

Elasticity of Demand and Supply

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Elasticity measures how responsive one variable is to a change in another. Knowing whether demand or supply is elastic or inelastic tells you what actually happens to price, quantity, and revenue when conditions change.

Price Elasticity of Demand (PED)

Price elasticity of demand measures how responsive the quantity demanded of a good is to a change in its own price, holding all other factors constant.

$$PED = \frac{\% \Delta Q_D}{\% \Delta P}$$

The coefficient is always negative (price and quantity move in opposite directions), but the negative sign is conventionally dropped and the absolute value is used.

Types of PED

| Value | Name | Meaning |
|---------|---------------------|--|
| PED > 1 | Elastic | Quantity demanded changes by a larger percentage than price |
| PED = 1 | Unitary elastic | Quantity demanded changes by the same percentage as price |
| PED < 1 | Inelastic | Quantity demanded changes by a smaller percentage than price |
| PED = 0 | Perfectly inelastic | Quantity demanded does not change at all when price changes |
| PED = ∞ | Perfectly elastic | Any price rise causes quantity demanded to fall to zero |

Example

The price of phone cards rises from **120** to 130 and quantity demanded falls from 10 to 8 units.

Step 1: % change in Qd

$$\frac{8 - 10}{10} \times 100 = -20\%$$

Step 2: % change in P

$$\frac{130 - 120}{120} \times 100 = 8.33\%$$

Step 3: PED

$$\text{PED} = \frac{-20\%}{8.33\%} = -2.4 \Rightarrow |\text{PED}| = 2.4$$

Since $2.4 > 1$, demand is **elastic**. A 1% price rise causes a 2.4% fall in quantity demanded.

Exam Tip

Always show the three steps: calculate % change in Qd, % change in P, then divide. Do not round intermediate values. State your interpretation (elastic, inelastic, or unitary) and confirm whether the value is above or below 1.

Determinants of PED

| Factor | More elastic when... | More inelastic when... |
|-----------------------------|--|--|
| Availability of substitutes | Many close substitutes exist | Few or no substitutes available |
| Necessity vs luxury | It is a luxury (can go without) | It is a necessity (must have) |
| Proportion of income spent | Large share of income (price matters more) | Small share of income (price is not noticed) |
| Time period | Given more time, consumers find alternatives | In the short run, habits are hard to change |
| Definition of market | Narrowly defined (e.g. "Pepsi") | Broadly defined (e.g. "drinks") |

PED and Total Revenue

| Demand type | Price rises | Price falls |
|---------------------------|-------------------------|-------------------------|
| Elastic (PED > 1) | Total revenue falls | Total revenue rises |
| Inelastic (PED < 1) | Total revenue rises | Total revenue falls |
| Unitary elastic (PED = 1) | Total revenue unchanged | Total revenue unchanged |

This relationship matters for pricing decisions. A firm selling an inelastic product (like fuel or medicine) can raise prices without losing much revenue. A firm selling an elastic product risks large revenue losses if it raises prices.

Income Elasticity of Demand (YED)

Income elasticity of demand measures how responsive the quantity demanded of a good is to a change in consumer income.

$$YED = \frac{\% \Delta Q_D}{\% \Delta Y}$$

where Y denotes income.

Interpreting YED

| YED value | Interpretation |
|-------------|--|
| YED > 0 | Normal good — demand rises as income rises |
| YED > 1 | Luxury good — demand rises proportionally more than income |
| 0 < YED < 1 | Necessity — demand rises but less than proportionally |
| YED < 0 | Inferior good — demand falls as income rises |

Example

When income rises by 10%, the demand for restaurant meals rises by 15%.

$$YED = \frac{15\%}{10\%} = 1.5$$

$YED = 1.5 > 1$ 'restaurant meals are a **luxury** good.

When income rises by 10%, demand for a cheap instant noodle brand falls by 5%.

$$YED = \frac{-5\%}{10\%} = -0.5$$

$YED = -0.5 < 0$ 'the noodle brand is an **inferior** good.

Cross-Price Elasticity of Demand (XED)

Cross-price elasticity of demand measures how responsive the quantity demanded of good A is to a change in the price of good B.

$$XED = \frac{\% \Delta Q_{D_A}}{\% \Delta P_B}$$

Interpreting XED

| XED value | Interpretation |
|----------------------|---|
| $XED > 0$ (positive) | Substitutes — goods that can replace each other |
| $XED < 0$ (negative) | Complements — goods used together |
| $XED = 0$ | Unrelated goods |

Example

The price of Pepsi rises by 10% and the quantity demanded of Coca-Cola rises by 6%.

$$XED = \frac{6\%}{10\%} = 0.6$$

XED = +0.6 'Pepsi and Coca-Cola are **substitutes**.

The price of cars rises by 20% and the quantity demanded of car insurance falls by 12%.

$$XED = \frac{-12\%}{20\%} = -0.6$$

XED = -0.6 'cars and car insurance are **complements**.

Price Elasticity of Supply (PES)

Price elasticity of supply measures how responsive the quantity supplied of a good is to a change in its own price.

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

PES is always positive because price and quantity supplied move in the same direction (law of supply).

Types of PES

| Value | Name | Meaning |
|---------|----------------------------|--|
| PES > 1 | Elastic supply | Quantity supplied changes by a larger percentage than price |
| PES < 1 | Inelastic supply | Quantity supplied changes by a smaller percentage than price |
| PES = 1 | Unitary elastic supply | Equal percentage changes |
| PES = 0 | Perfectly inelastic supply | Quantity supplied is fixed regardless of price |
| PES = ∞ | Perfectly elastic supply | Producers supply any amount at the current price |

Determinants of PES

| Factor | More elastic supply when... | More inelastic supply when... |
|---------------------|--|---|
| Time available | Long run — firms can expand capacity | Short run — fixed factors constrain output |
| Mobility of factors | Factors move easily between uses | Factors are specialised and immobile |
| Spare capacity | Firms have idle resources ready to use | All capacity is already used |
| Perishability | Goods can be stored and released | Goods are perishable — production timing is rigid |
| Production period | Short production cycle | Long growing or production season |

Remember

Time is the most important determinant of price elasticity of supply. In the very short run (market period), supply is perfectly inelastic — the amount available is fixed regardless of price. In the short run, firms can produce more using existing capacity. In the long run, all inputs are variable and supply becomes more elastic as firms can build new factories or enter the industry.

Example

The price of a good rises from **50** to 60 and quantity supplied rises from 200 to 260 units.

Step 1: % change in Qs

$$\frac{260 - 200}{200} \times 100 = 30\%$$

Step 2: % change in P

$$\frac{60 - 50}{50} \times 100 = 20\%$$

Step 3: PES

$$\text{PES} = \frac{30\%}{20\%} = 1.5$$

PES = 1.5 > 1 'supply is **elastic**.