Intermediate Microeconomics

Chapter 22: Cost Curves

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Fixed, Variable & Total Cost Functions

F is the total cost to a firm of its short-run fixed inputs （固定投入）.

F, the firm's fixed cost, does not vary with the firm's output level.

VC is the total cost to a firm of its variable inputs （可变投入）when producing y output units. VC is the firm's variable cost function.

VC depends upon the levels of the fixed inputs.

TC is the total cost of all inputs, fixed and variable, when producing y output units. TC is the firm's total cost function;

$$\text{TC}=\text{F}+\text{VC}, \text{ or } c(y) = c_v(y) + F$$

Types of Cost Curves

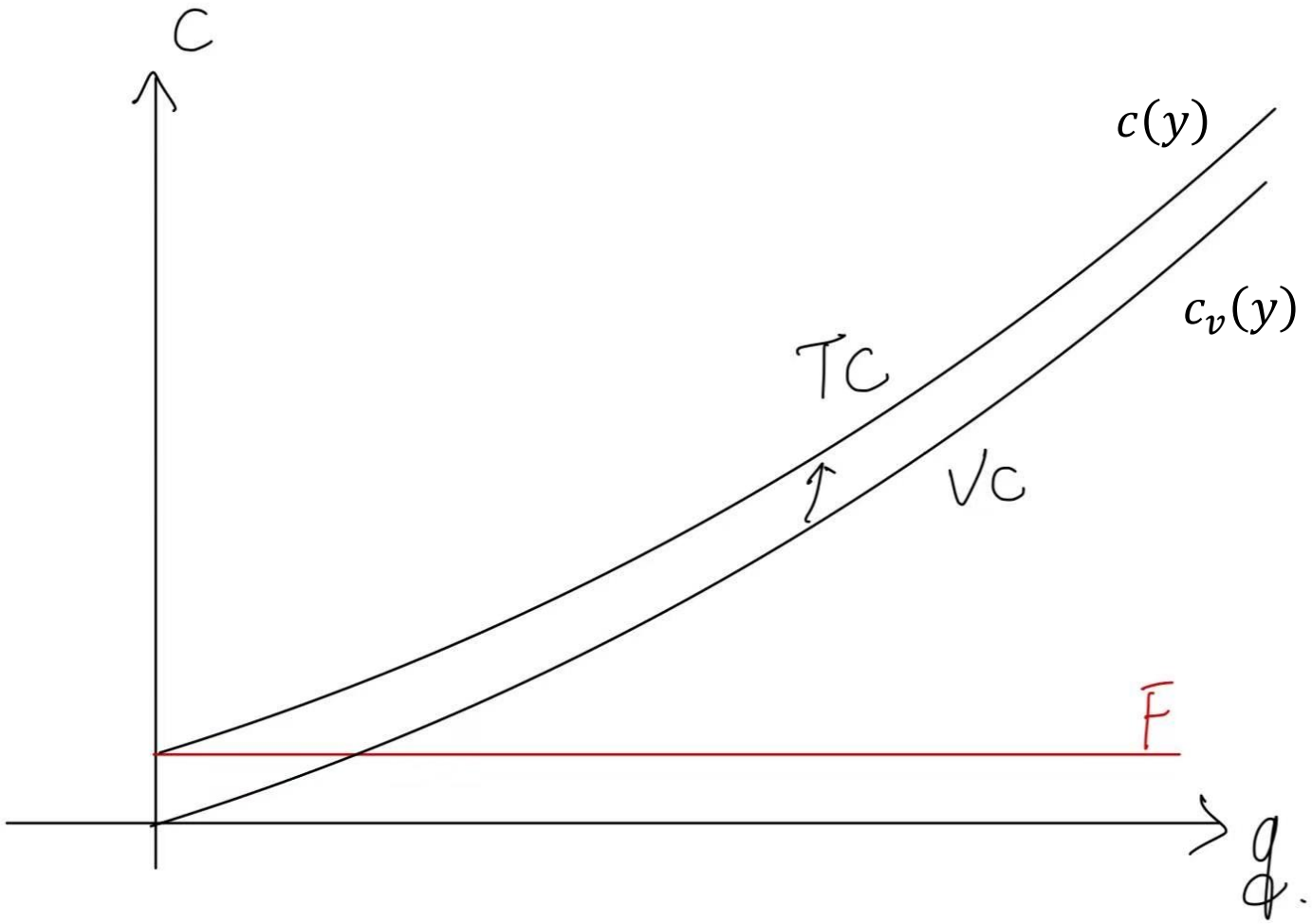
A total cost curve （总成本曲线）is the graph of a firm's total cost function.

A variable cost curve （可变成本曲线）is the graph of a firm's variable cost function.

An average total cost curve （平均成本曲线）is the graph of a firm's average total cost function.

How are these cost curves related to each other? How are a firm's long-run and short-run cost curves related?

Types of Cost Curves



Marginal Cost Function

Marginal cost is the rate-of-change of variable production cost as the output level changes. That is,

$$MC(y) = \frac{\partial c_v(y)}{\partial y}$$

The firm's total cost function is

$$c(y) = c_v(y) + F$$

and the fixed cost F does not change with the output level y, so

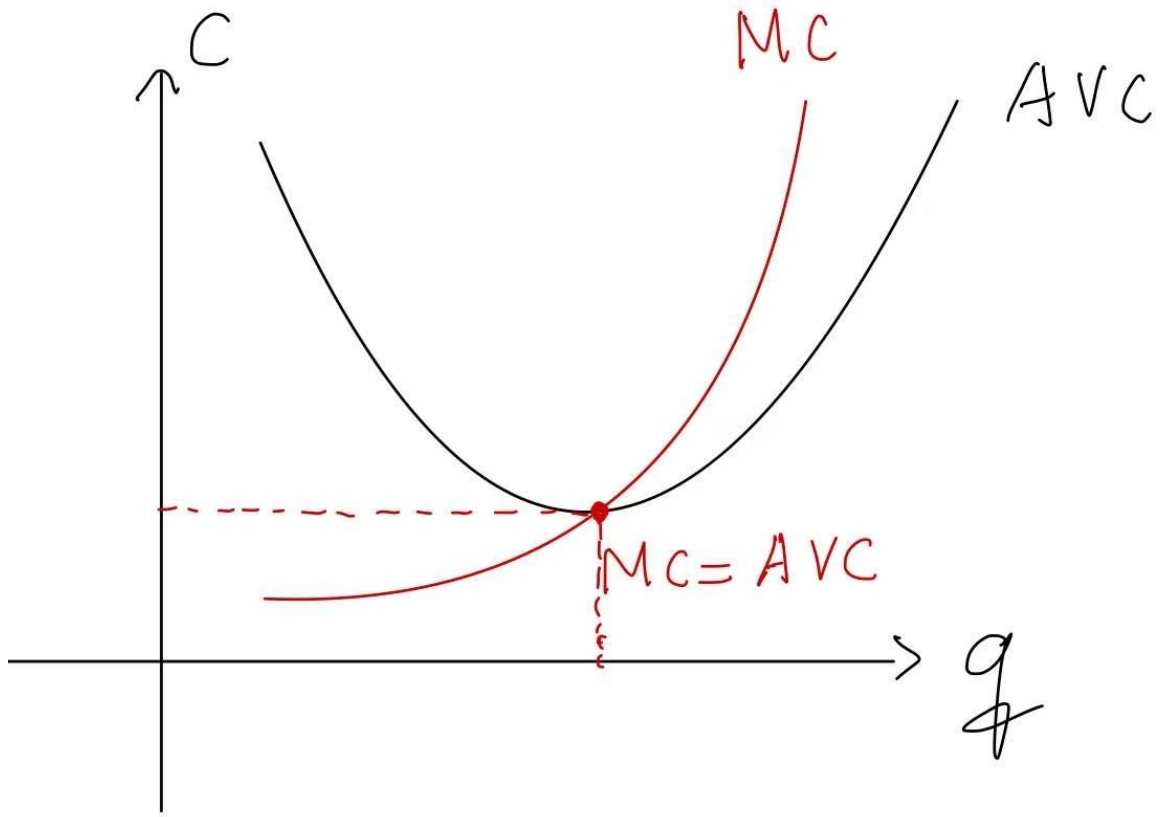
$$MC(y) = \frac{\partial c_v(y)}{\partial y} = \frac{\partial c(y)}{\partial y}$$

MC is the slope of both the variable cost and the total cost functions.

Marginal Cost and Returns to Scale

Q: When a firm operates under increasing returns to scale, is the marginal cost increasing or decreasing?

A: Marginal cost (MC) is decreasing under increasing returns to scale because production efficiency improves, reducing the cost per unit.



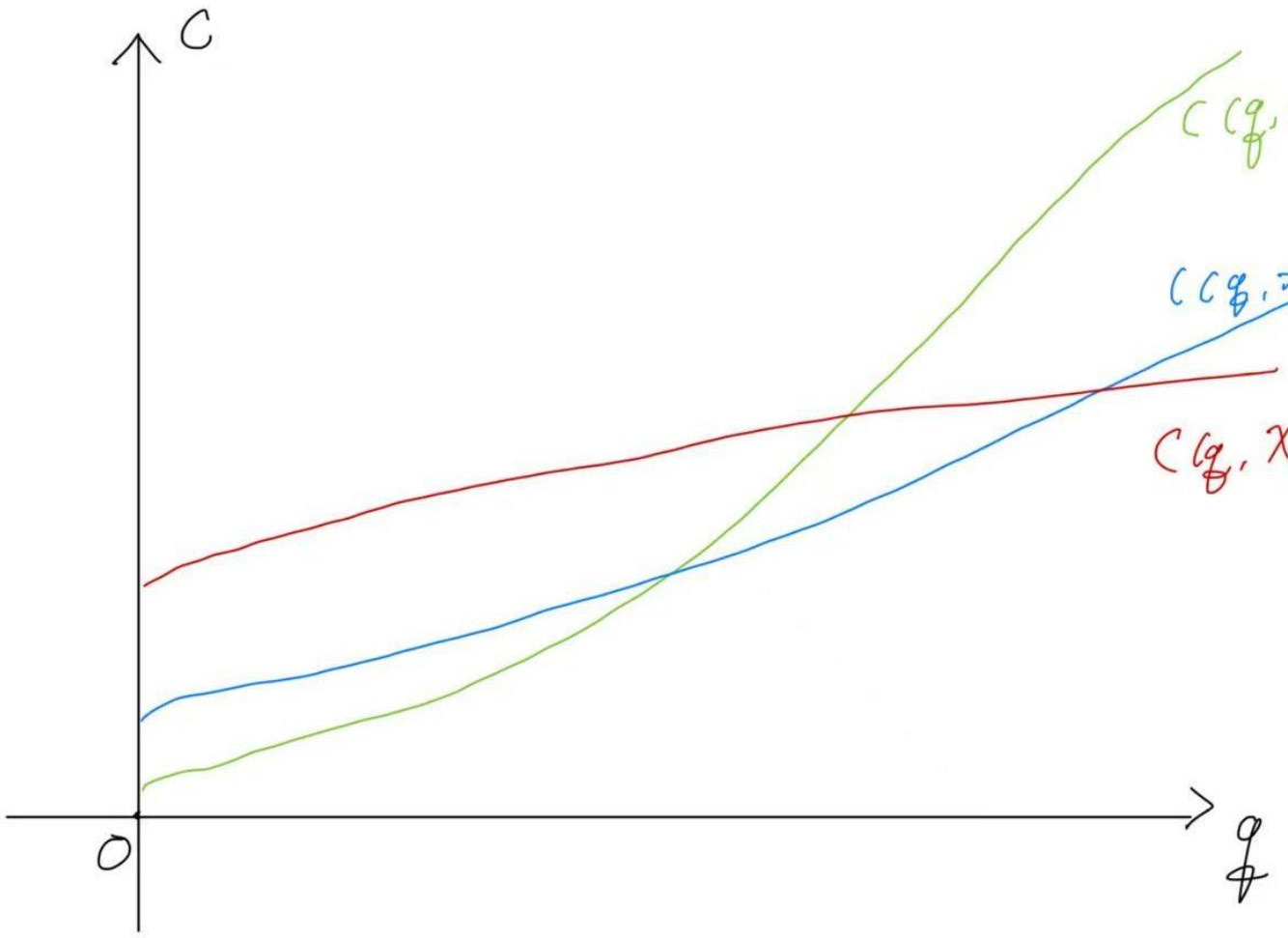
Short-Run & Long-Run Total Cost Curves

A firm has a different short-run total cost curve for each possible short-run circumstance.

Suppose the firm can be in one of just three short-runs ($x_2' < x_2'' < x_2'''$)

$$x_2 = x_2'$$
$$\text{or} \quad x_2 = x_2''$$
$$\text{or} \quad x_2 = x_2'''$$

Short-Run & Long-Run Total Cost Curves



$\min w_1 x_1 + w_2 \bar{x}_2$

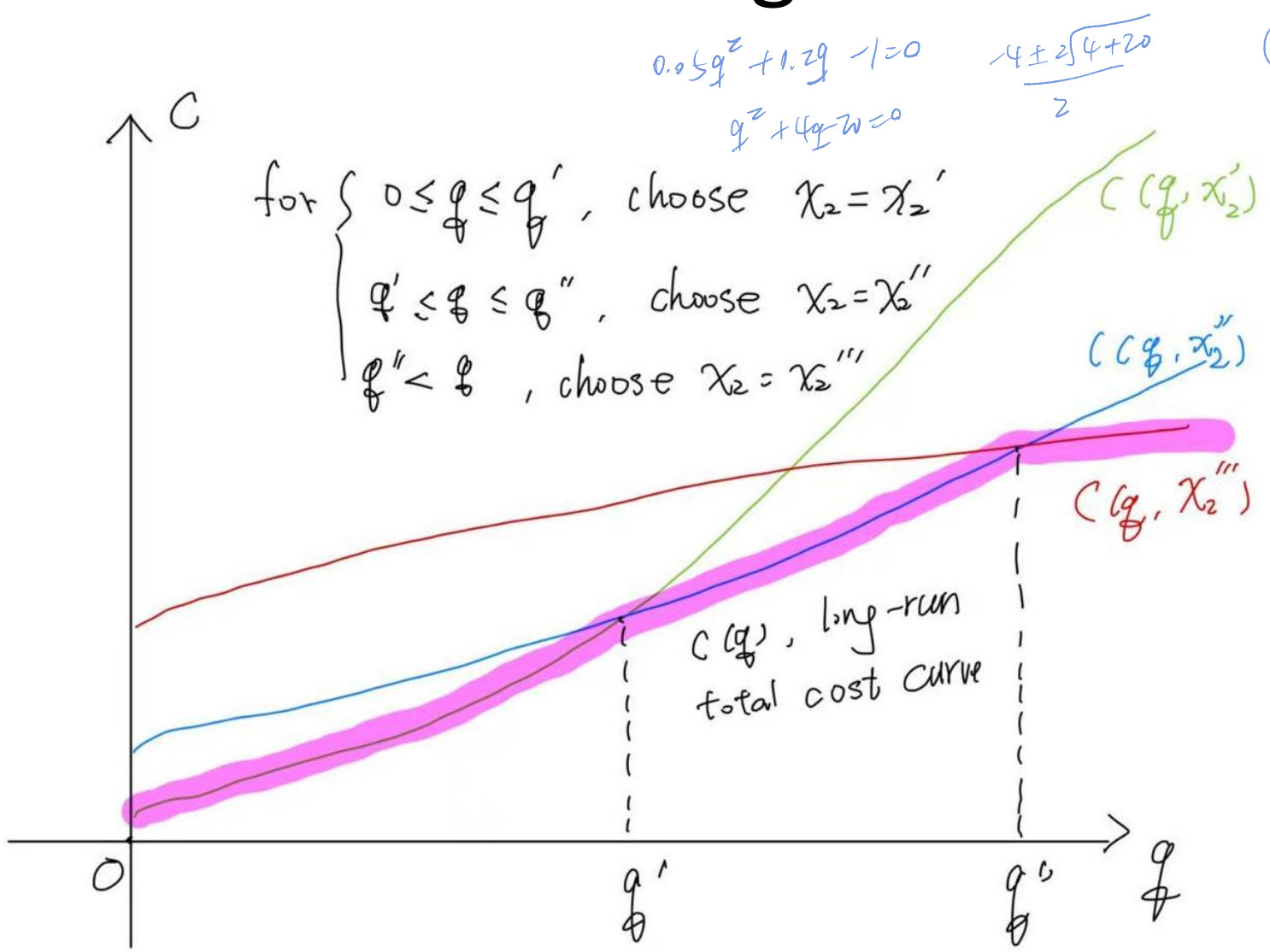
s.t. $f(x_1, x_2) = x_1^{\frac{1}{3}} x_2^{\frac{1}{3}} \geq q$.

$C(q, \bar{x}_2) = w_1 q^3 \bar{x}_2^{-2} + w_2 \bar{x}_2$

$C_s(q) = VC(q) + FC$.

$x_2'' < x_2'' < x_2'$

Short-Run & Long-Run Total Cost Curves



The firm's long-run total cost curve consists of the lowest parts of the short-run total cost curves.

The long-run total cost curve is the lower envelope of the short-run total cost curves.

Short-Run & Long-Run Total Cost Curves

$x_1 = q^3 x_2^{-2}$ $x_2 = \left(\frac{2w_1}{w_2}\right)^{\frac{1}{3}} \cdot q$.

The production function is

$$y = x_1^{1/3} x_2^{2/3}$$

Prices: p, w_1, w_2. Solve the short-run and long run cost-minimization problem.

$C_L(q) = \min_{x_2} w_1 q^3 x_2^{-2} + w_2 x_2$

$c'(q, \bar{x}_2) = -2w q^3 x_2^{-3} + w_2 = 0$

$\Rightarrow \bar{x}_2^* = \left(\frac{2w_1}{w_2}\right)^{\frac{1}{3}} \cdot q$.

Short run: $c\left(\underline{q}, \overline{x_2}\right) = w_1 \underline{q}^3 \overline{x_2}^{-2} + w_2 \overline{x_2}$

Long run: $c\left(\underline{q}\right) = (2^{-2/3} + 2^{1/3}) w_1^{1/3} w_2^{2/3} \underline{q}$

$C_L(q) = (2^{-\frac{2}{3}} + 2^{\frac{1}{3}})(w_1^{\frac{1}{3}} w_2^{\frac{2}{3}} q)$

$\Rightarrow C = \frac{w_1^{\alpha} w_2^{1-\alpha}}{(1-\alpha)^{1-\alpha} \alpha^{\alpha}} q$.

A question: Is the marginal cost the same in the short and long run?

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Chapter 23: Firm Supply

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Market Environments

Perfect

Pure competition (完全竞争) : A firm in a perfectly competitive market knows it has no influence over the market price for its product. The firm is a market price-taker. 价格接受者.

⇒ imply that the information is perfect.

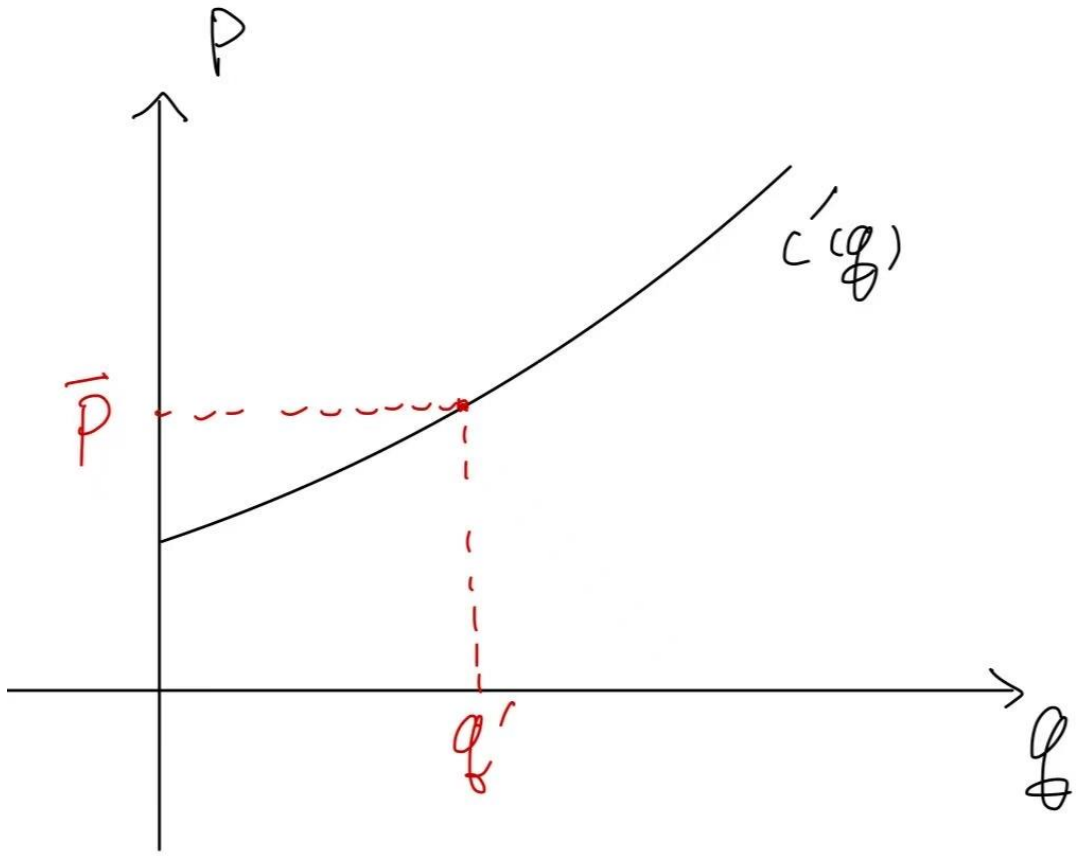
The search cost is 0.

Monopoly (垄断) : Just one seller that determines the quantity supplied and the market-clearing price.

Oligopoly (寡头垄断) : A few firms, the decisions of each influencing the payoffs of the others.

Monopolistic Competition (垄断竞争) : Many firms each making a slightly different product. Each firm's output level is small relative to the total.

The Firm's Short-run Supply Decision (Perfect Competition)

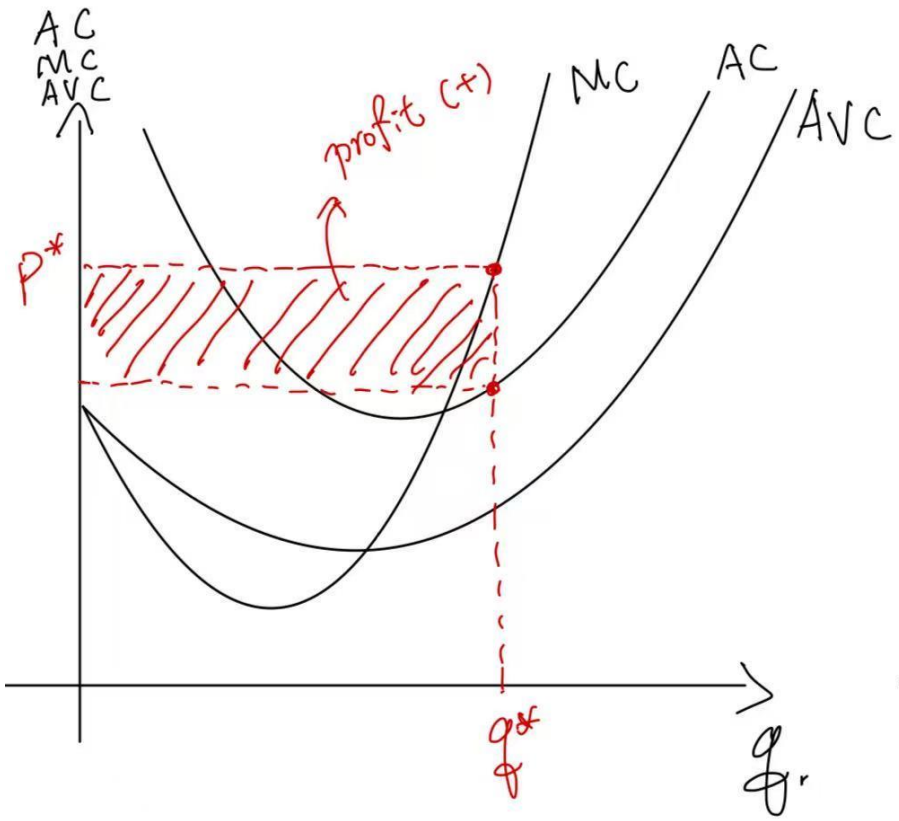


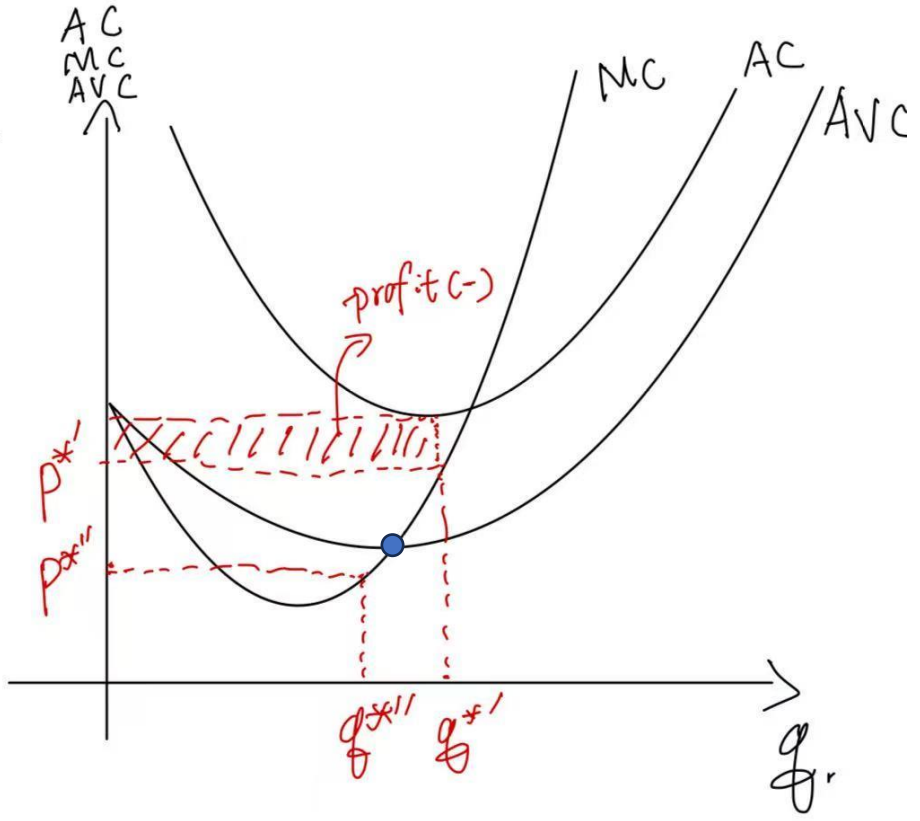
Each firm is a profit-maximizer and in a short-run.

Q: How does each firm choose its output level?

A: By solving $\max_{\underline{q}} p\underline{q} - c(\underline{q})$.

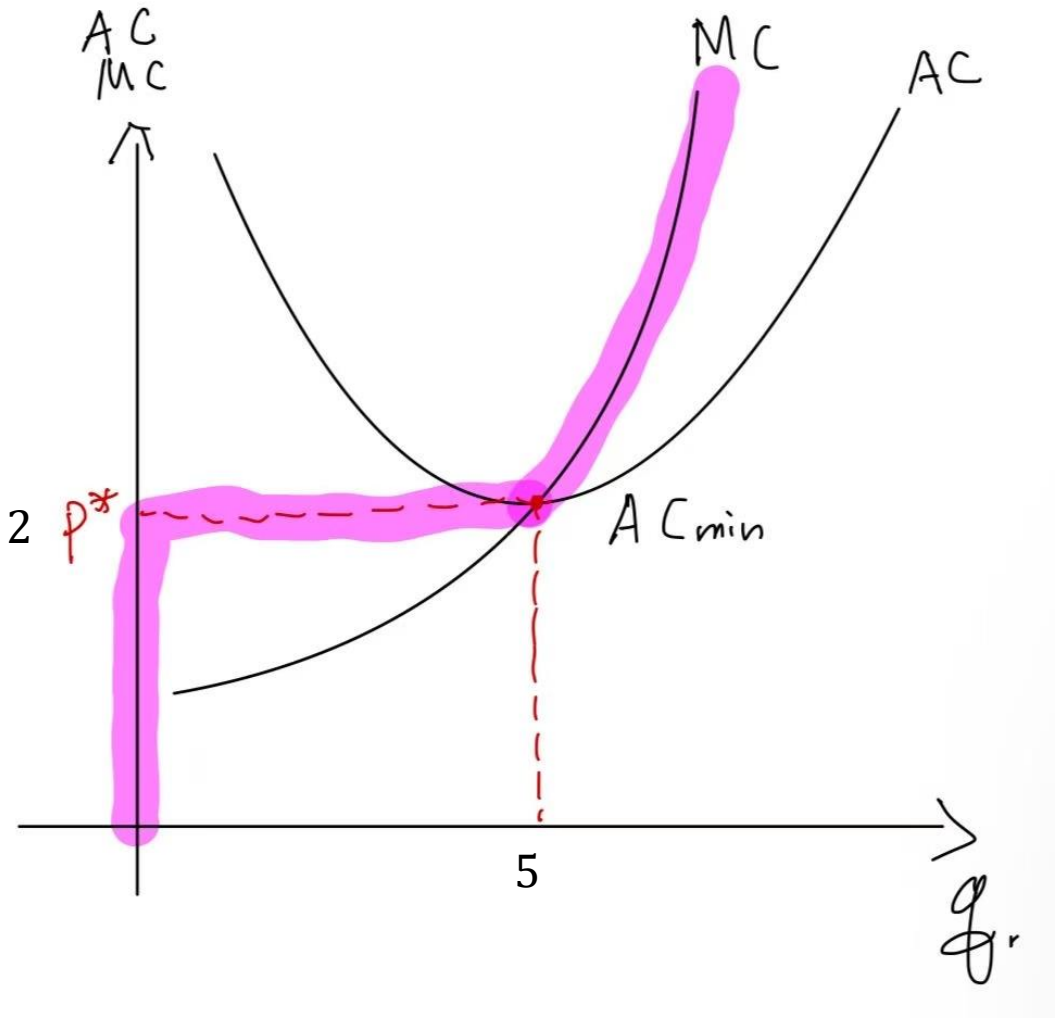
The Firm's Short-run Supply Decision (Perfect Competition)





$$p^* > p^{*\prime} > AVC > p^{*\prime\prime}$$

The Firm's Long-run Supply Decision (Perfect Competition)



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Chapter 24: Industry Supply

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Short-run Industry Supply

In a short-run the number of firms in the industry is, temporarily, fixed.

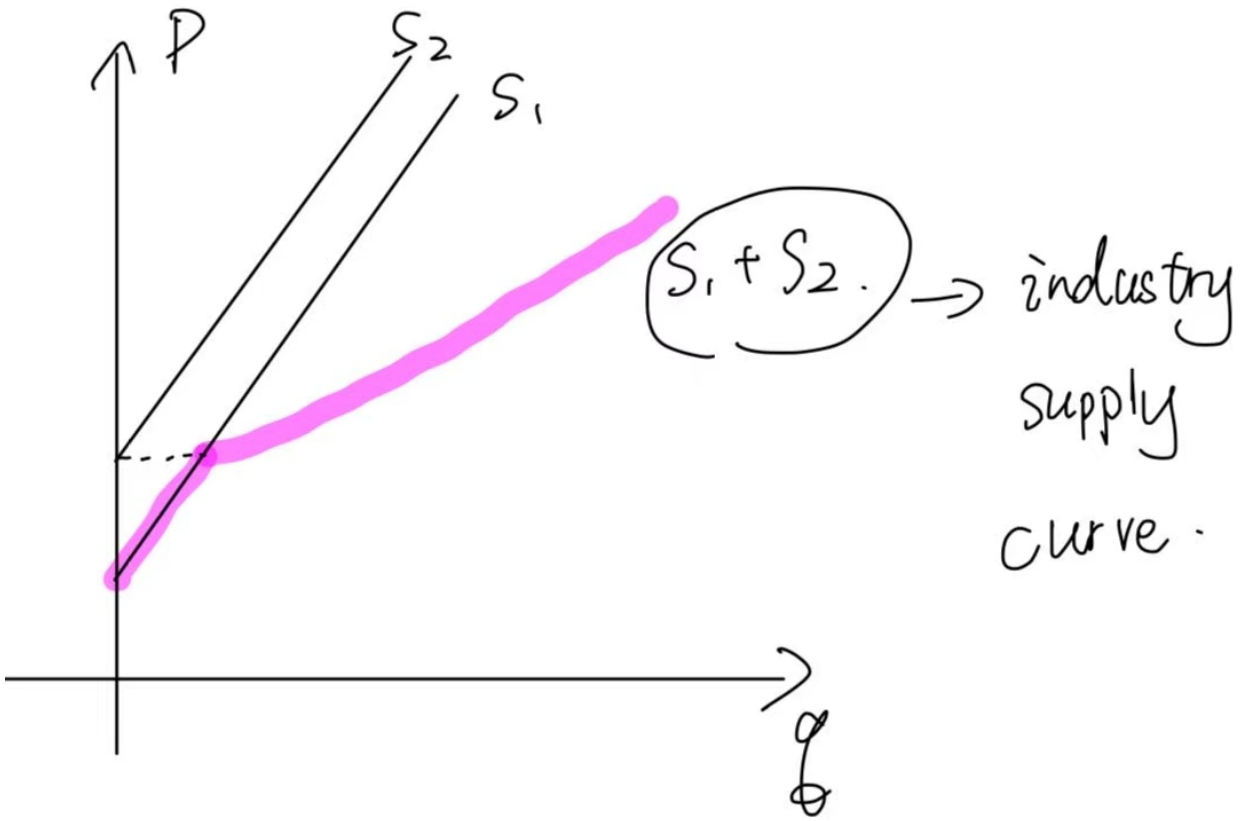
Let n be the number of firms;
$i = 1, \dots, n$.

$S_i(p)$ is firm i's supply function.

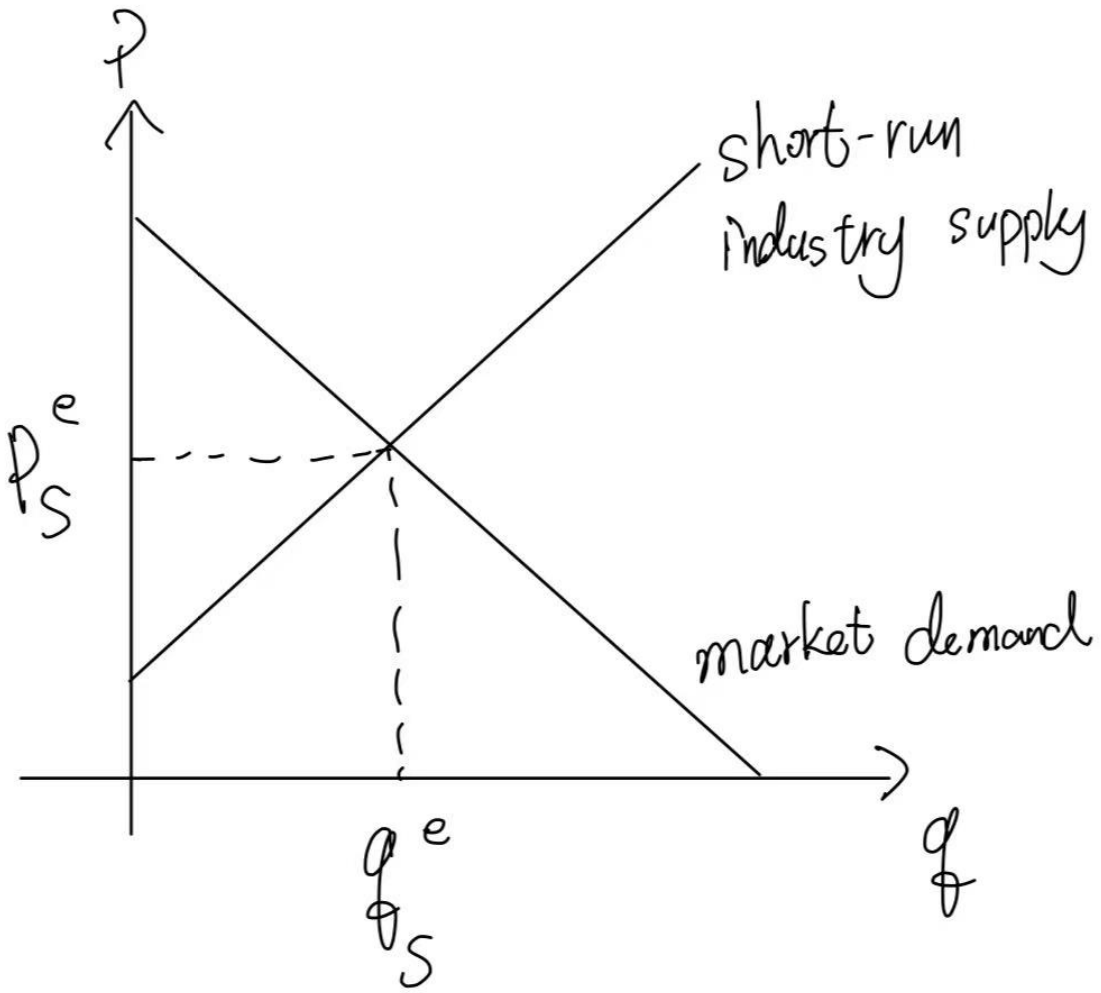
The industry's short-run supply function is

$$S(p) = \sum_{i=1}^{n} S_i(p)$$

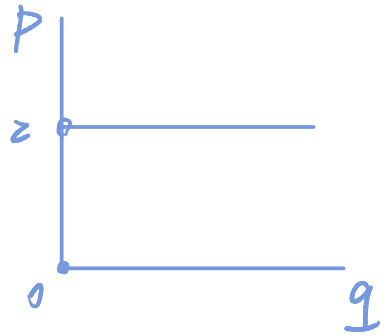
Short-run Industry Supply



Short-run Industry Equilibrium



Long-run Industry Supply



In the long-run every firm now in the industry is free to exit and firms now outside the industry are free to enter.

> The industry's long-run supply function must account for entry and exit as well as for the supply choices of firms that choose to be in the industry.

How is this done?

Positive economic profit induces entry.

Economic profit is positive when the market price p_s^e is higher than a firm's minimum av. total cost;

$$p_s^e > \min \mathrm{AC(y)}.$$

Entry increases industry supply, causing p_s^e to fall.

When does entry cease?