Firms in Competitive Markets

Additional note I

The Revenue of a Competitive Firm

- The Vaca Farm produces a quantity of milk, Q, and sells each unit at the market price, P
- The farm's total revenue is $P \times Q$
- Because the Vaca Farm is small compared with the world market for milk, it takes the price given by the market. This mean that the price does not depend on how much milk the Vaca Farm produces and sells.
- How much revenue does the farm receive for the typical gallon of milk?
- How much additional revenue does the farm receive if it increases the production of milk by 1 gallon?

Quantity (Q)	Price (P)	Total Revenue ($TR = P \times Q$)	Average Revenue ($AR = TR/Q$)	Marginal Revenue ($MR = \Delta TR/\Delta Q$)
1 gallon	$ 6	$ 6	$6	
				$6
2	6	12	6	
				6
3	6	18	6	
				6
4	6	24	6	
				6
5	6	30	6	
				6
6	6	36	6	
				6
7	6	42	6	
				6
8	6	48	6	

Profit Maximization and the Competitive Firm's Supply Curve

- Total cost includes fixed costs and variable costs.
- The Vaca family wants to produce the quantity of milk that makes its profit as large as possible.
- The farm maximizes profit by producing either 4 or 5 gallons of milk for a profit of $7.
- The Vaca can find the profit-maximizing quantity by comparing the marginal revenue and marginal cost of each unit produced.

Quantity (Q)	Total Revenue (TR)	Total Cost (TC)	Profit (TR-TC)	Marginal Revenue ($MR = \Delta TR/\Delta Q$)	Marginal Cost ($MC = \Delta TC/\Delta Q$)	Change in Profit (MR-MC)
0 gallons	$0	$3	-$3			
				$6	$2	$4
1	6	5	1			
				6	3	3
2	12	8	4			
				6	4	2
3	18	12	6			
				6	5	1
4	24	17	7			
				6	6	0
5	30	23	7			
				6	7	-1
6	36	30	6			
				6	8	-2
7	42	38	4			
				6	9	-3
8	48	47	1			

- As long as MR exceeds MC, increasing quantity produced raises profit
- Once the farm's output reaches 5 gallons of milk, however, the situation changes.
- The sixth gallon would have a MR of $6 and a MC of $7, so producing it would reduce profit by $1. As a result, the Vacas do not produce more than 5 gallons.
- If the MR is less than MC – the Vacas should decrease production

The Marginal Cost Curve and the Firm's Supply Decision

These cost curves exhibits the three features:

- The MC curve slopes upward
- The ATC curve is U shaped
- The MC curve crosses the ATC curve at the minimum of ATC

The price line is horizontal because a competitive firm is a price taker: the price of the firm's output is the same regardless of how much it produces.

For a competitive firm, the price equals both the firm's average revenue (AR) and its marginal revenue (MR)

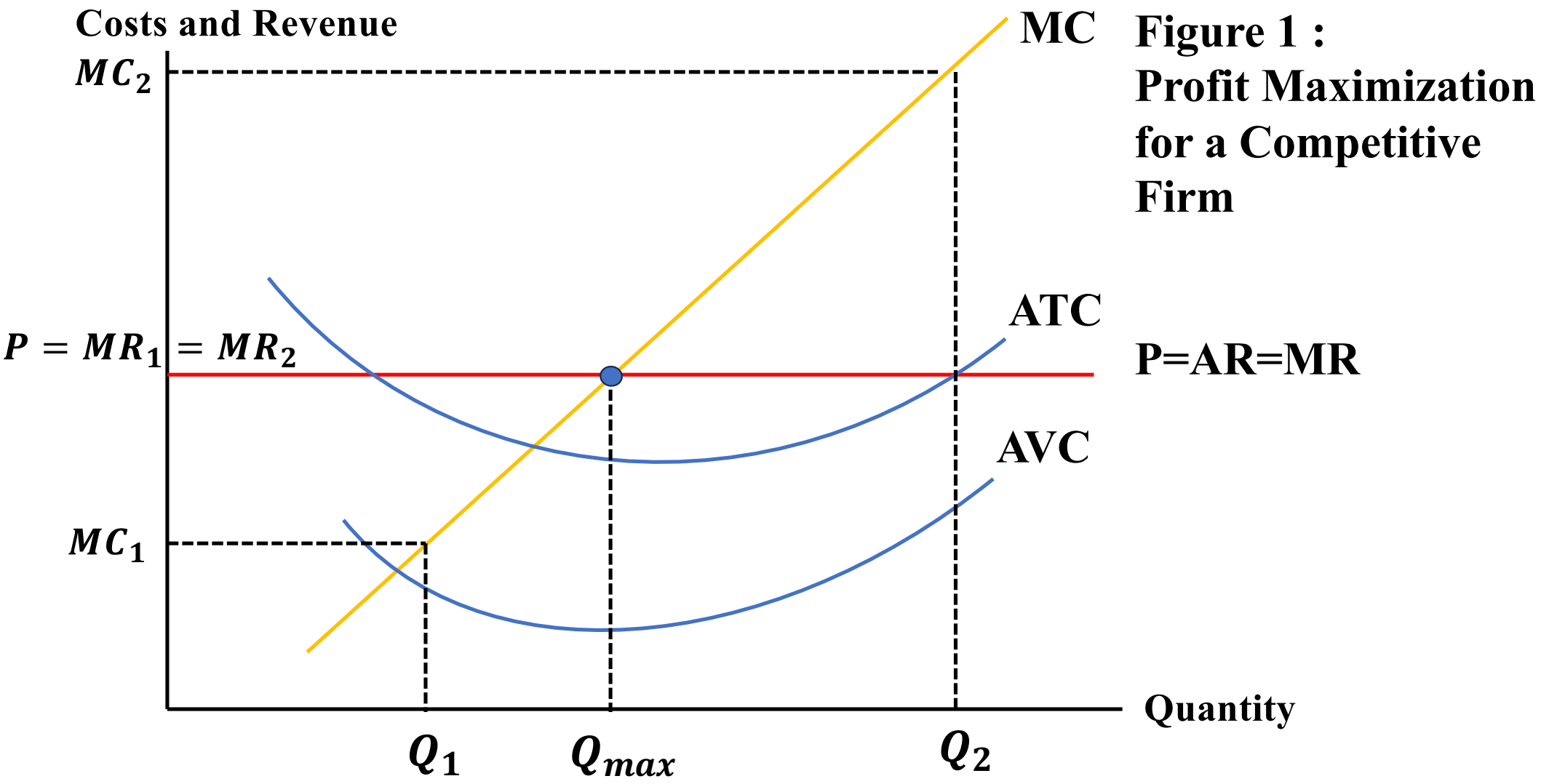

Figure 1 : Profit Maximization for a Competitive Firm

- At level $\boldsymbol{Q_1}$, the MR curve is above the MC curve, indicating the MR is greater than MC - This means that if the firm were to raise production by 1 unit, the additional revenue ($\boldsymbol{MR_1}$) would exceed the additional cost ($\boldsymbol{MC_1}$).
- Profit, which equals total revenue minus total cost, would increase.
- Hence, if the marginal revenue is greater than marginal cost, as it is at $\boldsymbol{Q_1}$, the firm can increase profit by increasing production.

- At level $\boldsymbol{Q_2}$, the MC curve is above the MR curve, indicating the MC is greater than MR - if the firm were to reduce production by 1 unit, the costs saved ($\boldsymbol{MC_2}$) would exceed the revenue lost ($\boldsymbol{MR_2}$).
- Therefore, if the marginal cost is greater than marginal revenue, as it is at $\boldsymbol{Q_2}$, the firm can increase profit by reducing production.

- The profit maximizing quantity, $\boldsymbol{Q_{max}}$, is found where the horizontal line representing the price intersects the marginal-cost curve

This analysis yields three rules for profit maximization

- If marginal revenue exceeds marginal cost, the firm should increase its output
- If marginal cost exceeds marginal revenue, the firm should decrease its output
- At the profit-maximizing level of output, marginal revenue equals marginal cost

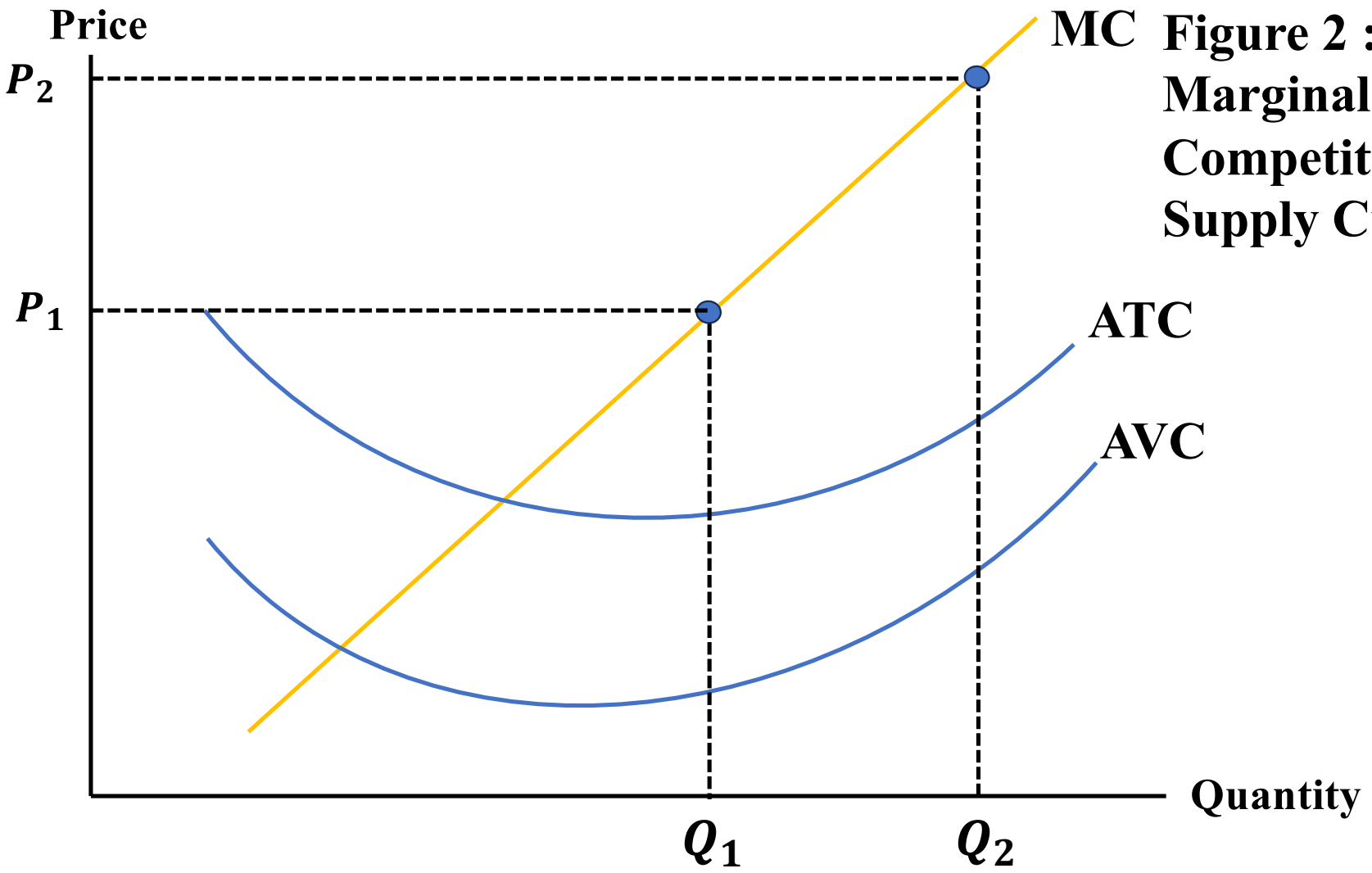

Figure 2 : Marginal Cost as the Competitive Firm's Supply Curve

An increase in the price from P_1 to P_2 leads to an increase in the firm's profit maximizing quantity from Q_1 to Q_2. Because the marginal cost curve shows the quantity supplied at any price, it is the firm's supply curve.

Figure 2 :Marginal Cost as the Competitive Firm's Supply Curve

- How a competitive firm responds to the price increase
- When the price is $\boldsymbol{P_1}$, the firm produces quantity $\boldsymbol{Q_1}$, the quantity that equates marginal cost to the price
- When the price rises to $\boldsymbol{P_2}$, the firm finds that marginal revenue is higher than marginal cost at the previous level of output, so it increases production
- The new profit-maximizing quantity is $\boldsymbol{Q_2}$, at which marginal cost equals the new, higher price.
- **Because the firm's marginal cost curve determines the quantity of the good the firm is willing to supply at any price, the marginal-cost curve is also the competitive firm's supply curve**

The Firm's Short-Run Decision to Shut Down

- A **shut down** refers to a short-run decision not to produce anything during a specific period because of current market conditions.
- **Exit** refers to a long-run decision to leave the market
- The short-run and long-run decisions differ because most firms cannot avoid their fixed costs in the short run but can do so in the long run.
- A firm that shuts down temporarily still must pay its fixed costs, while a firm that exits the market doesn't pay any costs at all, fixed or variable

- For example, consider production decisions at a farm
- The cost of the land is a fixed cost. If the farm owners decide not to produce any crops one season, the land lies fallow, and they cannot recover this cost. **When making the short-run decision of whether to shut down for a season, the fixed cost of land is said to be a sunk cost.**
- By contrast, if the farm owners decide to leave farming altogether, they can sell the land. When making the long-run decision of whether to exit the market, the cost of land is not sunk.

What determines a firm's shutdown decision?

- If the firm shuts down, it loses all revenue from the sale of its product. At the same time, it saves the variable costs of making the product (but must still pay the fixed costs).
- **Therefore, the firm shuts down if the revenue that it would earn from producing is less than its variable costs of production.**

Shut down if $TR < VC$

Shut down if $\mathbf{TR < VC}$

Shut down if $\mathbf{TR/Q < VC/Q}$

Shut down if $\mathbf{P < AVC}$

A firm shuts down if the price of the good is less than the average variable cost of production

The competitive firm's short-run supply curve is the portion of its marginal cost curve that lies above the average variable cost curve.

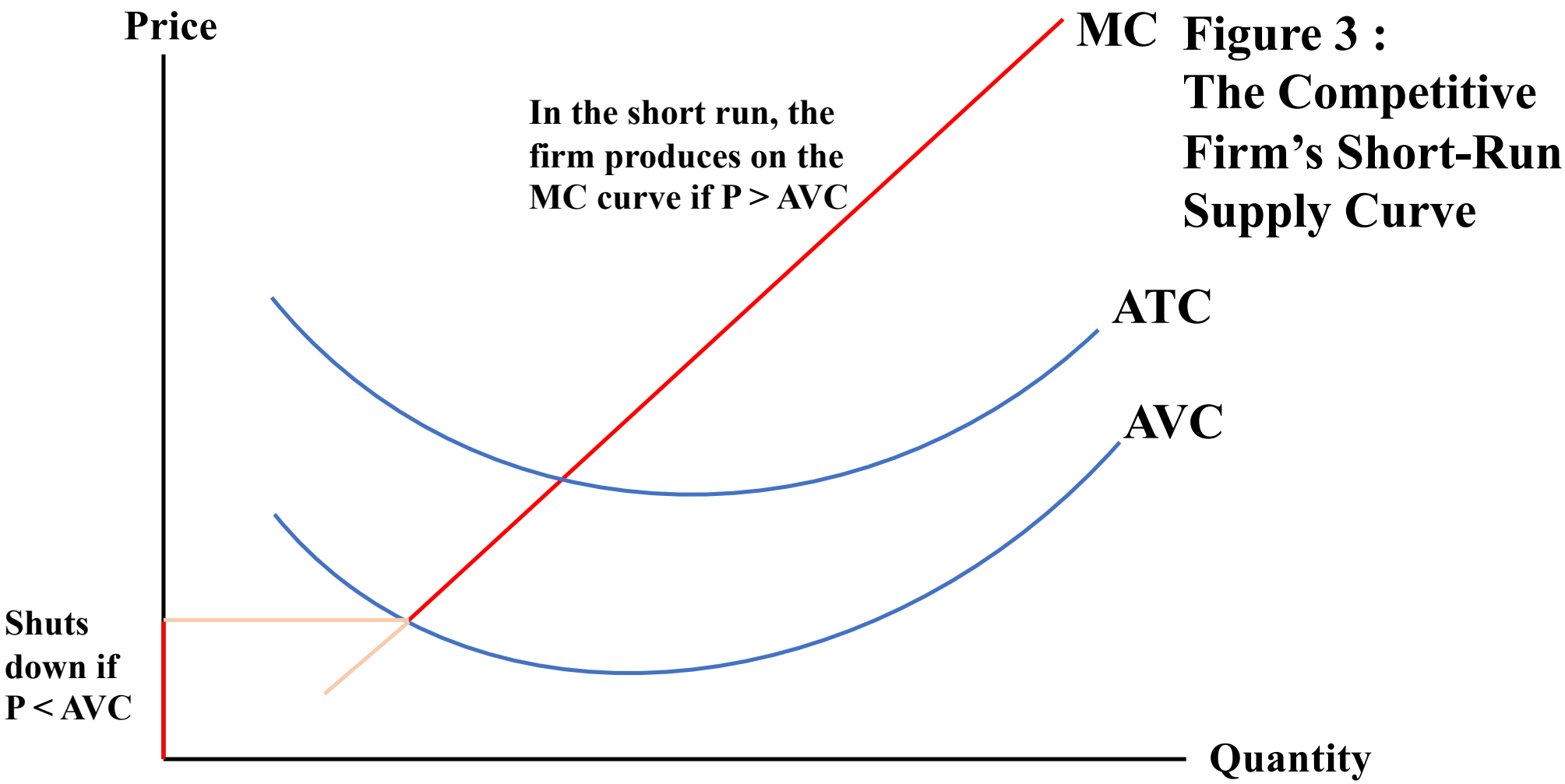

Figure 3 : The Competitive Firm's Short-Run Supply Curve

In the short run, the competitive firm's supply curve is the portion of its marginal cost curve (MC) that lies above its average-variable cost curve (AVC). If the price falls below average variable cost, the firm is better off shutting down temporarily

Reference

- Mankiw, N.G., (2023) **Principles of Microeconomics**, 10th ed., Cengage, (ISBN-13: 978-981-5119-30-5)