

## Homework 1

- Suppose demand and supply equations are given by:  
 $Q^d = 500 - 3P_x$  and  $Q^s = 2P_x$ 
  - Determine the equilibrium price and quantity. (2 points)
  - Find the optimal tax rate.
  - Determine the new price paid by the buyers, price received by the sellers and the quantity sold after the optimal taxes. (6 points)
  - What is the total tax revenue? (2 points)
  - What are the buyers and sellers share of tax? (3 points)
  - Draw a detail graph to show the above problem. (2 points)
- In a competitive labor market, demand for workers is  $Q_D = 10,000 - 100W$ , and supply is  $Q_S = 2000 + 1900W$ , where  $Q$  is the quantity of workers employed and  $W$  is the hourly wage. What is the initial equilibrium wage and employment level? Suppose that the government decides that \$5 per hour is the minimum allowable wage in any market. How would this new minimum wage alter this market? What would the new employment level be? What would happen to total payments to labor? Would there be any excess supply of labor? If so, how much?
- A new chemical cleaning solution is introduced to the market. Initially, demand is  $Q_D = 1000 - 2p$  and supply is  $Q_S = 100 + p$ . Determine the equilibrium price and quantity. The government then decides that no more than 300 units of this product should be sold per period, and imposes a quota at that level. How does this quota affect the equilibrium price and quantity? Show the solution using a graph and calculate the numerical answer.
- Demand for park visits is  $Q^*_0 = 10,000 - 100P$ . If park visits are free, how many visitors will attend? How will your answer change if the park adds a \$20 admission fee? Show using a graph.
- In a competitive labor market, demand for workers is  $Q_D = 9900 - 100W$ , and supply is  $Q_S = 2000 + 1900W$ , where  $Q$  is the quantity of workers employed and  $W$  is the hourly wage. Suppose the government decides to impose a wage ceiling of \$3 per hour. What would the equilibrium in this labor market?
- Use a graph to show that the incidence of a \$1/lb. tax on grapes is the same whether the tax is shown as a shift in the supply curve (tax on sellers) or the demand curve (tax on buyers). Under what circumstances would the incidence of the tax be split equally between buyers and sellers?

### ■ Answers to Additional Questions and Problems

- Without minimum wages, the equilibrium is

$$10,000 - 100W = 2000 + 1900W$$

$$W^* = 4$$

$$Q^* = 9600.$$

With the new minimum wage of \$5, employment will equal the amount of labor demanded at the minimum wage.

$$Q_d = 10,000 - 100(5) = 9500.$$

Total payments to labor would increase from \$38,400 to \$47,500. Excess supply of labor would equal  $2000 = 2000 + 1900(5) - 9500$ . Thus, in addition to the 100 people who would lose jobs that they had before the minimum, an additional 1900 would now want jobs that would be unobtainable at the higher wage rate.

3. The equilibrium solution with no government intervention is

$$\begin{aligned} 1000 - 2p &= 100 + p \\ p^* &= 300 \\ Q^* &= 400 \end{aligned}$$

When the quota is imposed at 300 units, supply cannot exceed that level, regardless of price. Thus the supply curve becomes vertical at 300 units. The new equilibrium quantity is 300 and price is determined by where the supply curve with the quota ( $S_{\text{quota}}$ ) intersects the demand curve (see Figure 2.5). To solve for the price, plug the quota value (300) into the demand equation.

$$\begin{aligned} 1000 - 2p &= 300 \\ p^* &= 350 \end{aligned}$$

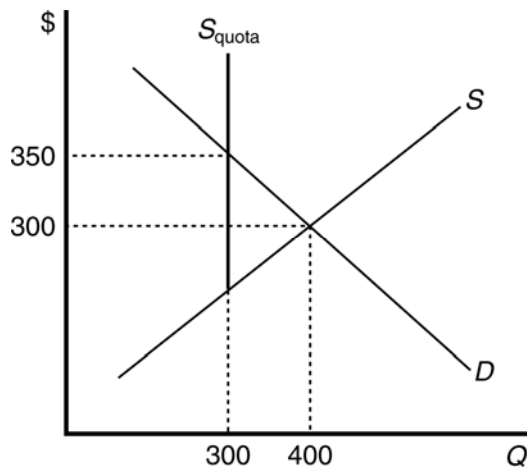


Figure 2.5

4. When park visits are free, the equilibrium quantity is  $10,000 = 10,000 - 100(0)$ . With a \$20 entrance fee quantity falls to 8000. See Figure 2.6.

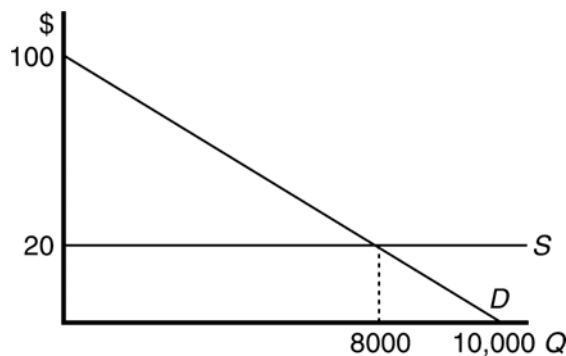


Figure 2.6

5. Without the wage ceiling, the equilibrium is given by

$$10,000 - 100W = 2000 + 1900W,$$

where  $W = 4$  and  $Q = 9600$ . With the wage ceiling of \$3 per hour, the market wage rate will be  $W = 3$ , and the amount of labor employed will be 7700.

6. In Figure 2.7, the initial equilibrium is at  $e_1$ . A tax of  $\$1/lb$  can be shown by shifting the supply curve up by  $\$1$  ( $S^2$ ), or by shifting the demand curve down by  $\$1$  ( $D^2$ ). In either case, price paid by consumers is the same ( $p_2$ ). The upper shaded area is the incidence on consumers, the lower shaded area is the incidence on suppliers. Using Equation 3.7, if the supply elasticity is equal to the demand elasticity, the incidence would fall equally on buyers and sellers.

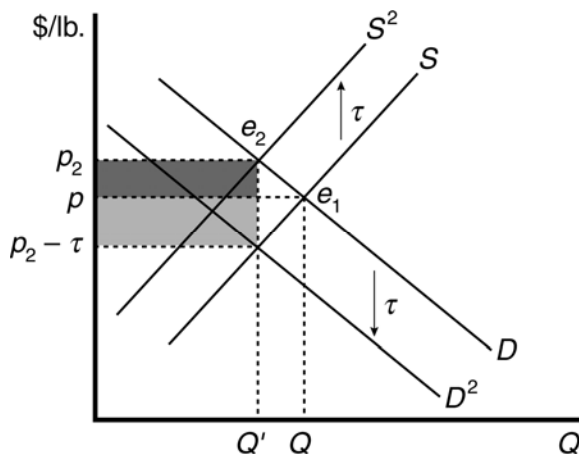


Figure 2.7