

Firm and industry supply

ECON 201 - Winter 2026

Week 3: January 21st, 2026

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Today's Agenda

1. Deriving the supply curve of an individual firm
2. Producer surplus
3. Deriving the short-run supply curve of an industry

Recap

- In the previous week, we were solving the firm's problem *given* some fixed market price p^*
- This week, we will examine the solution to the firm's problem as a *function* of any possible market price p
 $\Rightarrow$ We will call this function the **supply function**
- *Interpretation:* Firm is devising a **contingency plan** for how much to produce under any hypothetical market price

Recall

(Indirect) Profit Maximization Problem

$$\begin{aligned} \max_q \quad & \pi(q) \equiv pq - c \\ \text{s.t.} \quad & p = p^* \\ & c = c(q) \end{aligned}$$



Find optimal q^*

Supply decision

Goal: Trace out the dependence of q^* on p^* to get the supply function $q^s(p)$.

Firm's cost function has both a variable and fixed components:

$$c(q) = VC(q) + F$$

Supply decision

$$\max \left\{ -F, \max_q \pi(q) \right\}$$

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Extensive margin: Does the firm enter the market at all?

Intensive margin: How much output does the firm supply?

Extensive margin

Entry condition:

$$\max_q \pi(q) > -F$$

Intuition: The firm will enter the market only if it can at least reduce the losses F it already incurred.

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Interpretation: Average variable cost needs to be lower than the price for the firm to operate.

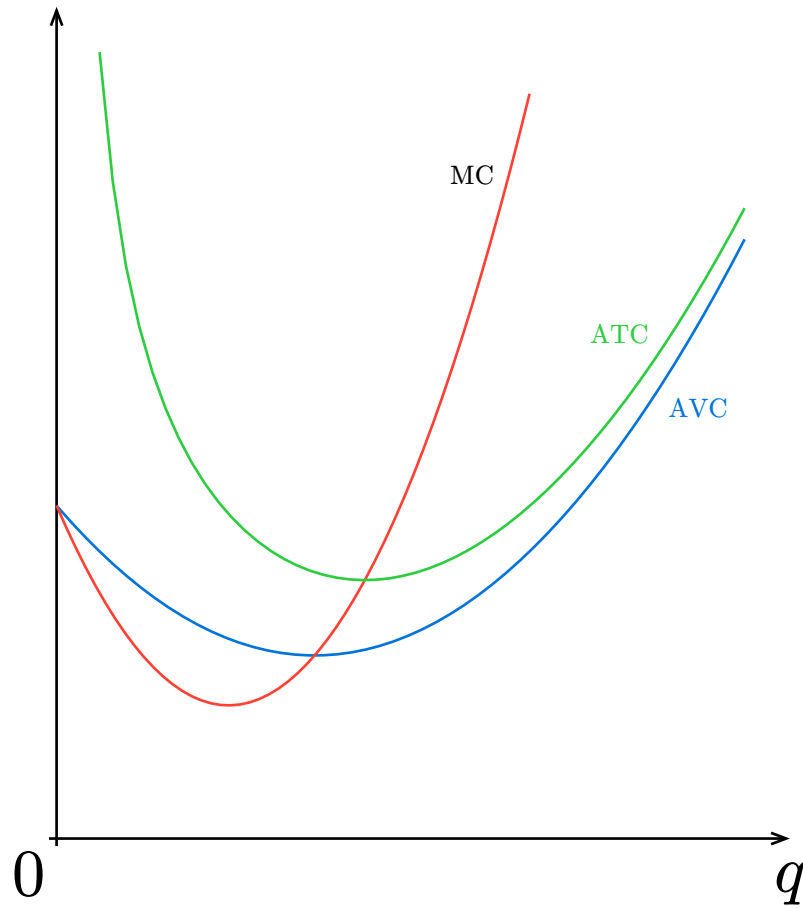
Intensive margin

(Indirect) Profit Maximization Problem

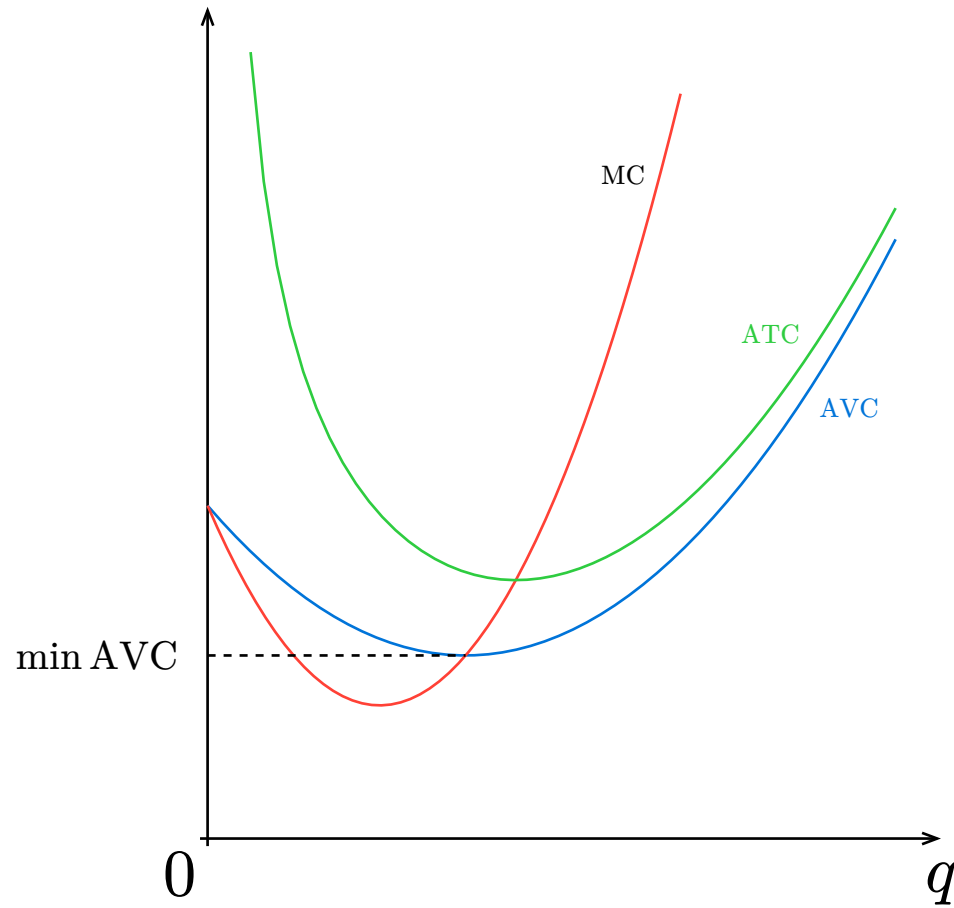
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Goal: Express q^* as a function of p^* for $p^* > AVC(q^*)$.

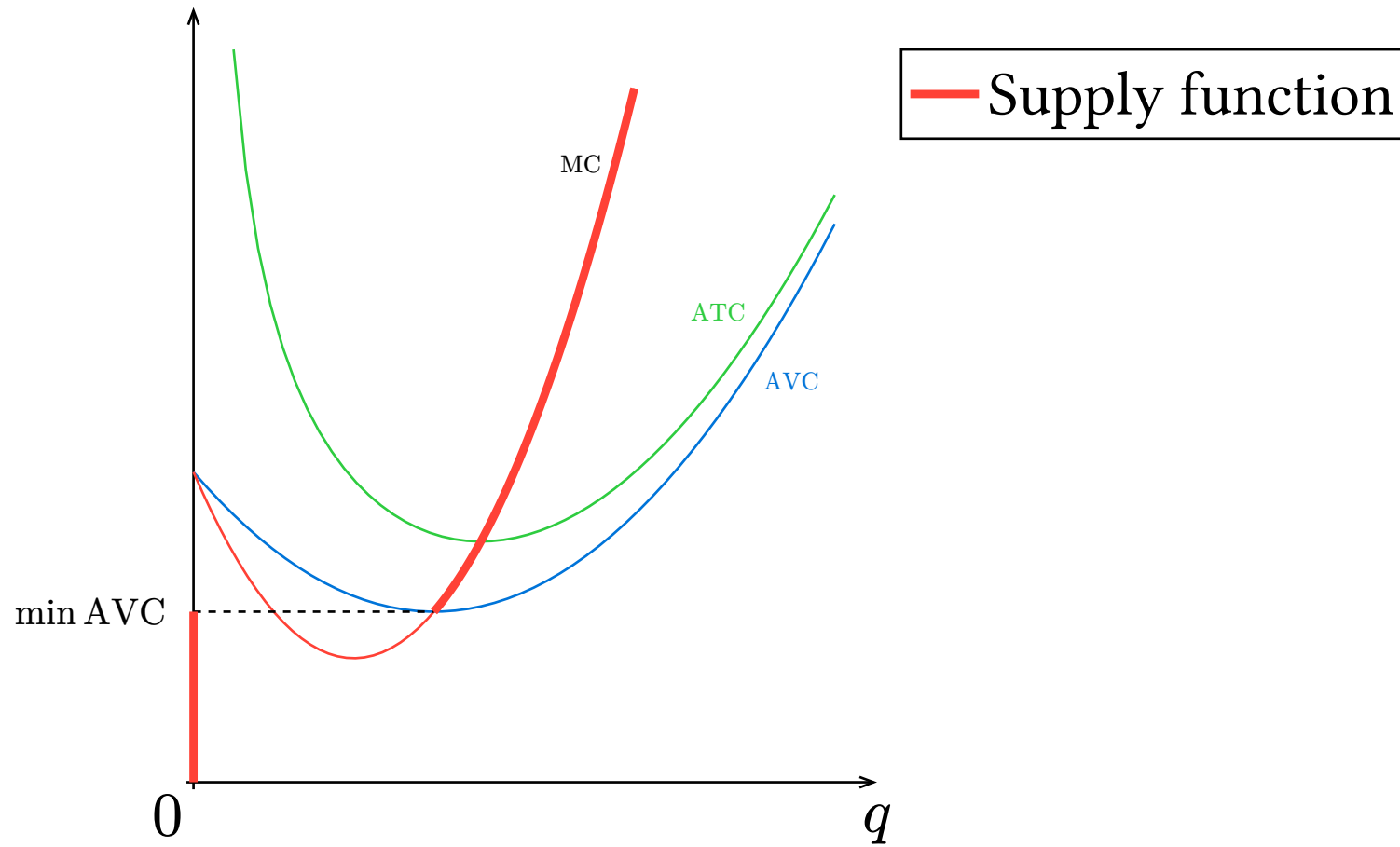
Illustration



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Producer surplus

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Surplus definition

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Surplus definition

$$\begin{aligned}\text{PS} &\equiv \int_0^{q^*} [p^* - \text{MC}(q)] \, dq \\ &= p^* q^* - \text{VC}(q^*)\end{aligned}$$

Interpretation: Producer surplus is the same as variable profits.

How to get the common definition

“The area under p^* to the left of the supply curve”

Define $\bar{q}$ as the quantity at which $MC(\bar{q}) = AVC(\bar{q})$.

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$$\begin{aligned} PS &\equiv \int_0^{q^*} [p^* - MC(q)] dq \\ &= \int_0^{\bar{q}} [p^* - MC(q)] dq + \int_{\bar{q}}^{q^*} [p^* - MC(q)] dq \end{aligned}$$

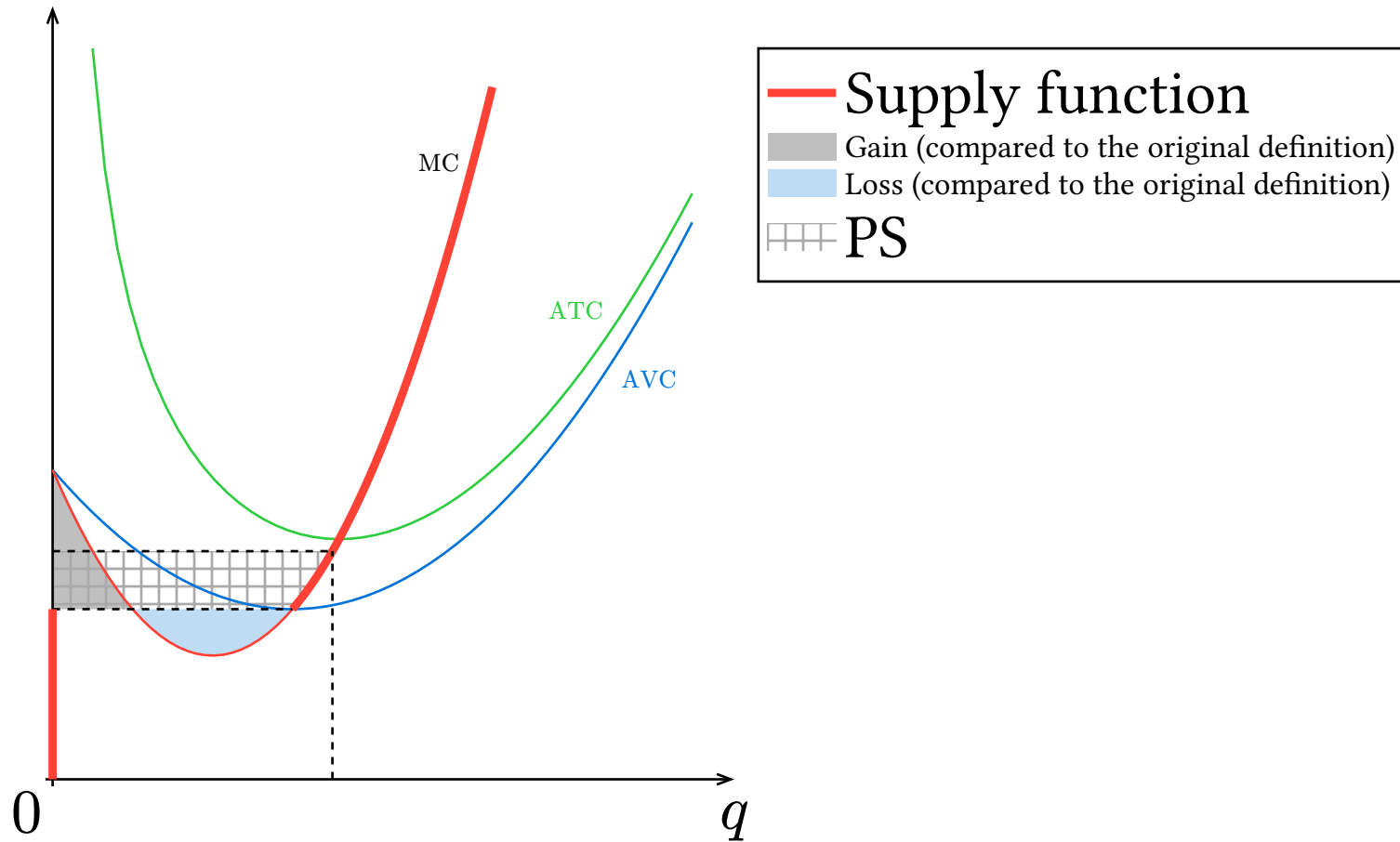
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How to get the common definition



Industry supply

Short-run industry supply

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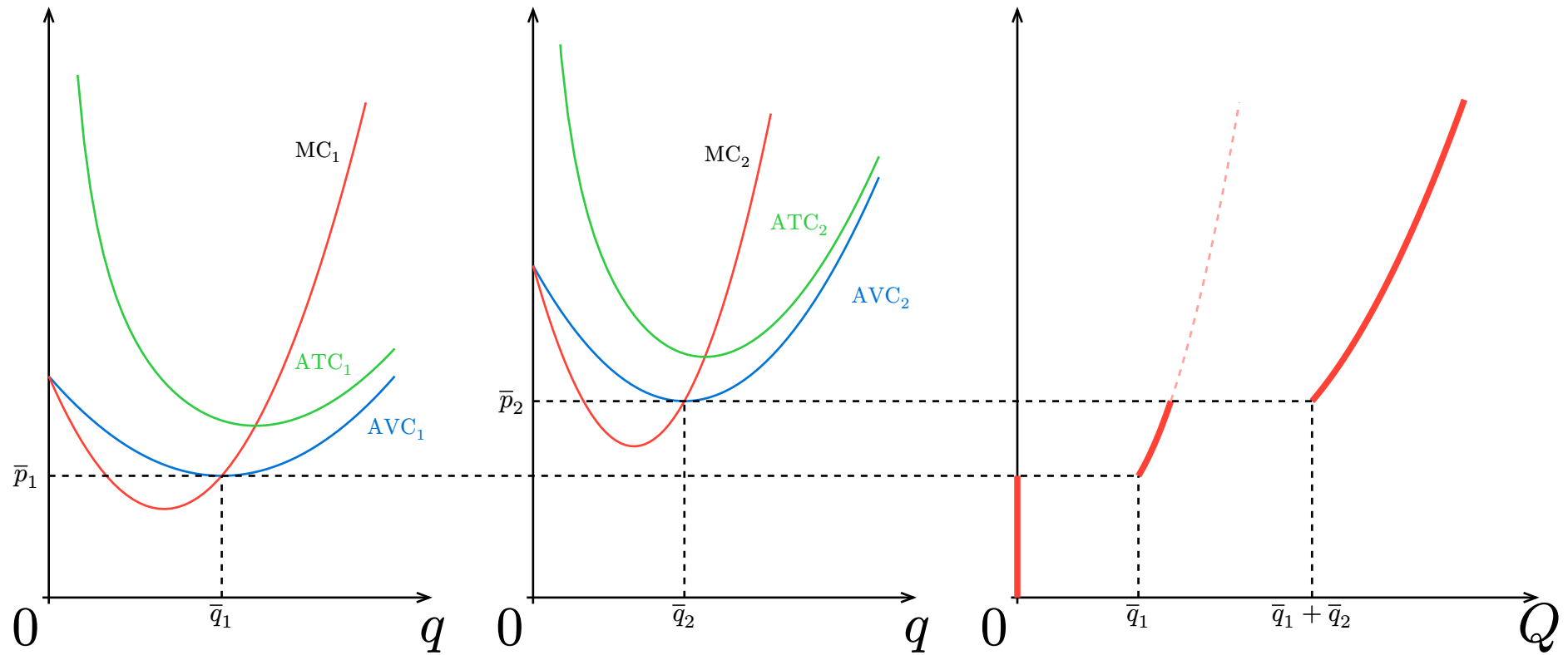
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 - $\Rightarrow$ The number of firms is *pre-determined*, even though they can supply nothing

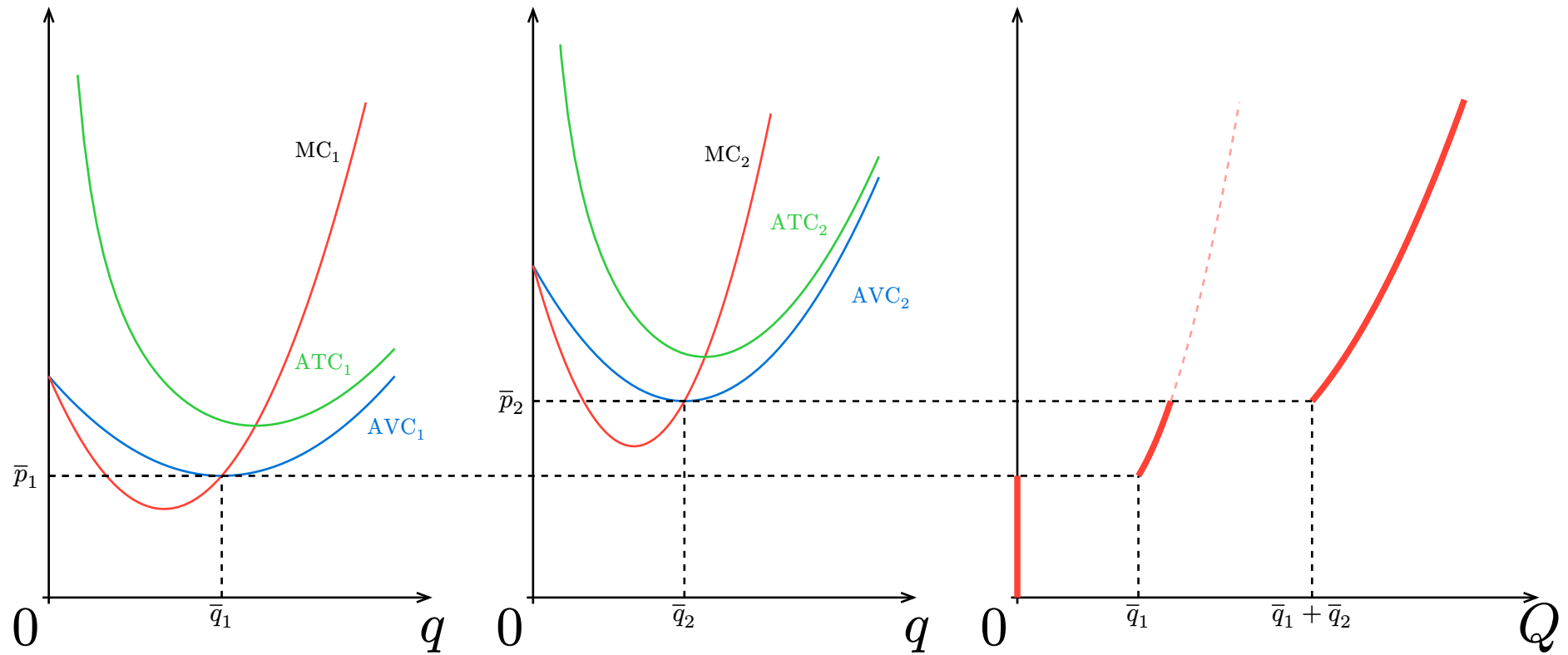
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 - $\Rightarrow$ The number of firms is *pre-determined*, even though they can supply nothing
- The aggregate supply is the *horizontal* sum of the individual firms’ supply curves.

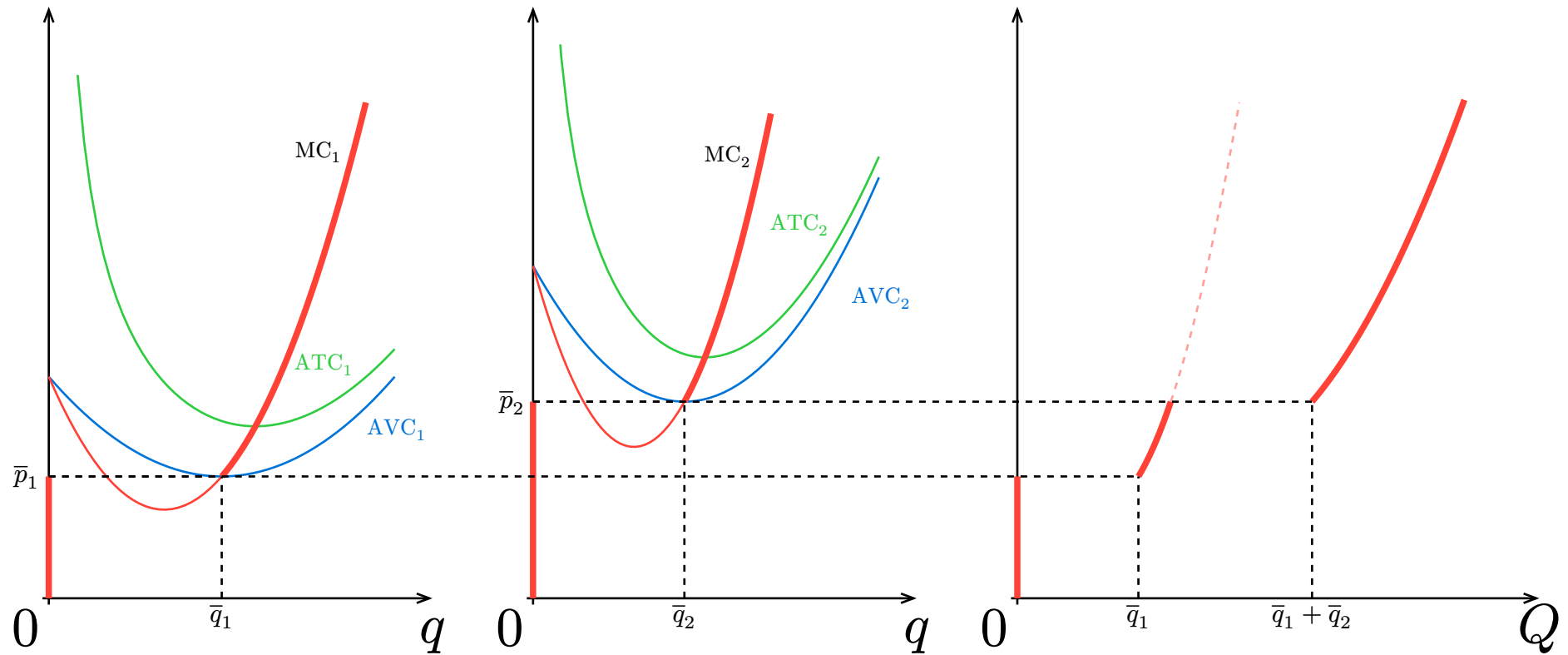
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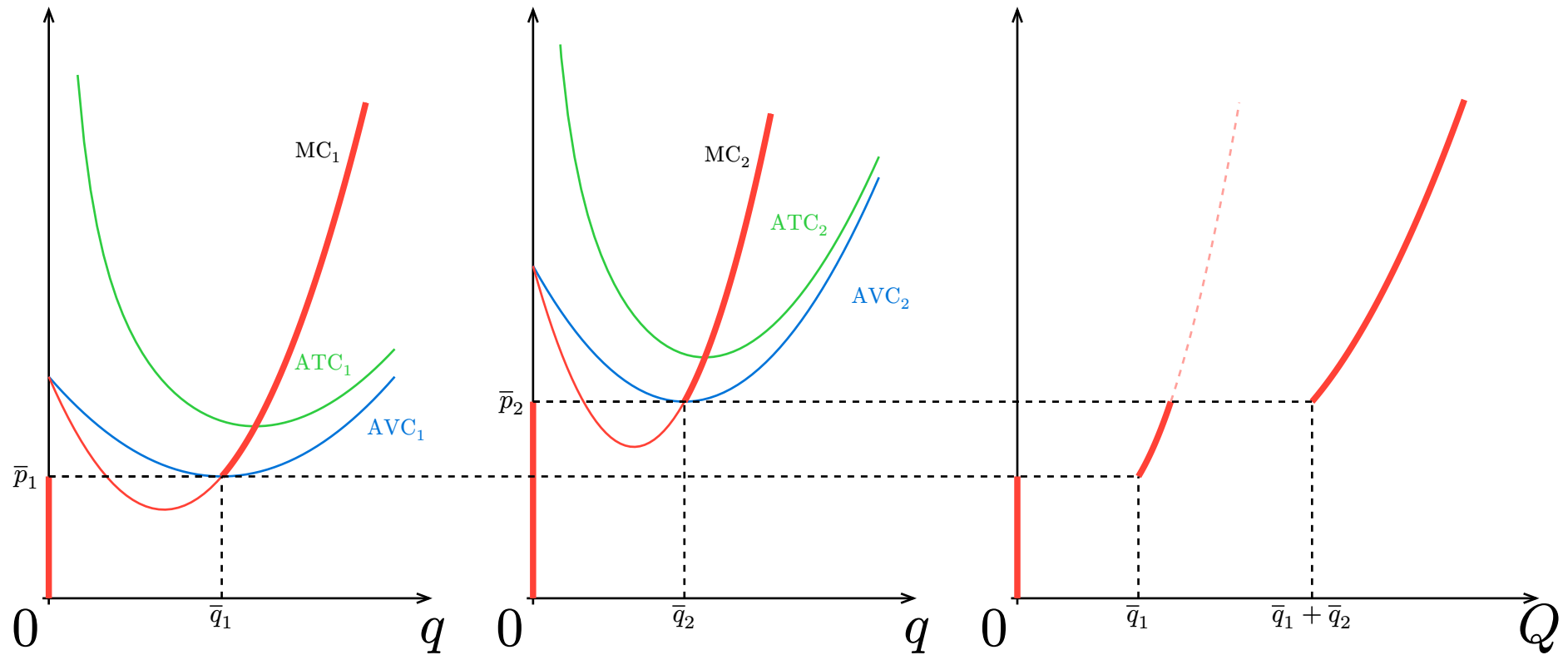
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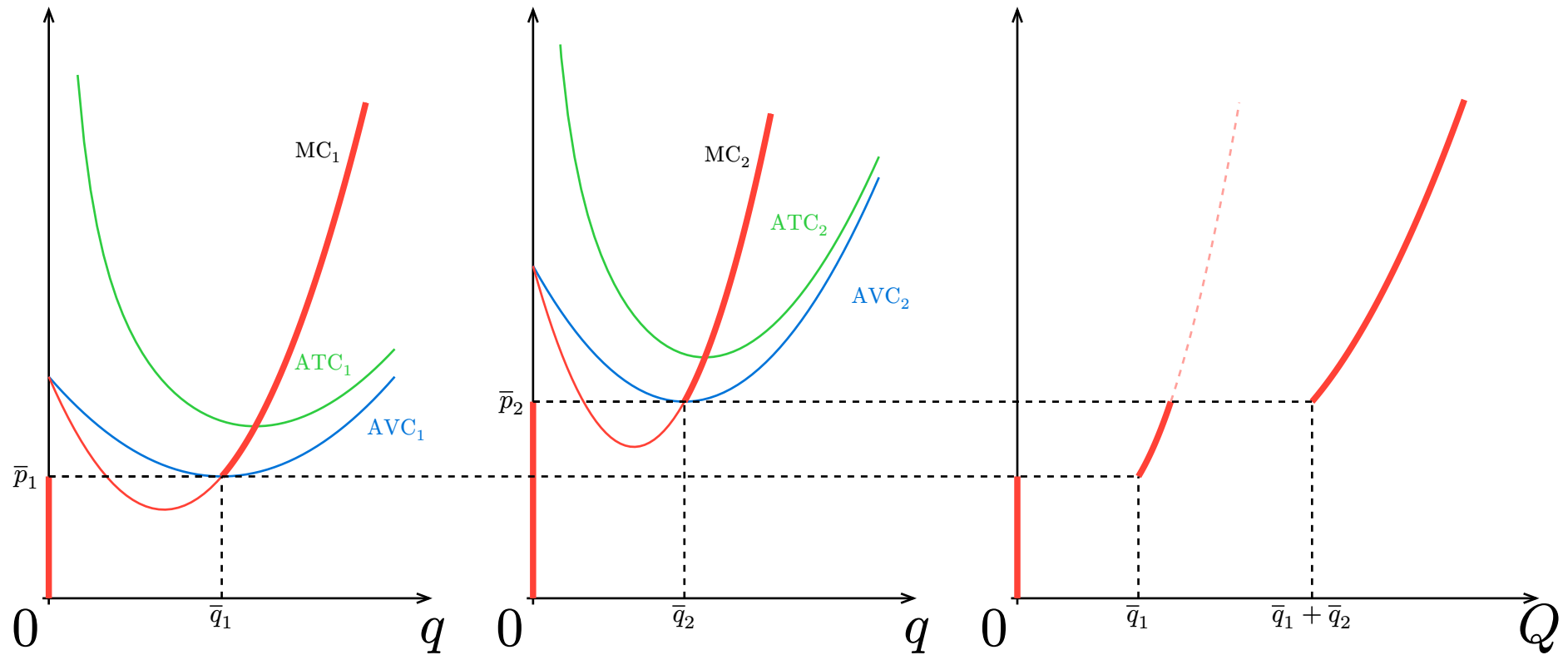
Short-run industry supply



Short-run industry supply



Short-run industry supply



Long-run industry supply

- In the long run, no fixed costs for entry
 - $\Rightarrow$ no sunk costs
 - $\Rightarrow$ only total costs matter for the extensive margin

Long-run Supply decision

$$\max \left\{ 0, \max_q \pi(q) \right\}$$

- There is a ‘pool’ of firms that can enter and exit the market freely
 - Often assumed to be infinite
 - Every firm understands the impact of its entry on the aggregate supply and, thus, on the equilibrium price

Long-run industry supply

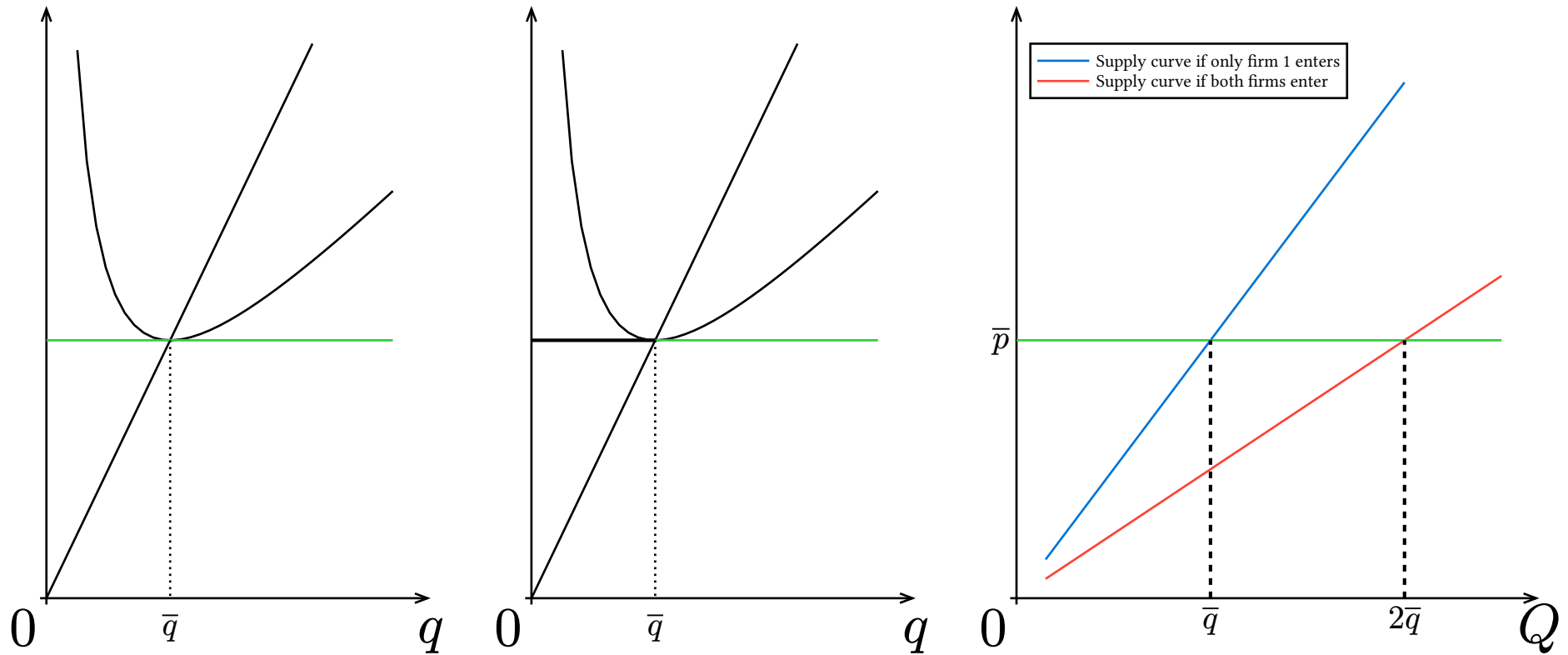
To derive the long-run industry supply curve, need to specify:

- Pool of firms that are considering entry
- Their production technologies and, consequently, cost functions
- The demand function

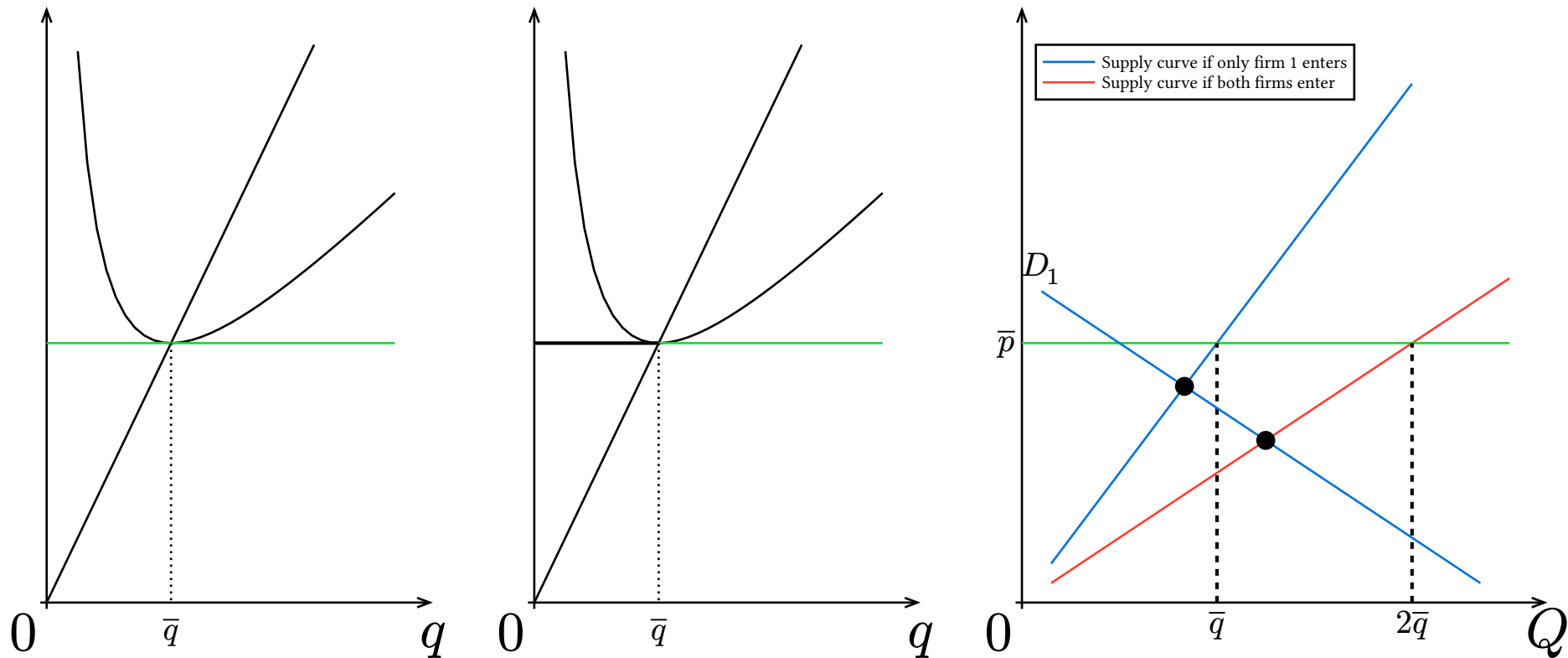
Let us consider an example:

- Pool of firms: 2 firms $i \in \{1, 2\}$.
- Cost functions: $c_i(q_i) = q_i^2 + 4, i \in \{1, 2\}$
 - Notice that the fixed component, 4, is not part of the entry cost
 - Firms incur it only if they choose to enter the market
- Inverse demand: $P = a - Q$
 - a is a parameter that we will vary to trace out the long-run supply curve

Long-run industry supply

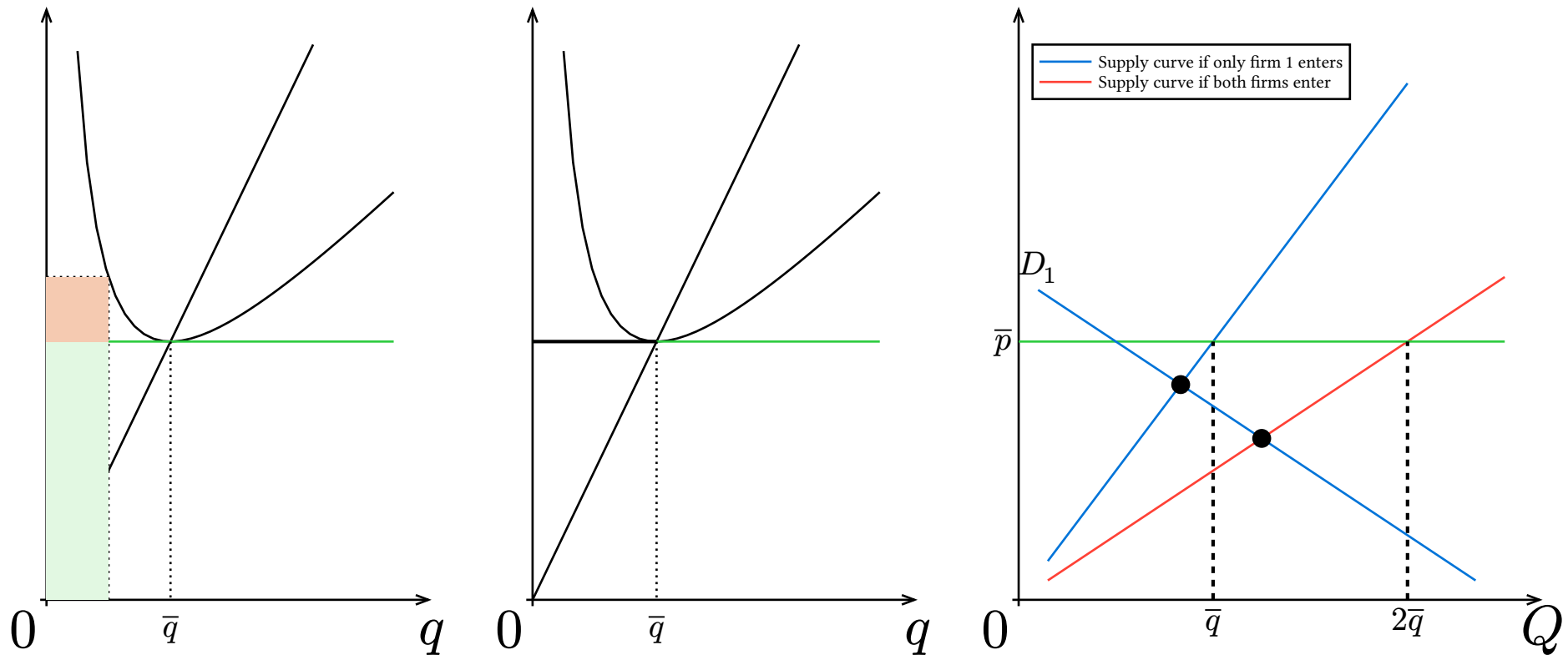


Long-run industry supply



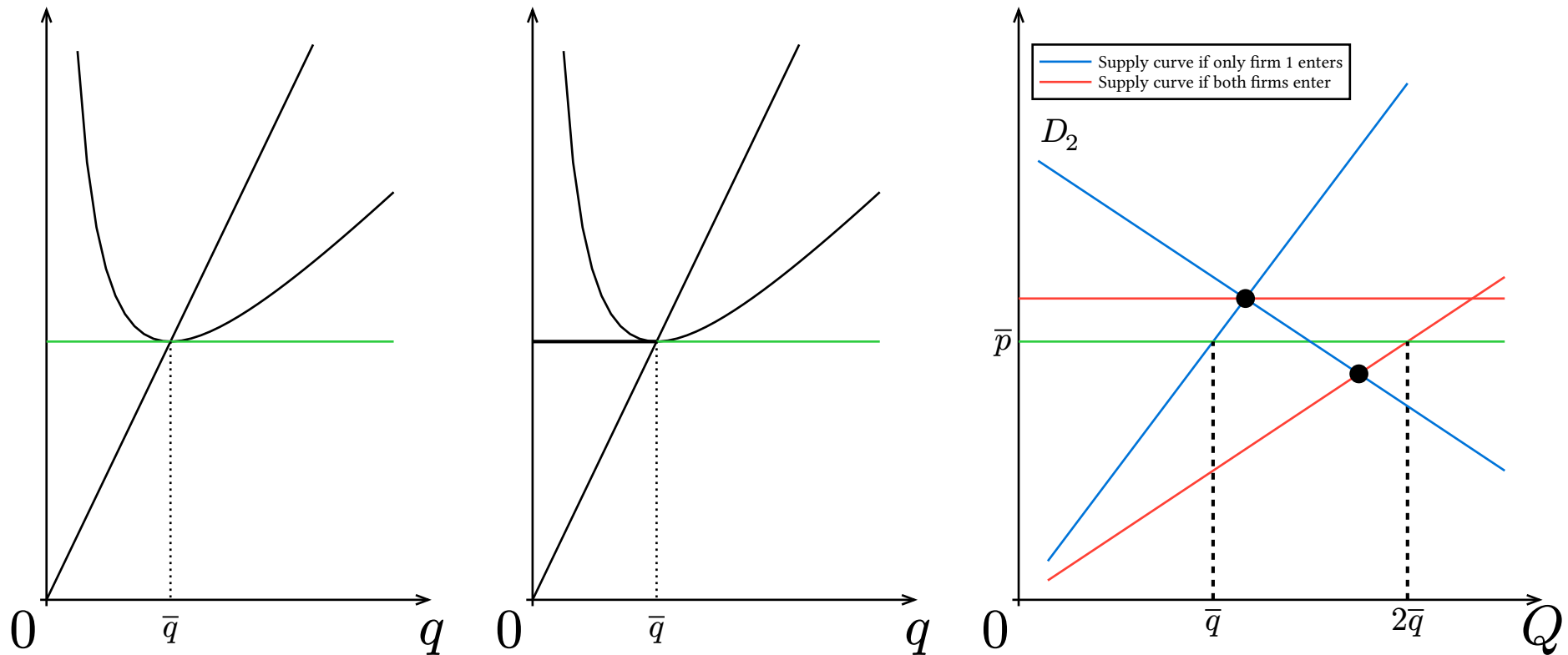
- Consider demand curve D_1 , where $a = 5$
- Regardless of which firms enter, the equilibrium price will be below $\bar{p} = \min_q AC(q)$
- None of the firms will enter the market

Long-run industry supply



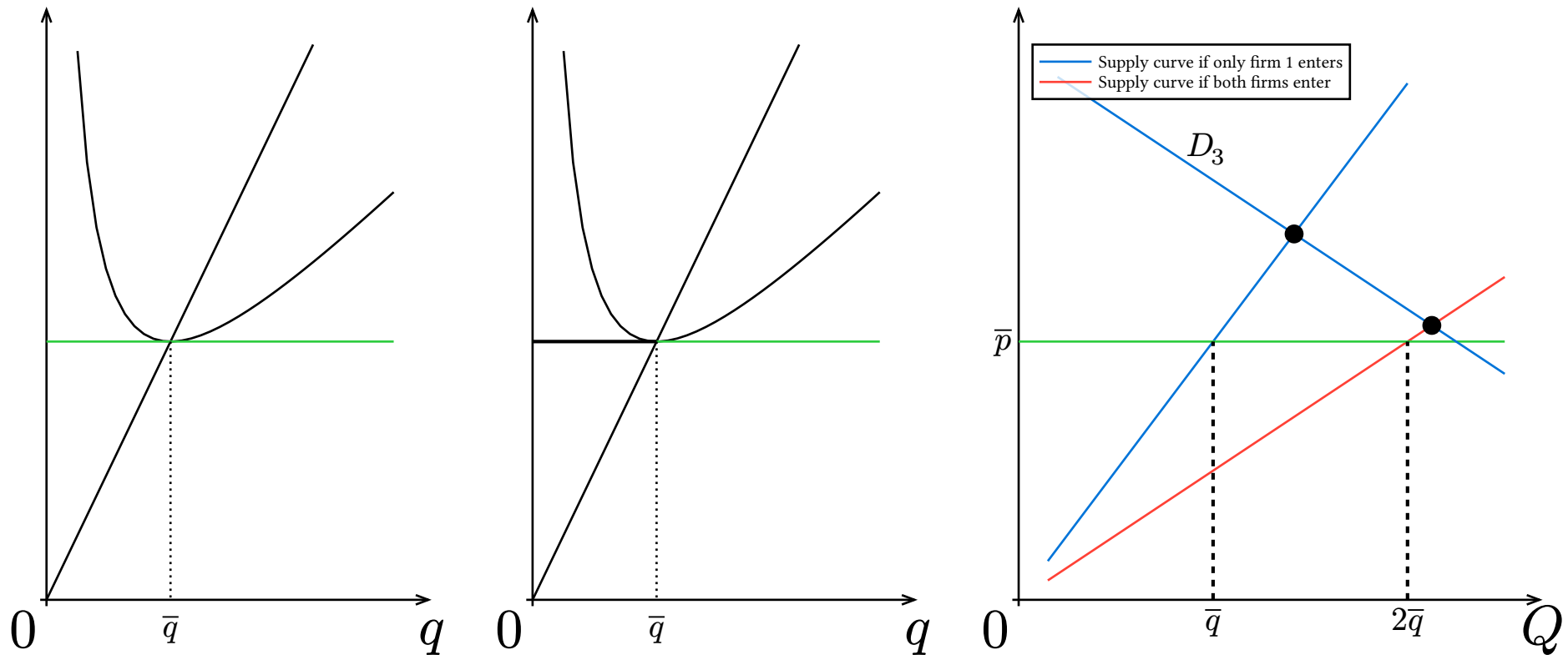
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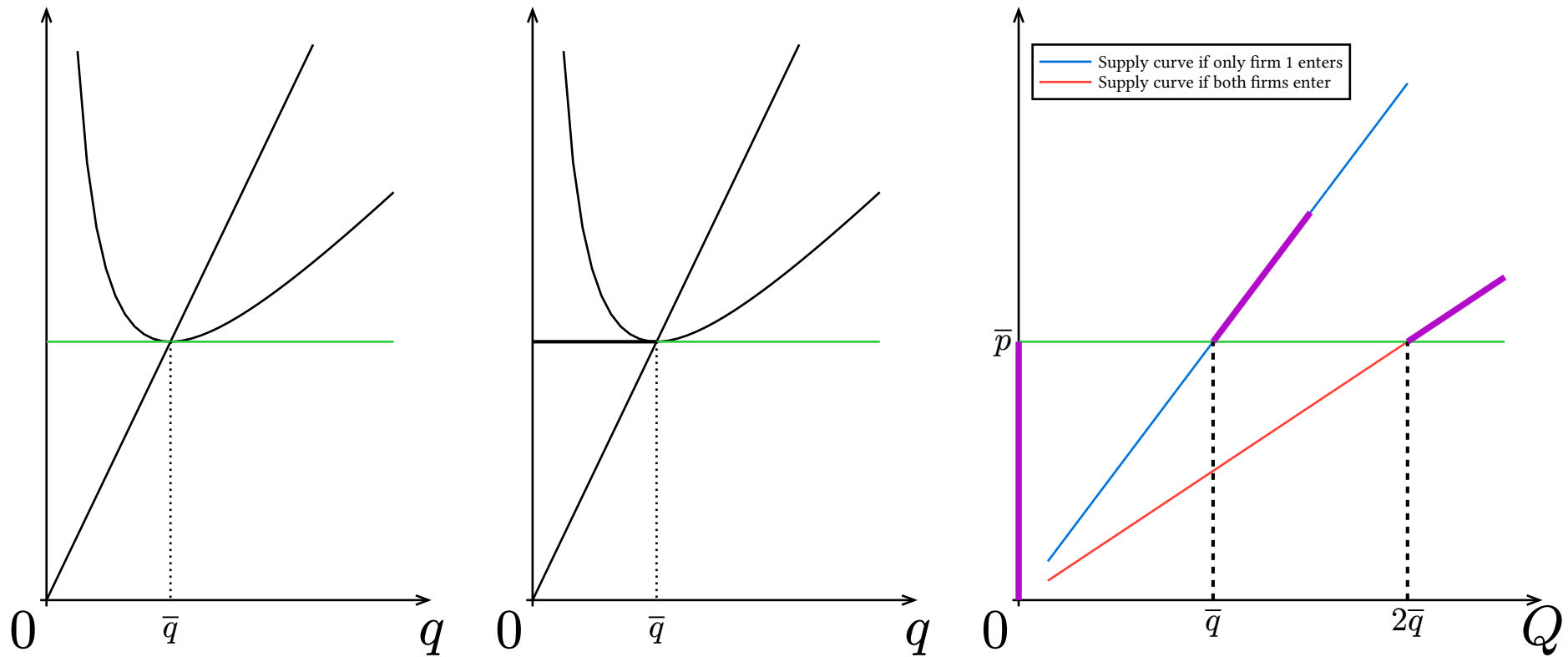
- Consider demand curve D_2 , where $a = 7$
- If only firm 1 enters, the equilibrium price will be above $\bar{p}$
- If both firms enter, the equilibrium price will be below $\bar{p}$
- Only firm 1 will enter the market

Long-run industry supply



- Consider demand curve D_3 , where $a = 8.5$
- If both firms enter, the equilibrium price is still above $\bar{p}$
- Both firms will enter the market

Long-run industry supply



As a result, the purple line traces the long-run industry supply curve

How can we get a perfectly elastic long-run supply curve?

- If we increase the number of firms in the initial pool and the size of demand, reflected by a , the purple line will converge to a flat line
- Alternatively, if we change the cost function so that the quantity threshold of 0 profits for each firm, $\bar{q}$, is smaller, then even for a fixed demand, the purple line will also converge to a flat line