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# Economics for Business - I

**MEC1001 [L3]**

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# Economics for Business - I

## Elasticities of Demand and Supply Curves

# Elasticity

- **Price of the good, price of related goods, income/wealth affect demand**
- **Price of the good, input prices affect supply**
- **Can we say more than just the direction of quantity changes?**

**Suppose Y = f(X):** Variable **Y** depends on variable **X**

**Elasticity depicts the % change in Y in response to a % change in X**

**Elasticity-** It measures the responsiveness of quantity demanded/supplied to a change in one of its determinants

In market analysis, assessing demand responsiveness is important

# Elasticity: Demand

## 3 types of elasticities of demand

- **Own-price**
- **Cross-price**
- **Income**

## Own-price elasticity

The % change in quantity demanded of a good resulting from a 1% change in its price

$$E_P = \frac{\%\ change\ in\ Q_D}{\%\ change\ in\ P} = \frac{\%\Delta Q_D}{\%\Delta P} = \frac{(\frac{\Delta Q_D}{Q_D})}{(\frac{\Delta P}{P})}$$

**Example-**

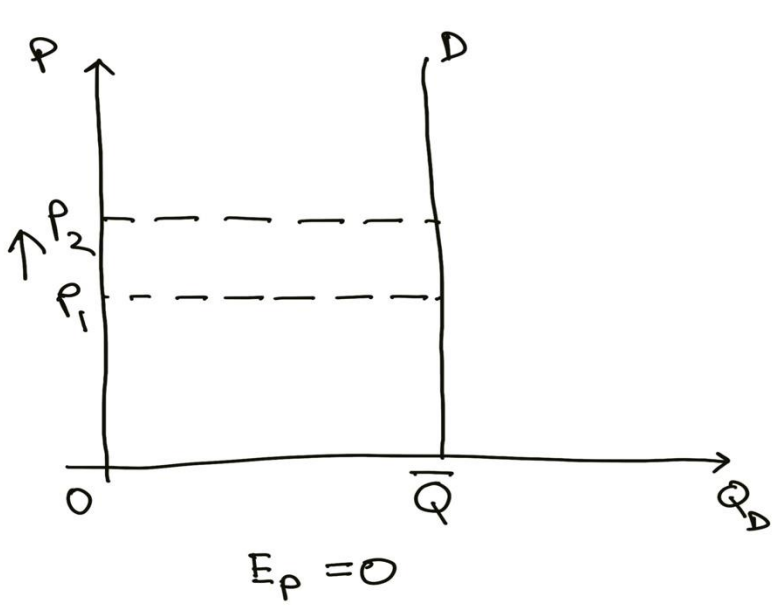
Suppose **the price of THALI increases** from INR 100 to INR 110- So a **10% increase in Price**

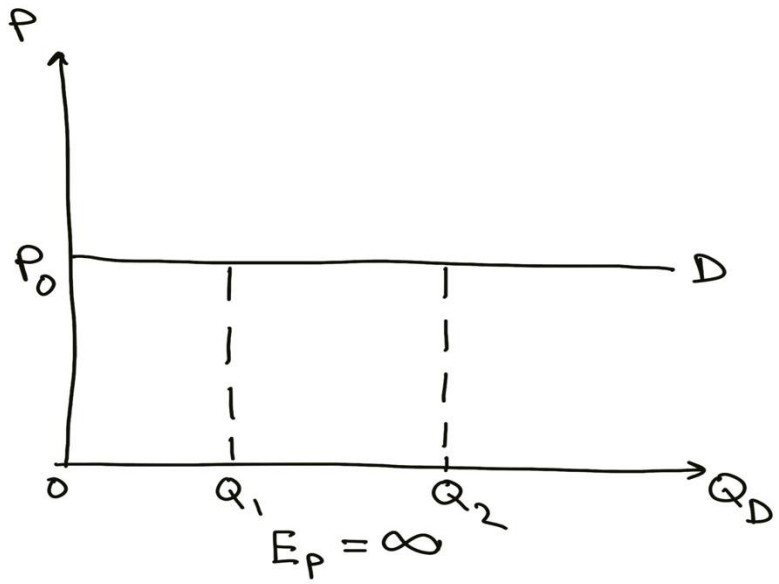
Because of the price hike, say, **demand for THALI falls** from 100 to 80 plates- So **a 20% fall in quantity** demanded. So, $E_P = \frac{\%\Delta Q_D}{\%\Delta P} = (-20\%)/(10\%) = -2$ . **So, the price elasticity of THALI is –2**.

As a convention we often use the **absolute value** of the elasticity, and **say own-price demand elasticity of THALI is 2** (negative relationship between price and demand is obvious)

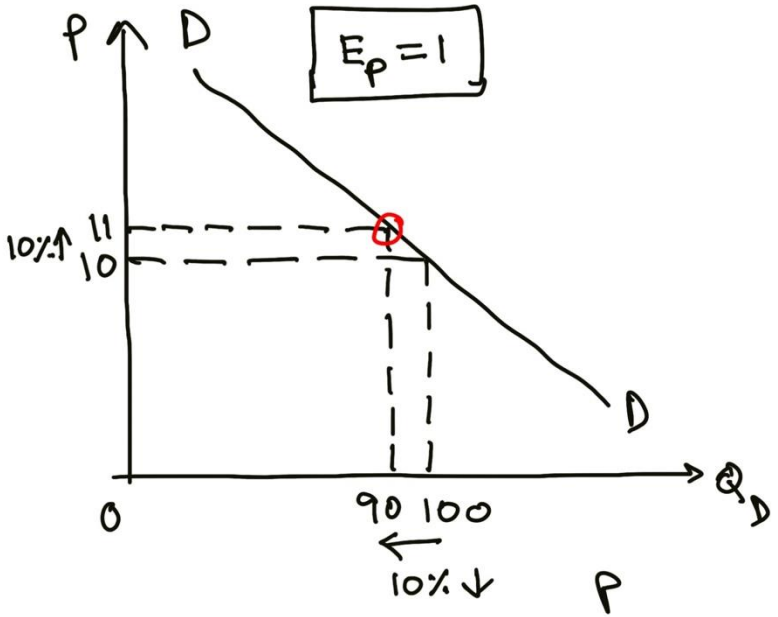
# Elasticity: Demand

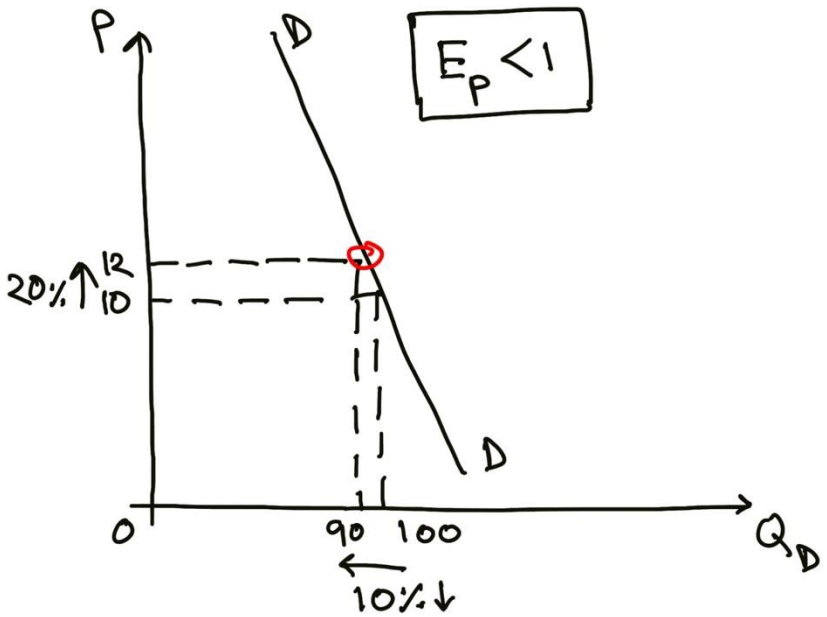
- **Perfectly inelastic demand: $E_P = 0$**
  - It means that a % change in P will have no impact on the quantity demanded [**Demand curve will be vertical**] – Consumers buy a fixed amount $\bar{Q}$
- **Perfectly elastic demand: $E_P = \infty$ (infinite)**
  - Buyers will buy any quantity of the good at any particular price ($P_0$); however, they will demand no good if the price is above $P_0$, or if the price is below $P_0$, there will be infinite demand [**Demand curve will be horizontal**]

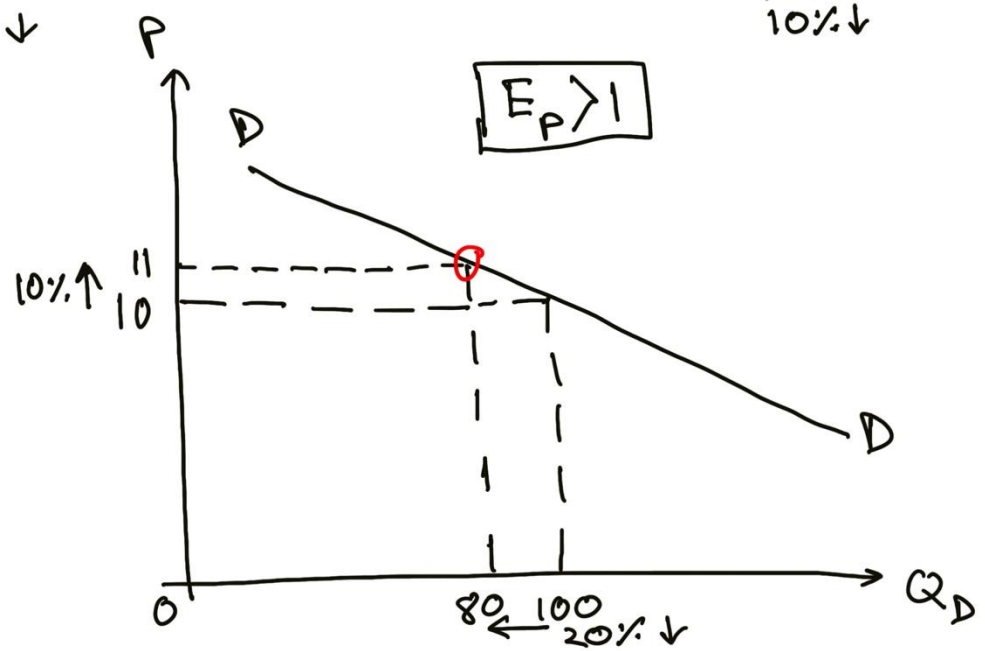


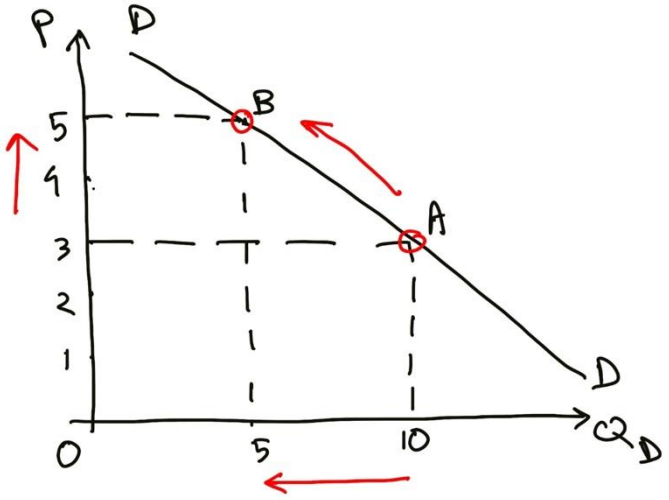
# Demand Elasticity (Examples)

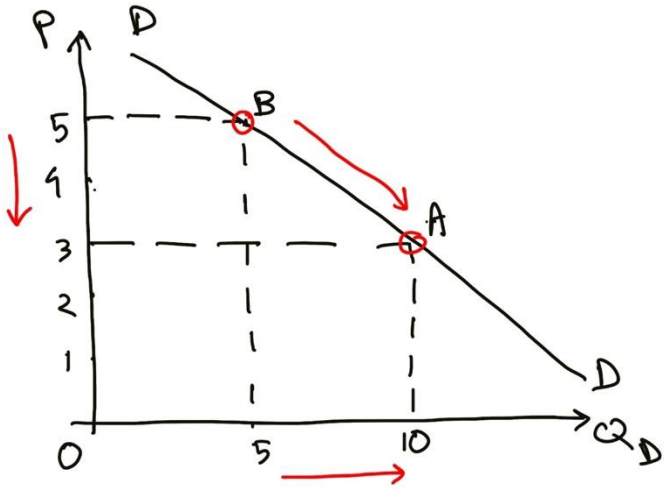


# Demand Elasticity: Midpoint Method




**The Midpoint Method**

$$E_P = \frac{(Q_2 - Q_1)/[\frac{Q_2 + Q_1}{2}]}{(P_2 - P_1)/[\frac{P_2 + P_1}{2}]}$$

**The midpoints between the two quantities and two prices are considered as bases → To address the problem of base effect with the previous method of calculating elasticity**

**How does the Midpoint Method impact Price Elasticity?**

Case 1: Movement from A to B

% change in Q = (5–10)/7.5= –67%

% increase in P = (5–3)/4 = 50%

**$E_P$ = |(–67%/50%)| = 1.34**

Case 2: Movement from B to A

% change in Q = (10–5)/7.5= 67%

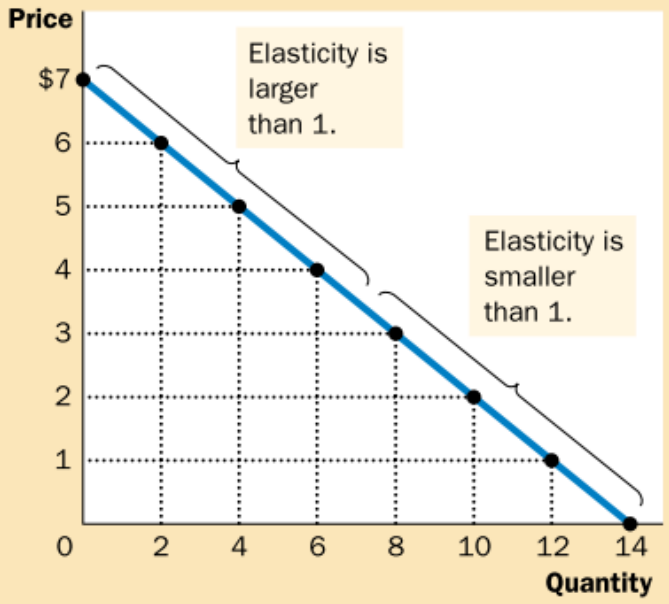
% change in P = (3–5)/4 = –50%

**$E_P$ = |(67%/(–50%))| = 1.34**

**Base Effect is eliminated, and we get the same elasticity**

# Demand Elasticity Example: Midpoint Method

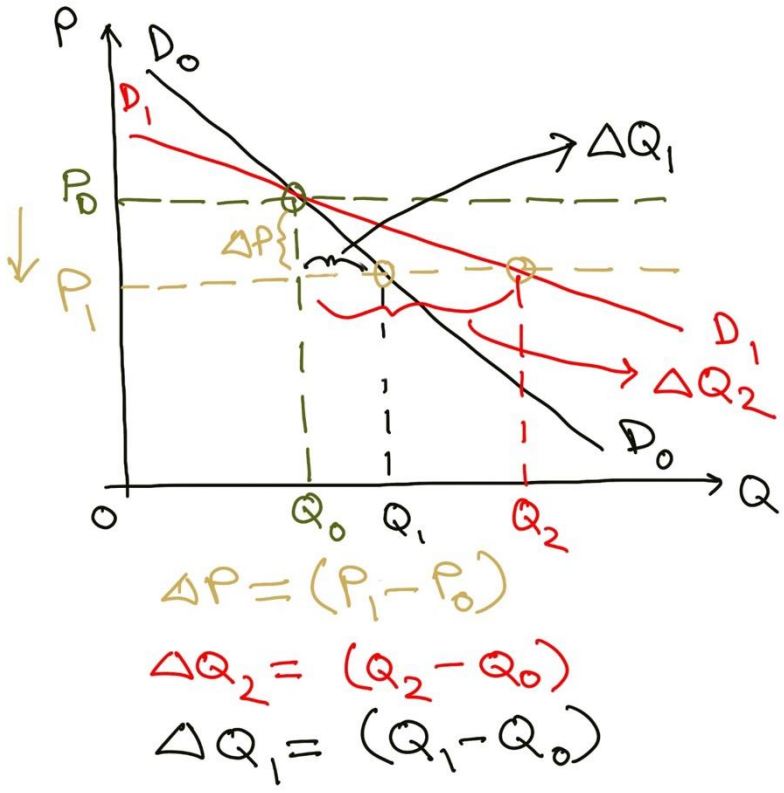
## Elasticity varies along a linear demand curve




| Price | Quantity | Total Revenue (Price × Quantity) | Percent Change in Price | Percent Change in Quantity | Elasticity | Description |
|---|---|---|---|---|---|---|
| $7 | 0 | $ 0 | | | | |
| | | | 15 | 200 | 13.0 | Elastic |
| 6 | 2 | 12 | | | | |
| | | | 18 | 67 | 3.7 | Elastic |
| 5 | 4 | 20 | | | | |
| | | | 22 | 40 | 1.8 | Elastic |
| 4 | 6 | 24 | | | | |
| | | | 29 | 29 | 1.0 | Unit elastic |
| 3 | 8 | 24 | | | | |
| | | | 40 | 22 | 0.6 | Inelastic |
| 2 | 10 | 20 | | | | |
| | | | 67 | 18 | 0.3 | Inelastic |
| 1 | 12 | 12 | | | | |
| | | | 200 | 15 | 0.1 | Inelastic |
| 0 | 14 | 0 | | | | |

Source: p.95, N. G. Mankiw (Principles of Microeconomics)

# Demand Elasticity: Elastic vs. Inelastic Demand




**What difference does elasticity make in terms of the quantity's response to changes in prices?**

**Ex-**

$D_0D_0$ and $D_1D_1$ – Two demand curves (**$D_1D_1$ is relatively more elastic**)

Suppose the price drops by $\Delta P$

Change in quantity $\Delta Q_1$ for $D_0D_0$ and $\Delta Q_2$ for $D_1D_1$

**$\Delta Q_2 > \Delta Q_1$**

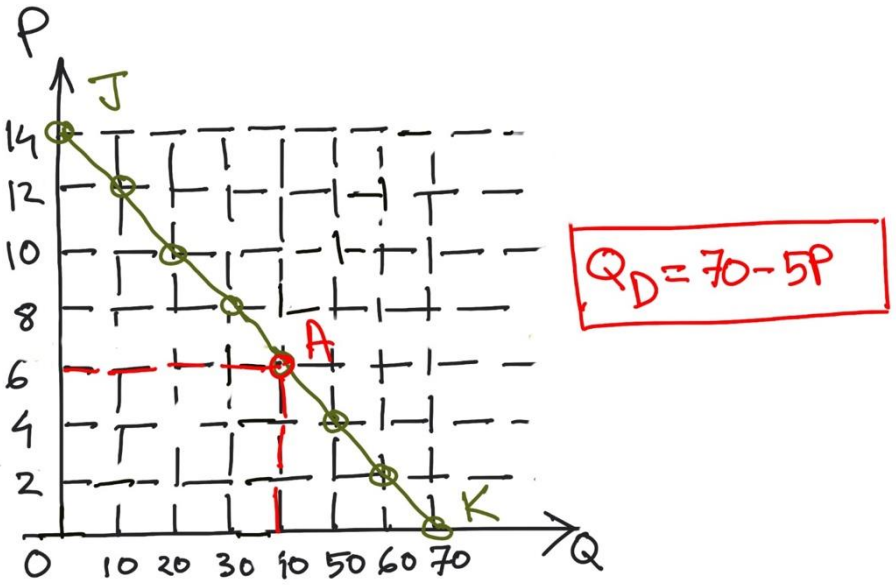
**A demand curve with greater elasticity will have a greater impact on the quantity demanded as a response to a change in its price**

# Demand Elasticity: Point vs. Arc Elasticity

**Point Elasticity of Demand—**

**It measures the change in demand at any point of the demand curve, given a small price change.**

$$E_P = \frac{\%\Delta Q_X}{\%\Delta P} = \frac{P}{Q_X}\frac{dQ_X}{dP}$$




Ex-
Calculate the elasticity at point A

Slope = (dP/dQ) = (0–6)/(70–40) = –(1/5)
Slope of demand function = dQ/dP = –5
Point elasticity at A= (P at A/Q at A)*(slope of demand function)= $E_P^A = |\frac{P^A}{Q^A} \times \frac{dQ}{dP}|$ = |(6/40)*(–5)| = **0.75**

**It is only used for estimating elasticity at a particular point on the demand curve**

# Demand Elasticity: Point vs. Arc Elasticity

**Arc Elasticity of Demand— (Large Change)**

**It measures the change in demand over a segment of the demand curve:**

$$E_P = \frac{(Q_2 - Q_1)/[\frac{Q_2 + Q_1}{2}]}{(P_2 - P_1)/[\frac{P_2 + P_1}{2}]}$$

**Point Elasticity of Demand— (Marginal Change)**

**It measures the incremental change in demand measured at any specific point on the demand curve (say a point A):**

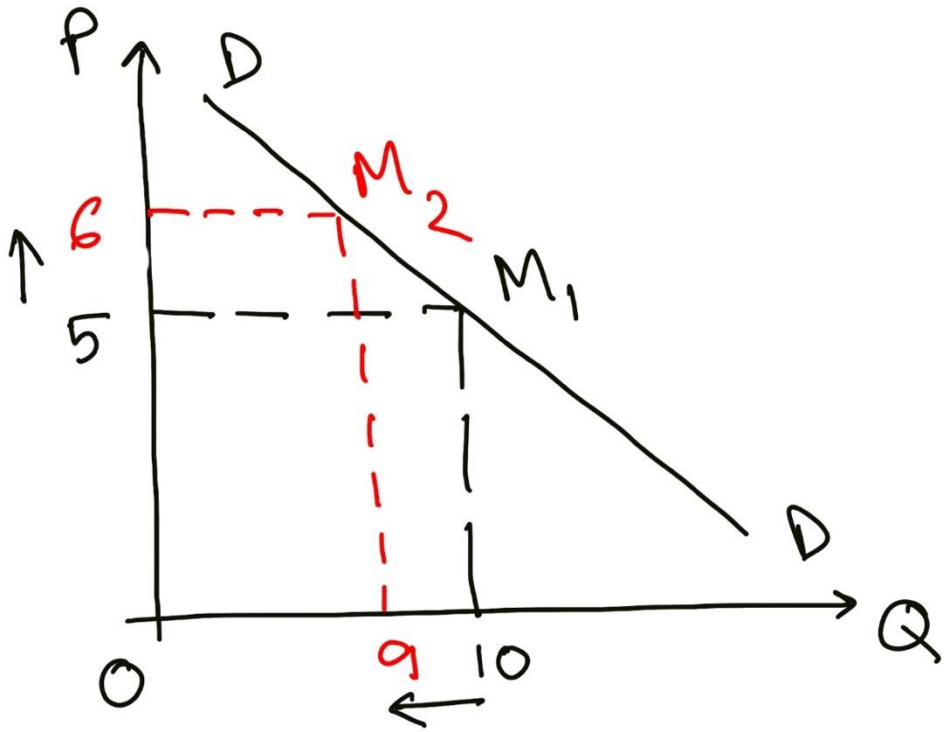
$$E_P = \frac{P}{Q_X}\frac{dQ_X}{dP}\Big|_{at\ point\ A}$$

**If you want to see the impact of a large change in price on the quantity demanded----- You should then use Arc Elasticity formula**

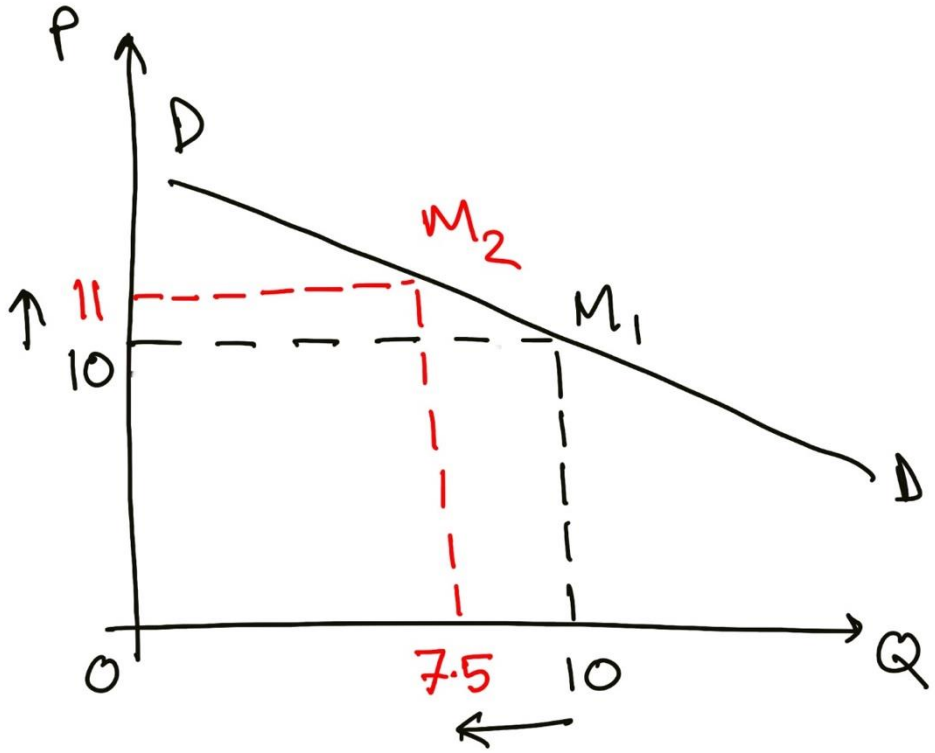
**When we want to say if a curve is elastic or inelastic, using Arc Elasticity is best.**

# Demand Elasticity: Impact on Revenue

**Revenue for a firm = Price it charges * Quantity it sells at that price = P * Q**




**Change in Revenue= (6*9) – (5*10)= 4**




**Change in Revenue= (11*7.5) – (10*10)= –17.5**

**For inelastic demand curve, increasing price results in revenue gain for a seller**

# Demand Elasticity: Others

**Two other demand elasticities---**

- **Income Elasticity**
- **Cross-price Elasticity**

**Though here we discuss the point-elasticities, the arc elasticities will follow similar formulae as used for own price elasticity**

Two goods: **X** and **Y**; Income: **I**

**Income elasticity of demand for good X $(E_I)$**

**= (% change in quantity of X demanded) / (% change in income)**

**= $\frac{\%\Delta Q_X}{\%\Delta I} = \frac{I}{Q_X}\frac{dQ_X}{dI}$; at a specific point**

**Cross-price elasticity of demand for good X $(E_{Q_X P_Y})$**

**= (% change in quantity demanded of good X) / (% change in price of good Y)**

**= $\frac{\%\Delta Q_X}{\%\Delta P_Y} = \frac{P_Y}{Q_X}\frac{dQ_X}{dP_Y}$; at a specific point**

# Supply Elasticity

Price elasticity of supply $(E_S) =$

$$\frac{\%\ change\ in\ Quantity\ supplied}{\%\ change\ in\ Price} = \frac{(\frac{\Delta Q_S}{Q_S})}{(\frac{\Delta P}{P})} = \frac{P}{Q_S} \times \frac{\Delta Q_S}{\Delta P}$$

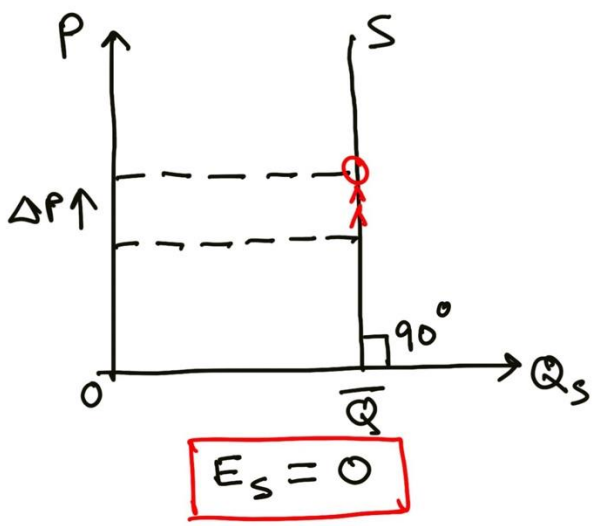
$E_S$ is always non-negative

- $E_S = 0$ ---- Perfectly inelastic
- $0 < E_S < 1$ ---- Inelastic
- $E_S = 1$ ---- Unit elastic
- $E_S > 1$ ---- Elastic
- $E_S = \infty$

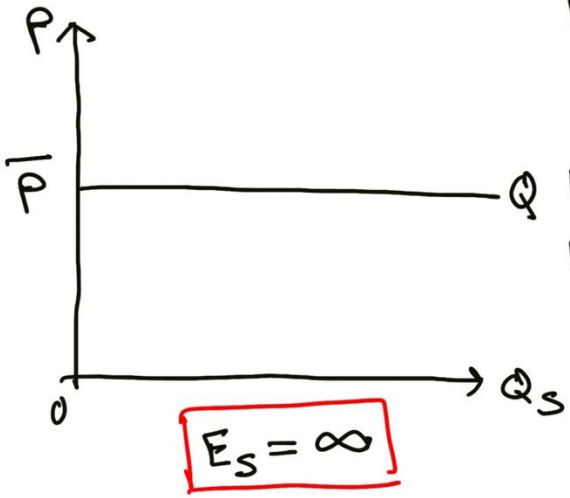
**Arc Elasticity =** $\dfrac{(Q_2 - Q_1) \Big/ [\frac{Q_2 + Q_1}{2}]}{(P_2 - P_1) \Big/ [\frac{P_2 + P_1}{2}]}$

Mid-point method or **Arc Elasticity is preferred when we want to see the impact of a large change in price.**
**Point Elasticity Method** is used when we want to check the impact of an infinitesimally small price change (**marginal change in price**).

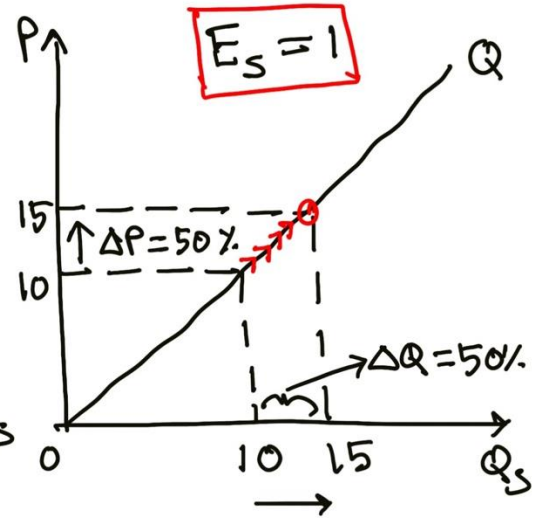
# Supply Elasticity: Examples



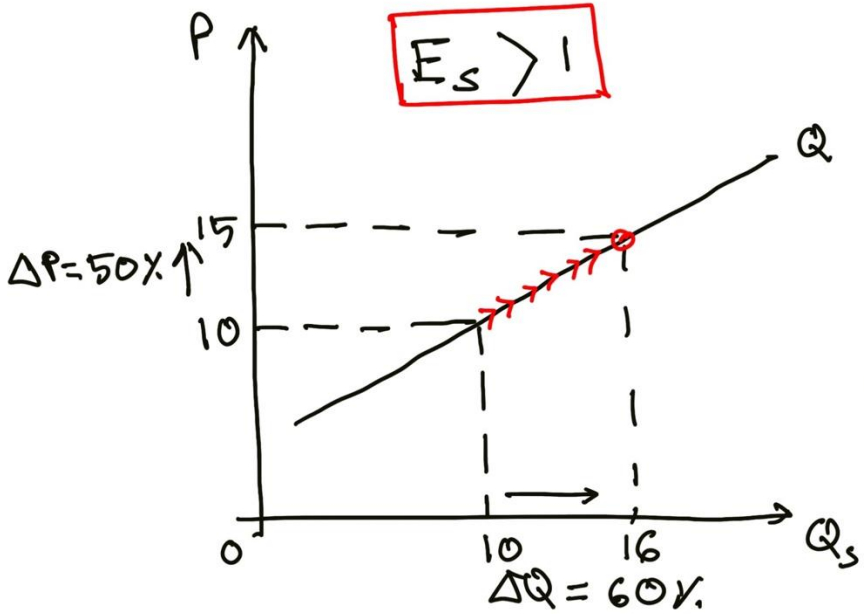

$E_s = 0$



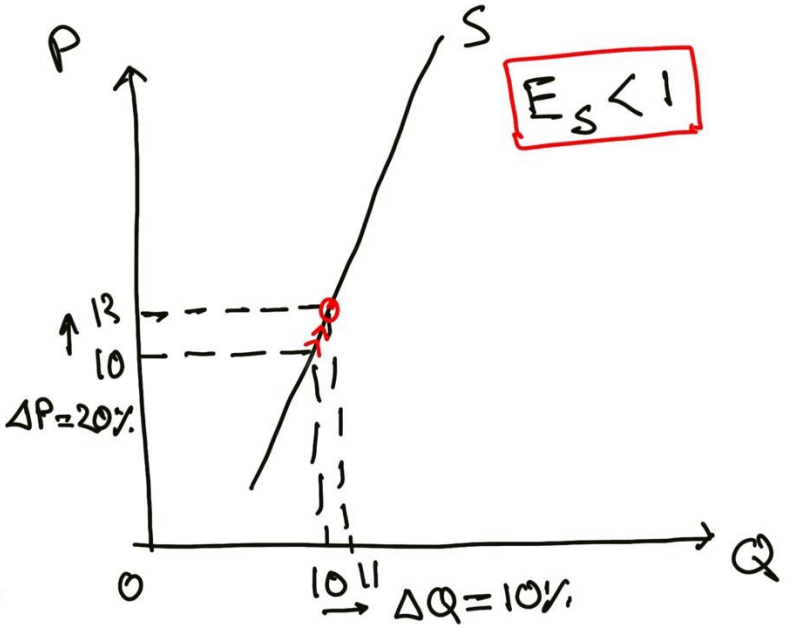

$E_s = \infty$




$E_s = 1$




$E_s > 1$




$E_s < 1$

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# Economics for Business - I

## Policy Implications: Price Controls and Taxation

# Policy Implications: Price Control, Taxation

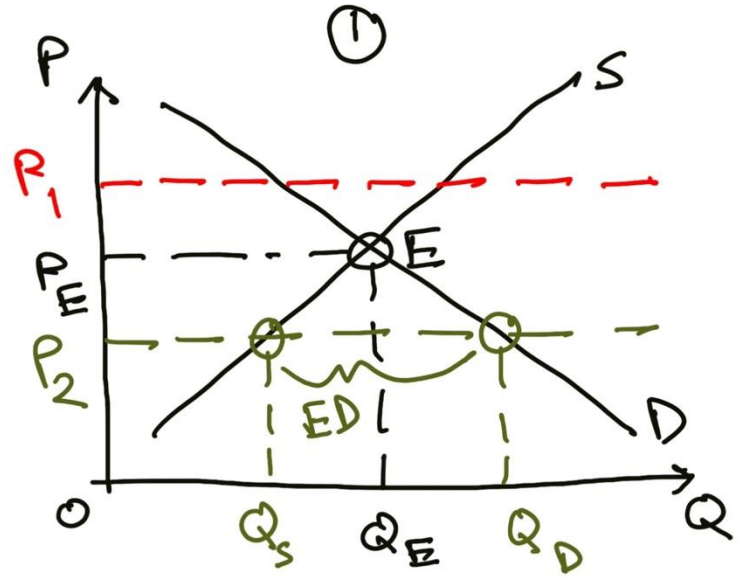
## Price Ceiling and Price Floor (set by authority or Government)

- **A price ceiling is an upper-bound** that is set on the price of a commodity
- **A price floor is a lower-bound** (minimum) of the price of a commodity
- Both of these can be binding or non-binding depending upon where these are fixed
- There is a possibility of excess supply or demand because of the price controls

## Impact of (Indirect) Taxation (on price)

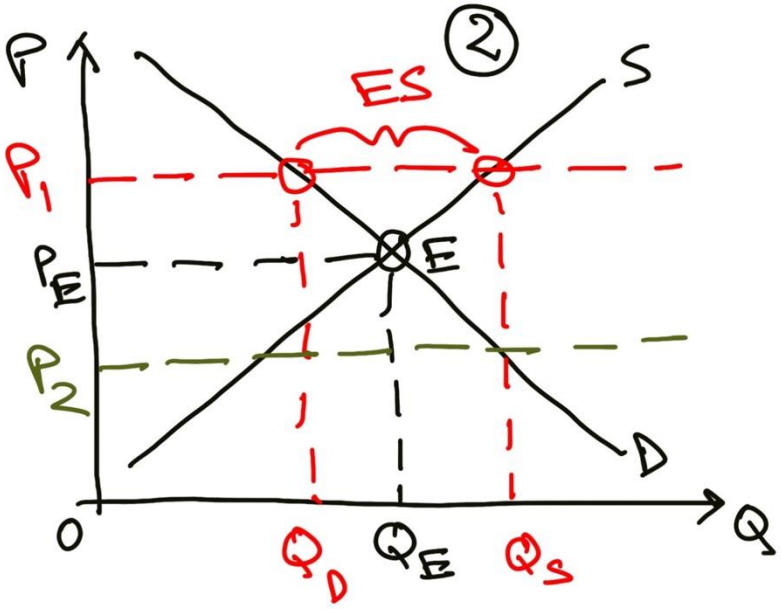
- Tax on the price of the commodity impacts both buyers and sellers
- Buyers pay more than the equilibrium price
- Sellers get less than the equilibrium price
- Quantity sold is lower than the equilibrium level

# Policy Implications: Price Controls




## Figure 1 (Price Ceiling)

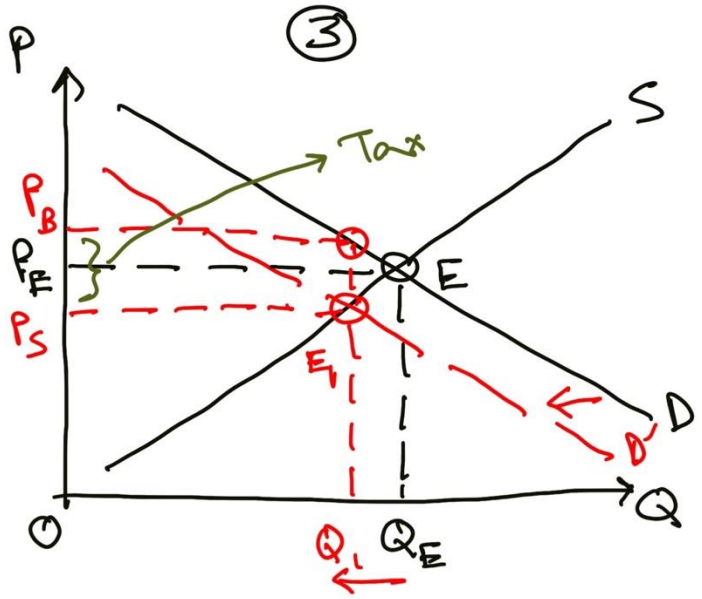
- Market **equilibrium at E**, corresponding price $P_E$
- A **price ceiling at $P_1$ is non-binding**
- A **price ceiling of $P_2$ is binding**, creating **excess demand** of $Q_DQ_S$
- Shortage of the good in market for price control at $P_2$




## Figure 2 (Price Floor)

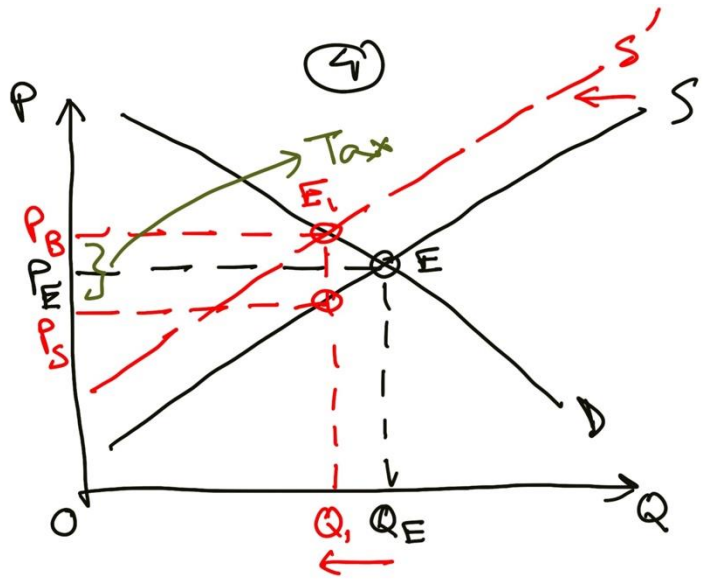
- Market **equilibrium at E**, corresponding price $P_E$
- A **price floor at $P_2$ is non-binding**
- A **price floor of $P_1$ is binding**, creating **excess supply** of $Q_SQ_D$
- Surplus of the good in market for price control at $P_2$

# Policy Implications: Taxation




## Figure 3 (tax on buyers)

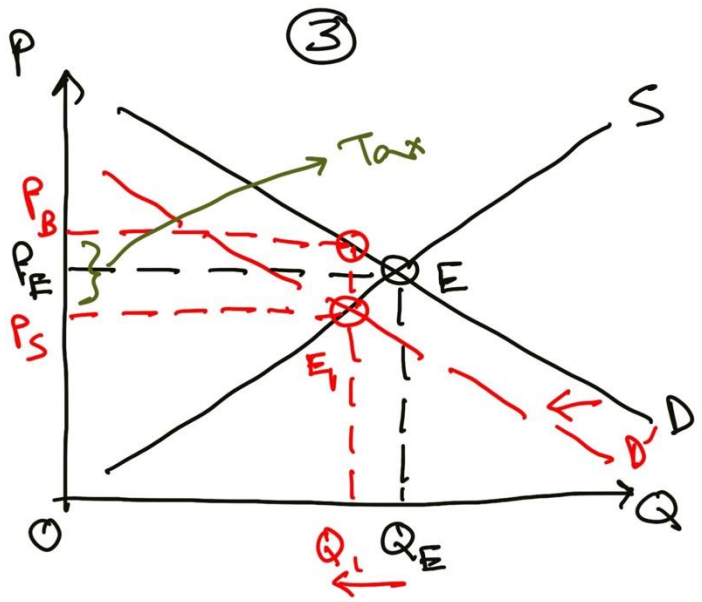
- Market **equilibrium at E**, corresponding price $P_E$
- Government imposes a tax $P_BP_S$
- **Left shift to the demand curve**
- Equilibrium shifts from E to $E_1$
- Quantity demanded reduces from $Q_E$ to $Q_1$
- Buyers pay $P_B$, sellers get $P_S$
- **Incidence of tax:** Buyers- $P_BP_E$; Sellers- $P_EP_S$

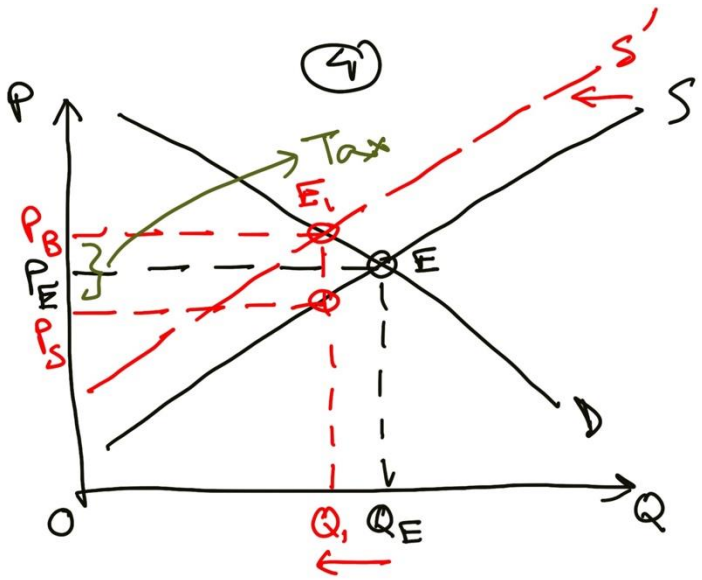



## Figure 4 (tax on sellers)

- Market **equilibrium at E**, corresponding price $P_E$
- Government imposes a tax $P_BP_S$
- **Left shift to the supply curve**
- Equilibrium shifts from E to $E_1$
- Quantity demanded reduces from $Q_E$ to $Q_1$
- Buyers pay $P_B$, sellers get $P_S$
- **Incidence of tax:** Buyers- $P_BP_E$; Sellers- $P_EP_S$

# Recap: Policy Implications



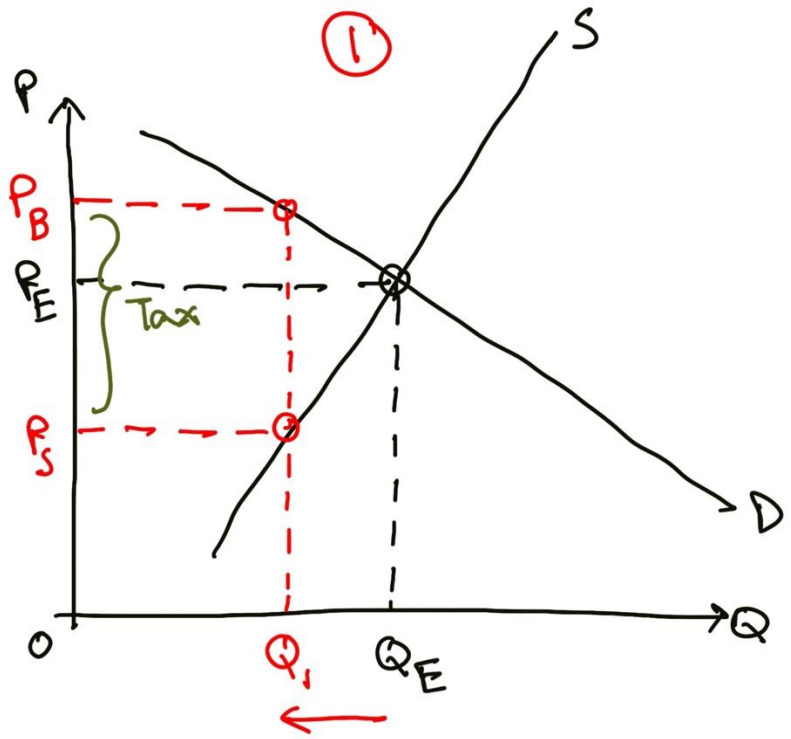

## Example: Figure 3 (tax on buyers)

- Market **equilibrium at E**, corresponding $P_E$=10 and $Q_E$ = 10
- Government imposes a tax, **t=5** on price
- Left shift to the demand curve **(But how much?)**
- Initial expenditure for buyers: $P_E$*$Q_E$ = 10*10 = 100 = M
- Expense due to tax = t*$Q_E$ = 5*10 = 50 = T
- To still consume $Q_E$, new price has to be $P_{new}$ = (M – T)/$Q_E$ = 5
- **Price has to be lower by tax amount, so vertical distance of the demand curve exactly matches the tax imposed**

## Example: Figure 4 (tax on sellers)

- Market **equilibrium at E**, corresponding $P_E$=10 and $Q_E$ = 10
- Government imposes a tax, **t=5** on price
- Left shift to the supply curve **(But how much?)**
- Initial revenue for sellers: $P_E$*$Q_E$ = 10*10 = 100 = R
- Revenue lost due to tax = t*$Q_E$ = 5*10 = 50 = T
- To still supply $Q_E$, new price has to be $P_{new}$ = (R+T)/$Q_E$ = 15
- **Price has to be higher by tax amount, so vertical distance of the supply curves match the tax imposed on sellers**

# Policy Implications: Tax Burden

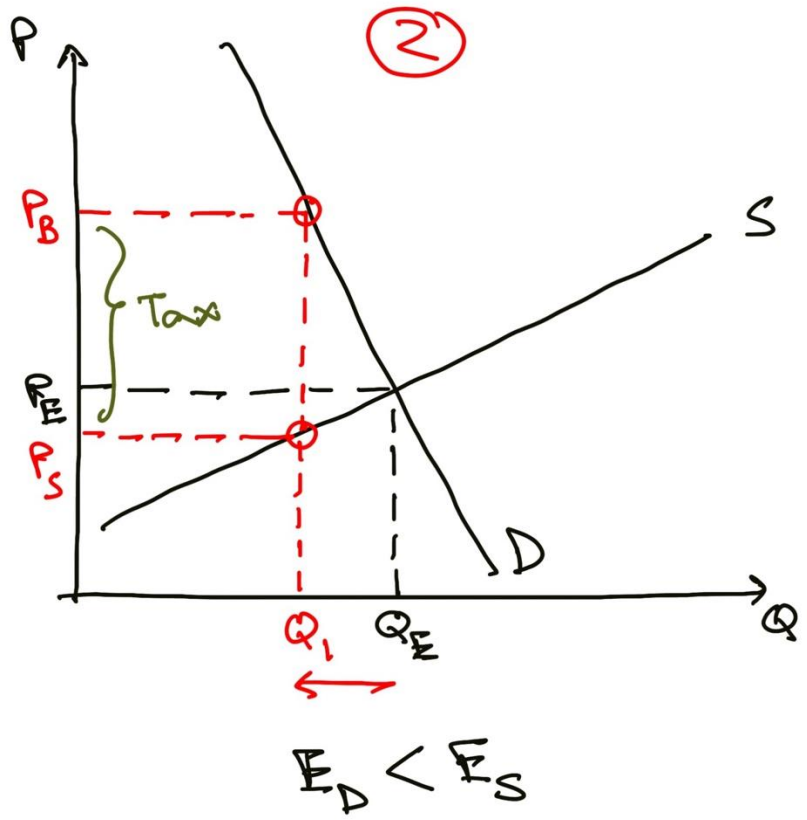



$E_D > E_S$

Tax = $P_B P_S$

Buyers' Pay = $P_E P_B$

Sellers' Pay = $P_E P_S$




$E_D < E_S$

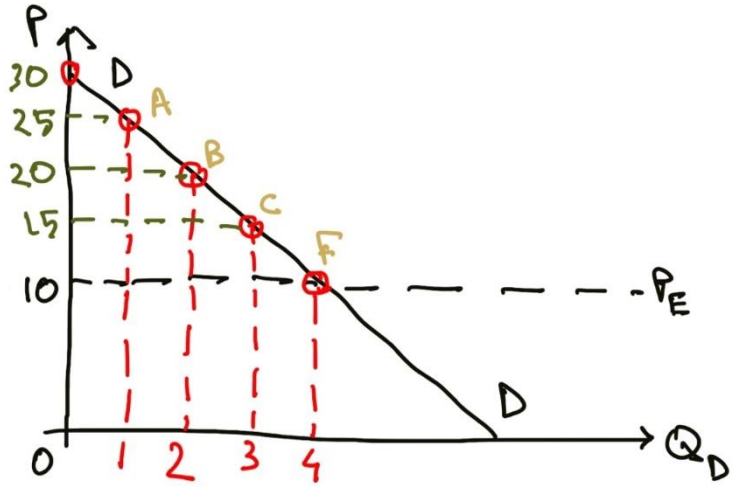
**Distribution of Tax Burden**

- When demand curve is relatively more elastic, sellers bear higher tax burden [**Figure 1**]
- When demand curve is relatively more inelastic, the buyers bear higher tax burden [**Figure 2**]

# Market Efficiency

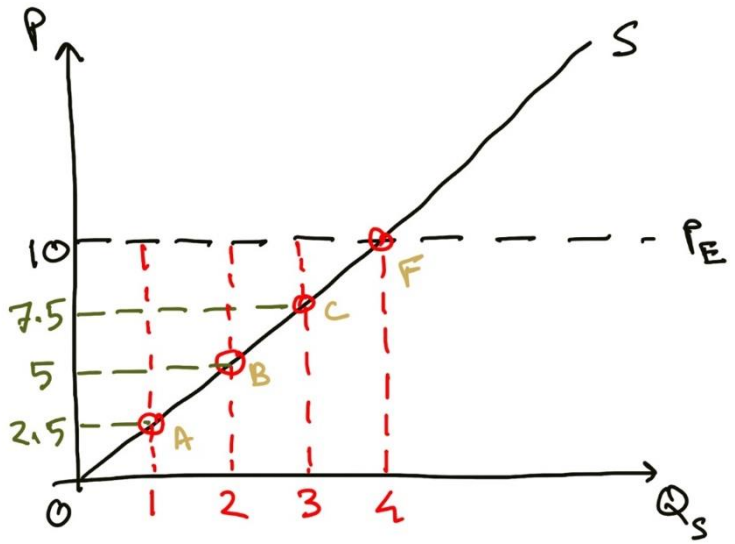
**Buyer's Willingness-to-pay (WTP)**

- At point A, you are willing to get 1 unit of the good paying 25→ Your willingness to pay (WTP)= 25
- For the next unit of the good (see point B), you are willing to pay 20→ Your willingness to pay (WTP)= 20
- For additional one unit of the good after the 3rd one (see point F), you are willing to pay 10→ Your willingness to pay (WTP)= 10
- Equilibrium price for all the goods you get = 10




**Cost to Producer**

- At point A, producer is willing to sell 1st unit at price 2.5 → cost to the producer = 2.5
- For next unit of the good (see point B), cost to producer = 5
- For additional one unit of the good after the 3rd unit (see point F), cost to producer = 10
- Equilibrium price for all the goods producer sells in the market = 10



# Market Efficiency

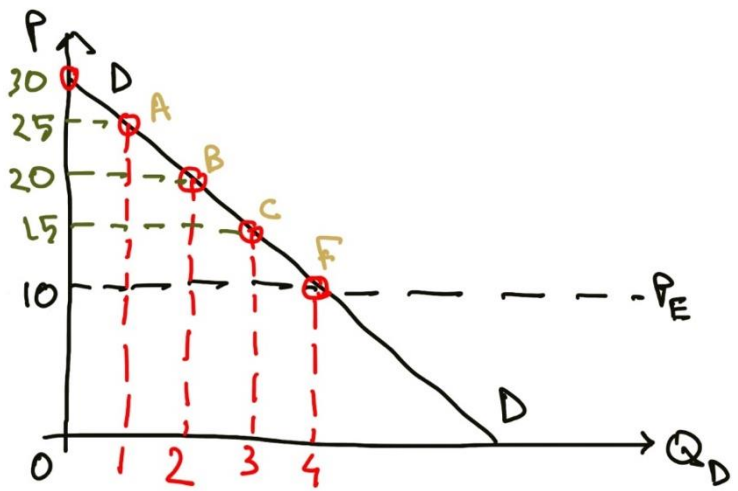
**Consumer Surplus (CS)**

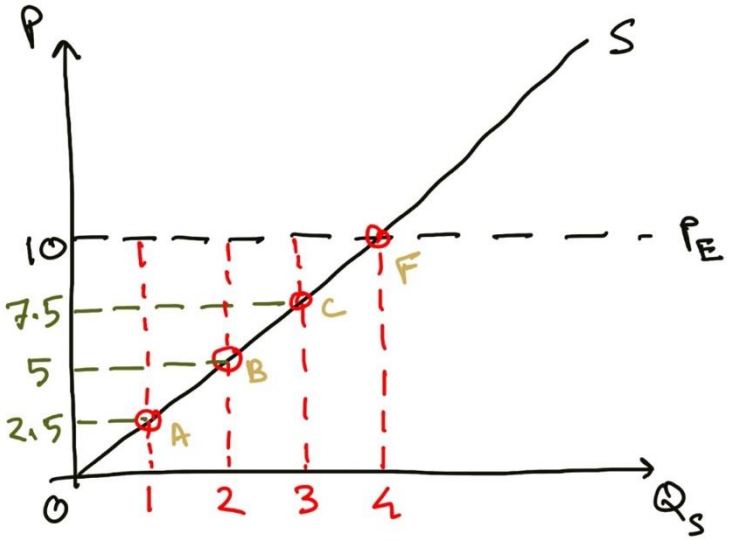
CS= (Buyer's willingness-to-pay) – (Actual amount paid)

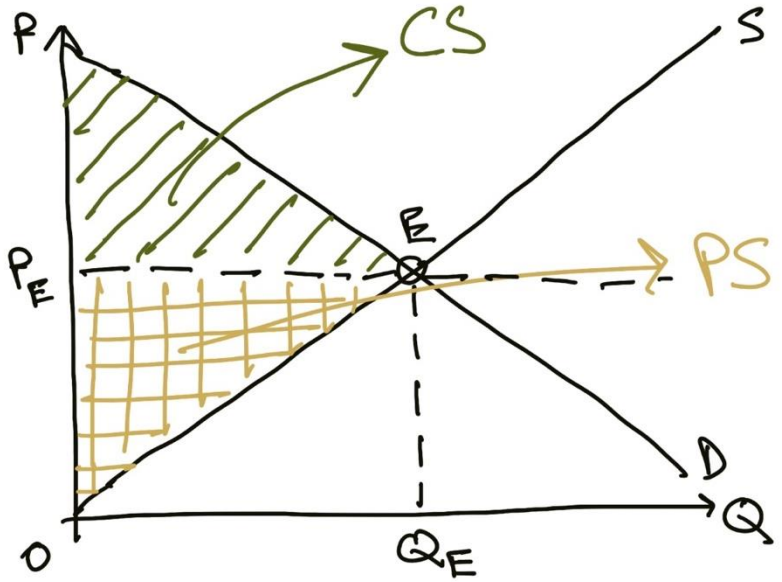
**Producer Surplus (PS)**

PS = (Actual amount paid to producer) – (Cost to producer)

**TOTAL SURPLUS = CS + PS**




**Market Efficiency**

If allocation of resources ensures that **TOTAL SURPLUS is maximised**