Engineering Economics

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Lecture 7
Elasticity of Demand and Supply

Elasticity of Demand and Supply

Income Elasticity of Demand

- The income elasticity of demand measures how the quantity demanded changes as consumer income changes.
- It is calculated as the percentage change in quantity demanded divided by the percentage change in income.
- $$\text{Income elasticity of demand} = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in income}}$$

$$= \frac{\frac{\Delta Q}{Q}}{\frac{\Delta Y}{Y}} = \frac{\Delta Q}{\Delta Y} X \frac{Y}{Q}$$

Where, Y = Consumer's Income, Q = Quantity Demanded.

Elasticity of Demand and Supply

- **Income Elasticity of Demand**
- In case of a normal goods, higher income raises the quantity demanded. As quantity demanded and income move in the same direction, normal goods have positive income elasticities.

- In case of an inferior goods, higher income lowers the quantity demanded. As quantity demanded and income move in opposite directions, inferior goods have negative income elasticities.

Elasticity of Demand and Supply

- **Income Elasticity of Demand**
- Example,

1. Calculate the income elasticity of demand and interpret the nature of the commodity.

Income [Y]	Quantity Demanded [Q]
70000	50
50000	70

2. Calculate the income elasticity of demand and interpret the nature of the commodity.

Income [Y]	Quantity Demanded [Q]
10000	75
15000	100

Elasticity of Demand and Supply

Cross Price Elasticity of Demand

- The cross price elasticity of demand measures how the quantity demanded of a commodity changes as price of the related commodity changes.

- It is calculated as the relative change in quantity demanded of a commodity [Say, X] divided by the relative change in the price of related commodity [Say, Y].

- Cross Price elasticity of demand = $\frac{\text{Relative change in quantity demanded of X}}{\text{Relative change in the price of Y}}$

$$= \frac{\frac{\Delta Q_X}{Q_X}}{\frac{\Delta P_Y}{P_Y}} = \frac{\Delta Q_X}{\Delta P_Y} * \frac{P_Y}{Q_X}$$

Where, P_Y = Price of Y, Q_X = Quantity Demanded of X.

Elasticity of Demand and Supply

- **Cross Price Elasticity of Demand**
- **In case of substitutes goods, higher prices of a commodity raises the quantity demanded of its related commodity. As quantity demanded of one good and price of substitute move in the same direction, substitute goods have positive cross price elasticities.**

- **In case of complementary goods, higher prices of a commodity falls the quantity demanded of its related commodity. As quantity demanded of one good and price of complementary good move in the opposite direction, complementary goods have negative cross price elasticities.**

Elasticity of Demand and Supply

- **Cross Price Elasticity of Demand**

1. Calculate the cross price elasticity of demand and interpret the nature of the commodity.

70	50
50	70

2. Calculate the income elasticity of demand and interpret the nature of the commodity.

10	75
15	100

Elasticity of Demand and Supply

The Price Elasticity of Supply

- The price elasticity of supply may be defined as the ratio of the relative change in quantity supplied to relative change in price.

- Price Elasticity of Supply, $\varepsilon^P = \dfrac{\textit{relative change in quantity supplied}}{\textit{relative change in price}}$

$$\varepsilon^P = \frac{\frac{\Delta Q}{Q}}{\frac{\Delta P}{P}}$$

$$\varepsilon^P = \frac{\Delta Q}{\Delta P} \text{ X } \frac{P}{Q}$$

Elasticity of Demand and Supply

- **The Price Elasticity of Supply**
- There are five types of price elasticity of supply. They are,

1. Relatively Elastic Supply
2. Relatively Inelastic Supply
3. Unitary Elastic Supply
4. Perfectly Elastic Supply
5. Perfectly Inelastic Supply

Elasticity of Demand and Supply

The Price Elasticity of Supply

1. *Relatively Elastic Supply*

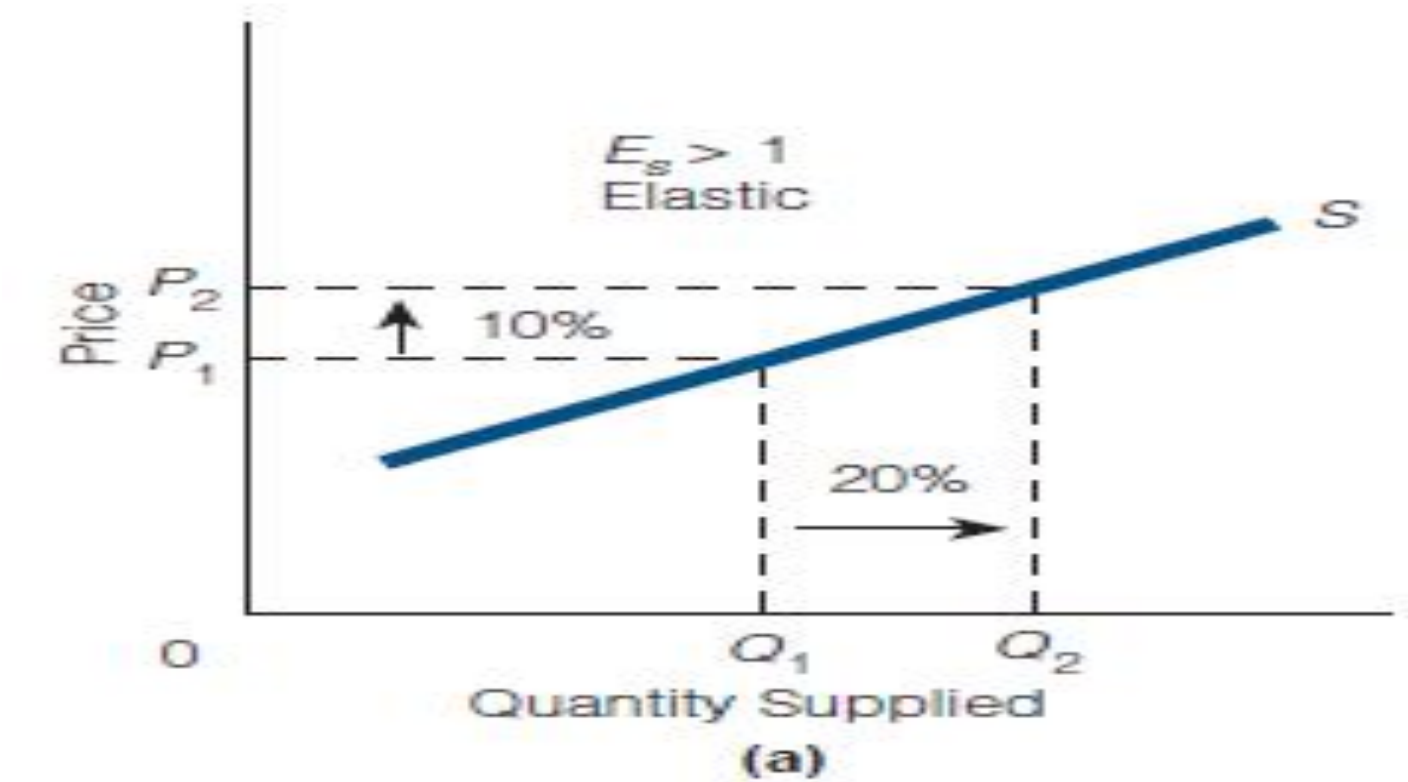
- When the relative change in quantity supply is more than the relative change in price, it is known as relatively elastic supply.

- In this case price elasticity of supply would be more than one ($\varepsilon^P > 1$).

Elasticity of Demand and Supply

- The Price Elasticity of Supply

1. *Relatively Elastic Supply*



Elasticity of Demand and Supply

The Price Elasticity of Supply

2. *Relatively Inelastic Supply*

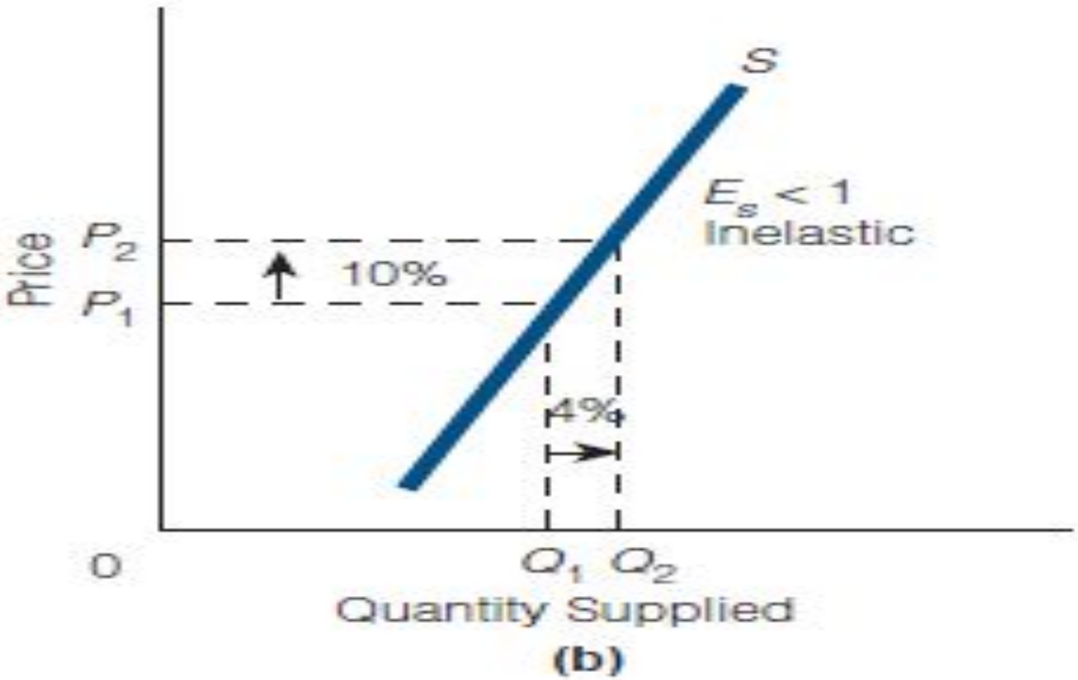
- When the relative change in quantity supply is less than the relative change in price, it is known as relatively inelastic supply.

- In this case price elasticity of supply would be less than one ($\varepsilon^P < 1$).

Elasticity of Demand and Supply

- **The Price Elasticity of Supply**

2. ***Relatively Inelastic Supply***



Elasticity of Demand and Supply

The Price Elasticity of Supply

3. *Unitary Elastic Supply*

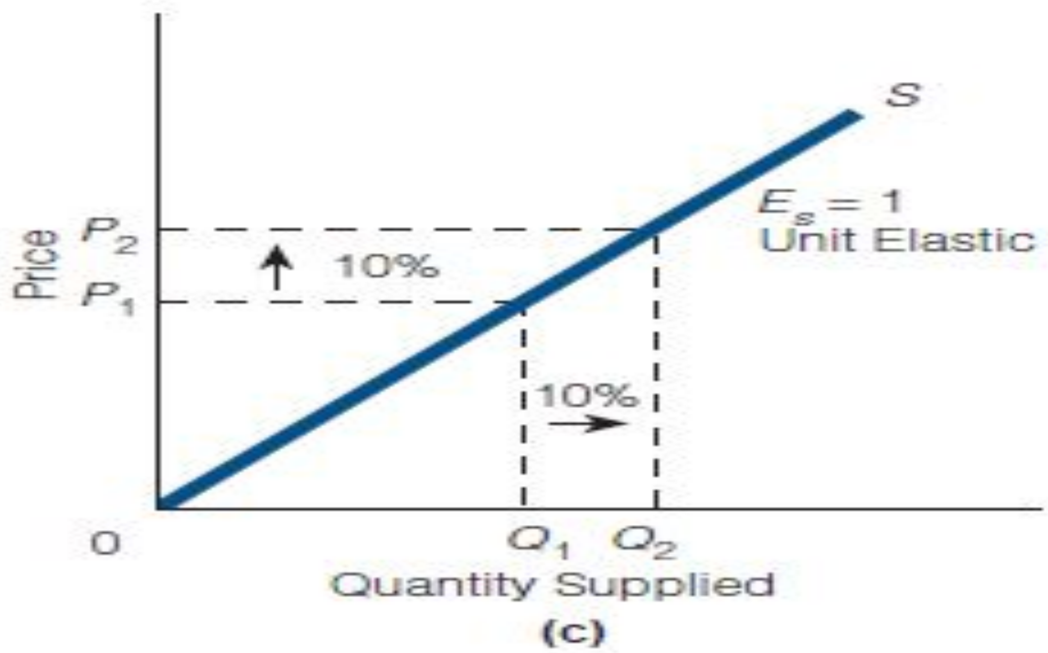
- When the relative change in quantity supply is exactly equal to the relative changes in price, it is known as unitary elastic supply.

- In this case price elasticity of supply would be equal to one ($\varepsilon^P = 1$).

Elasticity of Demand and Supply

- **The Price Elasticity of Supply**

3. *Unitary Elastic Supply*



Elasticity of Demand and Supply

The Price Elasticity of Supply

4. *Perfectly Elastic Supply*

- Perfectly elastic supply occurs as the price elasticity of supply approaches infinity and the supply curve becomes horizontal, reflecting the fact that very small changes in the price lead to huge changes in the quantity supplied.

- In this case price elasticity of supply would be equal to infinity ($\varepsilon^P = \infty$).

Elasticity of Demand and Supply

- The Price Elasticity of Supply

4. *Perfectly Elastic Supply*

Elasticity of Demand and Supply

The Price Elasticity of Supply

5. *Perfectly Inelastic Supply*

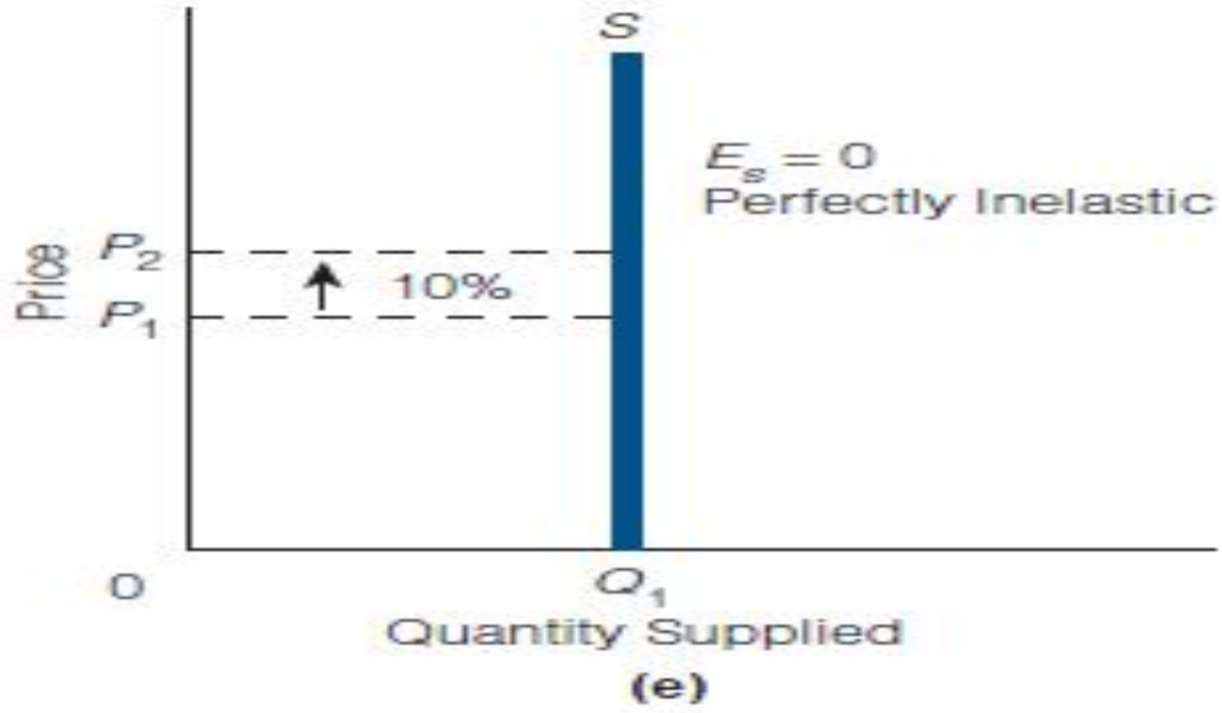
- When the price for a product changes – increases or decreases even when there is no change in quantity supply, it is known as perfect inelastic supply.

- In this case price elasticity of supply would be equal to zero ($\varepsilon^P = 0$).

Elasticity of Demand and Supply

- **The Price Elasticity of Supply**

5. *Perfectly Inelastic Supply*



Elasticity of Demand and Supply

- **Summary of the Four Elasticity Concepts**

EXHIBIT 9

Summary of the Four Elasticity Concepts

Type	Calculation	Possibilities	Terminology
Price elasticity of demand	$\frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in price}}$	$E_d \quad 1$ $E_d \quad 1$ $E_d = 1$ $E_d = \infty$ $E_d = 0$	Elastic Inelastic Unit elastic Perfectly elastic Perfectly inelastic
Cross elasticity of demand	$\frac{\text{Percentage change in quantity demanded of one good}}{\text{Percentage change in price of another good}}$	$E_c \quad 0$ $E_c \quad 0$	Complements Substitutes
Income elasticity of demand	$\frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in income}}$	$E_y \quad 0$ $E_y \quad 0$ $E_y \quad 1$ $E_y \quad 1$ $E_y = 1$	Normal good Inferior good Income elastic Income inelastic Income unit elastic
Price elasticity of supply	$\frac{\text{Percentage change in quantity supplied}}{\text{Percentage change in price}}$	$E_s \quad \vert 1$ $E_s \quad 1$ $E_s = 1$ $E_s = \infty$ $E_s = 0$	Elastic Inelastic Unit elastic Perfectly elastic Perfectly inelastic

Readings

- N. G. Mankiw- Principles of Microeconomics, 5th Edition, Chapter – 5.
- Roger A. Arnold- Microeconomics, 10th Edition, Chapter – 6.


ANY
QUESTIONS?

Thank You