Market Supply

EC 311 - Intermediate Microeconomics

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Outline

Chapter 08

- Topics
  - Perfect Competition: Short-Run (8.3)
  - Perfect Competition: Long-Run (8.4)

g # Markets {.inverse .note}

Market Supply

We will label **Market Supply** as Q_S

And it is obtained in the exact same way as market demand

- If you know the Q^* of one firm, and there are 10 identical firms, then we get

$$Q_S = 10 \cdot Q^*$$

But finding market supply is not as interesting as the dynamics between the **Short-Run & Long-Run**

Perfect Competition: Short-Run

Short-Run vs Long-Run

Previously, we referred to the **Short-Run Supply Curve** as the curved created by **P = MC**

- We are able to say this is the **short-run** because over a longer time horizon:
  - Firms will **enter** or **exit** the market

In other words, in the **Long-Run**:

- Firms that are already in the market can choose to **exit the market** and stop paying the Fixed Costs
- Additionally, new firms can **enter the market** and begin to pay the Fixed Costs

What Makes a Firm Enter or Exit?

What could determines whether a firm enters or exists the market?

PROFITS

- We saw how the perfectly competitive firm can be operating optimally and still have negative profits
  - Some firms will operate at a loss as long as it is less than their Fixed Costs
- There are also circumstances in which the perfectly competitive firm can behave optimally and make positive profits

In either case, the fact that profits are not zero has implications for the Long-Run

Short-Run to Long-Run: Exit Condition

$$P < \min\{ATC(Q^*)\}$$

Short-Run

Firms operate at a loss in order to offset some of their **FC**

Long-Run

Firms **exit** the market

Short-Run to Long-Run: Entry Condition?

What happens when we have

$$P > \min\{ATC(Q^*)\}$$

Short-Run

Firms will produce and earn a positive economic profit

Long-Run

New firms (Firms outside the market) see these positive profits, and enter the industry to collect these profits themselves

Perfect Competition: Long-Run

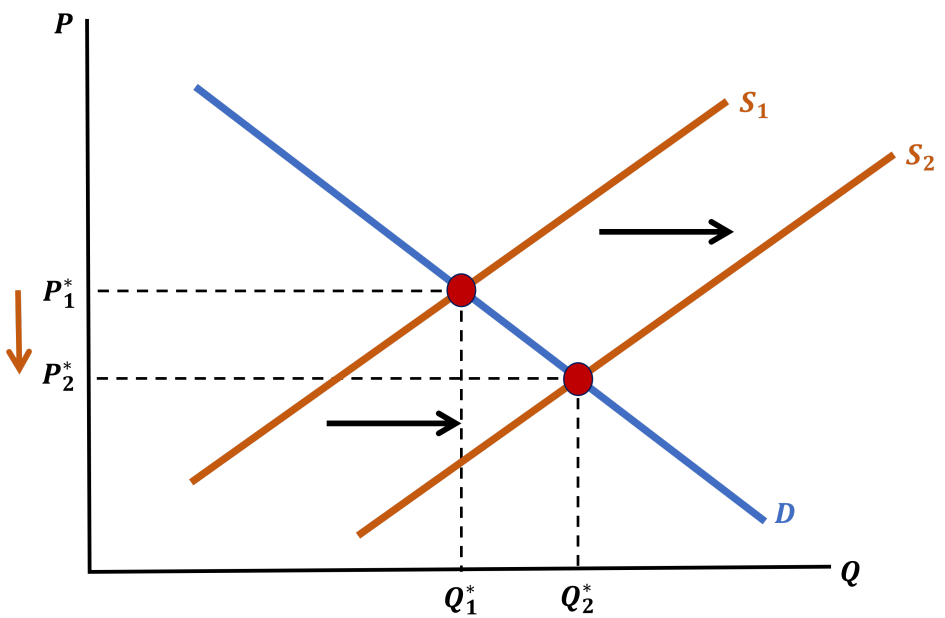
Profits and Market Feedback

Firms entering or exiting the market has a really important feedback effect

Do your best to recall from EC 201:

When the number of firms in an industry increases, what effect does this have on the market price?

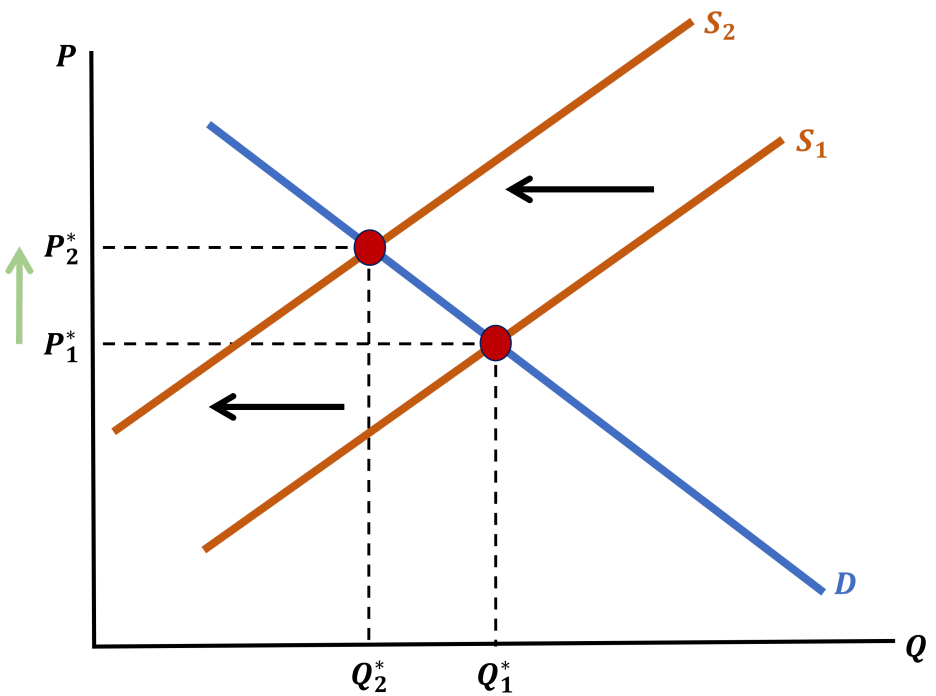
It DECREASES the price



Profits and Market Feedback

When the number of firms in an industry decreases, what effect does this have on the market price?

It INCREASES the price



Long-Run Feedback Effect

The feedback has predictable outcomes that we can organize in our minds

$$P > \min\{ATC(Q)\}$$

1. In the **Short-Run**, firms in the market make **positive economic profits**
2. In the **Long-Run**, new firms enter the market
3. The market now has **more** firms, which means there is **more quantity** produced
4. This repeats until

$$P = \min\{ATC(Q)\}$$

$$P < \min\{ATC(Q)\}$$

1. In the **Short-Run**, firms in the market make **negative economic profits**
2. In the **Long-Run**, firms exit the market
3. The market now has **less** firms, which means there is **less quantity** produced
4. This repeats until

$$P = \min\{ATC(Q)\}$$

Long-Run Outcomes

No matter what price is initially, in the **Long-Run** we will always return to

$$P = \min\{ATC(Q)\}$$

How do shifts in quantity affect market prices?

Negative Profits

- With a decrease in quantity, market prices climb with each firm that leaves until we return to **zero-profits**

Positive Profits

- With an increase in quantity, market prices decrease with each entering firm until we return to **zero-profits**

Long-Run Outcomes

So if prices in the **Long-Run** will always be

$$P = \min\{ATC(Q)\}$$

What does this imply about profits in the Long-Run

There are no economic profits in the Long-Run!

But let's be careful with interpreting what this means

Profits in the Long-Run

Saying there are zero economic profits can be a tricky phrase so let's dive in:

- It does not mean that the firm is making zero money
- They have already paid their **Labor (wages)** and **Capital (or shareholders if they financed capital through equity, for example)**
- After all responsibilities are dealt with, there are zero profits above and beyond that

Why Care About the Short-Run?

If we know what happens in the **Long-Run**, then why care about the **Short-Run**?

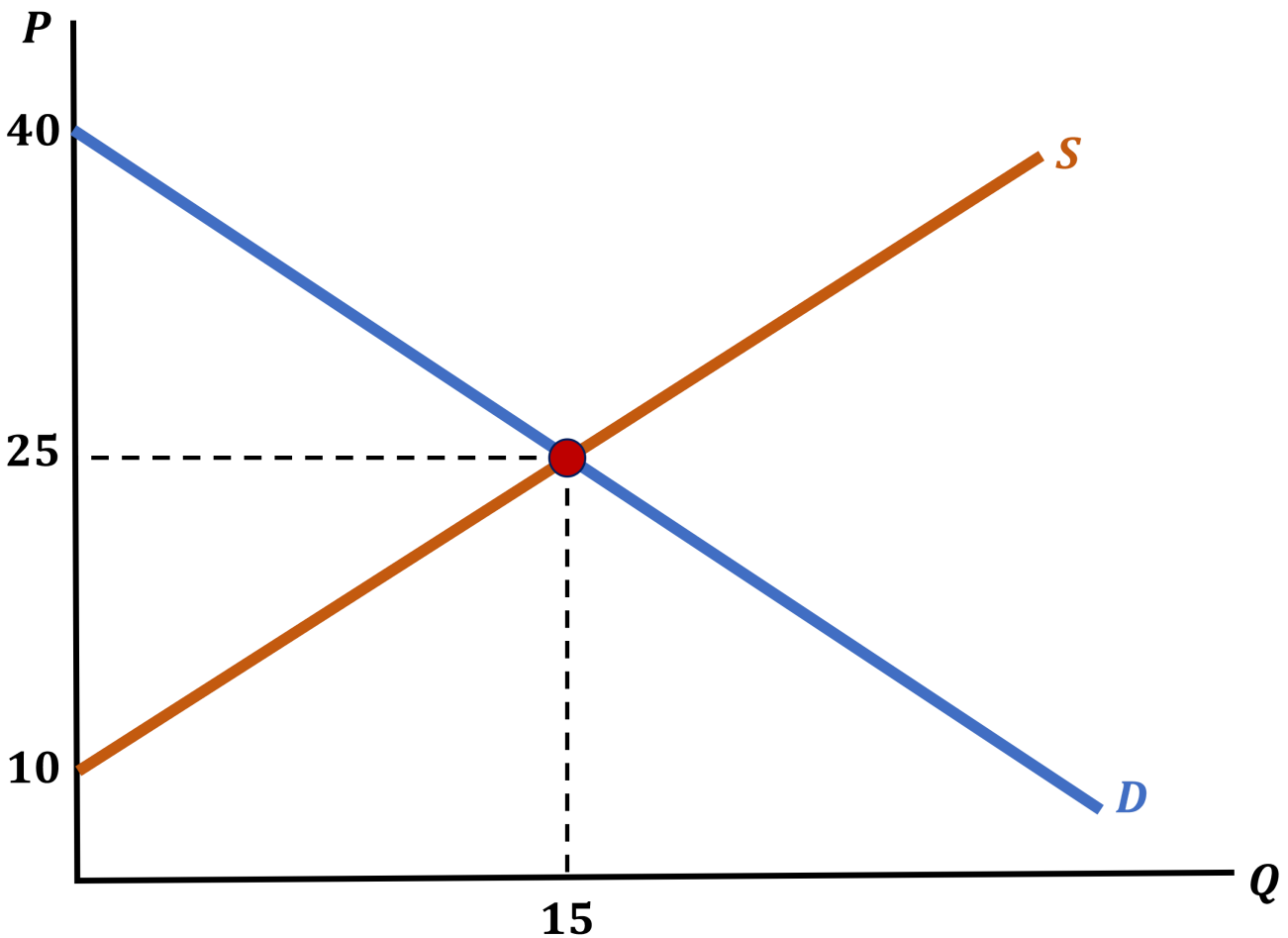
The Short-Run is where interesting things happen

- It is where firms make big money, before competitors can catch up (Think early Tesla days and the EV market)
- It is where firms lose a lot of money because they are stuck operating at a loss (any restaurant ever)
- **It is where demand shifts can cause major price distortions**
  - This is an interesting dynamic that we will use to transition to thinking about the market

Demand Shift Dynamics

Let's imagine the following market:

- The **Short-Run** market supply curve is $P = Q_S + 10$ when $P > 10$
- Assume that $\min\{ATC(Q)\} = 25$
- The demand curve is $P = 40 - Q_D$



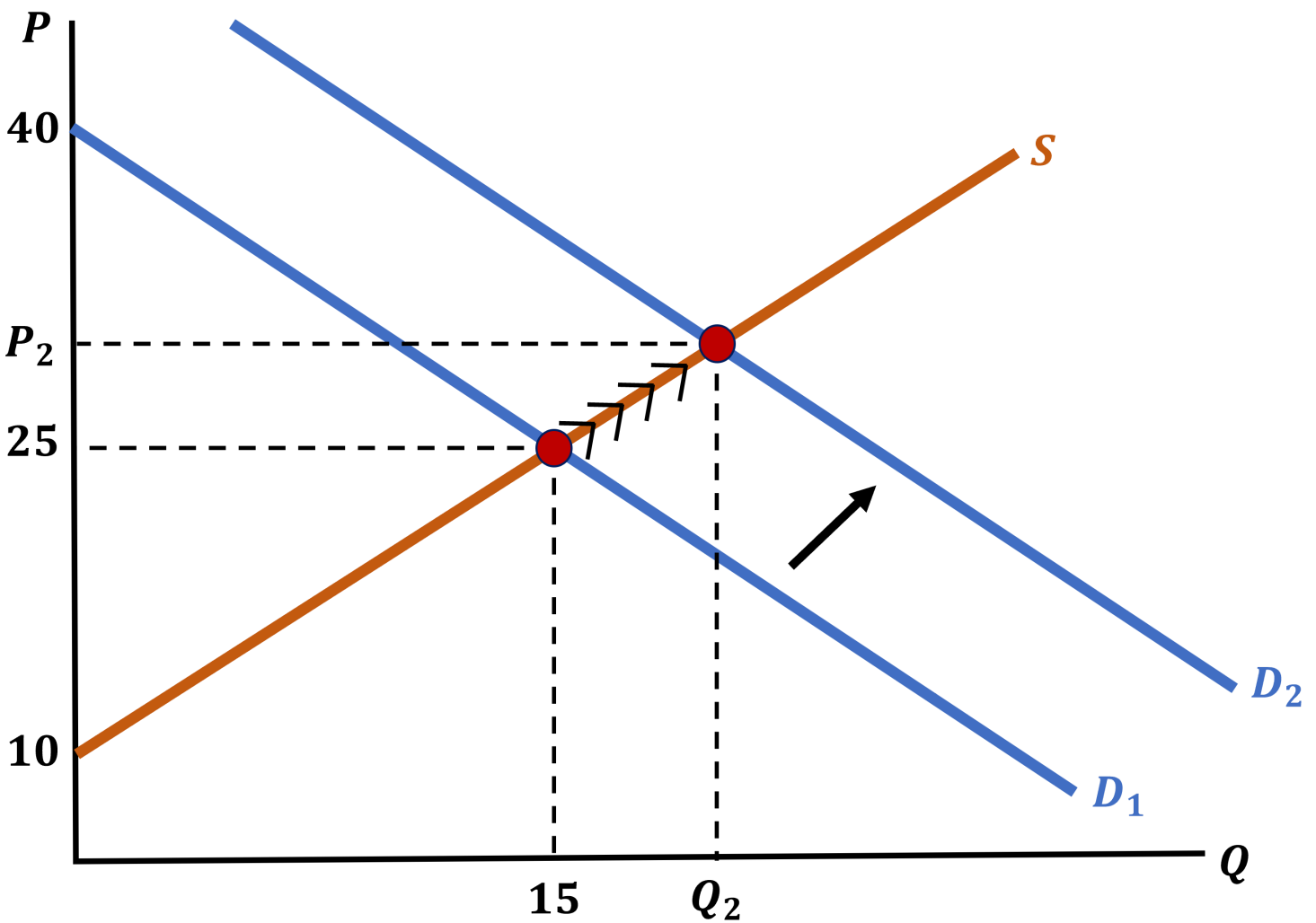
Demand Shift Dynamics

Because initial price of 25 is equal to $\mathbf{min}\{ATC(Q)\}$ and there are no profits

- The market is in its **Long-Run Equilibrium**
- Now imagine that this product gets much more popular
  - What do we expect to happen with **Demand**?

It should shift to the right (increases)

Demand Shift Dynamics - Product Got More Popular

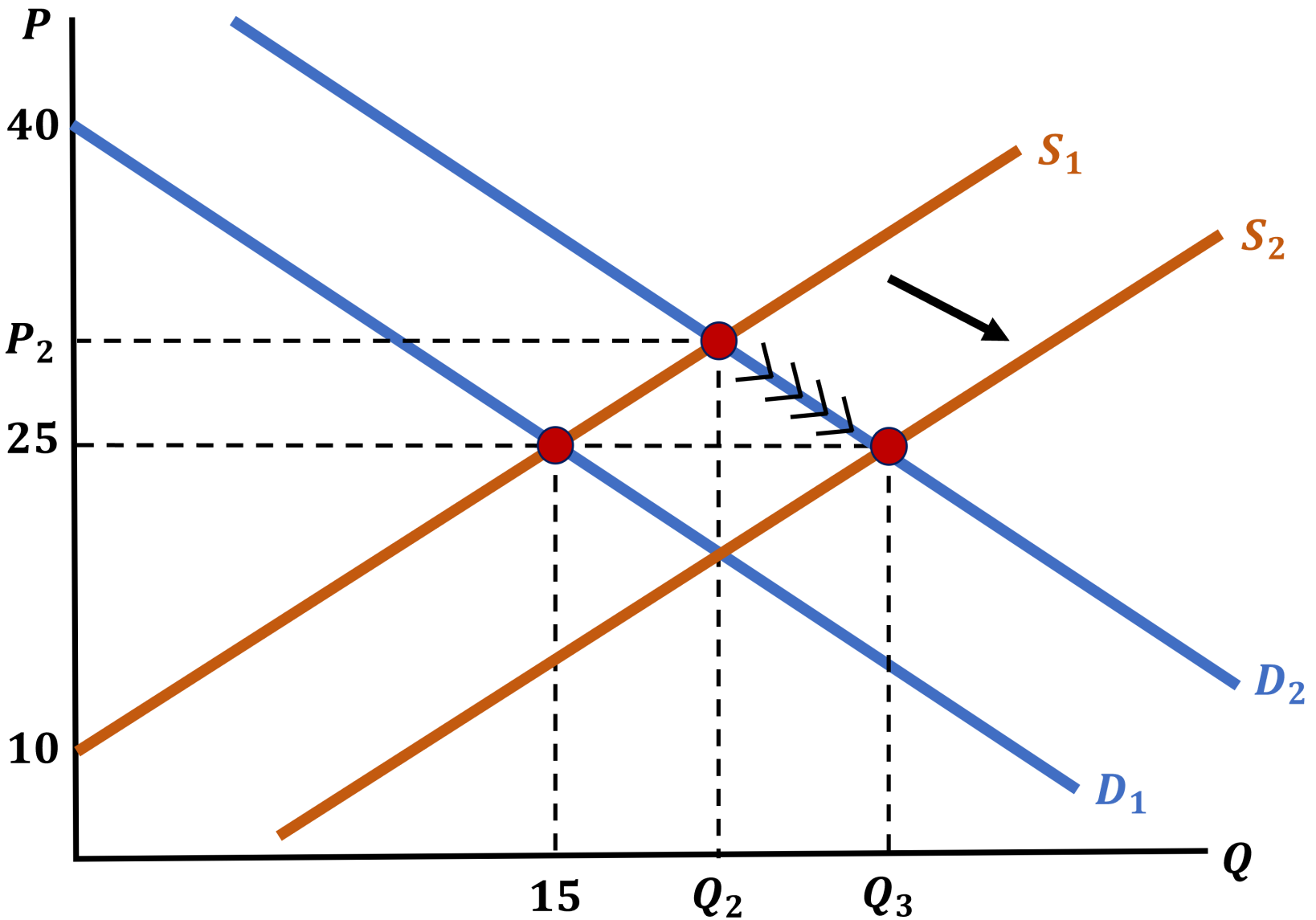


Demand Shift Dynamics

With an increase in **Demand**, we see that prices have also increased

- In the **Short-Run**, the **same number of firms produce more and earn positive profits**
- In the **Long-Run**, **new firms enter the market**
  - This increases supply

Demand Shift Dynamics - Entry of New Firms



Demand Shift Dynamics

With a Supply increase:

- The shift of supply **counteracts** the increase in Demand and the price returns to $\mathbf{min}\{ATC(Q)\}$
- However, a lot more good are supplied overall
  - In the **Long-Run**, each firm is supplying the same amount at Q_3 as they were in the initial equilibrium
- There are just more firms now

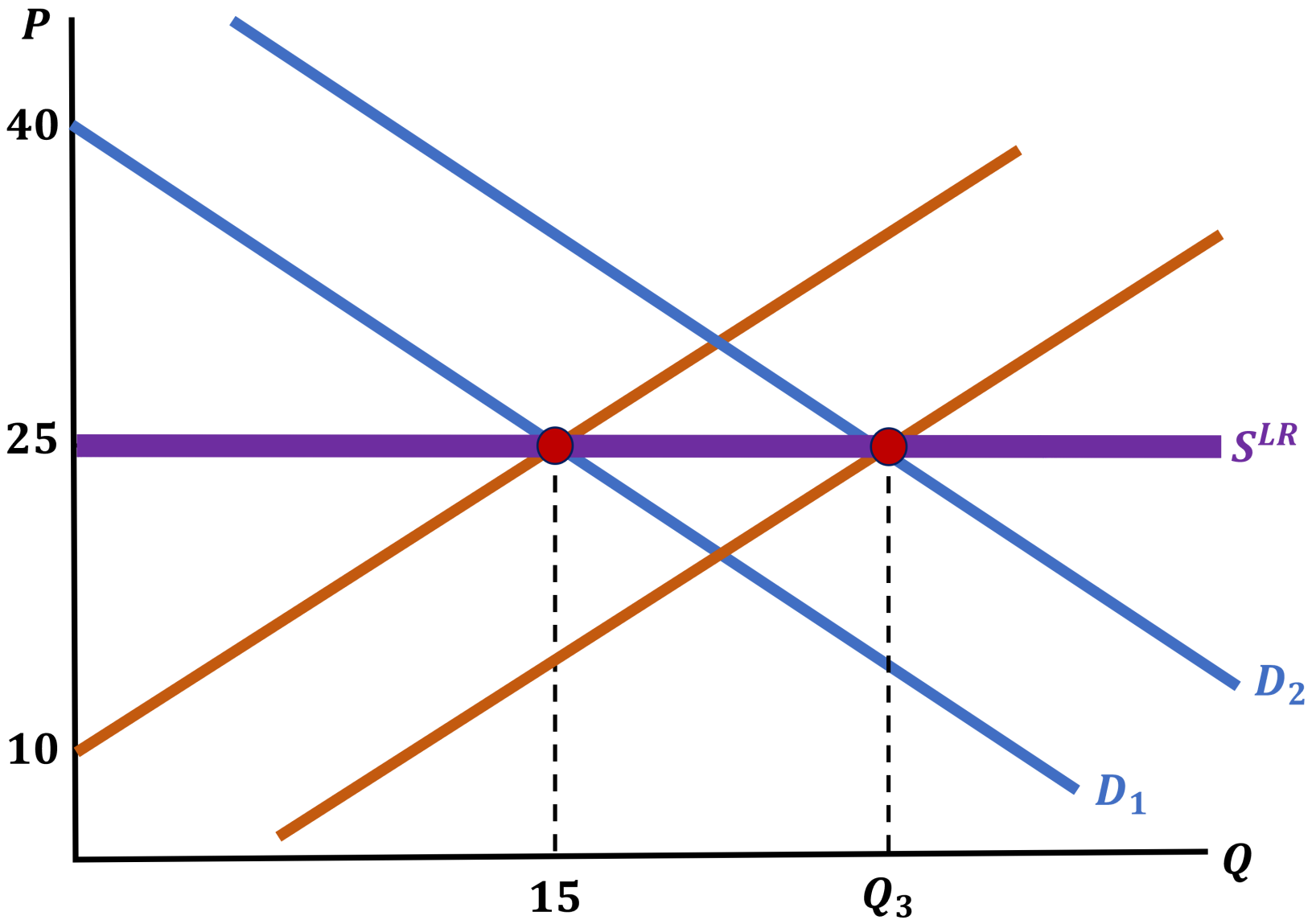
Long-Run Market Supply Curve

We can graph the Supply Curve in the **Long-Run**

It is simply a flat line at $P = \mathbf{min}\{ATC(Q)\}$

- The quantity (and the number of firms in the market) is determined by **Demand**

Long-Run Market Supply Curve



Let's Look at an Example

In this example we will:

- Find the **Short-Run** supply cure of the firm
- Find the market **Short-Run Supply Curve** when there are 20 identical firms
- Find the market **Long-Run Supply Curve**
- Graph both market supply curves, add demand and quantity, assuming the **Long-Run Equilibrium**

The Cost Function of a firm is

$$C(Q) = Q^2 + 8Q + 100$$

Short-Run Supply Curve

$$C(Q) = Q^2 + 8Q + 100$$

Short-Run Supply is $P = MC$

$$MC = \frac{\partial C(Q)}{\partial Q} = 2Q + 8$$

Set P = MC

$$P = 2Q + 8$$

Market Short-Run Supply Curve with 20 Identical Firms

$$P = 2Q + 8$$

First, we find the individual firm supply function

$$\begin{aligned} P &= 2Q + 8 \\ 2Q &= P - 8 \\ Q &= \frac{P - 8}{2} \end{aligned}$$

Market Supply Function will be $N \cdot Q = Q_S$

$$\begin{aligned} Q_S &= N \cdot Q \\ Q_S &= 20 \cdot \left(\frac{P - 8}{2} \right) \\ Q_S &= 10P - 80 \end{aligned}$$

Market Supply Curve Is:

$$\begin{aligned} Q_S &= 10P - 80 \\ 10P &= Q_S + 80 \\ P &= \frac{Q_S}{10} + 8 \end{aligned}$$

Market Long-Run Supply Curve

$$\text{LR-Supply: } P = \min\{ATC(Q)\} \quad \& \quad C(Q) = Q^2 + 8Q + 100$$

We want an amount of Quantity and we will use the Zero-Profit Condition

Use $MC = ATC(Q)$

$$ATC(Q) = MC$$
$$Q + 8 + \frac{100}{Q} = 2Q + 8$$
$$Q \cdot \left(Q + 8 + \frac{100}{Q}\right) = Q \cdot (2Q + 8)$$
$$Q^2 + 8Q + 100 = 2Q^2 + 8Q$$
$$Q^2 = 100$$
$$Q^* = 10$$

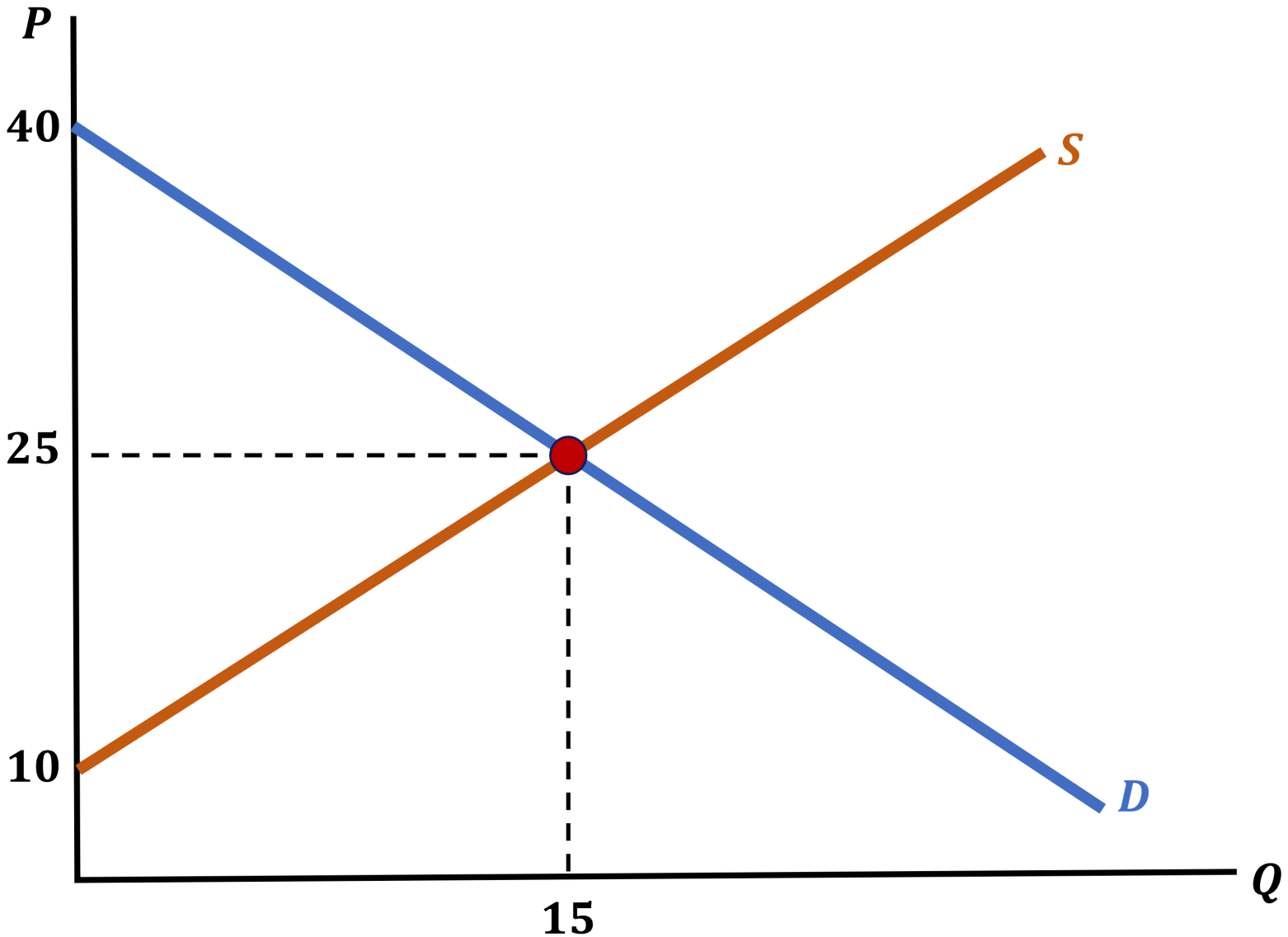
We also need to find P^*

$$MC(Q) = 2Q + 8$$
$$MC(10) = 2(10) + 8$$
$$MC = 28$$

Use fact that P = MC

$$P = MC = 28$$

Graph SR & LR Supply, Demand, & Quantity



A Sudden Shock!!!

Now let's throw a curveball

The market does not exist in isolation, it is affected by the world

Imagine that there is a sudden event that decreases the **Market Price** to 20

This raises the following questions:

- What is the **Short-Run Effect** on Q^* $\Rightarrow$ **Individual Firm Supply**
- What is the **Short-Run Effect** on Q_S $\Rightarrow$ **Market Supply**

A Sudden Shock $\Rightarrow$ P = 20

From our previous work, we know that

$$P = 2Q^* + 8$$

We can use this information to find Q^*

Individual Firm Supply

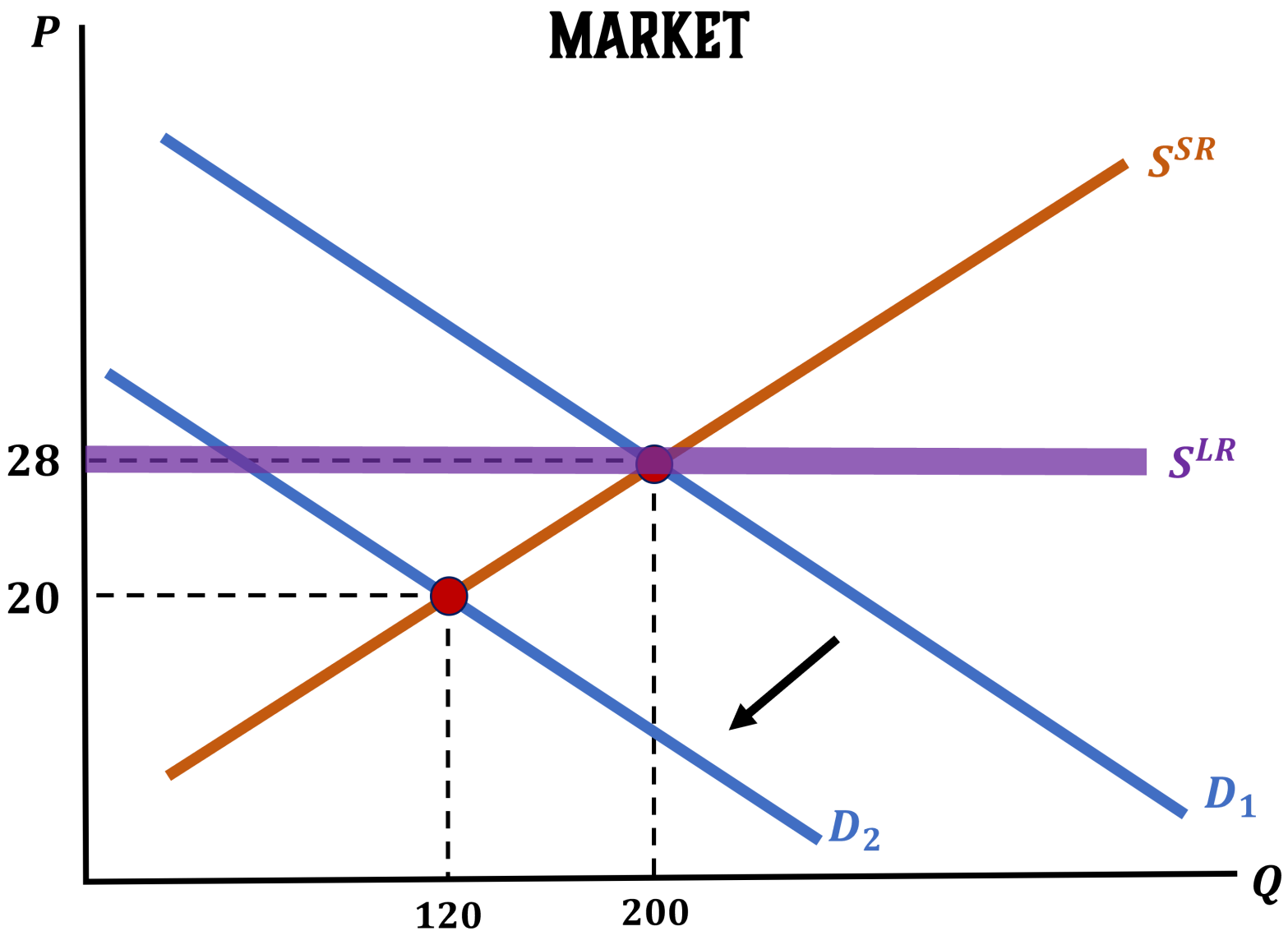
$$\begin{aligned} P &= 2Q^* + 8 \\ 20 &= 2Q^* + 8 \\ 12 &= 2Q^* \\ Q^* &= 6 \end{aligned}$$

Market Supply

20 Firms are still in the market

$$\begin{aligned} Q_S &= N \cdot Q^* \\ Q_S &= 20 \cdot 6 \\ Q_S &= 120 \end{aligned}$$

A Sudden Graph!!!



Shock Implications on the Long-Run

We can also ask questions about the **Long-Run**

- What is the **Long-Run Effect** on Q^* $\Rightarrow$ **Individual Firm Supply**

- If we assume that the **Long-Run Effect** on Q_S means that Market Supply will be equal to 100. How many firms remain in the **Long-Run**?

Long-Run Effects of the Shock

We know for a fact that in the **Long-Run** price will return to 28

What is the effect on individual firm supply?

There is NO Long-Run Effect on firm supply

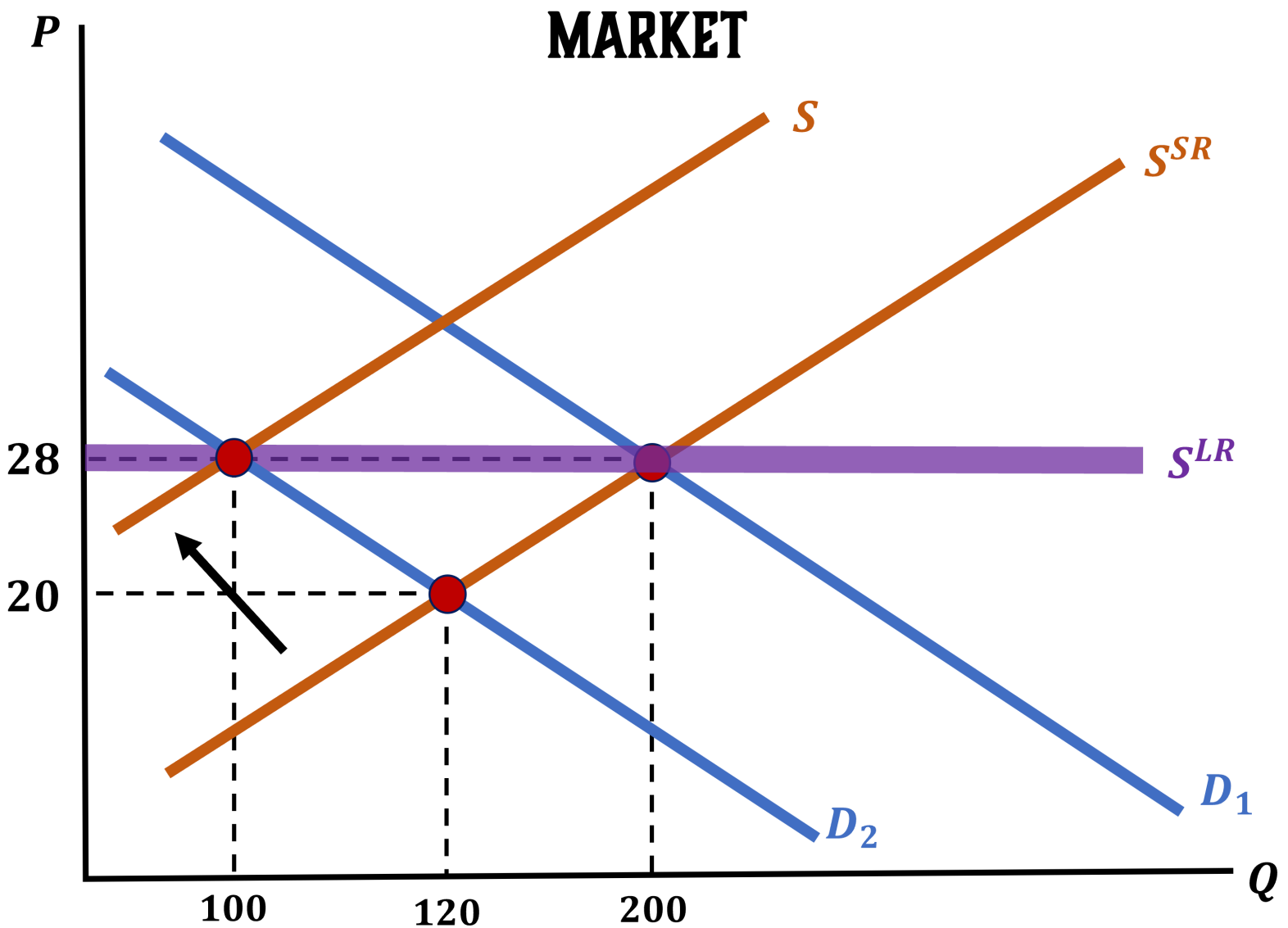
$$Q^* = 10$$

If we know that $Q_S = 100$, how many firms are producing in this market?

$$\begin{aligned} Q_S &= N \cdot Q^* \\ 100 &= N \cdot 10 \\ \frac{100}{10} &= N \\ N &= 10 \end{aligned}$$

After the price shock, 10 firms exit the market and 10 firms stay

A Sudden Long-Run Graph!!!



Distortions to Equilibrium

Market Shocks Create Distortions

We just saw how shocks to the market distort both the **Short-Run & Long-Run**

The **Long-Run** is very robust and is not really impacted by price shocks. But is this always the case?

When will distortions to equilibrium affect the Long-Run Equilibrium Price?

To answer that, we remember what determines the **Long-Run Price**

- Minimum Average Total Cost

So a shock will only affect the Long-Run Price if it impacts the Minimum Average Total Cost

Distortion Example - Oil Industry

What effect will the invention of more **fuel-efficient cars** have on the price of oil?

None! This is a shock to demand and thus the **minimum ATC** is unaffected

What effect will the invention of more **fuel-efficient cars** have generally?

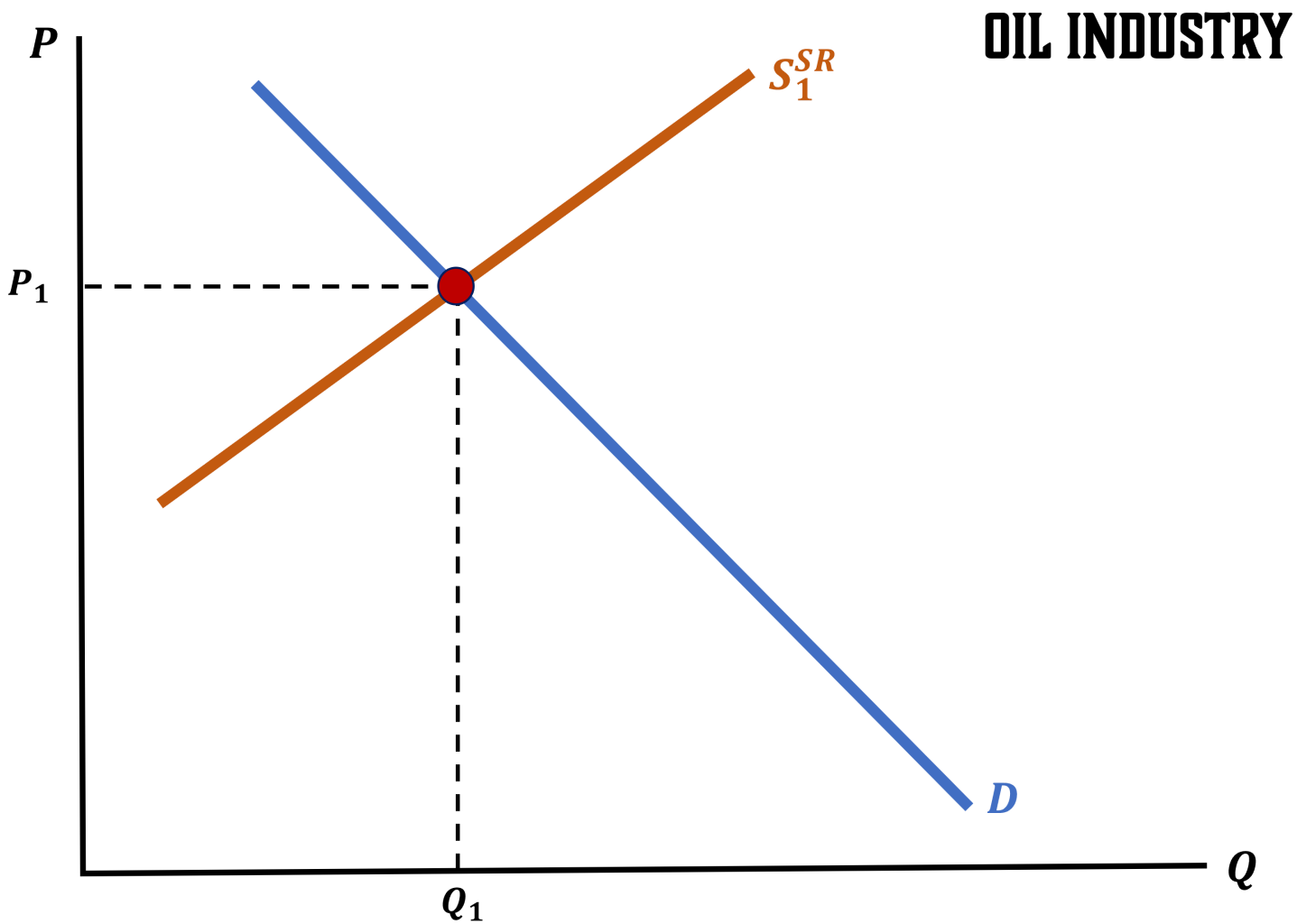
- We will see a **decrease** in price and quantity in the **Short-Run**
- Firms in the oil industry will make **negative profits**
- Firms will begin to leave the industry
- The **Supply Curve** shifts to the left and re-establishes the **Long-Run Price** with a lower quantity produced

Distortion Example - Oil Industry

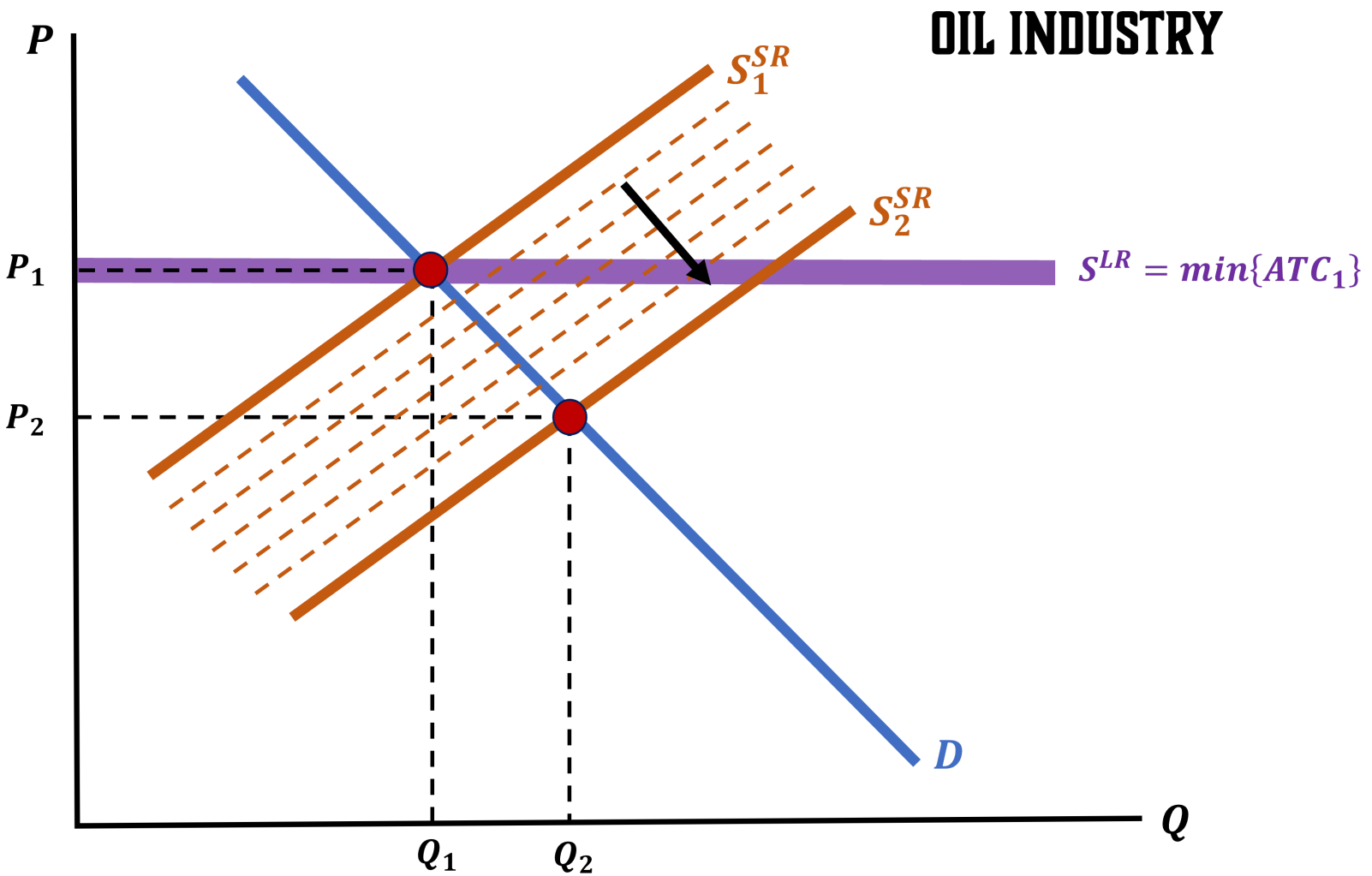
What effect will the invention of **more efficient drilling technology** have on the **Long-Run Price** of oil?

- This should lower the **Long-Run Price**. Why?
  - Because this should lower the **Average Total Cost**
- This will increase quantity supplied and decrease the market price

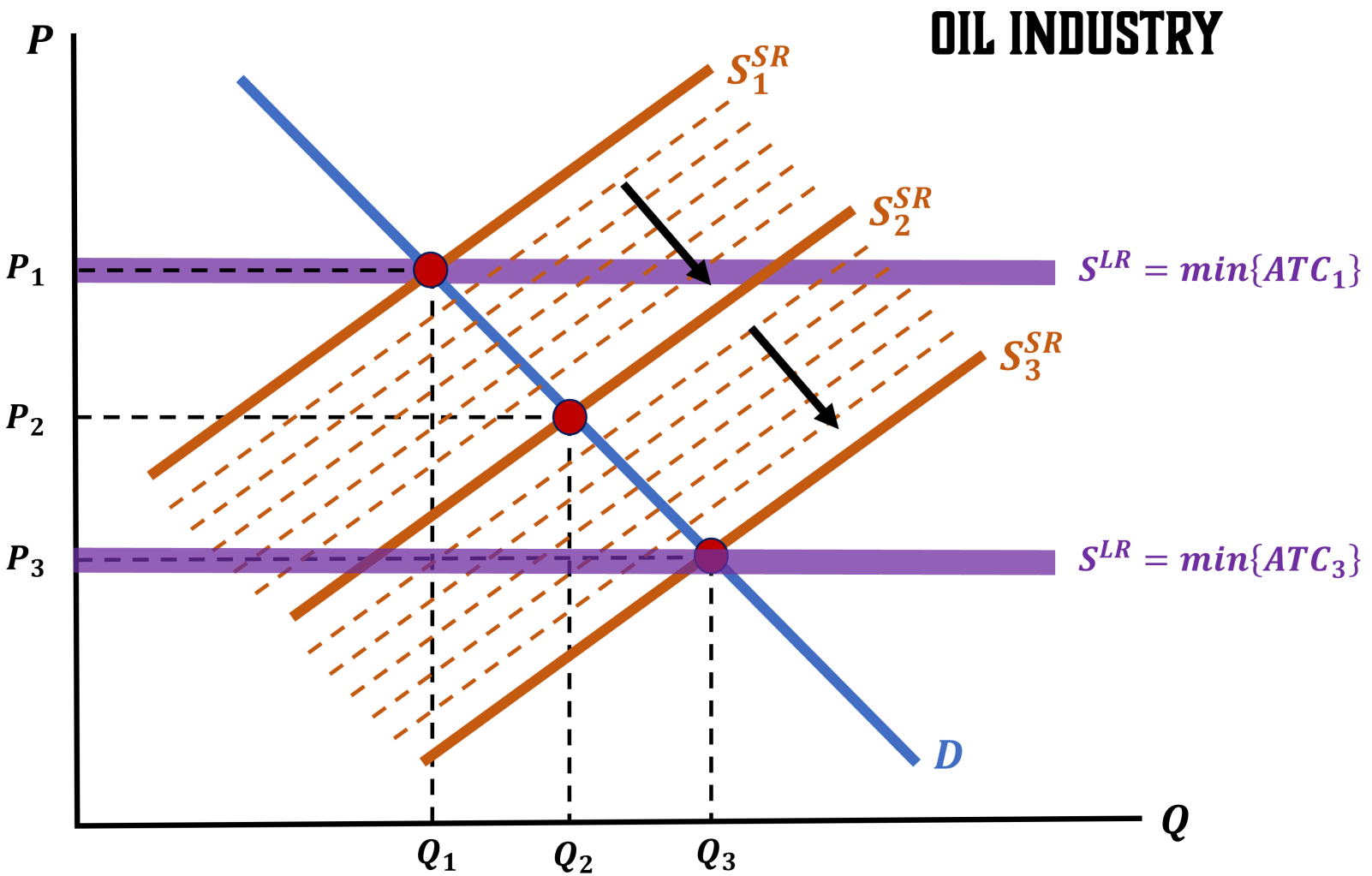
Efficient Drilling Technology Effects on Oil Industry



Efficient Drilling Technology Effects on Oil Industry



Efficient Drilling Technology Effects on Oil Industry



Distortions to Equilibrium

One very specific type of cost change that we want to consider is **Taxation**

We will deal with two types of taxes:

LUMP-SUM TAXES **PER-UNIT TAXES**

Lump-Sum Taxes

Under this **tax structure** firms have to pay a **One-Time Fee** to participate in the market

- Think licenses, permits, inspections, etc.
- These will affect a firm's fixed costs
  - Increasing fixed costs will increase the **Minimum ATC**
  - Decreasing fixed costs will decrease the **Minumum ATC**

Lump-Sum Taxes

These form of taxes will NOT affect the firm's Marginal Costs

The Short-Run Supply Curve is completely unnafected

- Imposing a **Lump-sum Tax** will have no **Short-Run Effect**
- In the **Long-Run**, firms will leave the industry as it converges to its new **Long-Run Equilibrium**

Per-Unit Taxes

These will affect the firm's marginal costs **DIRECTLY**

Take for example the following firm:

$$C(Q) = Q^2 + Q + 20$$

Where **Marginal Costs** are:

$$MC(Q) = 2Q + 1$$

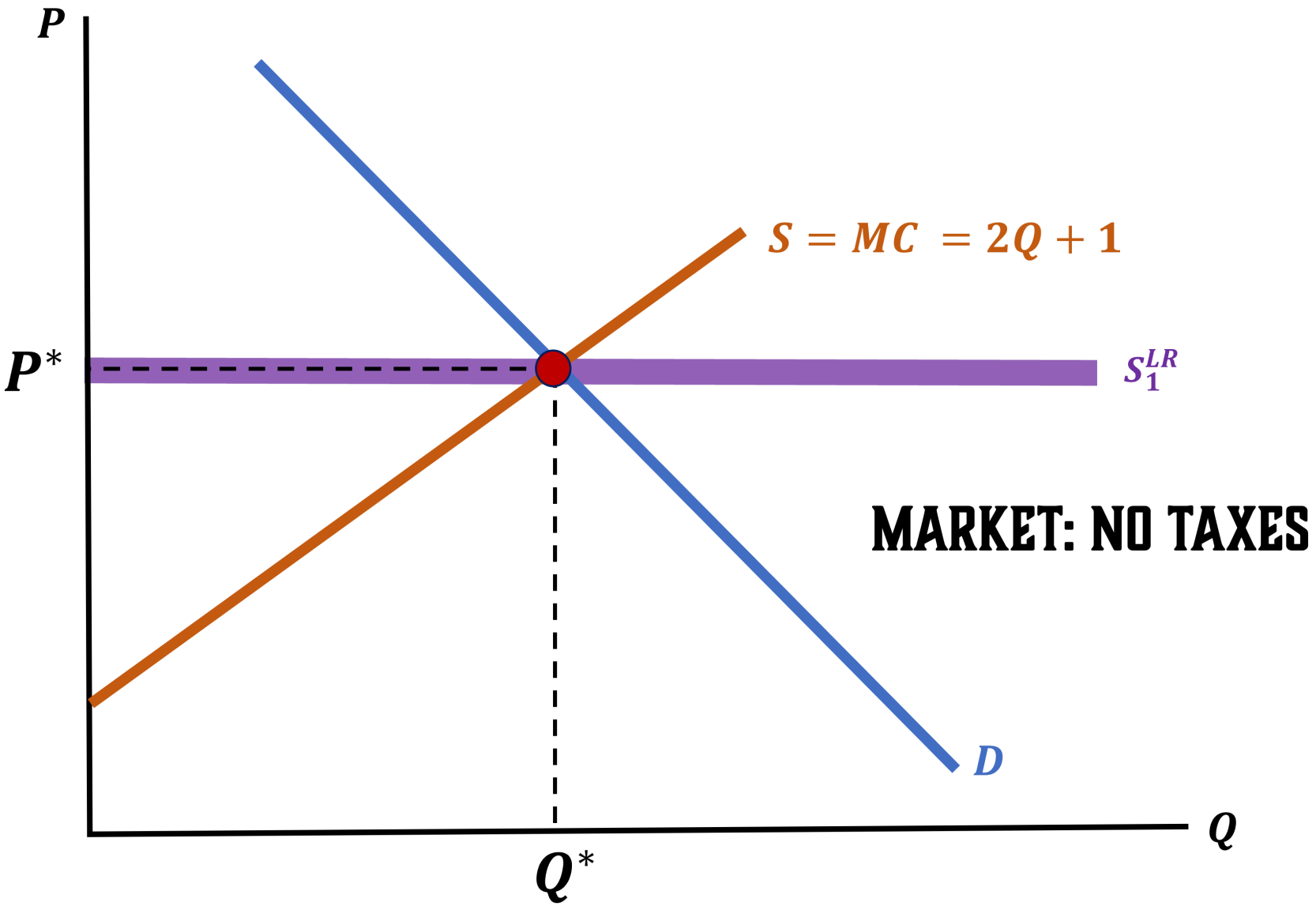
Let's impose the per-unit tax τ such that the cost function becomes:

$$C(Q) = Q^2 + Q + 20 + \tau \cdot Q$$

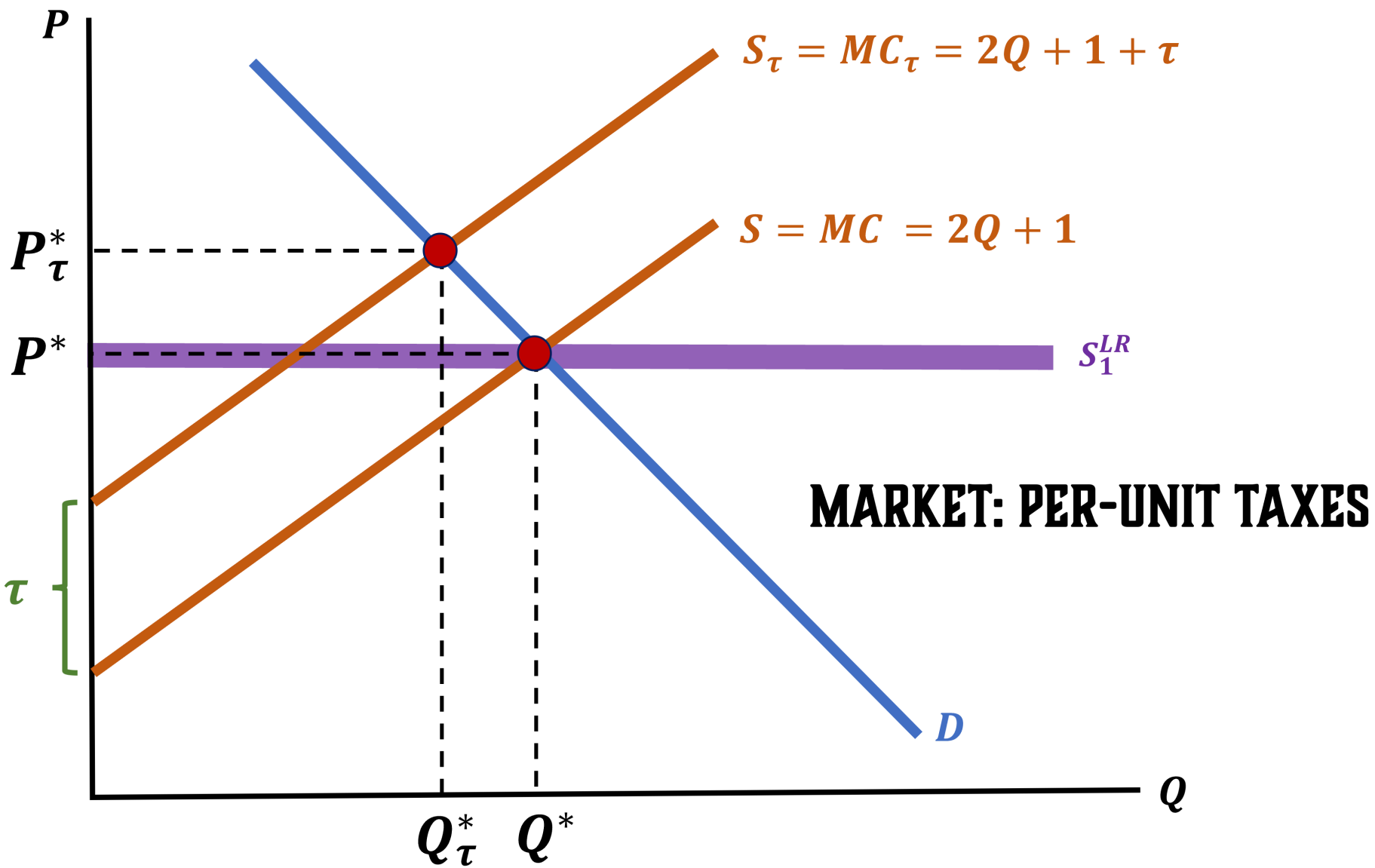
What is the Marginal Cost after Taxes?

$$MC = 2Q + 1 + \tau$$

Per-Unit Taxes



Per-Unit Taxes



Per-Unit Taxes

The **Marginal Cost (and then the Supply Curve)** is shifted up by the exact amount of the tax, so:

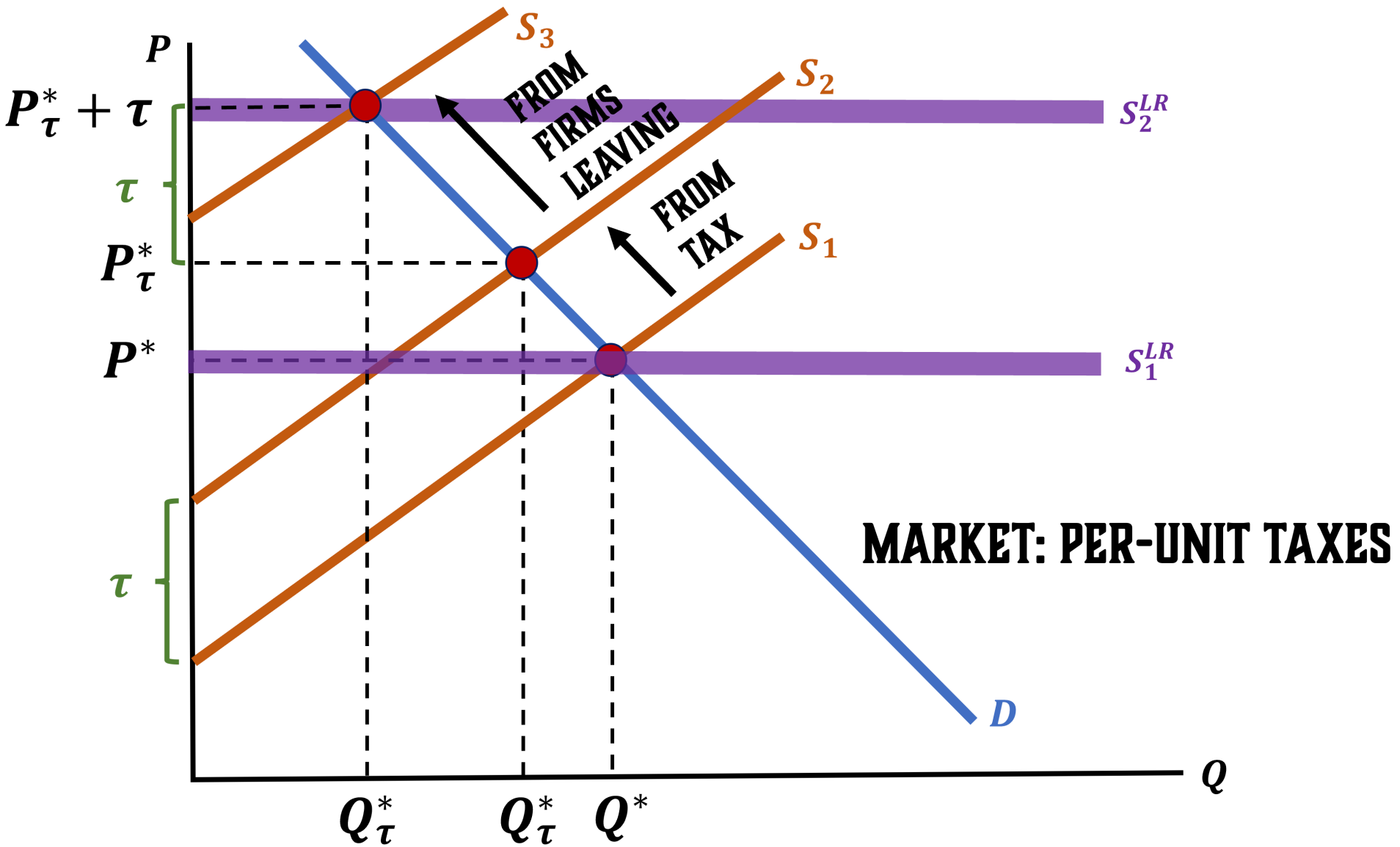
- The **New Price** $\left(P_{\tau}^{*}\right)$ is the price that consumers pay to the firm
- The **New Price** $\left(P_{\tau}^{*}\right)$ **minus the tax** is the price received by the producers **after they pay the tax**
- So even though the shift in the **Supply Curve** looks like it increased the price, **it brings down the price earned by the firm**

Per-Unit Taxes

In the **Long-Run**, firms will leave the market because the **tax induced losses**

The **Long-Run Equilibrium Price** is at exactly the original price, plus the tax

Per-Unit Taxes



Per-Unit Taxes

Why will the effect on the **Long-Run Price** be exactly the size of the tax?

Because it will be the case that the minimum ATC increased by exactly the tax (τ)

For the **Cost Function**

$$C(Q) = Q^2 + 9 + \tau Q$$

We have:

Average Total Cost

$$ATC = Q + \frac{9}{Q} + \tau$$

Marginal Cost

$$MC = 2Q + \tau$$

We set them equal to each other & the tax cancels out

$$ATC = MC$$

$$Q + \frac{9}{Q} + \tau = 2Q + \tau$$

Per-Unit Taxes

- So the **New Long-Run Price** is exactly the old **Long-Run Price + the Per-Unit Tax**

We see this in the previous example:

$$ATC = Q + \frac{9}{Q} + \tau$$

- Firms receive the same price per unit. We saw that the tax cancels out

$$ATC = MC$$
$$Q + \frac{9}{Q} + \tau = 2Q + \tau$$

- Overall quantity in the market is lower because there are fewer firms