Cost curves and profit

Calculating economic profits as an area on a graph

Economic profits can be visualized and calculated as an area on a graph that includes the marginal cost (MC), average cost (AC), and price level (P).

Graph explanation

1. **Marginal Cost (MC) Curve**: This curve shows the additional cost of producing one more unit of output.
2. **Average Cost (AC) Curve**: This curve shows the cost per unit of output, including both fixed and variable costs.
3. **Price Level (P)**: This is the price at which the firm sells its output. If the price level is above the AC curve, the firm is making a profit.

Visualizing economic profit

Economic profit is represented by the area between the price level (P) and the average cost (AC) curve, up to the quantity (Q) produced. This area can be visualized on the graph as follows:

1. **Determine the Quantity Produced (Q)**: This is where the marginal cost (MC) equals the price level (P), i.e., $MC = P$. This is the profit-maximizing quantity.
2. **Calculate the Average Cost (AC) at Quantity Produced**: Find the value of the AC curve at the quantity Q.
3. **Calculate the Economic Profit Area**: The economic profit is the area of the rectangle formed by the price level (P) above the AC curve, from the y-axis to the quantity Q. Mathematically, this area is:

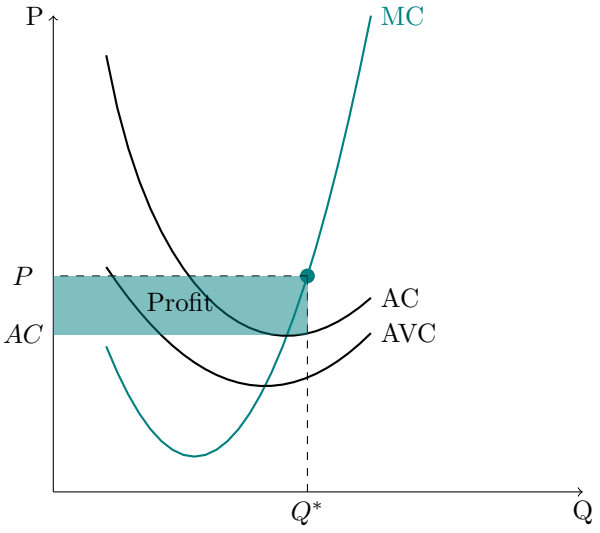
$$\text{Economic Profit} = (P - AC) \times Q = PQ - C = I - C$$

Where:

- P is the price level
- AC is the average cost at the quantity Q
- Q is the quantity produced

Graph Example

Below is a graph illustrating these concepts:



In this graph:

- The equilibrium point is where $MC = P$.
- The price level P is above the average cost AC, indicating a profit.
- The shaded area represents the economic profit, calculated as $(P - AC) \times Q$.

Price levels and economic profit

In the context of cost curves and pricing, firms face different financial outcomes based on the price level relative to their cost structures. Here are the three levels of pricing that generate economic loss, economic loss but above AVC, and profits greater than zero:

Economic loss

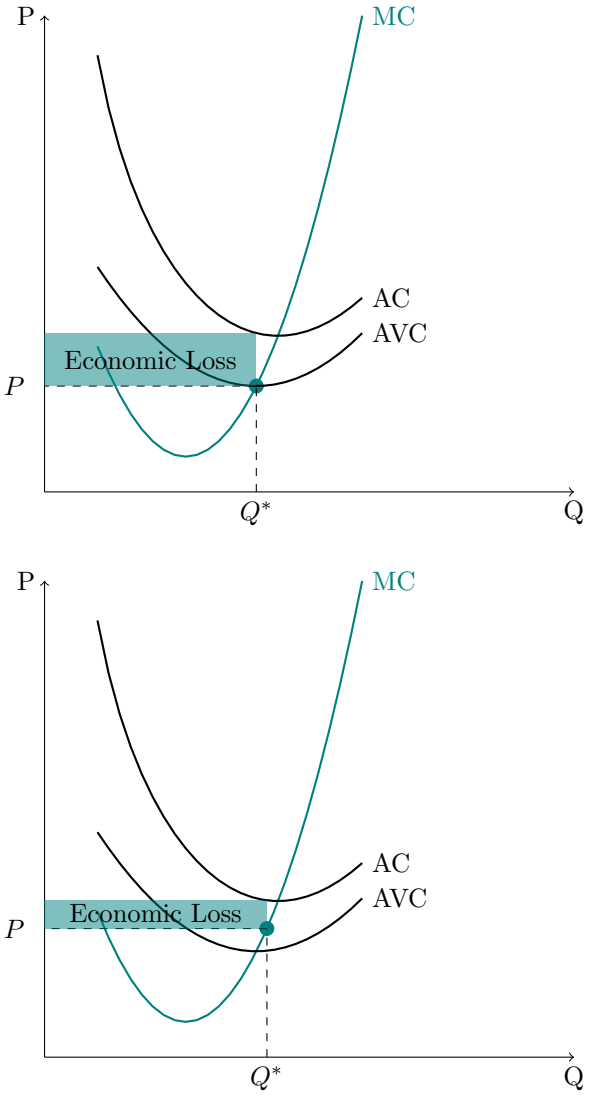
$$\text{Price} < \text{AVC}$$

When the price is below the average variable cost (AVC), the firm is unable to cover its variable costs, let alone fixed costs. Operating at this price results in economic losses, and the firm would minimize losses by shutting down production in the short run. This is because producing at a loss that cannot cover variable costs increases total losses. For example, if AVC is \$3 per unit and the price is \$2.5 per unit, the firm incurs a loss with every unit produced, as it cannot even cover the variable cost.

Economic loss but above AVC

$$\text{AVC} < \text{Price} < \text{AC}$$

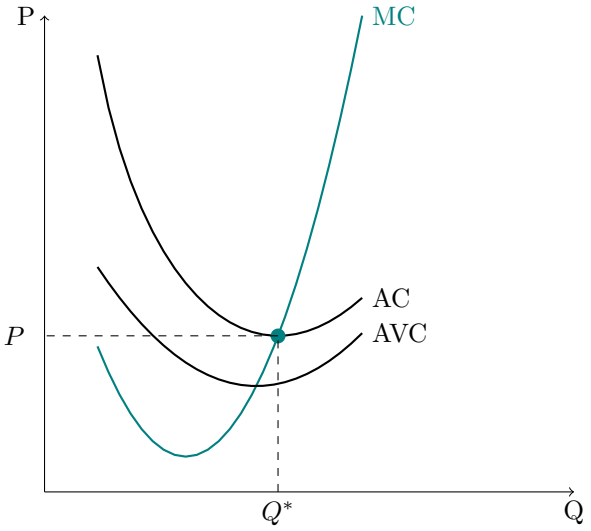
When the price is above the AVC but below the average cost (AC), the firm can cover its variable costs and part of its fixed costs, but not all of them. This situation results in an economic loss, but the firm will continue operating in the short run because it can reduce the total loss by contributing to fixed costs. For instance, if AVC is \$3 per unit, AC is \$5 per unit, and the price is \$4 per unit, the firm loses \$1 per unit (since \$4 < \$5), but it continues operating to cover part of the fixed costs.



Zero profits

Price = AC

When the price is equal to the average cost (AC), the firm covers all its costs (both variable and fixed) but does not generate any profit. Operating at this price level results in zero economic profit, meaning the firm is breaking even. This situation is often referred to as the normal profit condition, where the firm's total revenue is exactly equal to its total costs. For example, if AC is \$5 per unit and the price is also \$5 per unit, the firm does not make a profit or a loss, as the price exactly matches the average cost.



Profits greater than zero

Price > AC

When the price is above the average cost (AC), the firm covers all its costs (both variable and fixed) and generates a profit. Operating at this price level results in positive economic profit, encouraging the firm to continue production. For example, if AC is \$5 per unit and the price is \$6 per unit, the firm makes a profit of \$1 per unit, as the price exceeds the average cost.