

Practice With Taxes and Subsidies

1. Suppose demand for a product is $Q_D = 1000 - 10P_D$ and the supply is $Q_S = 5P_S - 50$
 - a. Graph supply and demand on Figure 1 below assuming $Q_D = Q_S = Q$ and $P_D = P_S = P$. Find the equilibrium quantity and price by solving for P and Q .
 - b. Suppose the government imposes a tax of 15 such that $P_D = P_S + 15$. Substitute $P_D = P_S + 15$ into $Q_D = 1000 - 10P_D$ to find the demand in terms of the price sellers receive. Graph this demand in Figure 2 and also graph the supply $Q_S = 5P_S - 50$ assuming $Q_D = Q_S = Q$. Find the equilibrium price the seller receives and the equilibrium quantity given this price.
 - c. Rewrite $P_D = P_S + 15$ as $P_S = P_D - 15$. Substitute $P_S = P_D - 15$ into $Q_S = 5P_S - 50$ to find the supply in terms of the price buyers pay. Graph this supply in Figure 2 and also graph the demand $Q_D = 1000 - 10P_D$ assuming $Q_D = Q_S = Q$. Find the equilibrium price the buyer pays and the equilibrium quantity given this price.
 - d. What is the difference in the equilibrium seller's price in b and the equilibrium buyer's price in c? This should equal the tax if you have done things right.
 - e. What is the difference in the equilibrium price in a and the equilibrium seller's price in b? This is the economic incidence of the tax for sellers.
 - f. What is the difference in the equilibrium price in a and the equilibrium buyer's price in c? This is the economic incidence of the tax for buyers.

2. For the demand and supply in problem 1:
 - a. Suppose the government imposes a subsidy of 15 such that $P_D = P_S - 15$. Substitute $P_D = P_S - 15$ into $Q_D = 1000 - 10P_D$ to find the demand in terms of the price sellers receive. Graph this demand in Figure 4 and also graph the supply $Q_S = 5P_S - 50$ assuming $Q_D = Q_S = Q$. Find the equilibrium price the seller receives and the equilibrium quantity given this price.
 - b. Rewrite $P_D = P_S - 15$ as $P_S = P_D + 15$. Substitute $P_S = P_D + 15$ into $Q_S = 5P_S - 50$ to find the supply in terms of the price buyers pay. Graph this supply in Figure 5 and also graph the demand $Q_D = 1000 - 10P_D$ assuming $Q_D = Q_S = Q$. Find the equilibrium price the buyer pays and the equilibrium quantity given this price.
 - c. What is the difference in the equilibrium seller's price in 2 a and the equilibrium buyer's price in 2 b? This should equal the subsidy if you have done things right.
 - d. What is the difference in the equilibrium price in 1 a and the equilibrium seller's price in 2 a? This is the economic incidence of the subsidy for sellers.
 - e. What is the difference in the equilibrium price in 1 a and the equilibrium buyer's price in 2 b? This is the economic incidence of the subsidy for buyers.

The approach outlined here is graphically a little different than what we have done in the past (usually we combine Figures 1 and 2, 1 and 3, 1 and 4, or 1 and 5). This alternative approach may be helpful for those of you who get confused about which price is the buyers and which price is the sellers.

What is important to recognize is that when we represent a tax or subsidy as a shift in the demand curve, the new demand curve is in terms of the price the seller receives as is the supply curve. Therefore, the equilibrium price being determined by the intersection of the supply and new demand curve is the seller's equilibrium price. To find the buyer's equilibrium price we simply add the tax or subtract the subsidy from the seller's equilibrium price.

Alternatively, when we represent a tax or subsidy as a shift in the supply curve, the new supply curve is in terms of the price the buyer pays as is the demand curve. Therefore, the equilibrium price being determined by the intersection of the demand and new supply curve is the buyer's equilibrium price. To find the seller's equilibrium price we simply subtract the tax or add the subsidy from the buyer's equilibrium price.

Figure 1

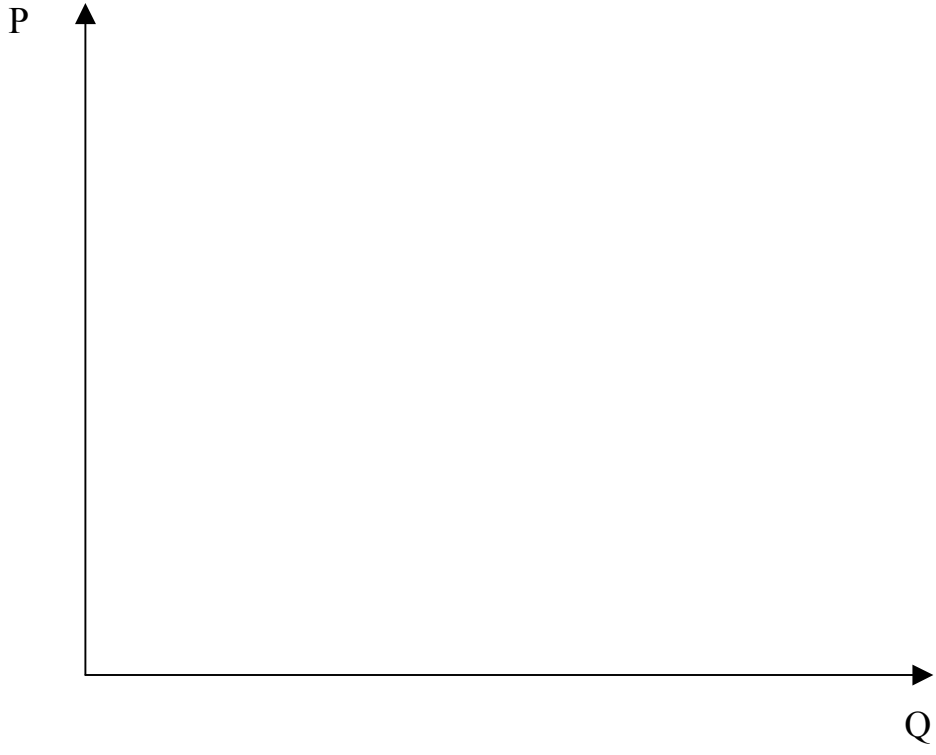


Figure 2

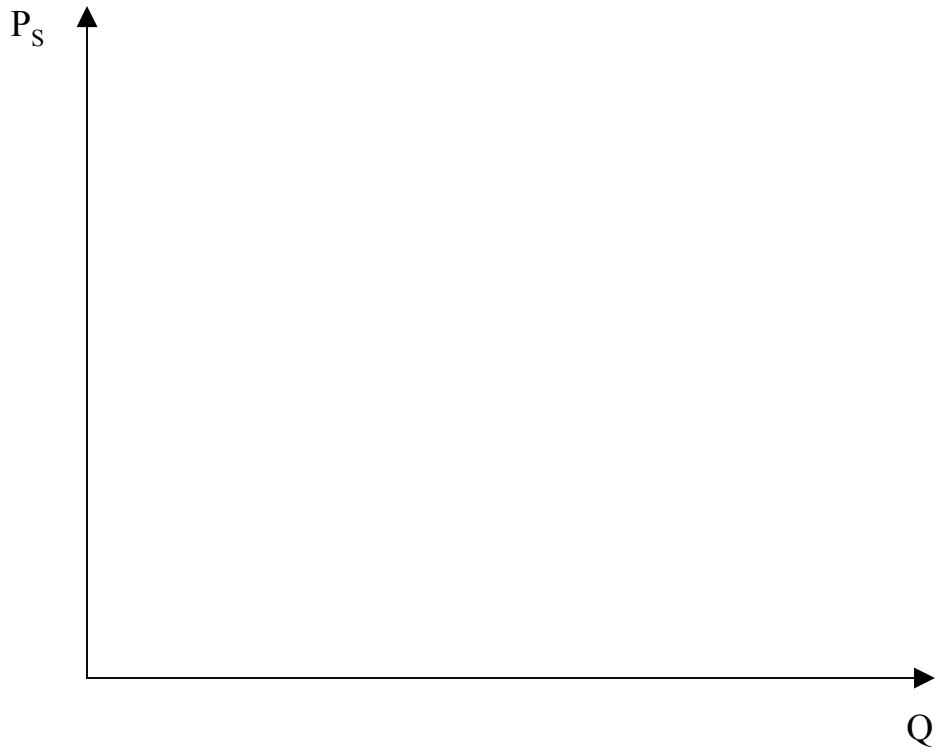


Figure 3

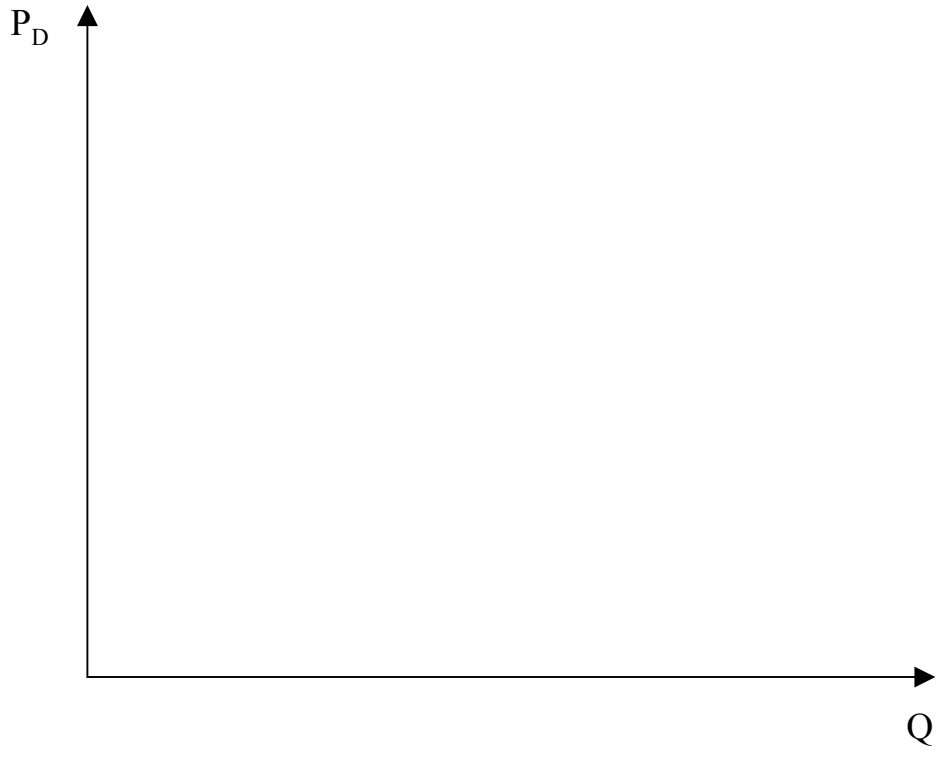


Figure 4

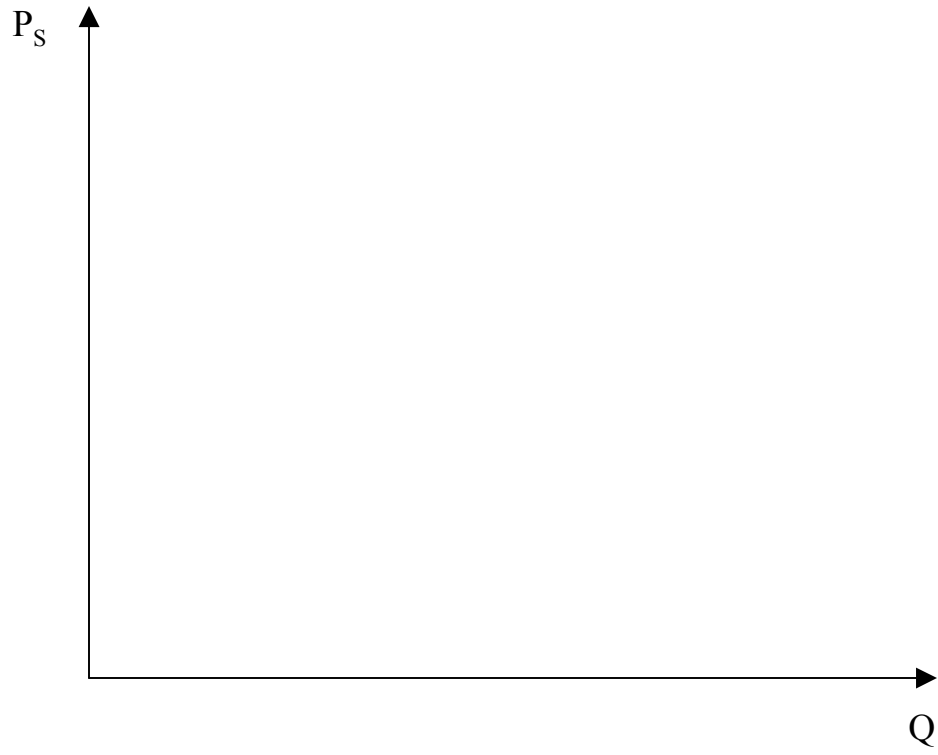


Figure 5

