

3.3.1 Revenue

Formulae

Total revenue = price $\times$ quantity sold

Average revenue (AR) is the revenue received per unit sold $\rightarrow$ Average revenue = total revenue $\div$ quantity

Since $TR = P \times Q$:

$$AR = (P \times Q) \div Q = P$$

Therefore, average revenue is the same as the price of the product (Hence why we label our demand curve $D=AR$ on cost/rev diagrams)

Marginal revenue (MR) is the change in total revenue from selling one additional unit .

$$MR = \text{change in total revenue} \div \text{change in quantity}$$

Revenue for a Price-Taking Firm

A price-taking firm accepts the market price as given. Changing the quantity it produces does not affect the market price.

This is most likely to occur in **perfect competition**, where:

- There are many firms.
- Products are identical.
- Individual firms have very little market power.
- Demand for an individual firm's product is perfectly price elastic.

The firm cannot charge a higher price because consumers would buy from another firm. Every unit is therefore sold at the same market price.

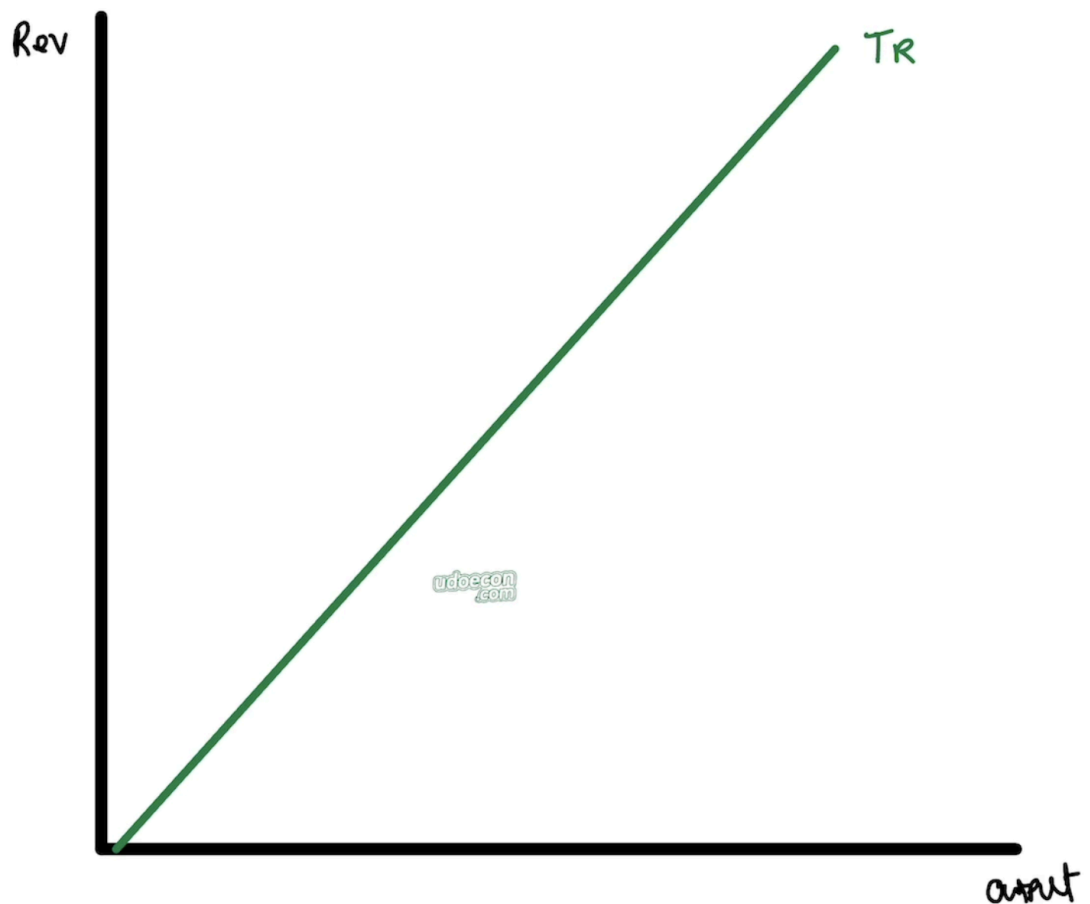
Total Revenue

$$TR = P \times Q$$

Since the price is fixed, every additional unit sold adds the same amount to total revenue.

- Total revenue increases at a constant rate as output rises.

- The TR curve is a straight, upward-sloping line beginning at the origin.

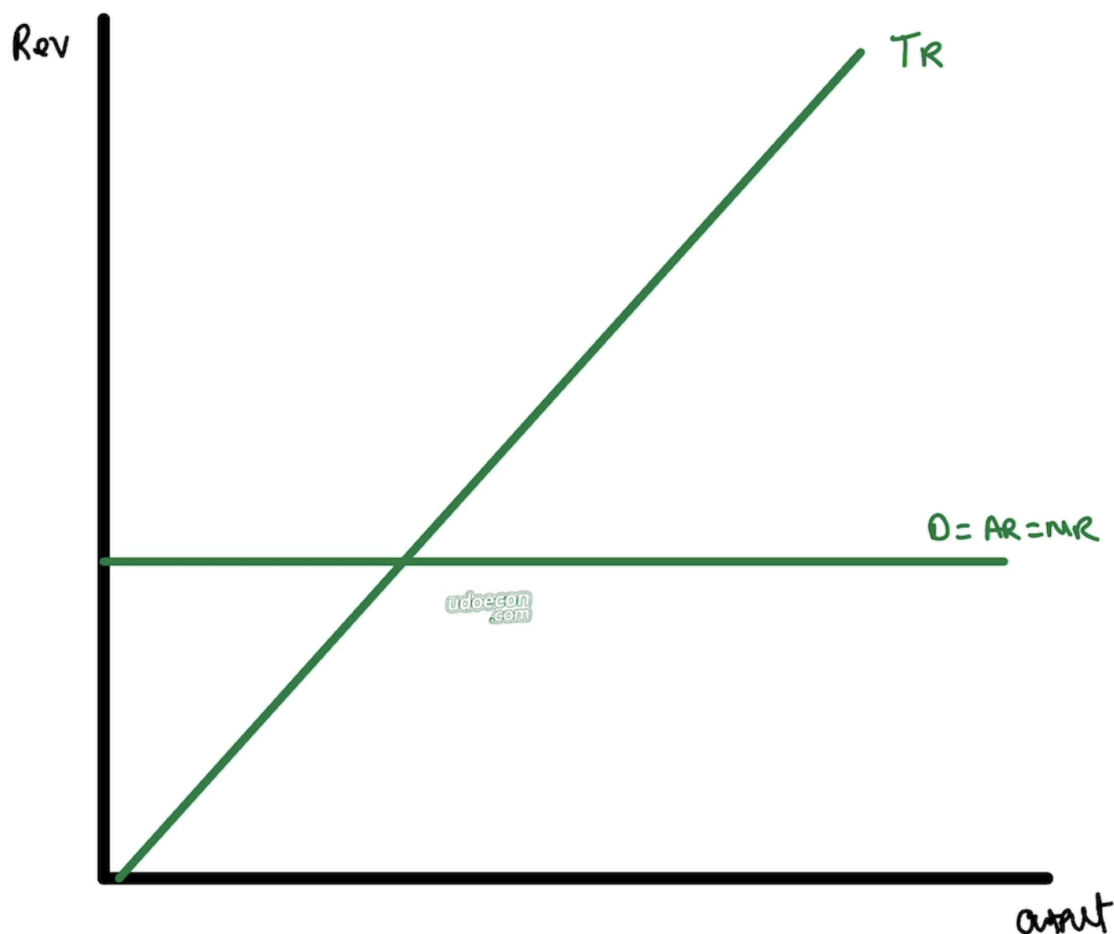


Average Revenue

$$AR = TR \div Q = P \text{ as... } AR = TR/Q \text{ and } TR/Q = P$$

Average revenue remains constant because the price does not change as output increases.

The AR curve is therefore a horizontal line at the market price.



Marginal Revenue

Marginal revenue is the extra revenue earned from selling one additional unit.

Since every unit is sold at the same price, the extra revenue earned from each unit is equal to the market price.

$$MR = AR = P = D$$

The firm's average revenue, marginal revenue and demand curves are the same horizontal line.

Numerical Example: Price-Taking Firm

Assume the market price is fixed at £5.

At one unit sold:

- $TR = £5$
- $AR = £5$
- $MR = £5$

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At two units sold:

- $TR = £10$
- $AR = £5$
- $MR = £5$

At three units sold:

- $TR = £15$
- $AR = £5$
- $MR = £5$

Total revenue increases by £5 whenever another unit is sold. Average revenue and marginal revenue both remain at £5.

Therefore:

$$AR = MR = P$$

Total Revenue Maximisation

Total revenue is maximised where $MR = 0$

The reason is:

- When $MR > 0$, selling another unit increases total revenue.
- When $MR < 0$, selling another unit reduces total revenue.
- When $MR = 0$, selling another unit causes no change in total revenue.

Total revenue is therefore maximised at the output where marginal revenue equals zero.

The Relationship Between PED and Total Revenue

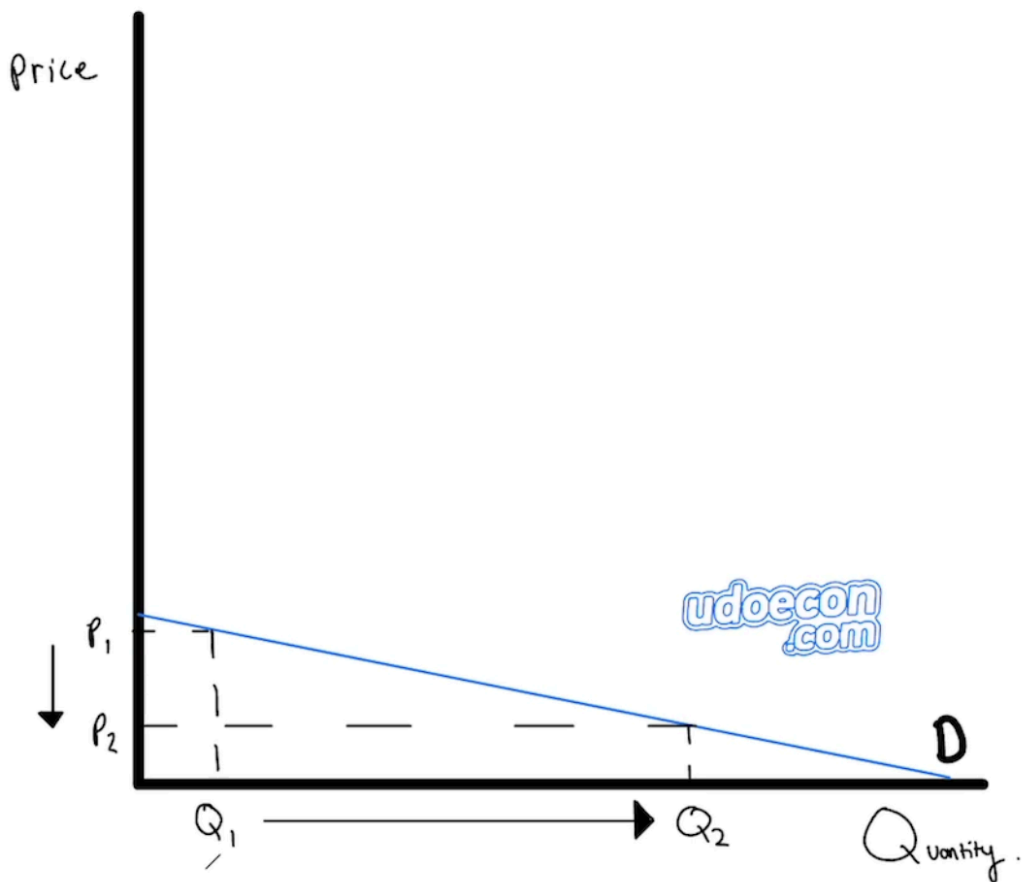
The effect of a price change on total revenue depends on the price elasticity of demand.

Price Elastic Demand

Demand is price elastic when:

$$PED > 1$$

A small fall in price causes a significant increase in quantity demanded.



For example:

- Price falls by 5%.
- Quantity demanded rises by 35%.

The increase in sales is proportionally greater than the fall in price. Total revenue therefore rises.

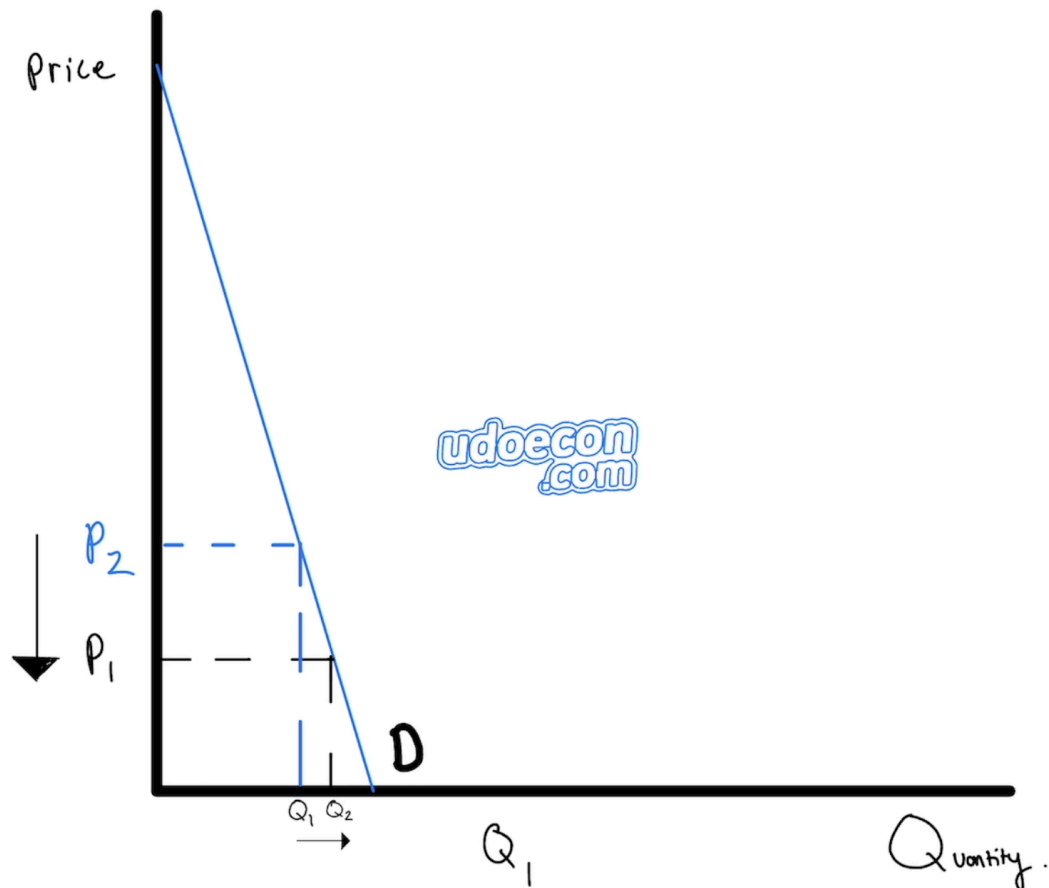
A rise in price would cause total revenue to fall.

Price Inelastic Demand

Demand is price inelastic when:

$$PED < 1$$

A fall in price causes a smaller percentage increase in quantity demanded.



For example:

- Price falls by 10%.
- Quantity demanded rises by 5%.

The increase in sales is not large enough to compensate for the lower price. Total revenue therefore **falls**.

An increase in price would cause total revenue to rise.

Unitary Elastic Demand

Demand is unitary elastic when:

$$PED = 1$$

A change in price causes an equal proportional change in quantity demanded.

For example:

- Price falls by 10%.
- Quantity demanded rises by 10%.

The two effects cancel out, so total revenue does not change.

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Summary of PED and Revenue

Elastic Demand

$$PED > 1$$

A fall in price causes quantity demanded to rise proportionally more.

- Total revenue rises.
- $MR > 0$.

Unitary Elastic Demand

$$PED = 1$$

A fall in price causes quantity demanded to rise by the same proportion.

- Total revenue remains unchanged and is maximised.
- $MR = 0$.

Inelastic Demand

$$PED < 1$$

A fall in price causes quantity demanded to rise proportionally less.

- Total revenue falls.
- $MR < 0$.

The key relationship is:

TR is maximised where $MR = 0$ and $PED = 1$.