CHAPTER 13: WAGE DETERMINATION

Introduction
The wages earned by workers have broad implications for the profitability of firms as well as the ability of those workers to buy consumer products. Chapter 13 identifies the means by which wages are determined in a variety of labor markets, the causes of wage differentials, and market imperfections. Material from Chapter 13 consistently appears in a few multiple-choice questions and often appears as a free-response question on the AP microeconomics exam. Questions about real and nominal wages, as well as investment in human capital, may also appear on the AP macroeconomics exam.

Labor and Wages
Labor refers to any human work, whether performed by factory workers, agricultural workers, service providers, or management. The wage is the payment firms make to workers for a period of time (per hour or week). Keep in mind that a wage is not only the paycheck the worker receives but includes any benefits such as insurance and vacation time.

An important distinction must be made between the nominal wage and the real wage. The nominal wage is the pay in current dollars—what the worker sees in his or her current paycheck. The real wage is how many goods and services the worker can afford to buy with that paycheck. This distinction is important because, as prices of products rise, the worker's paycheck will not stretch as far. If a worker's nominal wage rises 4 percent this year but prices rise 3 percent in that same time period, the worker's real wage has only risen 1 percent \((4 - 3 = 1)\). For the purposes of this analysis, we will use the real wage.

Real Wages and Productivity
Wages in the United States tend to be higher than those in many countries because of high worker productivity. Demand for labor is strong in advanced economies because large amounts of land, capital, and technology are available to workers and labor quality is high and specialized. In the long run, as productivity increases, real wages also rise.

The Perfectly Competitive Labor Market
In a perfectly competitive labor market, many firms compete to hire labor, and each worker is identical and independent. The market demand for labor consists of all of the demand curves (marginal revenue product curves) for all of the firms in the industry added horizontally. Thus, the demand for labor in the industry is downward-sloping.

Labor supply in the perfectly competitive labor market is represented by an upward-sloping supply curve. Every potential worker has the choice of using his or her time for work or leisure. When wages are low, potential workers see little opportunity cost involved in choosing leisure. But as wages rise, the opportunity cost of remaining idle rises, and more people are enticed to work for the wage. So at a lower wage, the quantity of labor supplied is low, and at a higher wage, the quantity of labor supplied rises. Keep in mind that workers are also free to move between firms and industries, so a higher wage may draw workers from another industry or from serving as a volunteer or homemaker.
Labor supply and labor demand in (a) a purely competitive labor market and (b) a single competitive firm

The equilibrium wage and quantity of workers hired are found at the point where supply equals the demand for labor. The wage set in the industry then translates to a perfectly elastic (horizontal) supply curve (the marginal resource cost) for the individual firm. The firm is a wage taker, because it must accept the wage set in the industry and it does not change, regardless of how many workers the firm hires. The individual firm maximizes profit (or minimizes loss) at the quantity of labor where the marginal revenue product (the firm’s demand curve) equals the marginal resource cost (the firm’s supply curve). This is the same MRP = MRC rule we saw in the last chapter and is very similar to the MR = MC rule the perfectly competitive firm uses to determine profit-maximizing output.

Changes in Labor Demand

Because the demand for labor is the workers’ marginal revenue product, the demand for labor can change due to a change in the productivity of the workers (marginal product) or a change in the price of the product. If workers become more productive due to better training or improved technology, or if the firm can increase the price of the product it sells, the MRP curve shifts to the right and the firm hires more workers. Because the MRC curve is horizontal, the wage does not change.

It is very important to note that it makes a difference whether the increased labor demand occurs throughout the industry or just for one firm. If one firm can achieve the increased productivity, only that firm will increase its labor demand (shown in the individual firm’s graph), but because the firm is such a small part of the industry, it has no effect on the industry graph. However, if the increased MRP occurs throughout the industry, it is shown by increasing the demand for labor in the individual firm as well as the demand in the industry. The increase in industry demand has a second effect, though—with a higher demand for labor, the wage rises, pushing the MRC (wage) for the firm up. The firm will then hire at the point where MRP = MRC at the new equilibrium.

Changes in the wage also affect the firm’s decision to hire workers. If the industry wage increases, the MRC shifts upward for the firm, causing the firm to reduce the number of workers it hires in order to maximize profit where MRP = MRC.
**Bear in Mind**
The multiple-choice and free-response questions on the AP microeconomics exams to date have dealt only with perfectly competitive labor markets. The monopsony, union, and bilateral monopoly models are briefly discussed to illustrate the differences among labor markets and explain some differences in wages.

**Monopsony**
A monopsony is a market in which only one firm hires labor. For example, if a coal mine is the only employer in an area, workers only have the option of working for this employer or not working at all, usually because of geographic immobility or limited skills. The firm is a wage maker, as the firm's wage varies with the quantity of workers hired.

The wage rate and level of employment in a monopsonistic labor market

The monopsony, like a perfectly competitive labor market, has an upward-sloping supply curve, representing the wage. To hire more workers, the firm must raise the wage. The marginal resource cost is higher than the wage, because the firm cannot offer the higher wage only to the next worker hired; it must also raise wages of all of the other workers in order to prevent worker frustration. So if the firm employs four workers at a wage of $10, and it must pay a wage of $11 to hire the fifth worker, the marginal resource cost is actually $15, because the firm must also pay the previous four workers the extra $1 in wage.

The monopolist, like the perfect competitor, maximizes profit at the quantity of workers where MRP = MRC. However, it will only pay the wage on the supply curve at that quantity, because workers are willing to accept that wage. The monopsonist maximizes its profit by hiring fewer workers and paying a lower wage than would occur in the perfectly competitive labor market.

**Taking the EEK! Out of Economics**
By now, you should recognize parallels between the monopoly selling in the product market and the monopsony hiring in the labor market. The monopsony graph looks like a flipped-over monopoly graph. In both cases, the firm has the market power to restrict its output or hiring in order to raise prices or lower wages. In both cases, society receives fewer products than it would under perfectly competitive conditions. Further, in the case of the monopoly, consumers must pay higher prices, and in the case of the monopsony, workers earn lower wages, than would occur under perfectly competitive conditions.
Labor Unions

**Exclusive or craft unionism**

Labor unions use bargaining power to negotiate for higher wages and improved benefits and working conditions. An exclusive (craft) union restricts the supply of labor in order to increase the wage. Doctors, teachers, cosmetologists, electricians, plumbers, and other workers must meet occupational licensing or other requirements that make it difficult to enter the career, so supply is restricted in order to ensure workers higher wages.

**Inclusive or industrial unionism**

An inclusive (industrial) union includes all workers in an industry, such as auto and steel workers. Rather than trying to exclude others from entering the industry, inclusive unions use the power of numbers to collectively bargain with management for higher wages. The higher wage (marginal resource cost) must be paid to all workers, and the firm hires where $MRC = MRP$ (demand). At that wage, the quantity of workers supplied is greater than the quantity demanded, resulting in unemployment. Therefore, union members have an incentive to increase demand for their product: to increase the demand for workers and reduce the unemployment associated with the higher wage.
A bilateral monopoly combines a monopsony (a single buyer of labor) with an inclusive labor union (a single seller of labor). An example would be a coal mine that is the only employer in an area combined with workers who are all members of the United Mine Workers union. The firm will hire the quantity of workers where $MRC = MPR$. But where will the wage be set? The firm wants to set the wage down on the supply curve, but the union wants to set the wage up where $MRC = MPR$. The final wage will depend on the relative strength of labor and management and will fall somewhere between those two wages.

**The Minimum Wage**
The federal government and many states set a minimum wage. An effective minimum wage creates a wage floor above the equilibrium wage. The model looks the same as the inclusive union model. If the minimum wage is below or equal to the equilibrium wage, it guarantees workers a minimum income and does not result in unemployment. But if the minimum wage is above the equilibrium wage, unemployment could result.

**Wage Differentials**
Differences among workers' wages largely result from the effects of supply and demand. Workers in industries with high labor demand or low supply are likely to earn higher wages than workers in industries with low labor demand or high supply. Workers with a high marginal revenue product, such as entertainers and professional athletes, tend to be paid a higher wage than workers with a lower marginal revenue product. Workers who have invested in their human capital (knowledge and skills) through education and training, as well as those with greater ability, are likely to command higher wages. Workers in more difficult, dangerous, and unpleasant jobs also tend to earn higher wages to compensate for the less desirable aspects of the job.

Beyond differences in marginal revenue product, human capital, and compensation for undesirable work, market imperfections also contribute to wage differences. Workers may not have the information that other firms are paying higher wages. Workers may be tied to communities for family reasons and be unwilling or unable to relocate. Unions and government licensing may restrict movement into a different career. Discrimination based on gender, race, age, and disability still result in wage differences that cannot be reasonably explained in other ways. In addition, the models do not take into account salaries of workers paid by the year regardless of daily output or commissions and bonuses that are awarded to employees based on productivity or other factors.
Bear in Mind
The information in the Chapter 13 Appendix discussing the details of labor unions, collective bargaining, and their effects lends an interesting, more detailed look at unions, but AP economics exams have not contained questions using this material.

Multiple Choice Questions

1. If Melissa’s nominal wage increases 2% this year, and the prices of products she buys increase 3%, Melissa’s real wage this year
   (A) increased by 5%
   (B) increased by 1%
   (C) increased by 2%
   (D) decreased by 1%
   (E) decreased by 5%

2. The firm’s demand curve for labor is its marginal
   (A) resource cost curve
   (B) cost curve
   (C) revenue curve
   (D) product curve
   (E) revenue product curve

3. The supply curve for labor represents the worker’s choice between
   (A) work and leisure
   (B) buying American-made products or imports
   (C) public and private goods
   (D) wages and benefits
   (E) real wages and nominal wages

4. In a perfectly competitive labor market, which is true?
   I. Firms are wage-takers.
   II. Workers are assumed to have identical skills.
   III. The demand curve for labor is downward-sloping.
   (A) I only
   (B) III only
   (C) I and II only
   (D) II and III only
   (E) I, II, and III

5. Labor is the only resource required for a firm selling its product in a perfectly competitive product market. The marginal revenue product of the next worker is $15 per hour, and the wage of that worker is $13.
   I. The firm should not hire the worker.
   II. Hiring the worker would increase the firm’s profit by $2.
   III. The firm must lower the price to sell that worker’s output.
   (A) II only
   (B) III only
   (C) I and III only
   (D) II and III only
   (E) I, II, and III
6. Which of the following would cause the wage for boat makers to decrease?
(A) The workers' productivity increases.
(B) The price of boats made by the workers decreases.
(C) Consumer incomes increase and boats are a normal good.
(D) The demand for boats increases.
(E) New technology helps boat makers produce more quickly.

7. If the government sets stricter licensing requirements for electricians, we would expect all of the following to occur in the labor market for electricians EXCEPT for the
(A) wages of electricians to increase.
(B) number of people working as electricians to decrease.
(C) demand for electricians to increase.
(D) quantity demanded of electricians to fall.
(E) supply of licensed electricians to fall.

8. An effective minimum wage
(A) creates a wage ceiling for labor.
(B) is lower than the equilibrium price for labor.
(C) results in unemployment.
(D) increases the quantity of labor demanded.
(E) reduces the quantity of labor supplied.

Free-Response Questions
1. Maheen's Bakery is a perfectly competitive firm that hires unskilled workers in a perfectly competitive labor market.
   (a) Using correctly labeled side-by-side graphs of the labor market for the bakery industry and the labor market for Maheen's Bakery, show each of the following.
      (i) the equilibrium wage in the industry
      (ii) the wage Maheen pays her workers
      (iii) the quantity of workers Maheen hires
   (b) Explain how Maheen should determine the profit-maximizing number of workers.
   (c) Now assume Maheen discovers a new baking technique that significantly increases the productivity of her workers, but she does not share this information with other firms in the baking industry. Explain the effect on the following.
      (i) the quantity of workers hired by Maheen
      (ii) the wage Maheen pays her workers

2. Susan's Taxi Service operates in a perfectly competitive market and hires drivers in a perfectly competitive labor market. The industry wage for taxi drivers is $8 per hour.
   (a) Draw correctly labeled side-by-side labor market graphs for the taxi industry and for Susan's Taxi Service. Show each of the following.
      (i) the equilibrium wage and quantity of drivers hired in the industry
      (ii) the wage paid by Susan's Taxi Service
      (iii) the quantity of drivers hired by Susan's Taxi Service
   (b) Now assume the state imposes a minimum wage of $10 per hour.
      (i) What condition will this effective minimum wage create in the industry?
      (ii) What will happen to the wage Susan pays her taxi drivers? Explain.
      (iii) What will happen to the quantity of drivers Susan hires? Explain.
Multiple-Choice Explanations
1. (D) The nominal wage increase (2%) minus the inflation increase (3%) leaves a -1% real wage increase.
2. (E) The marginal revenue product curve is the firm’s income earned from hiring one more worker and represents all of the points where the firm will hire labor, depending on the marginal resource cost.
3. (A) At a low wage, people tend to prefer leisure. But at higher wages, the opportunity cost for leisure increases and people prefer to work.
4. (E) The firm must accept the wage set in the industry and cannot affect it. Workers are assumed to be interchangeable, and the demand for workers is downward-sloping along the marginal revenue product curve.
5. (A) Because the MRP > MRC, the firm should hire the worker. The MRP is $2 higher than the MRC, so the firm’s profit would increase $2 by hiring that worker. And because the firm is selling in a perfectly competitive product market, it can sell as many products as it can make at the same price.
6. (B) A decrease in the product price reduces the marginal revenue product, shifting the industry demand for workers to the left, which lowers the wage.
7. (C) Licensing restrictions increase the cost of becoming an electrician, so the supply falls, raising the wage and reducing the quantity demanded.
8. (C) Because an effective minimum wage creates a wage floor above the equilibrium wage, the higher quantity of labor supplied and lower quantity of labor demanded combine to create unemployment at the new wage.

Free-Response Explanations
1. 8 points (5 + 1 + 2)
   (a) 5 points:
   • 1 point is earned for a correctly labeled industry graph with a downward-sloping demand and upward-sloping supply of labor.
   • 1 point is earned for correctly indicating the equilibrium wage in the industry.
   • 1 point is earned for a correctly labeled graph of Maheen’s labor market with a horizontal MRC curve at the industry wage and a downward-sloping MRP curve.
   • 1 point is earned for indicating the wage in Maheen’s labor market.
   • 1 point is earned for indicating the quantity of workers hired where MRP = MRC.
   (b) 1 point:
   • 1 point is earned for stating that the profit-maximizing quantity of workers is found where MRP = MRC (or the wage).
   (c) 2 points:
   • 1 point is earned for stating that Maheen will increase the number of workers.
   • 1 point is earned for stating that the wage Maheen pays workers will not change.

2. 8 points (3 + 5)
   (a) 3 points:
   • 1 point is earned for showing the equilibrium wage at $8 and quantity in the industry.
   • 1 point is earned for correctly linking the industry wage to the wage for the firm.
   • 1 point is earned for indicating the quantity of workers hired at MRC = MRP.
   (b) 5 points:
   • 1 point is earned for stating that the minimum wage will create unemployment.
   • 1 point is earned for stating that the wage Susan pays workers will increase to $10.
• 1 point is earned for explaining that Susan must accept the wage set in the industry (or that she must follow the law).
• 1 point is earned for stating that Susan will hire fewer drivers.
• 1 point is earned for explaining that the increase in the MRC causes the curve to cross the MRP at a lower quantity of workers.