Principles of Economics

Discussion Session 5: Costs and the Supply Curve

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Types of Costs

Imagine you own a restaurant...

1. **Fixed Costs:** Costs that must be paid whether the restaurant is operating or not.
   - Rent, equipment leases, alcohol license renewal fees, ...
2. **Variable Costs:** Costs that are only paid if the restaurant is operating.
   - Labor, food supplies, electricity, ...
3. **Total Cost:** The sum of fixed and variable costs.
   - $TC = FC + VC$
4. **Marginal Cost:** The cost of the *last unit produced*.
   - If you produce Q units, then
     $MC_Q = VC_Q - VC_{Q-1}$, or equivalently
     $MC_Q = TC_Q - TC_{Q-1} = FC + VC_Q - (FC + VC_{Q-1}) = VC_Q - VC_{Q-1}$
5. **Average Costs:** Just divide by the quantity produced.
   - $AFC = FC/Q, \quad AVC = VC/Q, \quad ATC = TC/Q$

Exercise 1: Types of Costs

Fill in the following table:

Q	VC	TC	AFC	AVC	ATC	MC
0		50	N/A	N/A	N/A	N/A
1	10			10	60	10
2	30	80				
3			16.67	20	36.67	30
4	100	150	12.50		37.50	
5	150			30		
6	210	260	8.33	35	43.33	60

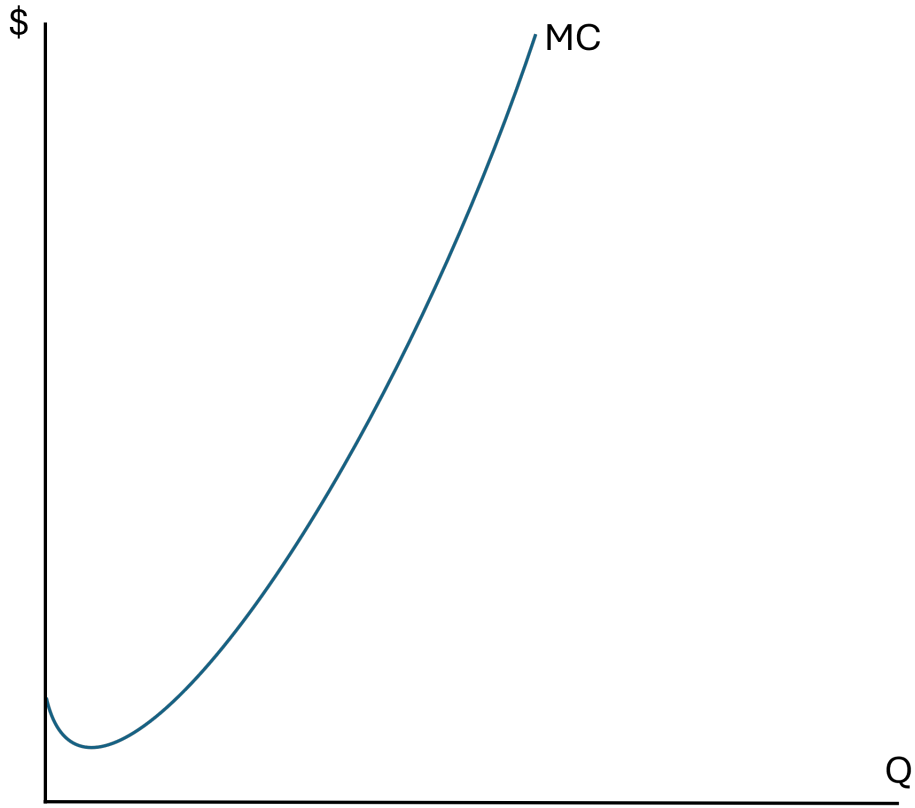
Exercise 1: Different Types of Costs

Solution:

Q	VC	TC	AFC	AVC	ATC	MC
0	0	50	N/A	N/A	N/A	N/A
1	10	60	50	10	60	10
2	30	80	25	15	40	20
3	60	110	16.67	20	36.67	30
4	100	150	12.50	25	37.50	40
5	150	200	10	30	40	50
6	210	260	8.33	35	43.33	60

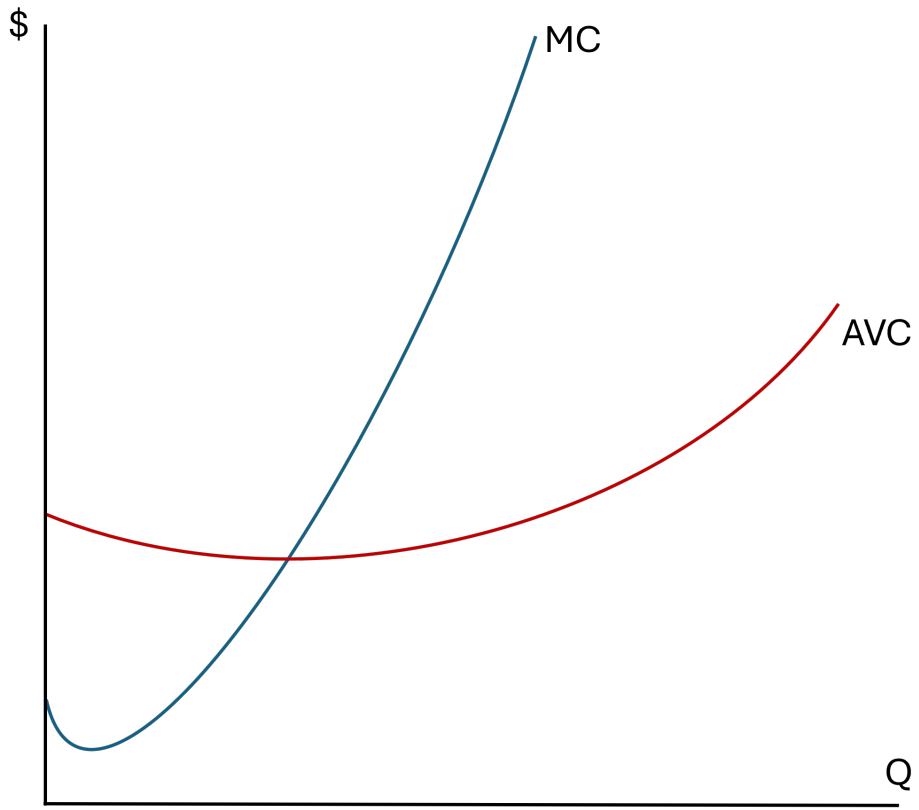
Cost Curves

- **Decreasing returns to scale:**
  The amount of input required to produce one more unit of output increases with quantity of output.
  $\Longrightarrow$ MC is upward-sloping.



Cost Curves

- **Decreasing returns to scale:**
  The amount of input required to produce one more unit of output increases with quantity of output.
  $\Longrightarrow$ MC is upward-sloping.
- AVC decreases when greater than MC and increases when less than MC.
  $\Longrightarrow$ MC crosses AVC at the minimum.



Cost Curves

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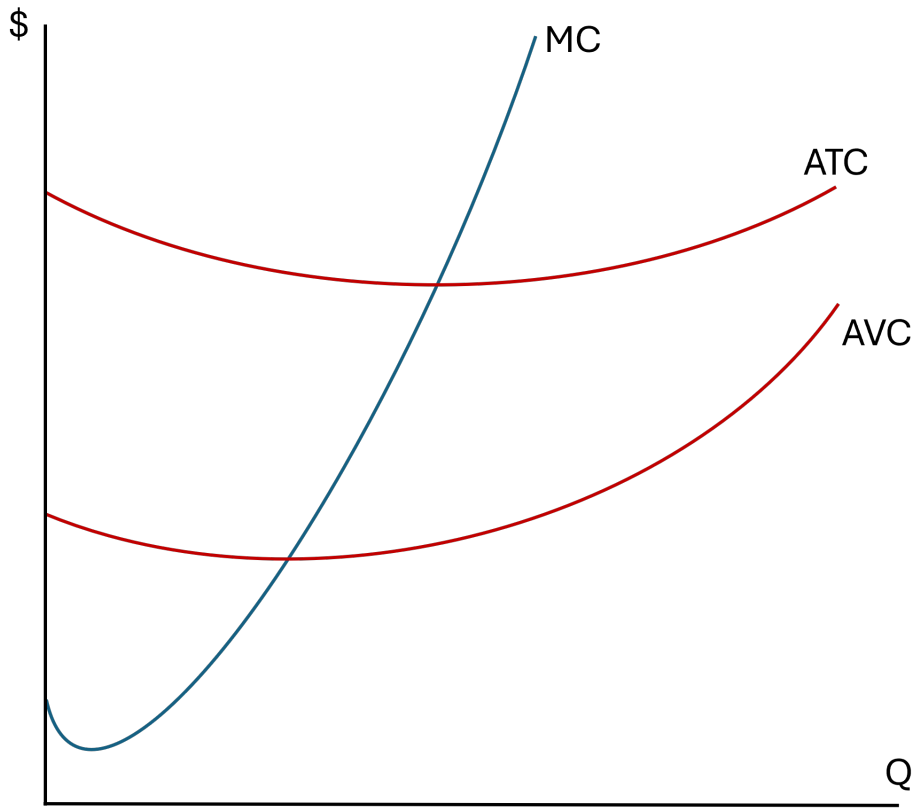
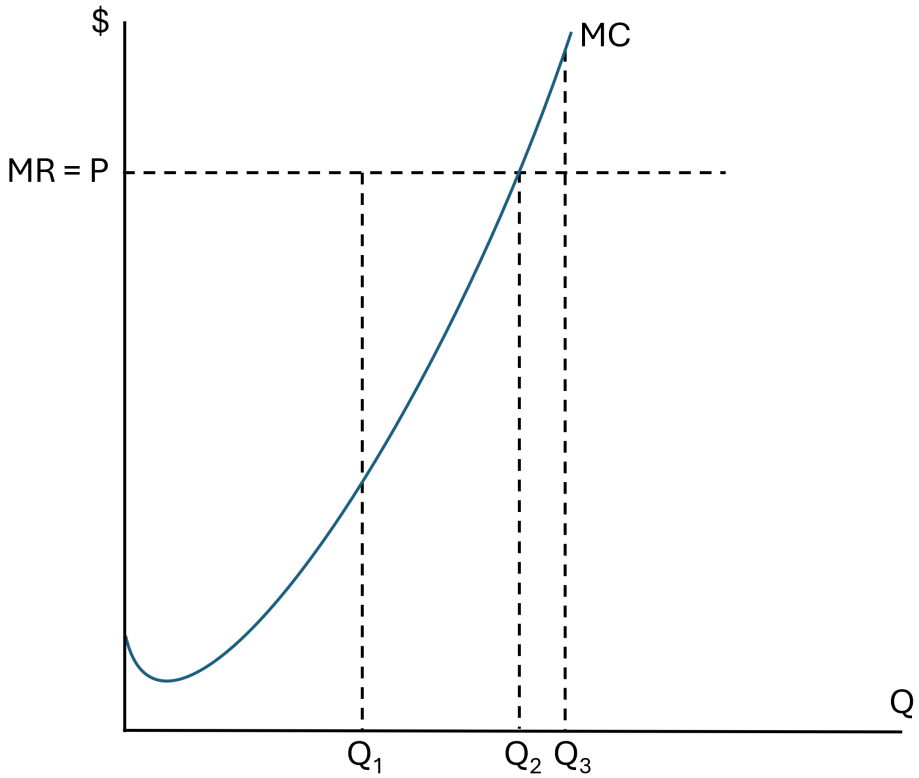
  $\Longrightarrow$ MC is upward-sloping.
- AVC decreases when greater than MC and increases when less than MC.
  $\Longrightarrow$ MC crosses AVC at the minimum.
- ATC adds average fixed cost to AVC
  $\Longrightarrow$ Behaves in the same way as AVC.



Profit Maximization

Suppose the market is perfectly competitive, and the equilibrium price is P.

Which quantity should the firm produce?

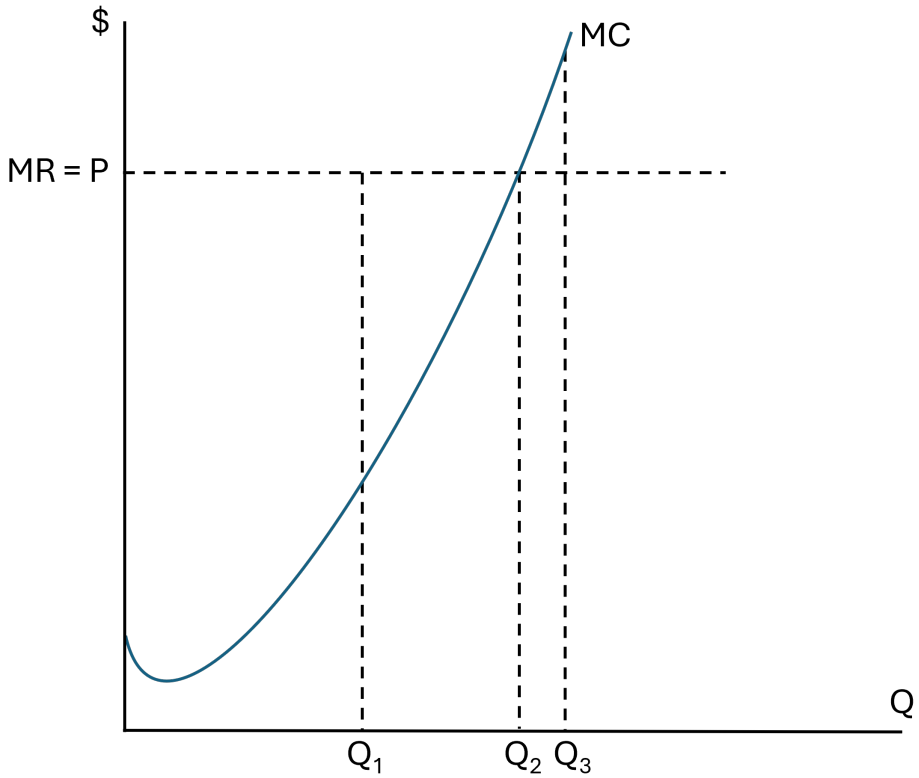


Profit Maximization

Suppose the market is perfectly competitive, and the equilibrium price is P.

Which quantity should the firm produce?

- Choosing Q_1 leaves money on the table: could produce more and still make positive marginal profits.
- Choosing Q_3 makes negative marginal profits on the final units.
- At Q_2 no improvement can be made.
- **Firms maximize profit by setting MR = MC.**



Exercise 2: Cost Calculation

Given competitive market price P and the pictured cost curves, calculate

1. Total Revenue
2. Total Cost
3. Variable Cost
4. Fixed Cost
5. Profit

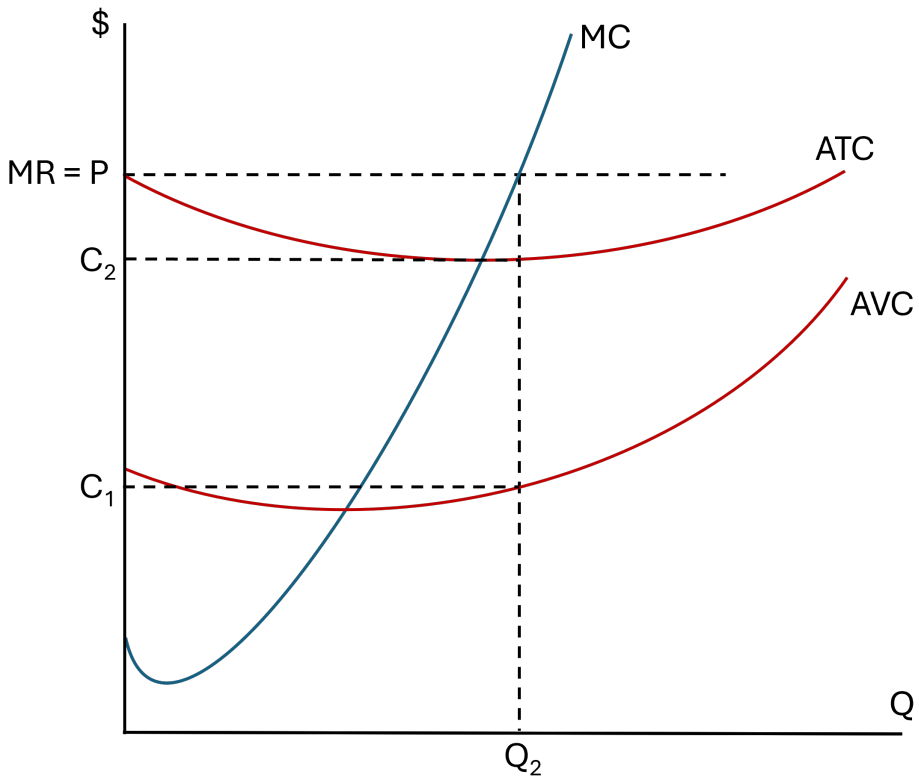
Hint:

$$TC = VC + FC$$

$$AFC = FC/Q$$

$$AVC = VC/Q$$

$$ATC = TC/Q$$

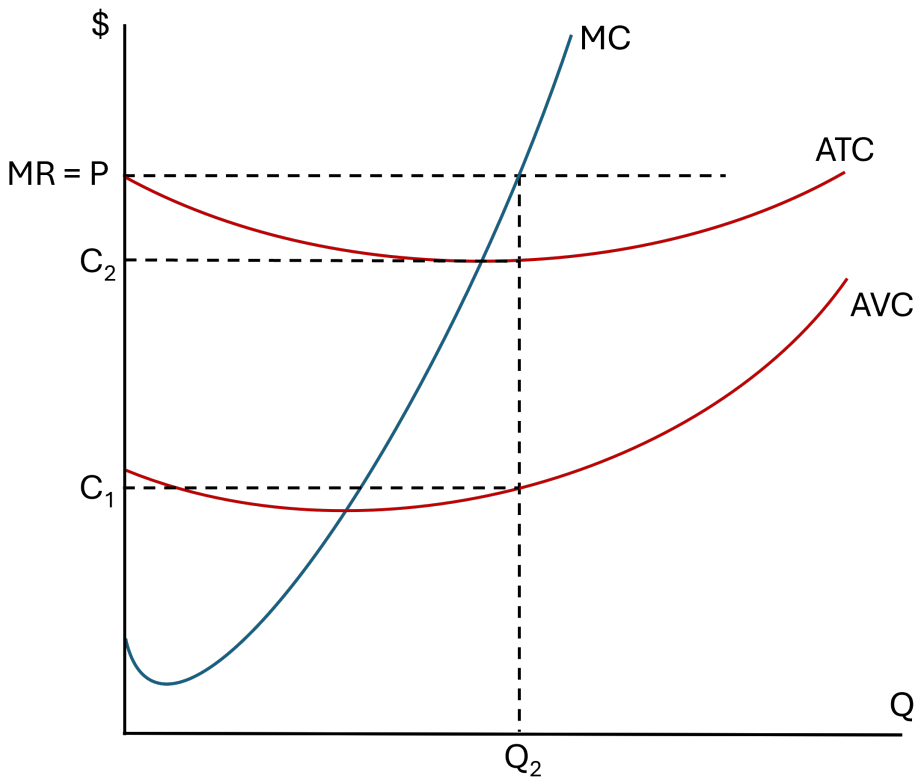


Exercise 2: Cost Calculation

Solution:

The firm maximizes profit by producing Q_2, where $MR = MC$.

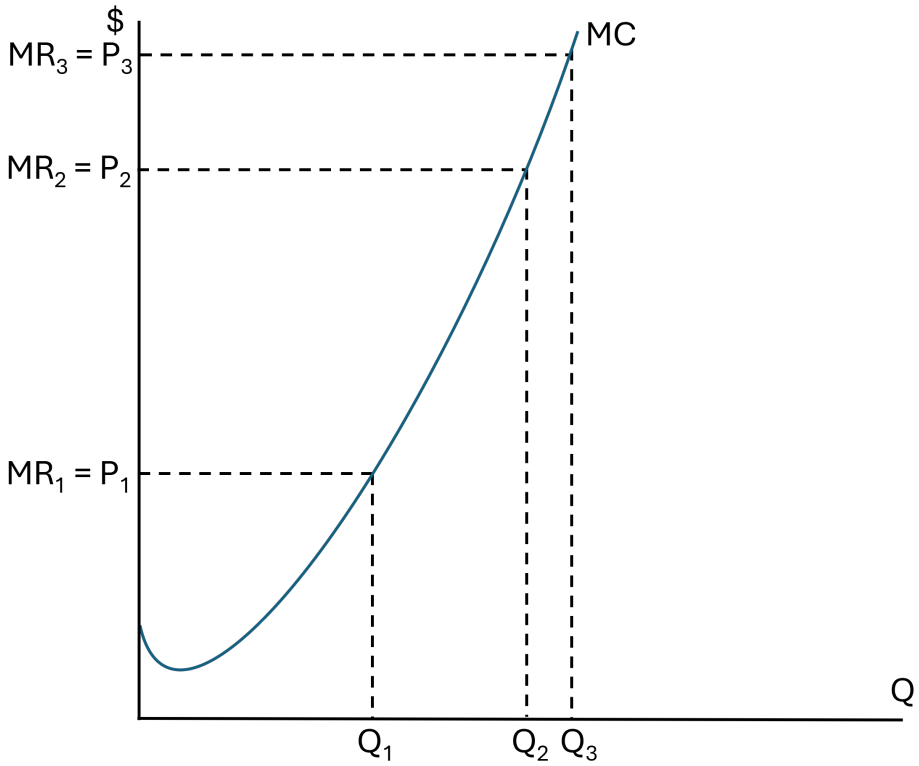
1. $TR = P \times Q_2$
2. $TC = ATC \times Q = C_2 \times Q_2$
3. $VC = AVC \times Q = C_1 \times Q_2$
4. $FC = TC - VC = (C_2 - C_1) \times Q_2$
5. $\Pi = TR - TC = (P - C_2) \times Q_2$



The Supply Curve

- **Firms maximize profit by setting MR = MC.**

→ The marginal cost curve describes the relationship between price and quantity supplied.



The Supply Curve

- **Firms maximize profit by setting MR = MC.**

→ The marginal cost curve describes the relationship between price and quantity supplied.

- For a competitive market (where $P = MR$), the MC curve *is the firm's supply curve!*