1 Consumer Surplus

Marginal Willingness to Pay The marginal value that a consumer places on one more unit of consumption. This is essentially what one more unit of the good is worth to a consumer in dollar terms.

Consumer Surplus (CS) The difference in dollars between what a consumer is willing to pay for a good and what they actually have to pay for it.

Consumer surplus is equal to the area under the inverse demand curve and above the market price, up to the quantity consumed.

2 Producer Surplus

Producer Surplus The difference in dollars between the amount a producer sells a good for and marginal cost of producing that good.

Producer surplus is equal to the area above the inverse supply curve and below the market price, up to the quantity produced.

$$PS = R - VC \Rightarrow \pi = PS - FC$$

3 Welfare

We can use the sum of consumer and producer surplus as a measure of the welfare (W) of society.

$$W = CS + PS$$

A perfectly competitive market with no externalities will maximize the welfare for society.

Deadweight Loss (DWL) The net loss in welfare to society that occurs when there is an action that alters a market equilibrium.

Deadweight loss occurs because the marginal consumer's valuation of an extra unit of output is different than the marginal cost of producing one more unit of output.

Market Failure Inefficient production or consumption, often because a price does not equal marginal cost.

Price Floor A guaranteed minimum price.

Price Ceiling A guaranteed maximum price.

4 Exercises

1. The government has decided that not enough people are going to UC Davis basketball games even though they're first place in their conference. In order to increase attendance, the government has decided to provide a subsidy for anyone who wants to go see the game. Suppose the original supply and demand curve are given by

$$Q_D(p) = 21 - \frac{p}{5}$$

and

$$Q_S(p) = \frac{p}{10}$$

(a) What is the equilibrium price and quantity before the government intervenes?

$$Q_D(p) = Q_S(p) \Leftrightarrow 21 - \frac{p}{5} = \frac{p}{10} \Leftrightarrow p^* = \$70$$

By plugging the price into the supply or demand function (supply is easier), we get

$$Q^* = 7$$

(b) What is the consumer surplus? What is the producer surplus?

Here it is helpful to solve for inverse demand and inverse supply.

$$Q_D(p) = 21 - \frac{p}{5} \Leftrightarrow p(Q_D) = 105 - 5Q$$

So inverse demand has an intercept of 105 and a slope of -5.

$$Q_S(p) = \frac{p}{10} \Leftrightarrow p(Q_S) = 10Q$$

Inverse supply has an intercept of 0 and a slope of 10.

Consumer surplus is given by the area under the inverse demand curve and above price up to the quantity of 7. Using the formula for the area of a triangle

$$CS = \frac{1}{2}(105 - 70)(7) = 122.5$$

Producer surplus is the area above the inverse supply curve and below the price up to the quantity of 7.

$$PS = \frac{1}{2}(70)(7) = 245$$

(c) Suppose the basketball team made a profit of \$50. What were their fixed costs?

We know that producer surplus is equal to revenue minus variable costs. Subtracting fixed costs from both sides give us

$$PS - FC = R - VC - FC \Leftrightarrow PS - FC = \pi \Leftrightarrow FC = PS - \pi$$

Plugging in our values gives us

$$FC = 245 - 50 = \$195$$

(d) The government has decided to provide a subsidy of \$30 per ticket. What is the new equilibrium quantity?

Here we want to set $p(Q_d) - 30 = p(Q_S)$

$$105 - 5Q - 30 = 10Q \Leftrightarrow Q = 9$$

(e) How much do fans pay for a ticket? How much money does the basketball team receive for each ticket sold?

Plug into inverse demand to get the price the fans pay, and plug into inverse supply to get the price the basketball team receives.

$$p_D = 105 - 5(9) = 60$$

$$p_S = 10(9) = 90$$

(f) What is the new consumer surplus? What is the new producer surplus?

$$CS = \frac{1}{2}(105 - 60)(9) = 202.5$$

$$PS = \frac{1}{2}(90)(9) = 405$$

(g) The subsidy has allowed more people to watch college basketball, which surely can only be a good thing. Is this true? That is, is there any deadweight loss? If so, what is the value of the deadweight loss?

Unfortunately, this is not true. More fans are attending games, but they have a marginal valuation that is lower than the marginal cost of attending a game. Once we factor in the government cost of the subsidy, we can see that overall welfare has decreased.

$$\Delta CS = 202.5 - 122.5 = +80$$

$$\Delta PS = 405 - 245 = +160$$

$$T = 30(9) = 270 > 240 = 80 + 160$$

$$DWL = 270 - 240 = 30$$

(h) The government has decided that maybe a subsidy isn't the greatest idea, and have decided to instead place a price *ceiling* on tickets of \$60. Will this lead to an efficient outcome?

This will still lead to an inefficient outcome, because there will now be a shortage of tickets. If the price is not allowed to go above \$60 then

$$Q_D(60) = 21 - \frac{60}{5} = 9$$

$$Q_S(60) = \frac{60}{10} = 6$$

so there are people who would like to buy a ticket but cannot because the basketball team is not willing to sell an additional ticket at such a low price.