

EE211

PRINCIPLES OF MICROECONOMICS

Topic 3:

Elasticity: Measure of Response

Topics

- Elasticity of demand
 - Price elasticity of demand
 - Income elasticity of demand
 - Cross-price elasticity of demand
- Elasticity of supply

Introduction

- A scenario...

Suppose you currently sell rice for 200 baht/bag, the price at which you can sell 50 bag per day.

Due to flood, the costs rise, and you wish to raise the price to 250 baht/bag.

But the law of demand says that the quantity demanded is lower at a higher price.

Question: How many bags of rice would you sell at a higher price? Would you revenue increase or decrease?

→ The answer depends on the price elasticity of demand.

Basic Idea about Elasticity

- **Elasticity** measures how much one variable responds to changes in another variable.

- Formula:

$$\text{Elasticity} = \frac{\text{Percentage Change in } Y}{\text{Percentage Change in } X}$$

$$\varepsilon = \frac{\% \Delta Y}{\% \Delta X} = \frac{\Delta Y / Y}{\Delta X / X}$$

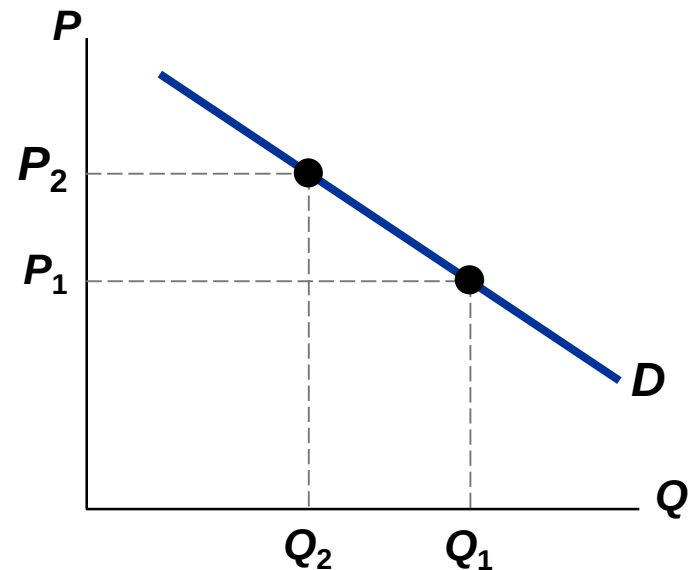
Price Elasticity of Demand

- **Price elasticity of demand** measures how much Q_d responds to a change in P .
 - I.e., it measures the price-sensitivity of buyers' demand.

$$\varepsilon_d = \frac{\% \Delta Q_d}{\% \Delta P}$$

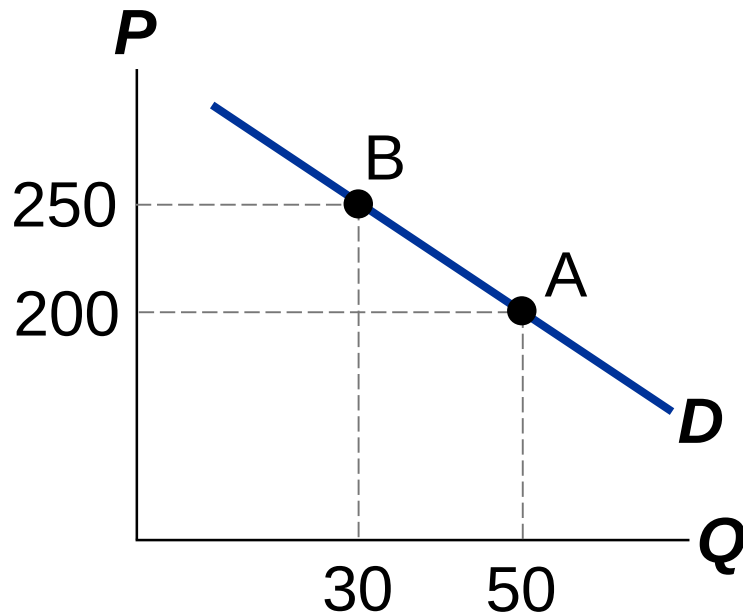
- Example:

Suppose P rises by 10%,
and Q falls by 15%.



Calculating Percentage Change (1)

Demand for rice



The Standard Method:

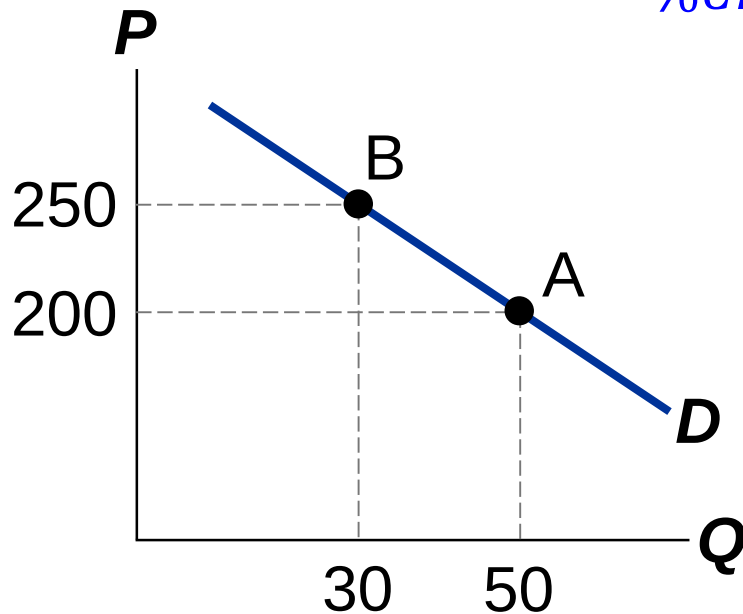
$$\%Change = \frac{\text{end value} - \text{start value}}{\text{start value}} \times 100\%$$

Problem:

The standard method gives different answers depending on where you start.

Calculating Percentage Change (2)

Demand for rice



The Midpoint Method:

$$\%Change = \frac{\text{end value} - \text{start value}}{\text{midpoint}} \times 100\%$$

Point Elasticity (Linear Demand Curve)

- $\varepsilon_d = \frac{\% \Delta Q_d}{\% \Delta P} = \frac{1}{\text{slope}} \times \frac{P}{Q_d}$
- Given $P = 40 - Q$, determine the price elasticities of demand when $P = 40, 20$, and 0 .

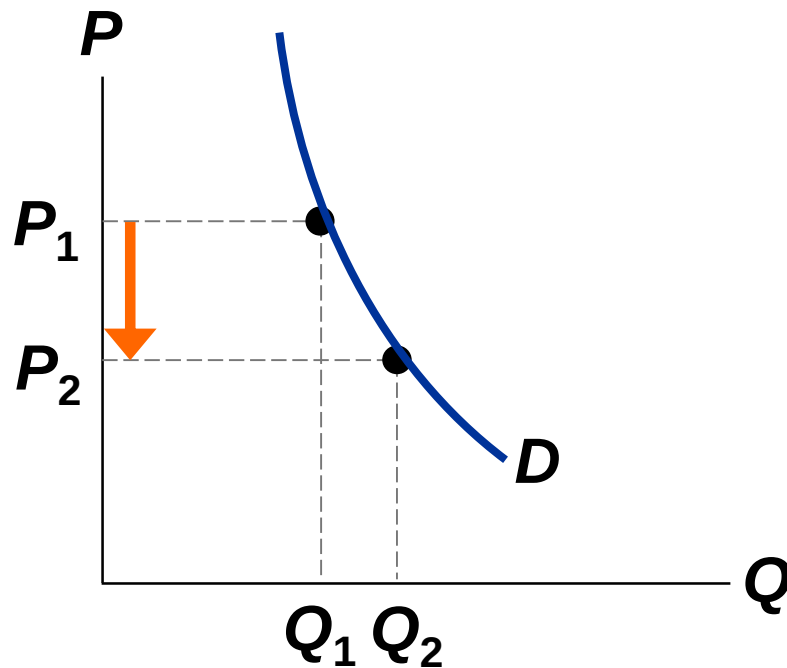
The slope of a linear demand curve is constant, but its elasticity is not.

The Variety of Demand Curves

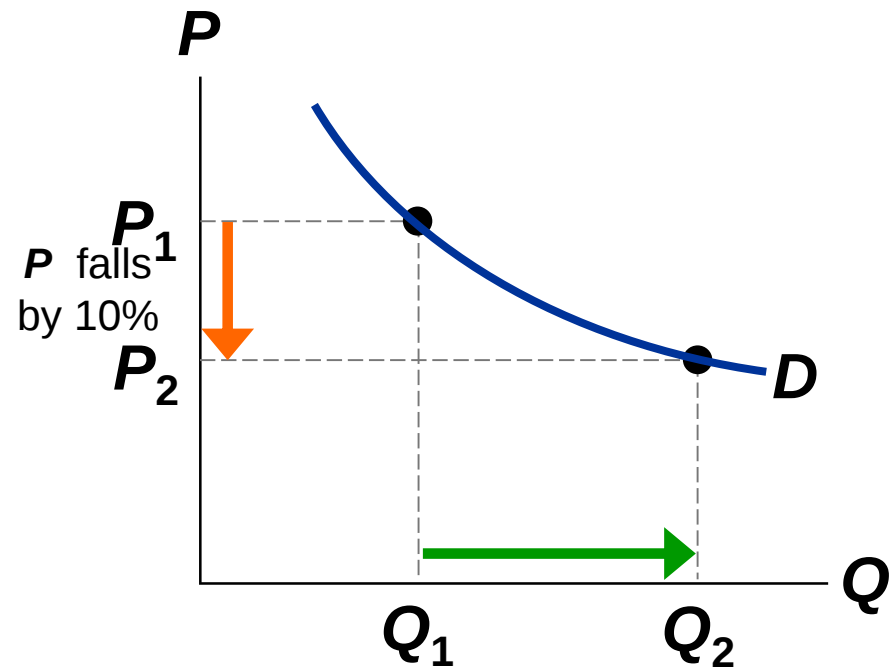
- The price elasticity of demand is closely related to the slope of the demand curve.
- Rule of thumb:
The flatter the curve, the bigger the elasticity.
The steeper the curve, the smaller the elasticity.
- Summary:
 - D is perfectly elastic if $\varepsilon_d = -\infty$ (i.e. $|\varepsilon_d| = \infty$).
 - D is elastic if $-\infty < \varepsilon_d < -1$ (i.e. $1 < |\varepsilon_d| < \infty$).
 - D is inelastic if $-1 < \varepsilon_d < 0$ (i.e. $0 < |\varepsilon_d| < 1$).
 - D is perfectly inelastic if $\varepsilon_d = 0$ (i.e. $|\varepsilon_d| = 0$).
 - D is unitary elastic if $\varepsilon_d = -1$ (i.e. $|\varepsilon_d| = 1$).

Elastic & Inelastic Demand

- Inelastic demand

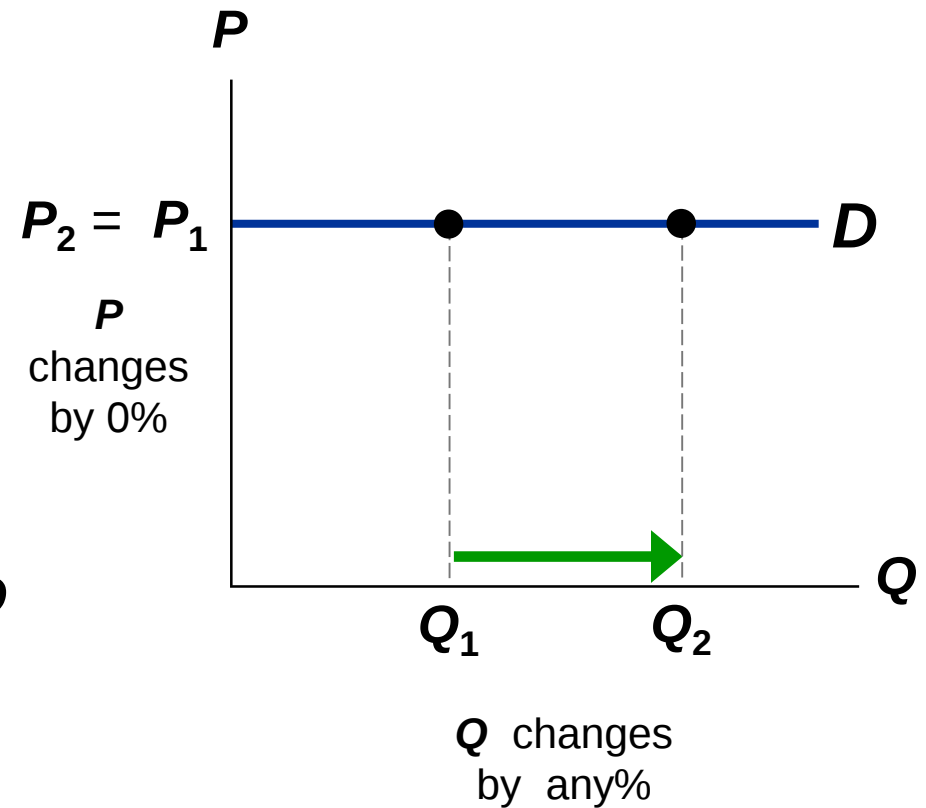
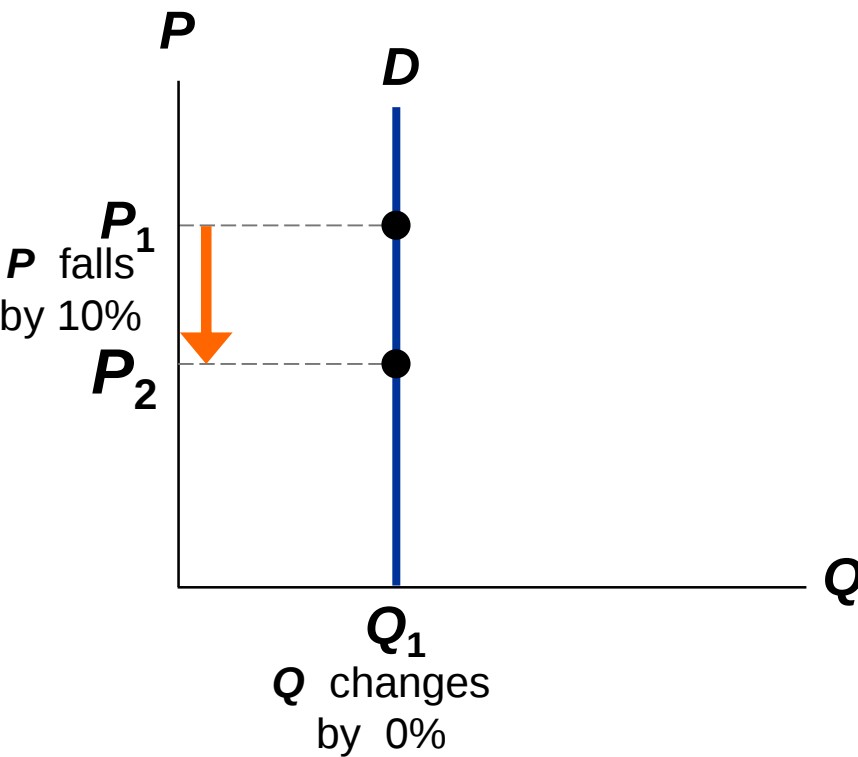


- Elastic demand

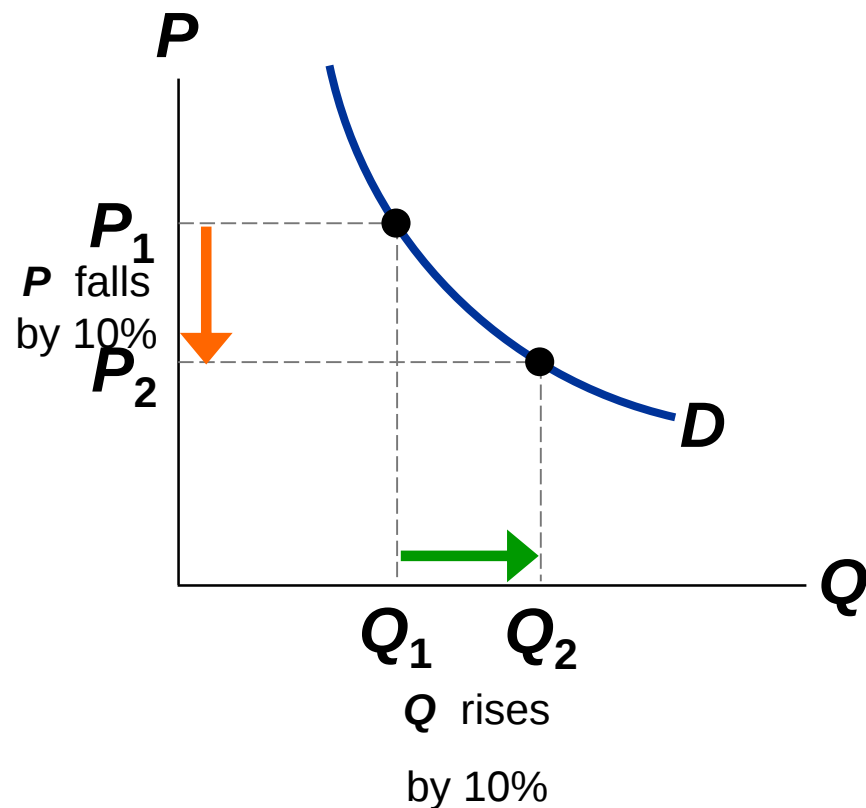


Extreme Cases

- Perfectly Inelastic Demand
- Perfectly Elastic Demand



Unitary Elastic Demand

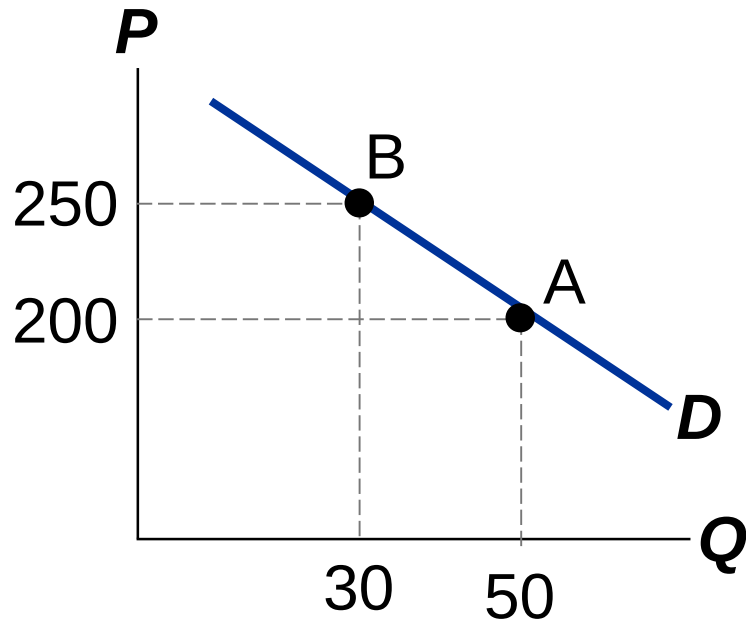


- The price elasticity of demand is constant along the demand curve, and it is equal to 1.

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Price Elasticity and Total Revenue (1)

Demand for rice



- $TR = P \times Q$

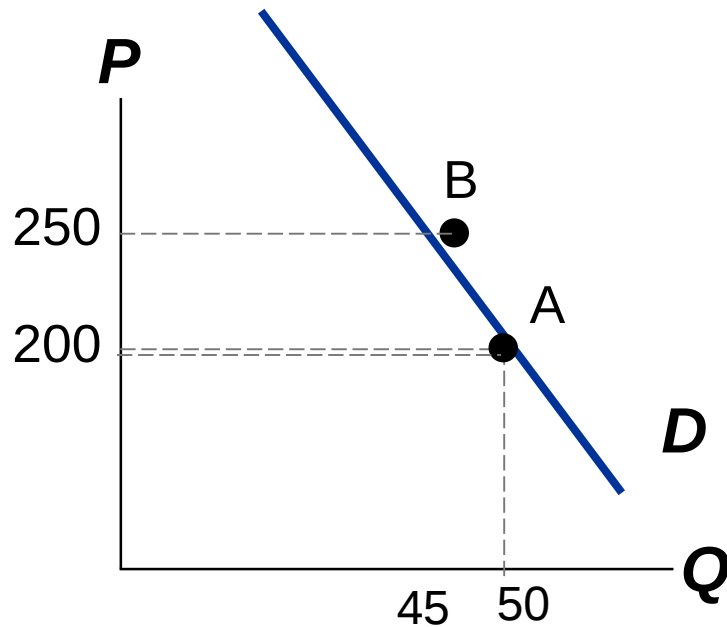
- $\epsilon_d = \frac{\% \Delta Q_d}{\% \Delta P}$

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When **D** is elastic, a price increase causes revenue to fall.

Price Elasticity and Total Revenue (2)

Demand for rice



- $TR = P \times Q$

- $\epsilon_d = \frac{\% \Delta Q_d}{\% \Delta P}$

-

When D is inelastic, a price increase causes revenue to rise.

Determinants of Price Elasticity of Demand

- Definition of the good
- Availability of close substitutes
- Whether the good is a necessity or a luxury
- The time horizon: short run and long run

Other Elasticities of Demand

- In addition to its own price, quantity demanded is determined by income and price of other products.

- Income elasticity of demand

$$\varepsilon_I = \frac{\% \Delta Q_d}{\% \Delta I}$$

- Cross-price elasticity of demand for X (with respect to change in price of Y).

$$\varepsilon_{XY} = \frac{\% \Delta Q_X}{\% \Delta P_Y}$$

Income Elasticity of Demand

- **Income elasticity of demand** measures how much Q_d responds to a change in **income**: $\varepsilon_I = \frac{\% \Delta Q_d}{\% \Delta I}$.
- $\varepsilon_I \geq 0 \rightarrow$ Normal goods
 - $0 \leq \varepsilon_I \leq 1 \rightarrow$
 - $1 < \varepsilon_I \leq \infty \rightarrow$
- $\varepsilon_I < 0 \rightarrow$ Inferior goods

Example

- Suppose when the average income increases from \$28,000 to \$32,000, the quantity demanded at a given price P_0 rises from 60 to 80 units. What is the income elasticity of demand?

Cross-Price Elasticity of Demand

- **Cross-price elasticity of demand** measures how much Q_d responds to a change in *price of other goods*:

$$\varepsilon_{XY} = \frac{\% \Delta Q_X}{\% \Delta P_Y}.$$

- $\varepsilon_{XY} < 0 \rightarrow$
- $\varepsilon_{XY} > 0 \rightarrow$

Example

- Suppose the quantity demanded for good X increases from 100 units to 120 units when the per price of good Y drops from 80 baht to 75 baht. Determine the cross-price elasticity of the demand for good X with respect to the price of good Y.

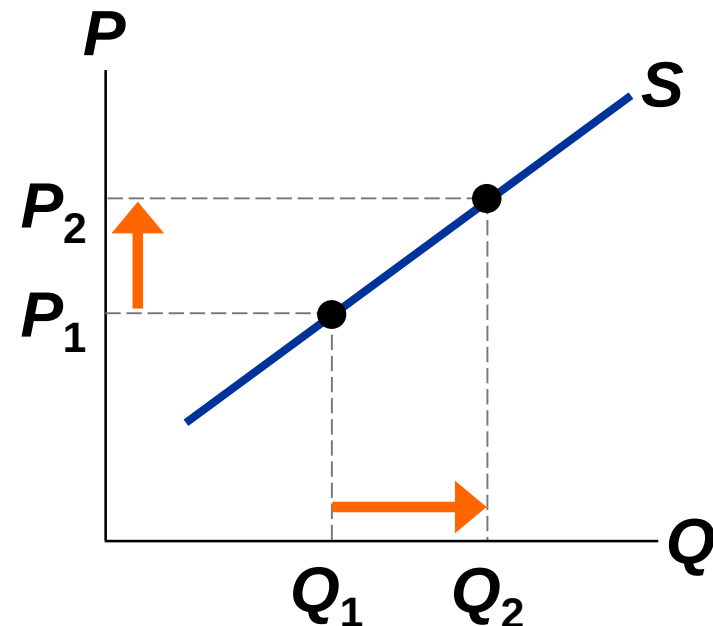
Price Elasticity of Supply

- **Price elasticity of supply** measures how much Q_s responds to a change in P .
 - I.e., it measures the price-sensitivity of **sellers' supply**.

$$\varepsilon_s = \frac{\% \Delta Q_s}{\% \Delta P}$$

- Example:

Suppose P rises by 8%,
and Q increases by 16%.

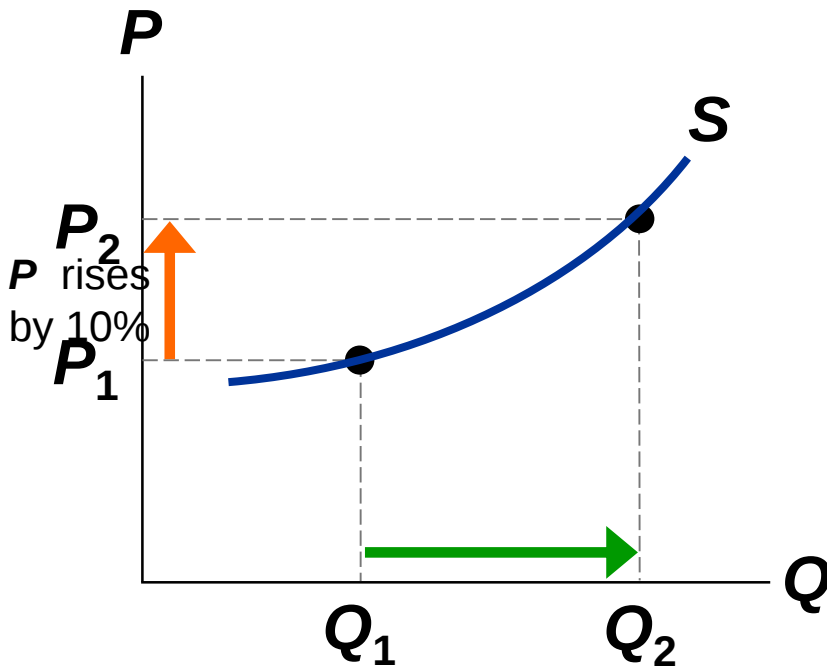


The Variety of Supply Curves

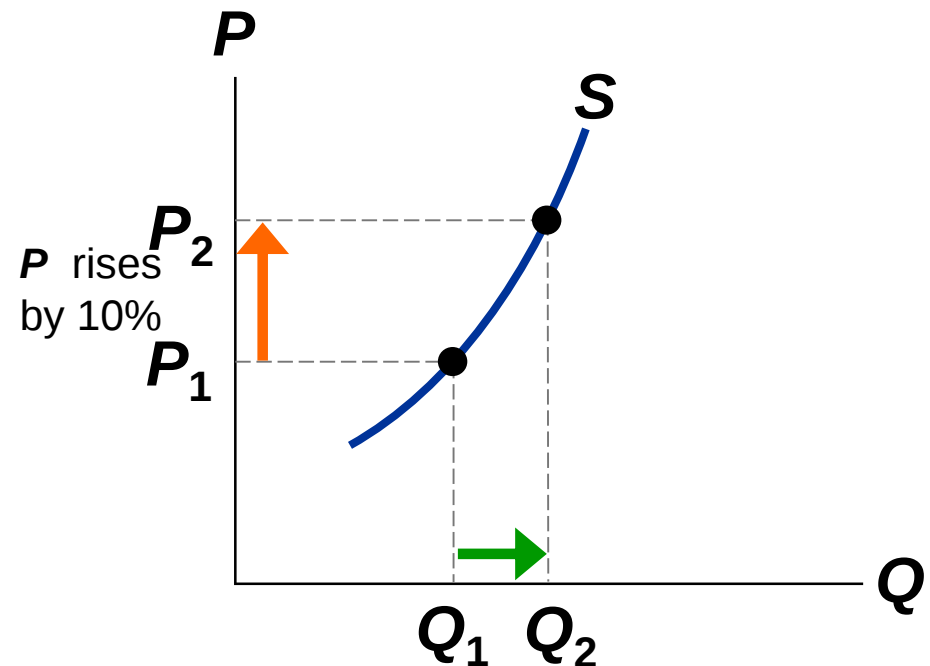
- Rule of thumb:
The flatter the curve, the bigger the elasticity.
The steeper the curve, the smaller the elasticity.
- Summary:
 - S is perfectly elastic if $\varepsilon_s = \infty$.
 - S is elastic if $\varepsilon_s > 1$.
 - S is inelastic if $\varepsilon_s < 1$.
 - S is perfectly inelastic if $\varepsilon_s = 0$.

Elastic & Inelastic Supply

- Elastic Supply

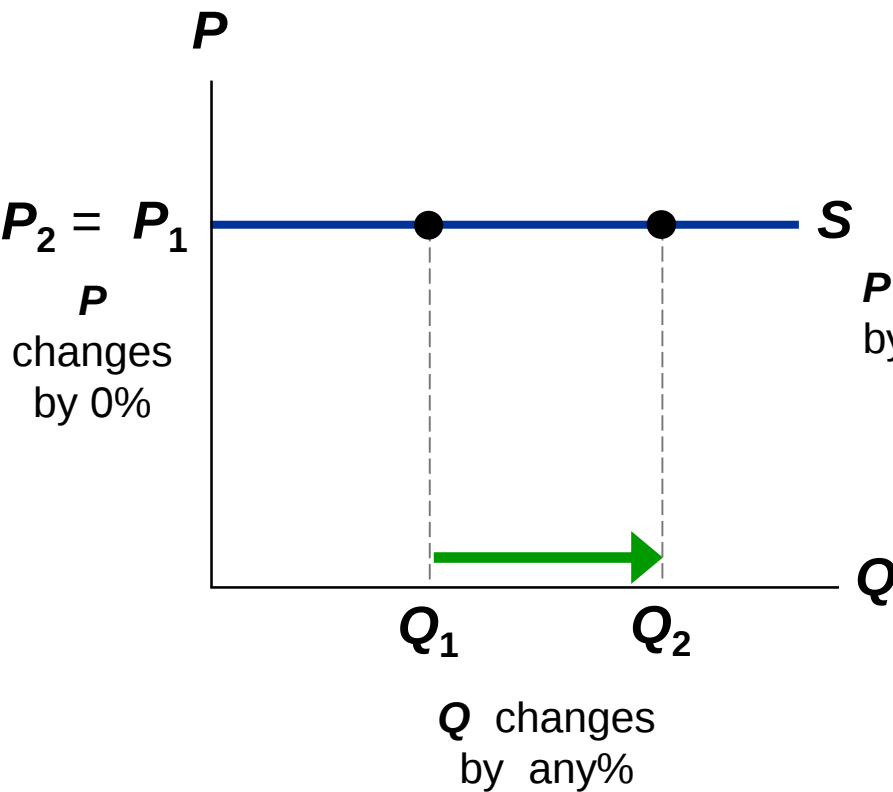


- Inelastic Supply

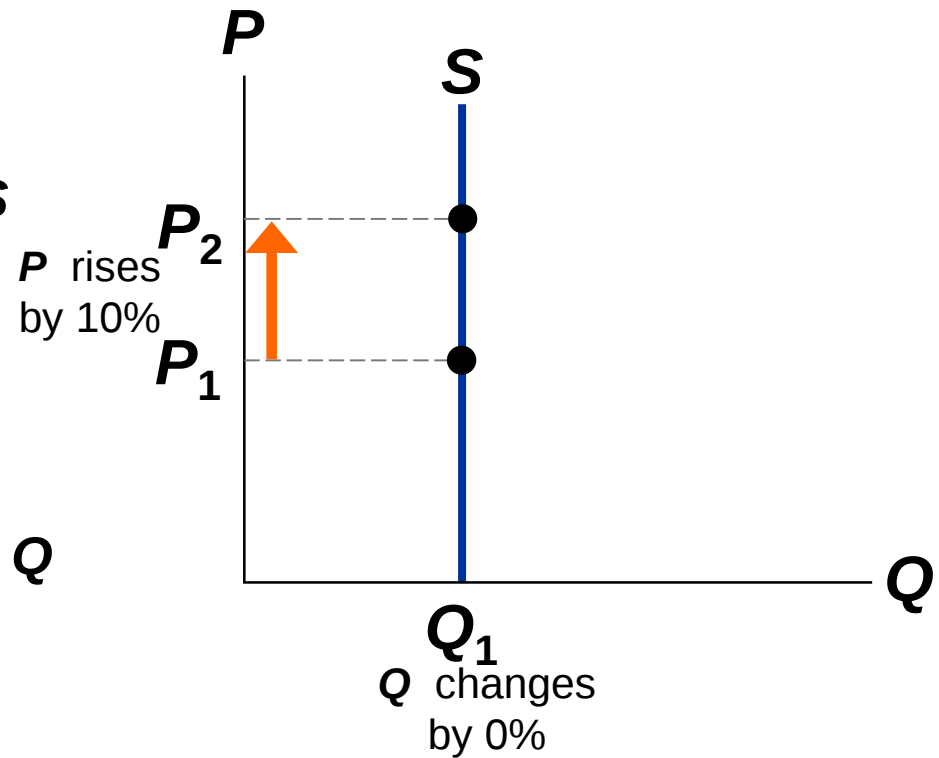


Extreme Cases

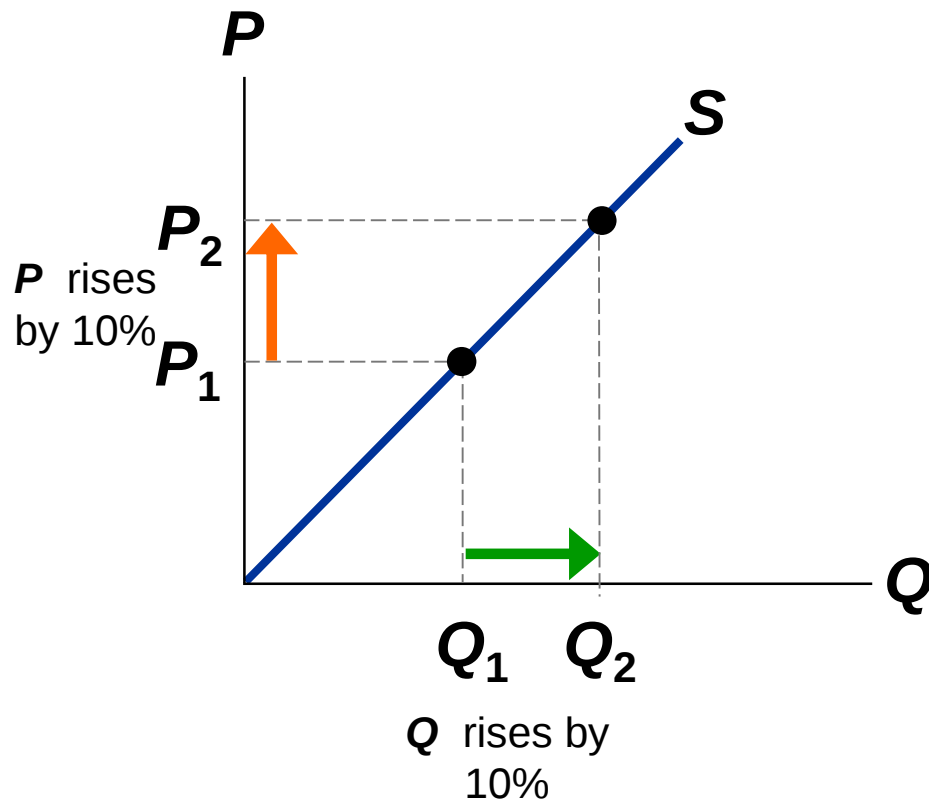
- Perfectly elastic supply



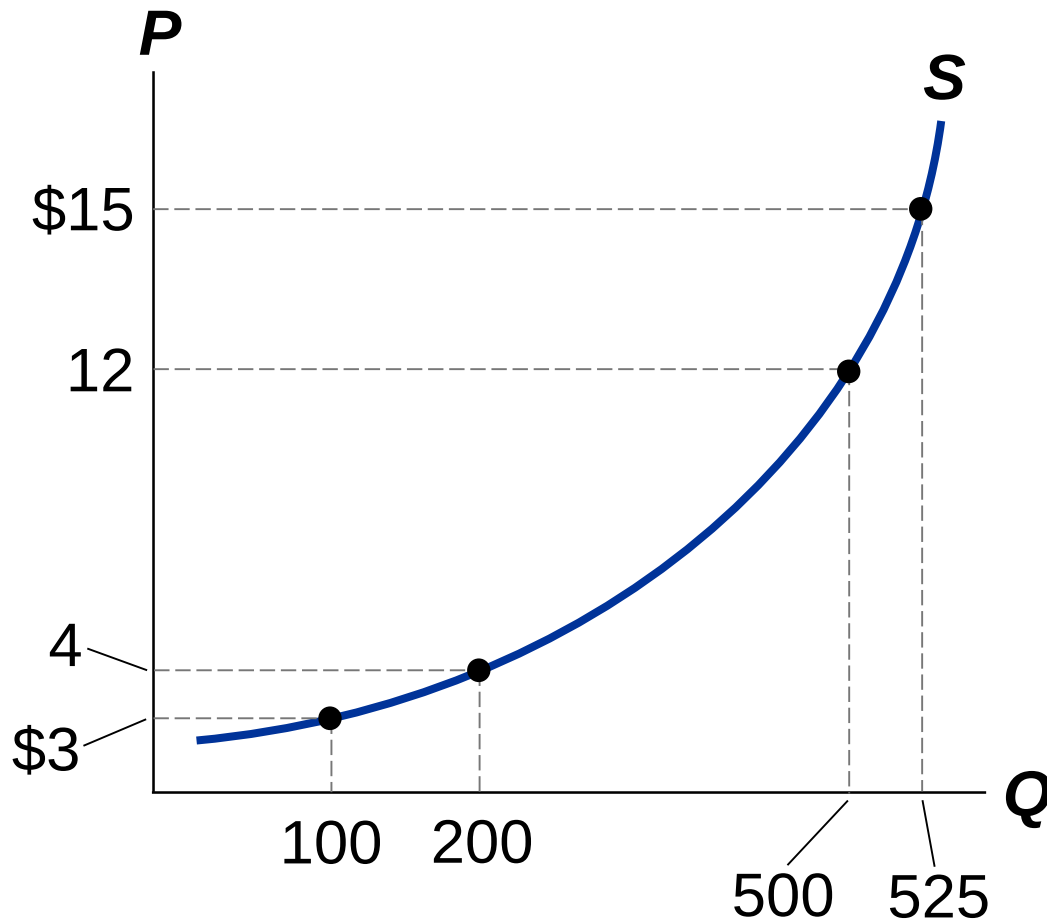
- Perfectly inelastic supply



Unitary Elastic Supply



How the Price Elasticity of Supply Can Vary



Determinants of Price Elasticity of Supply

- Substitution and production costs.
 - The more easily sellers can change the quantity they produce, the greater the price elasticity of supply.
- The time horizon: Short run and long run