
4. e
5. c

Discussion Questions

1. Productivity influences people’s income-earning potential. As productivity measured by real hourly output has increased, so has real hourly compensation. When they are graphed, the curves measuring productivity and real hourly compensation are almost indistinguishable.

   Education is an important determinant of people’s income-earning potential. Some 71.8 percent of managerial and professional people, people who earn higher incomes, have college degrees. Most jobs in service areas, sales, and office support are staffed by people with high school and college degrees. Roughly 25 percent of those in natural resources, construction, maintenance, production, transportation, and material moving are high school dropouts. Among these occupations, 3 percent or fewer of workers have college degrees.

   Minority status and gender also make a difference in income-earning potential. Blacks, Hispanics, and women earn significantly less than white men in comparable jobs. These earnings disparities reflect a combination of current and past discrimination against minorities and women in the labor market.

2. It follows perfectly from the theory that wages and productivity would change together over time. The demand for labor is the marginal physical product of labor times the price of the output labor produces. The marginal physical product is a measure of labor productivity. As it rises, so does the demand for labor and the wage rate, given a constant labor supply.
Homework Questions

True-False Questions — If a statement is false, explain why.

1. The law of diminishing returns means that as more labor is added to a fixed amount of capital, beyond some point, the marginal physical product of labor begins to decline. (T/F)

2. Firms in competitive labor markets are wage takers, therefore, the marginal labor cost for these firms is constant. (T/F)

3. If the minimum wage is set above the market wage, some workers will be unemployed. (T/F)

4. As labor migrates from Mexico to the United States we can expect that the difference in wage rates between the two regions will increase. (T/F)

5. If the price of the good or service labor produces decreases, then the demand for labor decreases. (T/F)

Multiple-Choice Questions

1. Profit for a firm in a competitive labor market increases as more workers are hired as long as the
   a. firm can cover its total variable costs
   b. marginal revenue product is twice the wage rate
   c. marginal revenue product is greater than the wage rate
   d. firm must raise the wage rate to hire additional workers
   e. workers are highly skilled

2. The upward-sloping market supply curve for labor reflects the fact that
   a. firms must meet the higher opportunity costs of the new workers added to production
   b. workers prefer leisure
   c. not all wages are efficiency wages
   d. the most productive workers command the highest wages
   e. if wage rates are cut, workers must work longer hours

3. A technological advance increases the marginal physical product of labor, therefore, in a competitive labor market where innovation is ongoing, we would expect that the
   a. supply of labor is increasing
   b. the wage rate is decreasing
   c. the marginal revenue product of labor is increasing
   d. demand for labor is decreasing
   e. level of unemployment is increasing
4. The unemployment caused by an increase in the minimum wage above the market wage is lower if the
   a. demand for labor is very inelastic
   b. supply of labor is very elastic
   c. supply of labor is increasing rapidly
   d. demand for labor is very elastic
   e. labor is unskilled

5. The long-run impact of the North American Free Trade Agreement, which allows for United States
   companies to establish production facilities in Mexico, will be to make wage rates in the United
   States and Mexico
   a. less equal as Mexican capital moves to the United States
   b. less equal as more Mexican workers move to the United States
   c. more equal as more American workers move to Mexico
   d. less equal as more Mexican factories move to the United States
   e. more equal as United States firms move production to Mexico

Discussion Questions/Problems

1. Can technological progress cause unemployment in a perfectly competitive labor market? Explain in
   words and with graphs.

2. Using graphs and in words, compare the effect of an increase in the minimum wage first in a situation
   where the minimum wage starts out set above the market equilibrium wage, then in a situation where the
   minimum wage is first below the market equilibrium, and is raised to a level still below the market
   equilibrium.