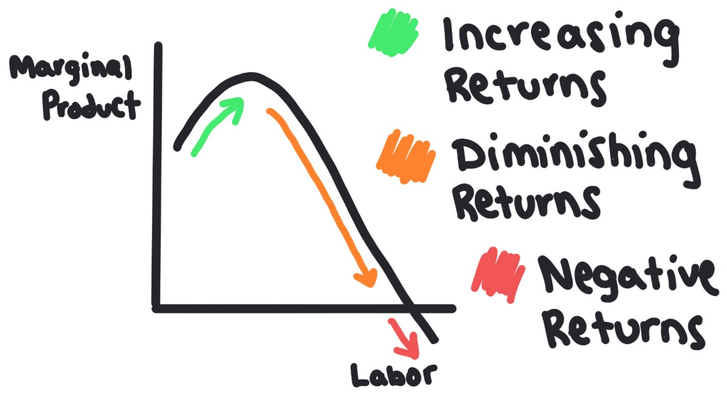
The Ultimate Unit 3 Cheat Sheet

Everything you need to know about short-run production, profit maximization, and perfect competition

The Production Function

Production Function: The relationship between the quantity of inputs (factors of production) used to make a good and the quantity of output of that good.

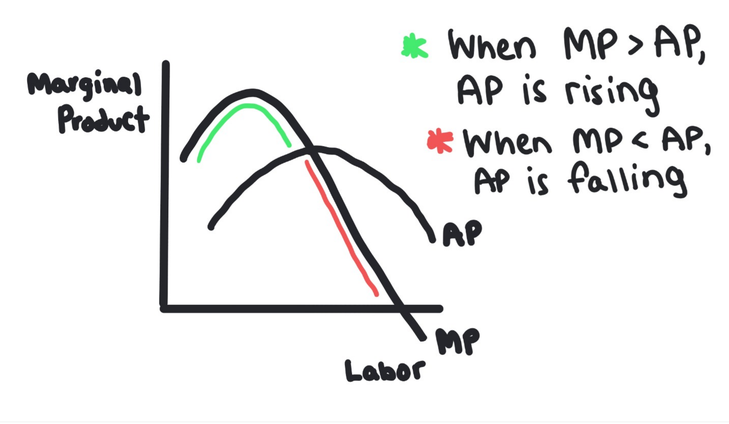
- Short-Run Production: time period where at least one factor of production is fixed (e.g. a firm is locked into a 1-year lease)
- Long-Run Production: time period where all factors of production are variable; no fixed inputs



Total Product: the total quantity of output produced by a firm using a specific combination of inputs in the short run.

Average Product: the total output produced by a firm, divided by the quantity of a specific variable input used in production, like labor.

- Average Product = Total Product / Quantity of Input



Marginal Product: The additional output produced by hiring one more unit of a variable input (like one more worker).

- MP = Change in Total Product / Change in Inputs

The Law of Diminishing Marginal Returns: A principle stating that as more units of a variable input are added to a fixed input, the marginal product of the variable input will eventually decline.

- MP tends to increase at first due to specialization, then decrease due to diminishing marginal returns

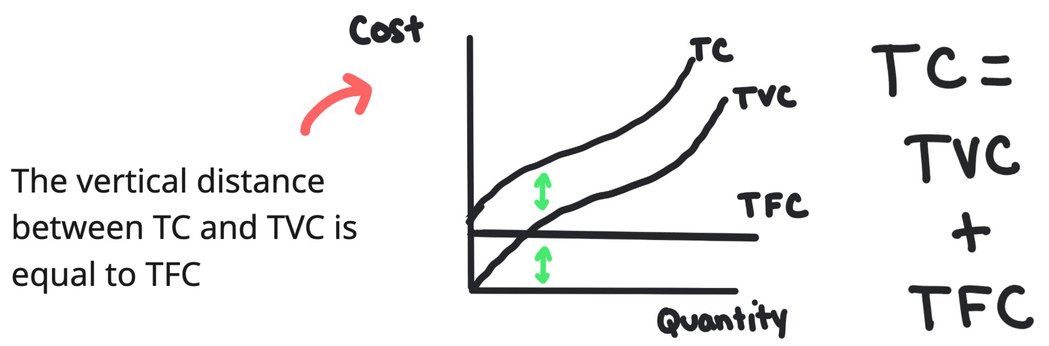
Short-Run Production Costs

Fixed Costs: Costs that do not change with the level of output produced.

- EX: monthly rent for a factory, loan payments, insurance premiums

Variable Costs: Costs that change with the level of output produced.

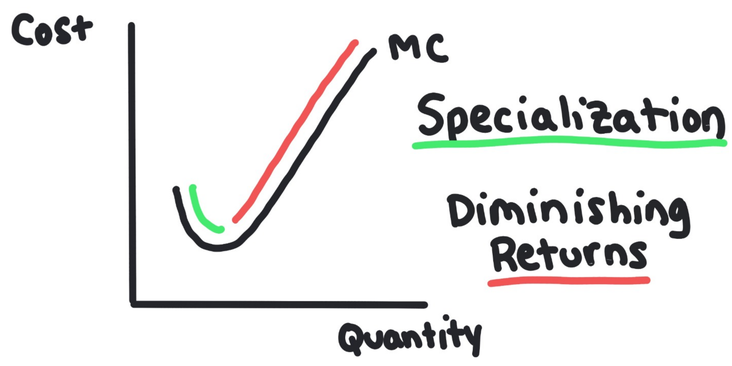
- EX: wages for hourly workers, raw materials or ingredients, electricity use in production



The vertical distance between TC and TVC is equal to TFC

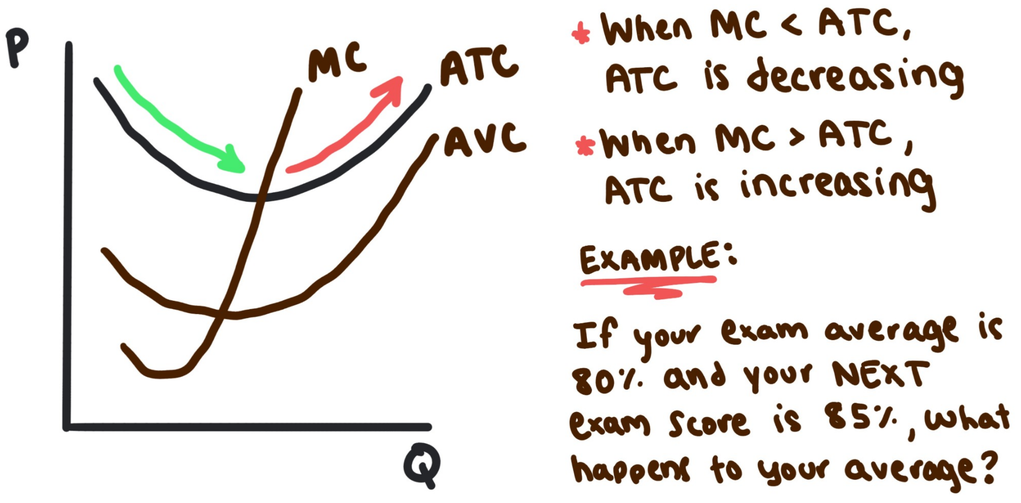
Total Costs: The sum of fixed costs and variable costs

- Total Costs (TC) = Total Fixed Cost (TFC) + Total Variable Cost (TVC)
- Increases as output increases due to rising variable costs



Marginal Cost: The additional cost incurred by producing one more unit of output.

- Marginal Cost = Change in Total Cost / Change in Quantity
- Opposite of MP curve; decreases at first (specialization) and then increases (diminishing marginal returns)
- Marginal Cost curve crosses AVC and ATC at their respective minimums



Average Fixed Cost (AFC): The total fixed cost divided by the quantity of output produced.

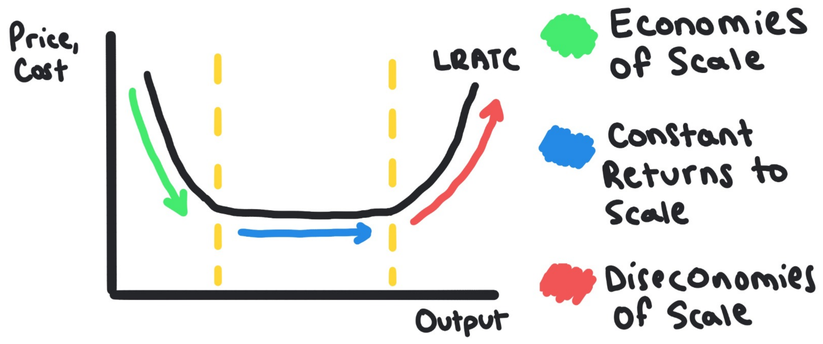
- AFC = TFC / Q
- AFC always decreases; fixed costs remain constant, so a larger quantity results in lower AFC

Average Variable Cost (AVC): The total variable cost divided by the quantity of output produced.

- AVC = TVC / Q
- Decreases at first, then increases

Average Total Cost (ATC): The total cost divided by the quantity of output produced.

- ATC = AFC + AVC
- Decreases at first, then increases



Long-Run Production Costs

The Long Run: A time period in which all factors of production are variable; there are no fixed costs.

Economies of Scale: When long-run average total cost falls as the quantity of output increases.

- Occurs due to specialization and bulk purchasing.
- Represented by the downward-sloping portion of the firm's LRATC curve

Constant Returns to Scale: When long-run average total remains constant as output increases.

- Represented by the horizontal portion of the firm's LRATC curve

Diseconomies of Scale: When long-run average total increases output increases.

- Occurs due to coordination problems and bureaucracy in very large firms.
- Represented by the increasing portion of the firm's LRATC curve

Types of Profit

Explicit Costs: Direct, out-of-pocket payments for inputs.

- EX: wages for hourly workers, equipment used for production, etc.

Implicit Costs: The opportunity costs of using resources that the firm or individual already owns.

- EX: the yearly salary given up when an employee quits to start their own business

Normal Profit: When economic profit is zero. This means the firm is covering all costs, including the opportunity cost of the owner's time and capital.

Accounting Profit

Total Revenue − Explicit Costs

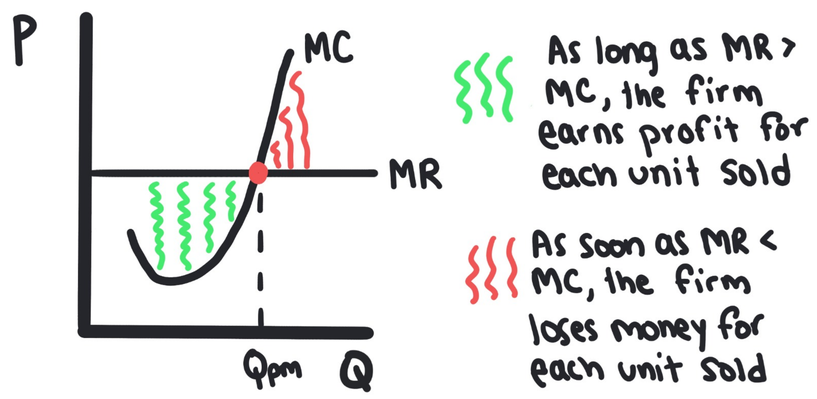
Economic Profit

Total Revenue − (Explicit + Implicit Costs)

Profit Maximization & Shut-Down Rule

Profit Maximization Rule: To maximize profit (or minimize loss), a firm should produce the quantity where marginal revenue equals marginal cost.

- Marginal Revenue: the additional revenue generated from selling one more unit of output.
- Marginal Cost: The additional cost incurred by producing one more unit of output.

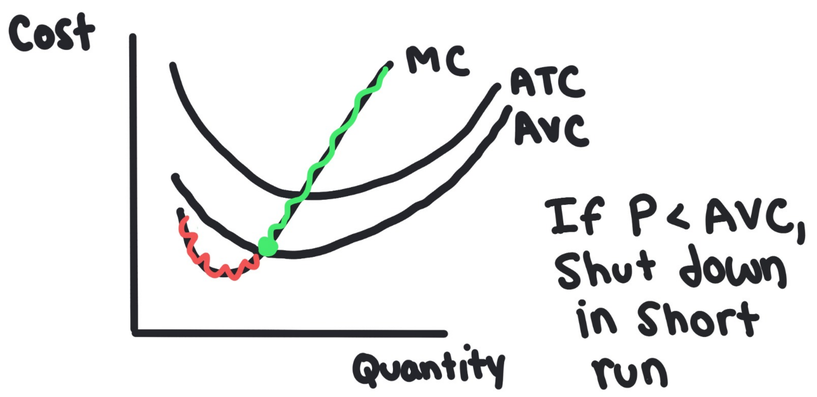


Shut Down Rule: In the short run, a firm should shut down (produce quantity zero) if the price falls below the minimum Average Variable Cost (AVC).

- If P < AVC, the firm loses more by producing than by shutting down.
- If ATC > P > AVC, the firm produces at a loss but is able to cover some fixed cost that it would be unable to cover if it did not produce

Short-Run Supply Curve: The portion of the marginal cost curve that lies above the minimum average variable cost.

- The firm will produce where MR = MC, so the MC curve shows us the point of production
- If P < AVC, the firm will shut down, so only the portion of the MC above AVC is relevant



Perfect Competition

Perfectly Competitive Market: a market structure with many small firms, identical products, and low barriers to entry and exit.

- Low barriers to entry mean it is easy for lots of firms to join the market when there is profit to be made; also easy for firms to exit the market when earning losses
- Since there are lots of firms selling identical products, each firm is a "price-taker"; they accept the market price and the demand for their product is perfectly elastic
- Given the low barriers to entry and high levels of competition, firms tend to earn zero economic profit in the long-run. Economic profit and losses are possible in the short-run.

Allocative Efficiency: occurs when a firm produces the quantity of goods that matches society's wants and needs

- How to Find on a Graph: allocative efficiency occurs where P = MC
- Perfectly competitive firms are ALWAYS allocatively efficient

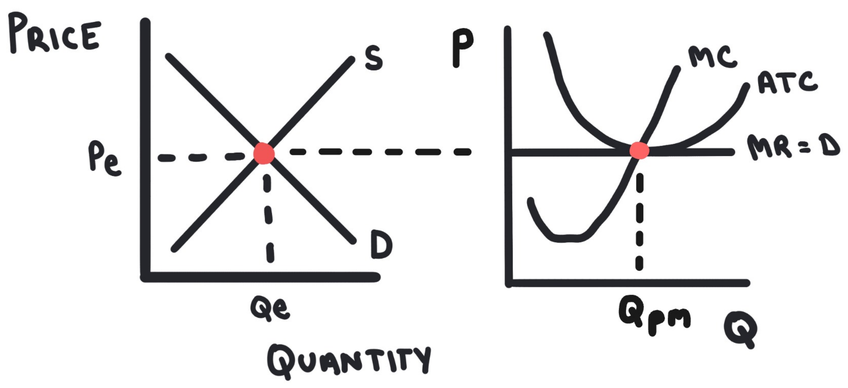
Productive Efficiency: occurs when a firm produces the quantity of goods minimizes its average total costs

- How to Find on a Graph: productive efficiency occurs where MC = ATC (lowest point along ATC curve)
- Perfectly competitive firms are productively efficient when in long-run equilibrium

Key Characteristics

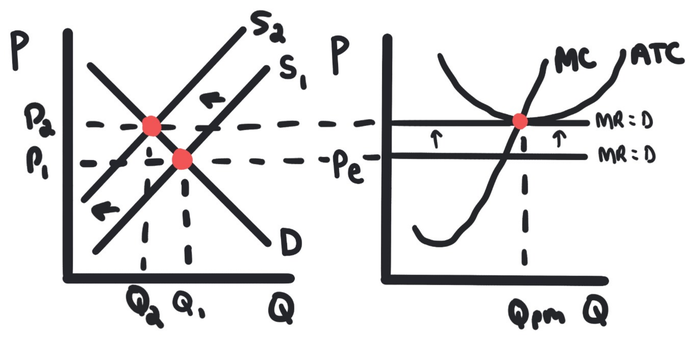
Characteristic	
Number of Firms	Many
Barriers to Entry	Low
Types of Products	Identical
Price Control	None; Price-Takers
Long-Run Profits	Zero Economic Profit

Long-Run Equilibrium



1. Firm "takes" the market price
2. Each unit is sold for that price, so MR = P = D = AR
3. Profit-maximizing quantity is where MR=MR; at this point, the firm earns zero economic profit

Economic Losses → L.R.E



1. Some firms leave the market due to economic losses, causing market supply to decrease
2. Market price increases
3. Each firm earns higher MR, returning them to long-run equilibrium

Knowledge Check

Check your answers at apdojo.com/ultimateCramSheet/answer-keys

a. Lily decides to quit her job as a barista, which pays an annual salary of $45,000, and start her own coffee shop. The equipment, rent, and all other explicit costs total $20,000. In her first year, the coffee shop earn $60,000 in total revenue. Calculate Lily's economic profit.

b. A firm is currently producing at a point where MC = $17 and ATC = $15. Will the firm's average total costs increase, decrease, or remain constant if they continue producing?