1 Equilibrium

Partial Equilibrlium- Study of a single market in isolation.

Where do prices come from?

1.1 Supply and Demand

Demand: what is the quantity consumers want at a particular market price p

Supply : what is the quantity firms produce at a particular market price p

$Q_d(p) = \frac{2500}{p}, Q_s(p) = 100p$

1.2 Example of Out-of-Equilibrium Prices

Suppose $p = 10$

$Q_d(10) = \frac{2500}{10} = 250, Q_s(10) = 100p = 1000$

Here, there is an **over supply.** Supply is 1000 and demand is 250.

There is a **downward pressure** on prices. Any of the firms with unsold units have an incentive to try and sell them at a lower price.

Suppose $p = 1$

$Q_d(1) = \frac{2500}{1} = 2500, Q_s(1) = 100$

There is an over-demand for this good.

There is an **upward pressure** on prices as consumers who currently don't get to buy the good can convince firms who are not currently producing to produce at a higher price.

1.3 Equilibrium

An equilibrium is a **stable state**. A state with no tendency for change.

In partial equilibrium, a stable state (an **equilibrium)** occurs where quantity demand is equal to quantity supplied:

An equilibrium is p^* such that

$$Q_d(p^*) = Q_s(p^*)$$

At p^* there is no tendency for the price to rise of fall. It is a stable state.

1.4 Example

$Q_d(p) = \frac{2500}{p}, Q_s(p) = 100p$

$p = 1$ is too low. $p = 10$ is too high.

$$Q_d(p^*) = Q_s(p^*)$$

$$\frac{2500}{p} = 100p$$

$$2500 = 100p^2$$

$$25 = p^2$$

$$p^* = 5$$

Equlibrium quantity:

$$Q_d(5) = \frac{2500}{5} = 500, Q_s(5) = 100(5) = 500$$

$$Q^* = 500$$

1.4.1 Fixed Supply Example

$Q_d(p) = \frac{500}{p}, Q_s(p) = 1000$

$$Q_d(p^*) = Q_s(p^*)$$

$$\frac{500}{p} = 1000$$

$$p^* = \frac{1}{2}$$

$$Q^* = 1000$$

1.4.2 Linear Demand Example

$Q_d(p) = 300 - 50p, Q_s(p) = 100p$

$$300 - 50p = 100p$$

$$300 = 150p$$

$$2 = p^*$$

$$Q_s(2) = 200, Q_d(2) = 200$$

$$p^* = 2, Q^* = 200$$

1.4.3 Graphing Equilibrium

$Q_d(p) = 300 - 50p$,$Q_s(p) = 100p$

Inverse demand tells us "what price would be responsible for consumers buying Q units of the good?".

To find inverse demand, write the demand function, then isolate p.

$$Q = 300 - 50p$$

$$50p = 300 - Q$$

$$p = \frac{300}{50} - \frac{1}{50}Q$$

$$p = 6 - \frac{1}{50}Q$$

What price is responsible for consumers buying 200 units?

$$p = 6 - \frac{1}{50}200 = 6 - \frac{200}{50} = 6 - 4 = 2$$

Inverse Supply Curve

Start with the supply function.

$$Q = 100p$$

Isolate price.

$$p = \frac{Q}{100}$$

1.4.4 Surplus

Surplus is a way of quantifying (in terms of dollars) how well off consumers and producers are because a market exists.

Consumer Surplus.

The area under the inverse demand curve but above the price.

Producer Surplus.

The area above the inverse supply curve but below price.

Remeber . The area of a triangle is $\frac{1}{2}b * h$.

In our example:

$CS = \frac{1}{2} * (6-2) * 200 = \frac{1}{2} * 4 * 200 = 400$

$PS = \frac{1}{2} * 2 * 200 = 200$

Total surplus (TS) : $CS + PS$

$TS = 400 + 200 = 600$

The equilibrium total surplus is **the most** surplus that be generated by a market.

1.4.5 Example

$Q_d(p) = 200 - 40p, Q_s(p) = 10p$

a) What is the equilibrium price and quantity?

$$200 - 40p = 10p$$

$$200 = 50p$$

$$p^* = 4$$

$$Q_d(4) = 200 - 40(4) = 40, Q_s(p) = 10p = 10 * 4 = 40$$

$$Q^* = 40$$

b) What is the inverse demand and supply.

$$Q_d(p) = 200 - 40p, Q_s(p) = 10p$$

$$Q = 200 - 40p$$

$$40p = 200 - Q$$

$$p = 5 - \frac{1}{40}Q$$

$$Q = 10p$$

$$p = \frac{1}{10}Q$$

c) Plot the equilibrium, mark the equilibrium price and quantity.

d) What are the consumer and producer surplus?

$$CS = \frac{1}{2} * 1 * 40 = 20$$

$$PS = \frac{1}{2} * 4 * 40 = 80$$

$$TS = 100$$

e) What is the price elasticity of demand at the equilibrium price?

$$Q_d(p) = 200 - 40p$$

$$\epsilon = \frac{\partial(200 - 40p)}{\partial p} \frac{p}{200 - 40p}$$

$$= -40\frac{p}{200 - 40p}$$

$p^* = 4$

$$= -40\frac{4}{200 - 40 * 4} = -40\frac{4}{40} = -4$$

When price goes up by 1% demand goes down by 4% this is **elastic demand**.