Lecture 9:
Supply in a Competitive Market

November 7, 2017

Overview

Course Administration

Ripped From Headlines

Market Structure and Perfect Competition

Profit Maximization in a Competitive Market

Perfect Competition in the Short Run

Perfect Competition in the Long Run

Course Administration

1. Elasticity memo due November 14
   - Office hours Monday November 13
   - If they fill up, let me know and I will open additional slots
2. Exam 2 is December 5
3. Problem Set 9 is posted
4. Skipping section 8.5 due to lack of time

Ripped from the Headlines

Next Week Afternoon

Finder	Presenter
Katlyn Riggins	Prusha Hasan
Tessa Cannon	Ian Tang

Evening

Finder	Presenter
Katherine Lundie	Shelbe Klebs
Kellen Moore	Kevin Brannick
Jolito Rivera	Will Denison

Big Questions for Today

- How does a firm choose how much to produce?
- How does long run behavior differ from short run behavior?
- Where does the market supply curve come from?
- Which firms get producer surplus?

Market Structure and Perfect Competition

Market Characteristics and Types

Key Characteristics of Markets

- Number of firms
- Substitutability of products
- Barriers to entry

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- Number of firms
- Substitutability of products
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Types of Markets

- Perfectly competitive
- Monopolistic competition
- Oligopoly
- Monopoly

Market Characteristics by Type

	No. of firms	Subst. of Products	Barriers to Entry
Perfectly Comp.	many	entirely	none
Monopolistic Comp.	many	not entirely	yes
Oligopoly	few	either	some
Monopoly	one	n/a	yes

Elements of a Perfectly Competitive Market

- Many firms in the market
- Products sold are perfect substitutes
- No barriers to entry

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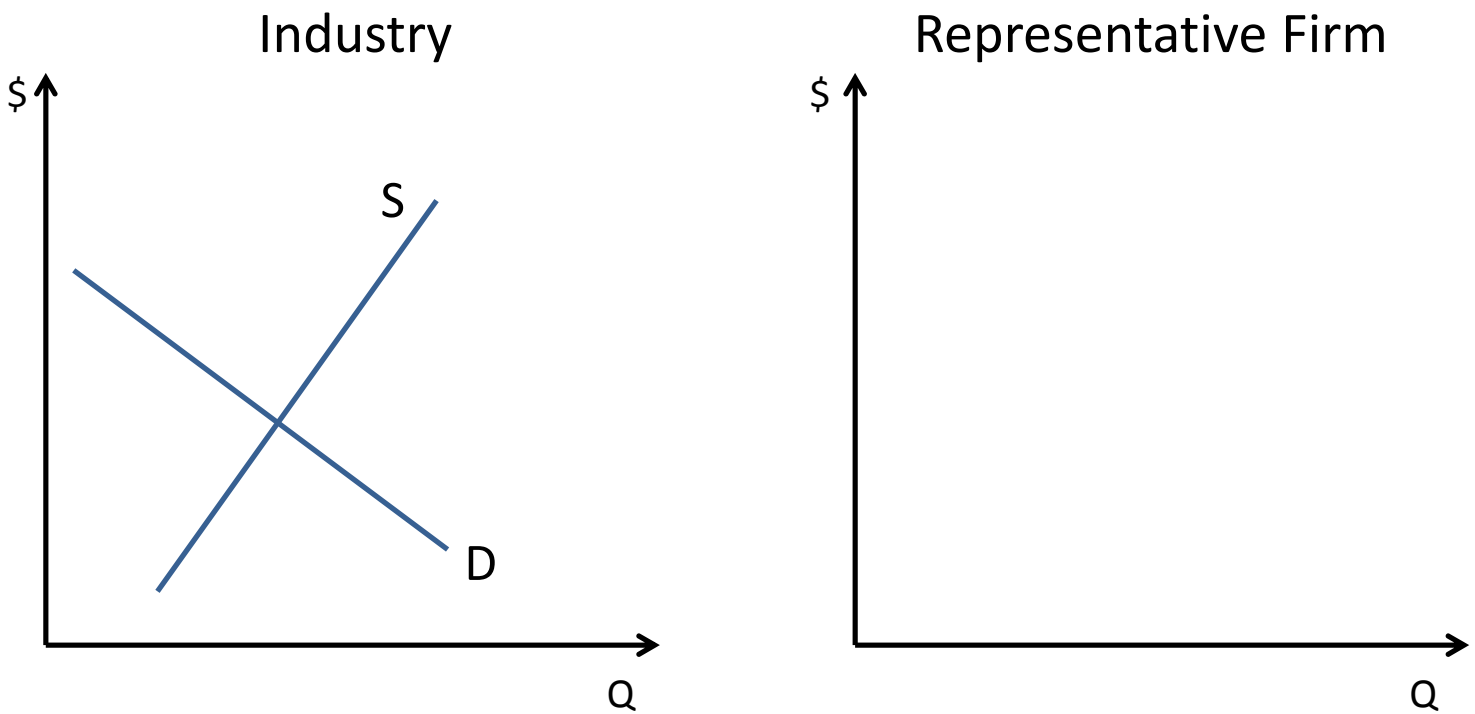
Of course, this is very rare. We care about this case – a "best case scenario" – as a baseline.

Demand Curve as Seen By a Price-Taker

- Call a perfectly competitive firm a price-taker
- This firm can't impact price
- To this firm, demand is infinite at market price
- In other words, the firm perceives demand as perfectly elastic at the equilibrium market price

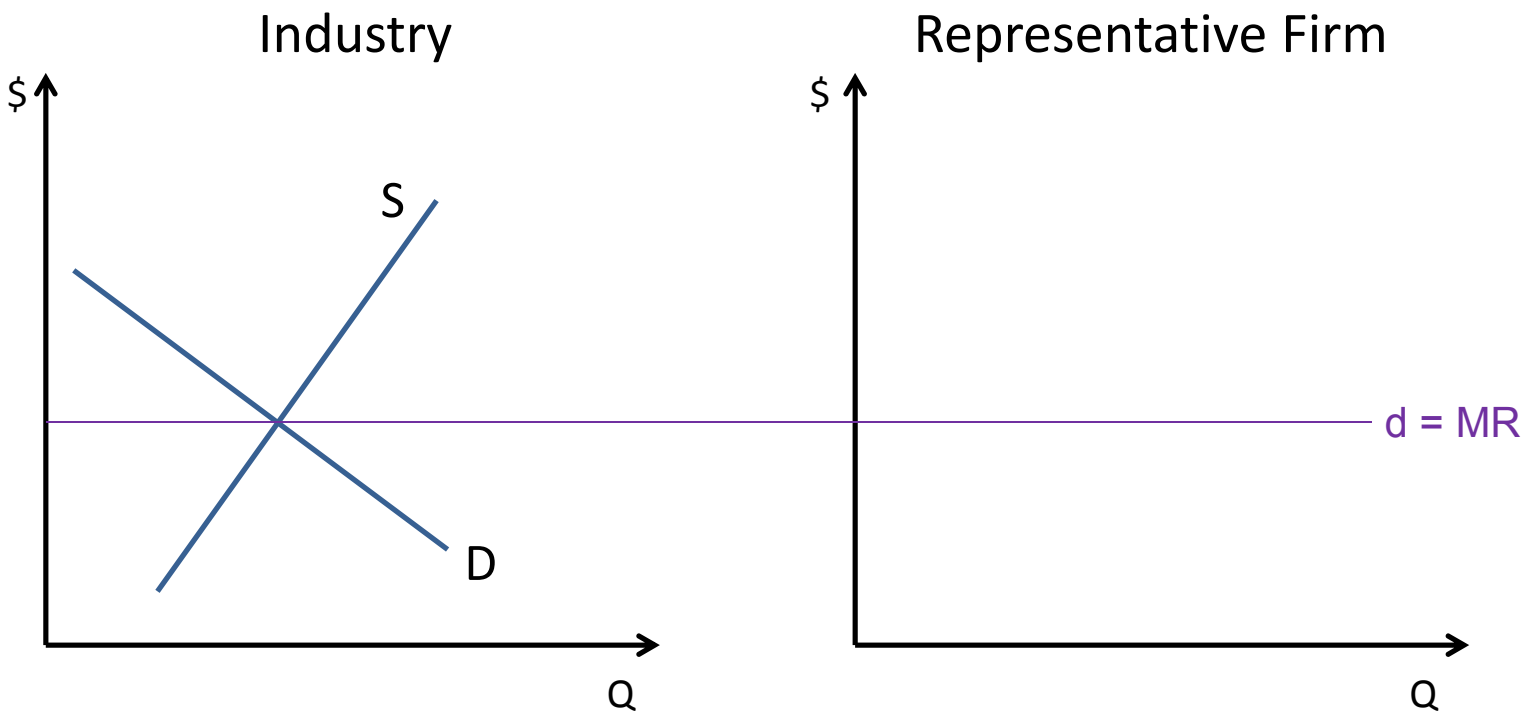
Market Demand vs Demand Perceived by Firm

Market Equilibrium



Market Demand vs Demand Perceived by Firm

Firm's View of Market Equilibrium



Profit Maximization in a Perfectly Competitive Environment

Recall and Define Key Terms

- Economic profit $\neq$ accounting profit

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  - accounting profit $\equiv$ total revenue - total cost
  - economic profit $\equiv$ total revenue - total cost, including opportunity costs
- Marginal revenue $\equiv$ additional revenue from an additional unit of output
- If the firm perceives the demand curve as constant, then $MR = P$

Profit Maximization in a Perfectly Competitive World

- Firm cannot affect P
- Additional revenue from an additional unit is $MR = P$
- Additional cost from an additional unit is MC
- If $MC > MR$...

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Profit Maximization in a Perfectly Competitive World

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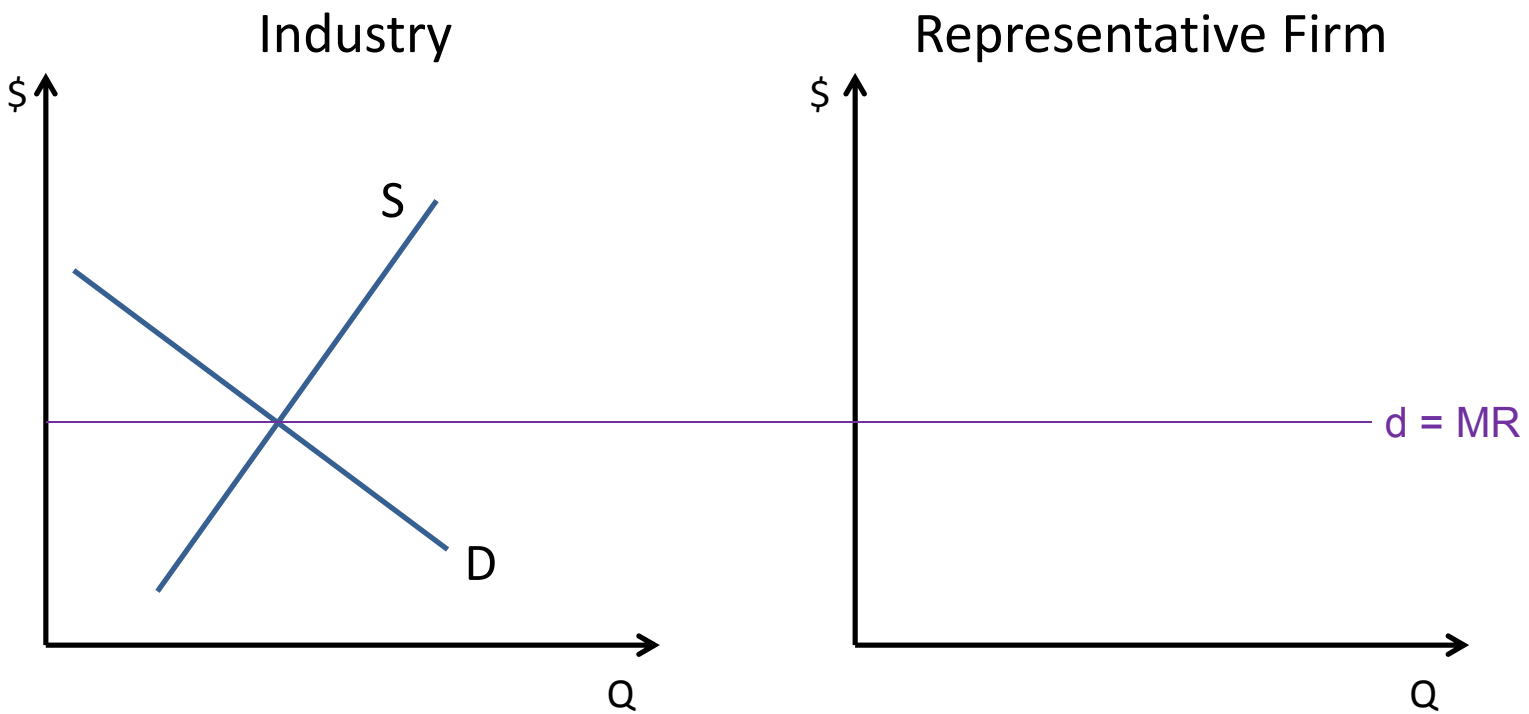
- Additional cost from an additional unit is MC
- If $MC > MR$... it's a bad idea for the firm to produce
- If $MC < MR$... the firm should produce more and make more money
- $\rightarrow$ profit is maximized where $MR = MC$
- And since $MR = P$, firm maximizes profits where $MR = MC$, or $P = MC$

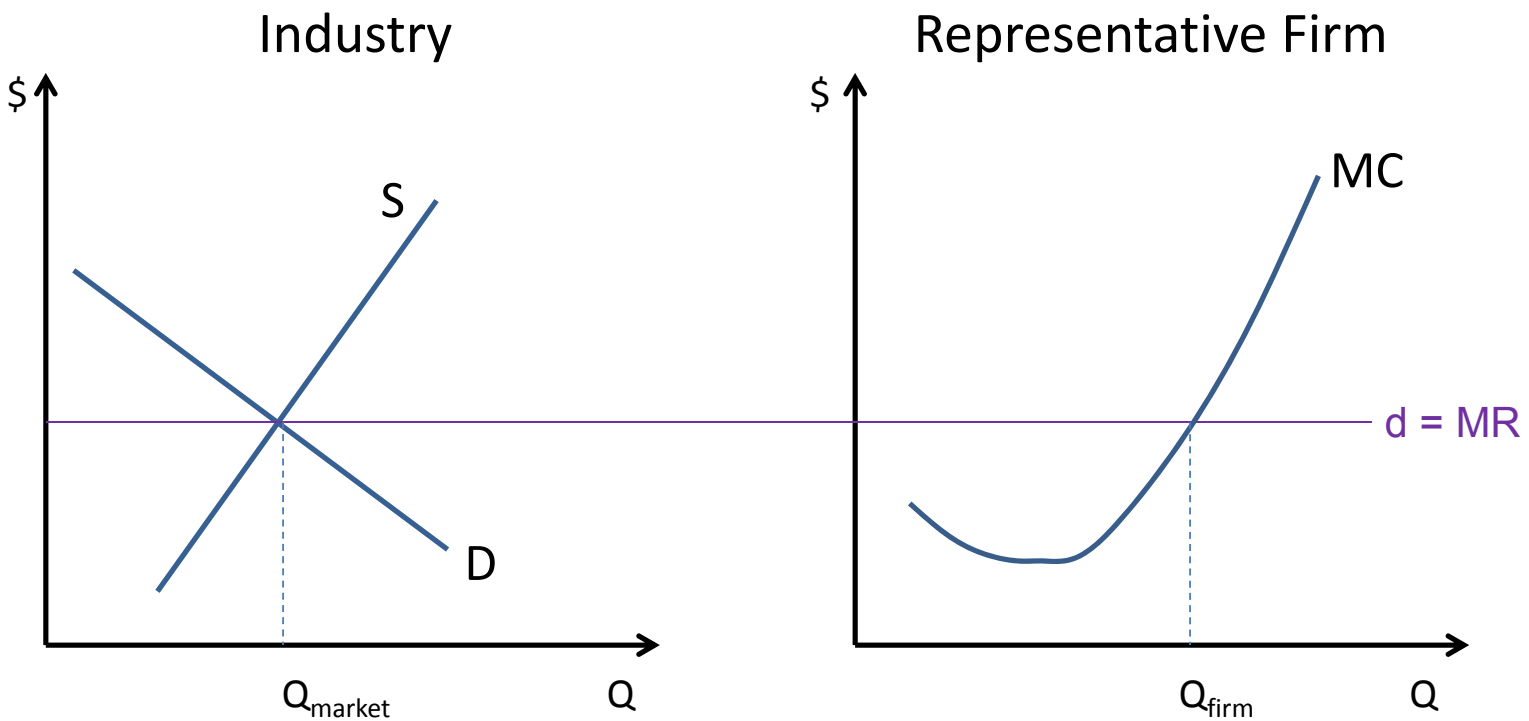
$MR = MC$ in Pictures

Firm's View of Demand



$MR = MC$ in Pictures

Intersecting with Firm's Costs



What are Profits at this Point?

Profits = total revenue - total cost

$$\pi = TR - TC$$

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$$\begin{aligned} \pi &= TR - TC \\ &= (P * Q) - (ATC * Q) \end{aligned}$$

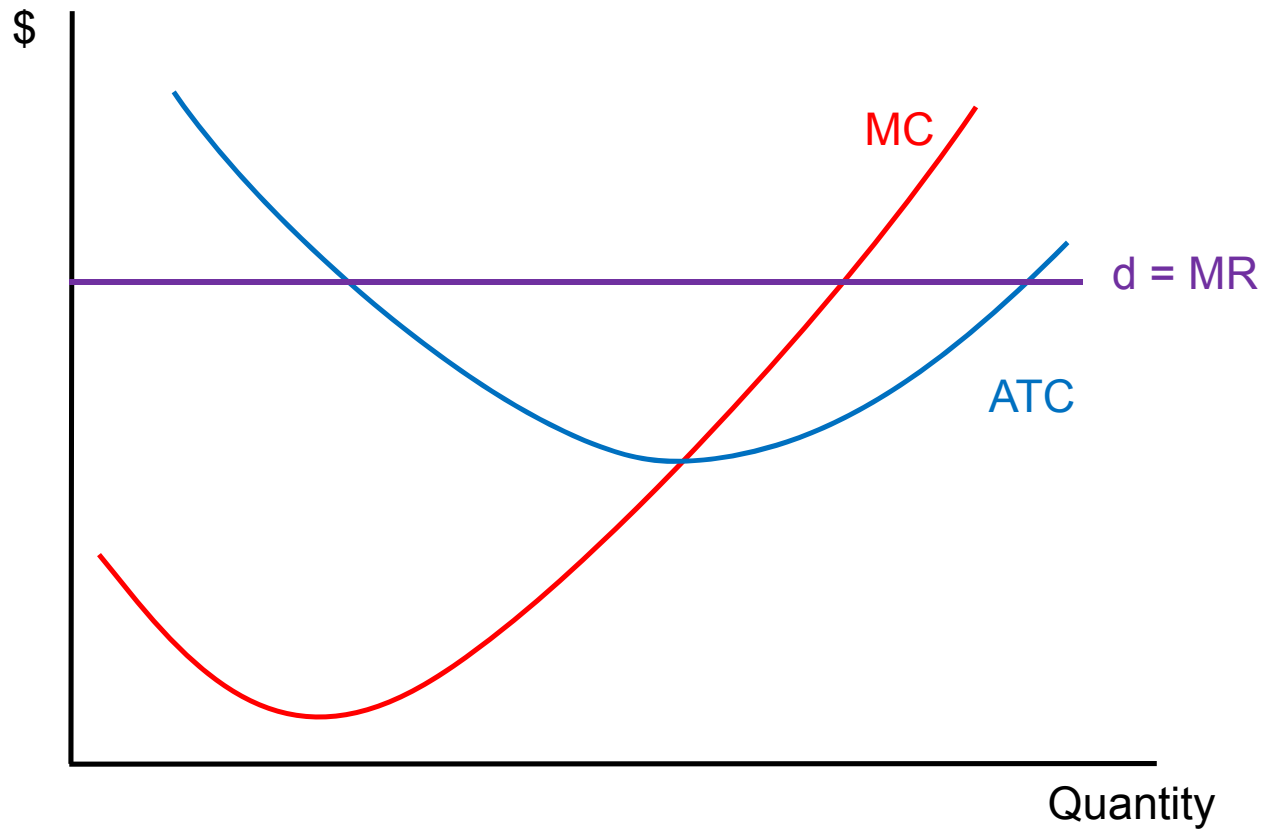
What are Profits at this Point?

Profits = total revenue - total cost

$$\begin{aligned} \pi &= TR - TC \\ &= (P * Q) - (ATC * Q) \\ &= Q(P - ATC) \end{aligned}$$

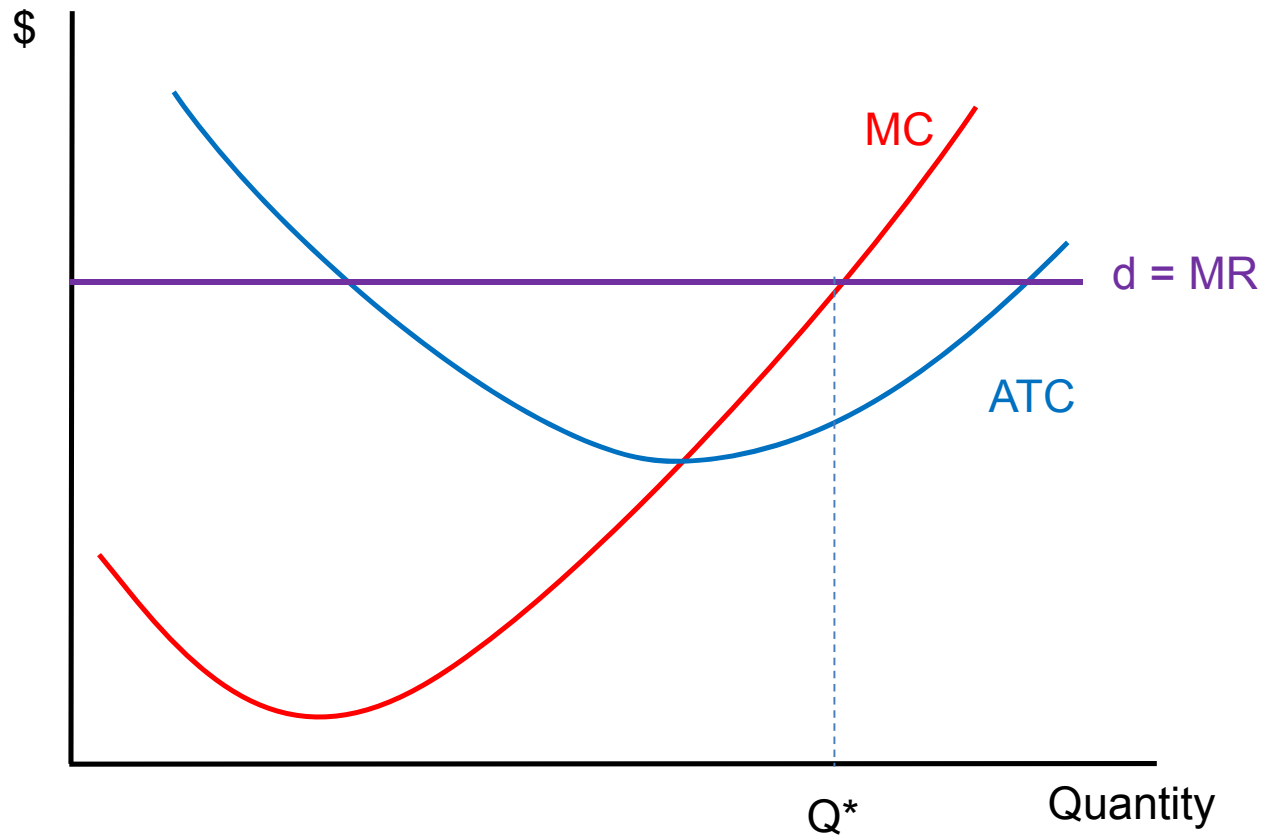
Finding Profit

What is the Profit-Maximing Q?



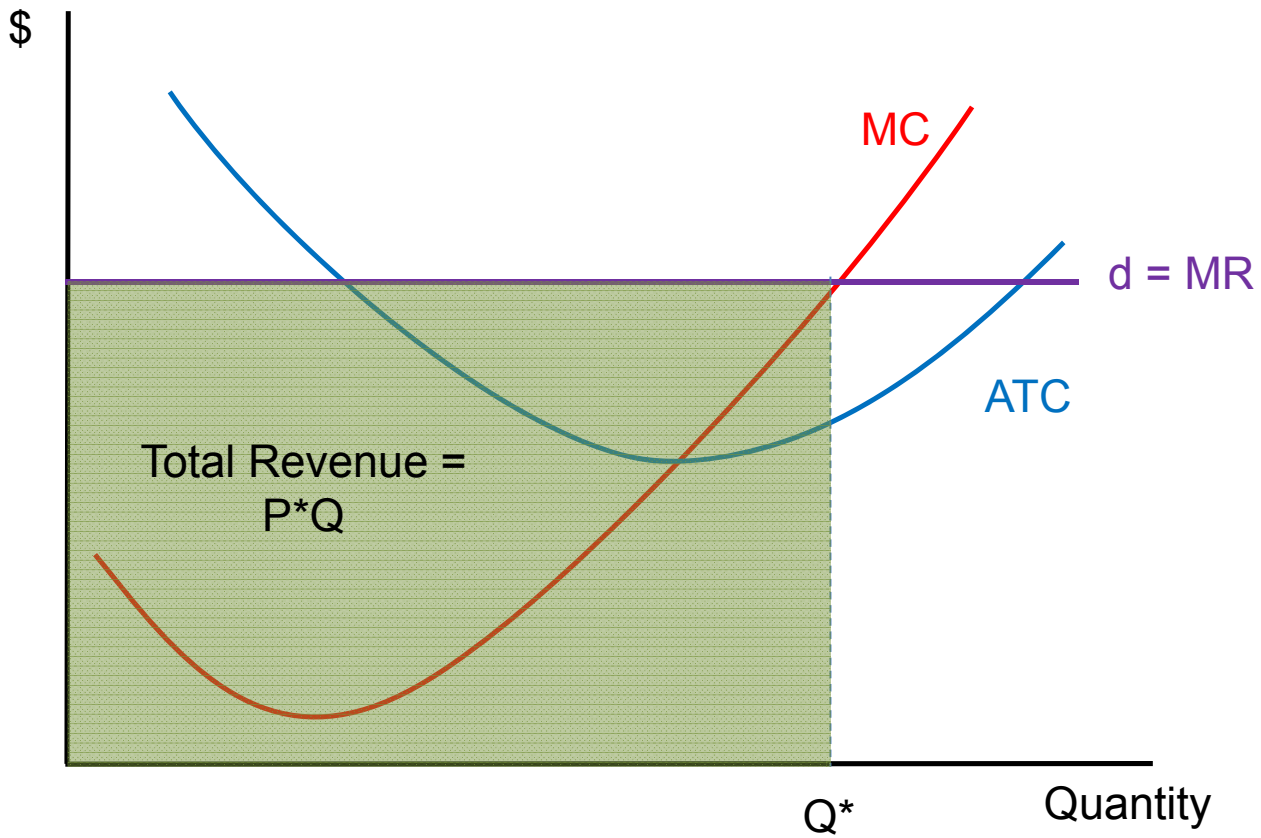
Finding Profit

Where is total revenue?



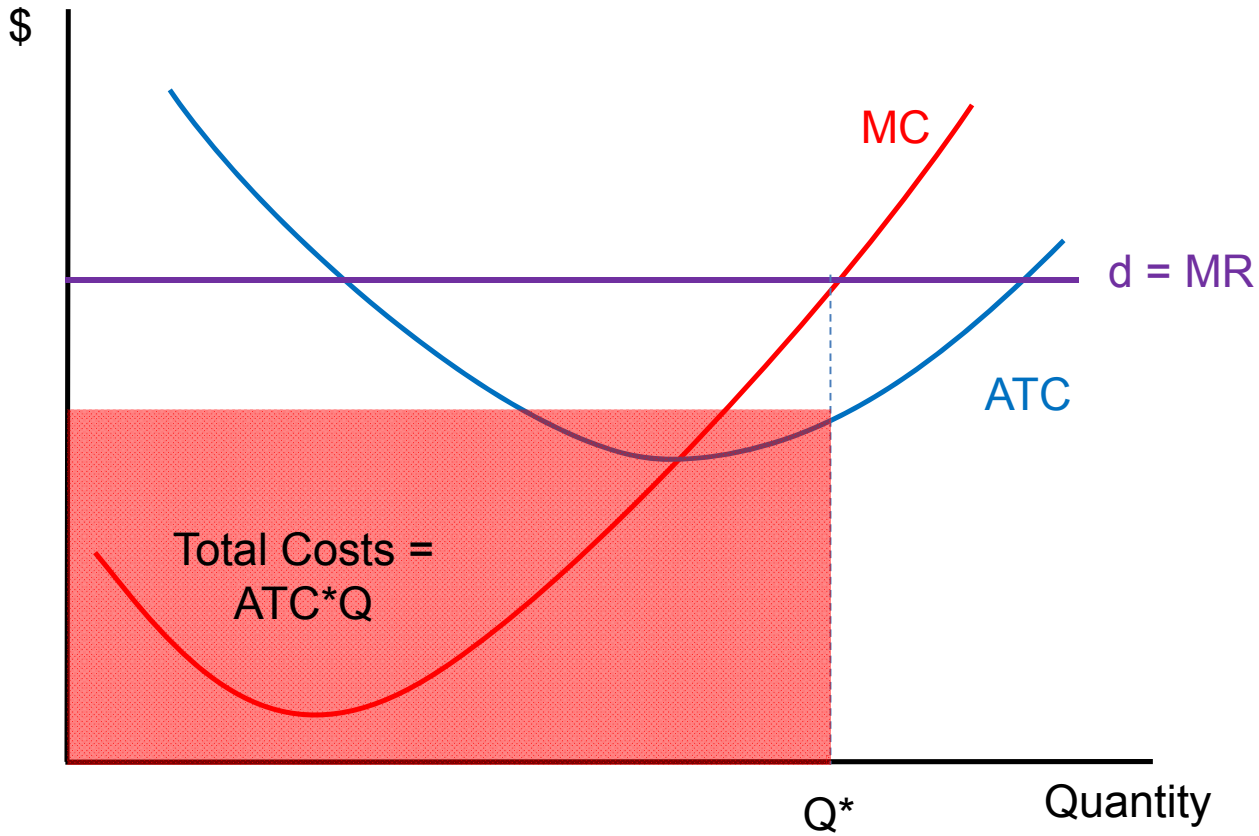
Finding Profit

Where are total costs?



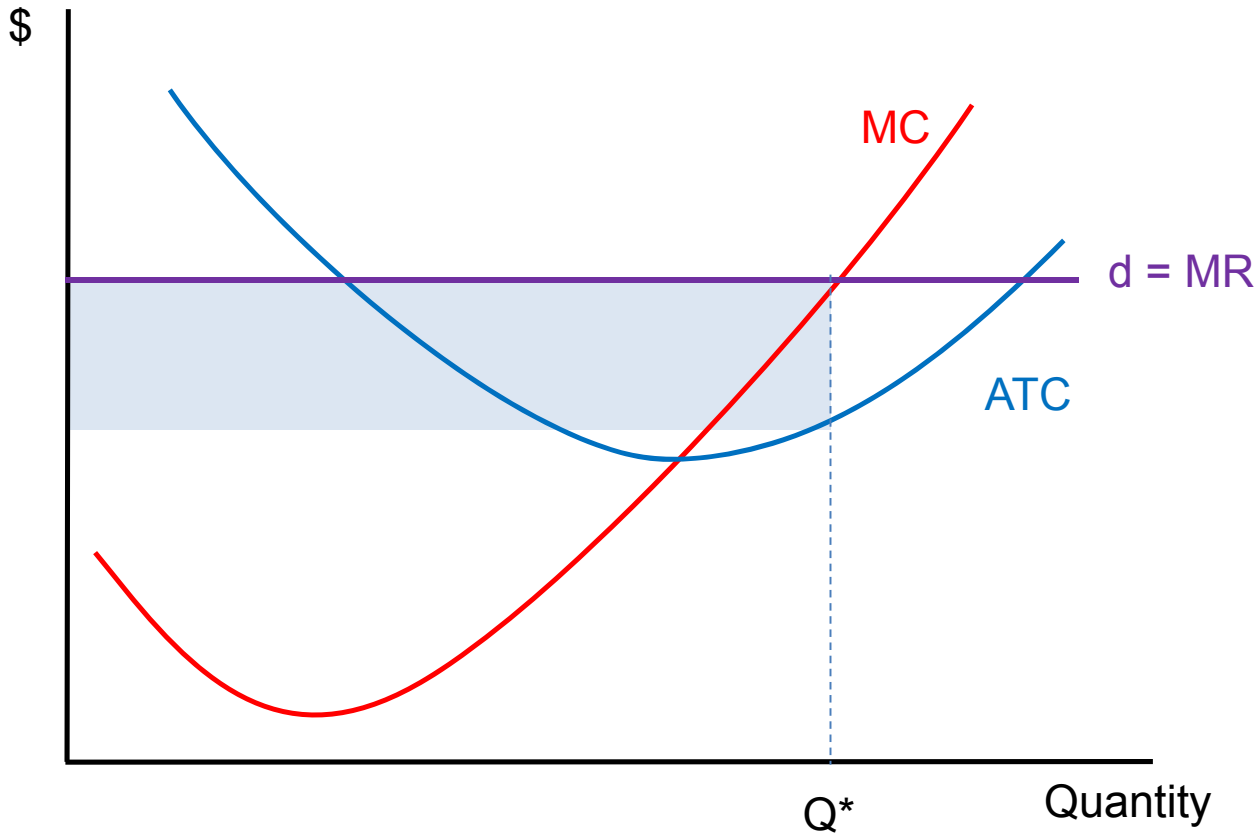
Finding Profit

How do you find profit?



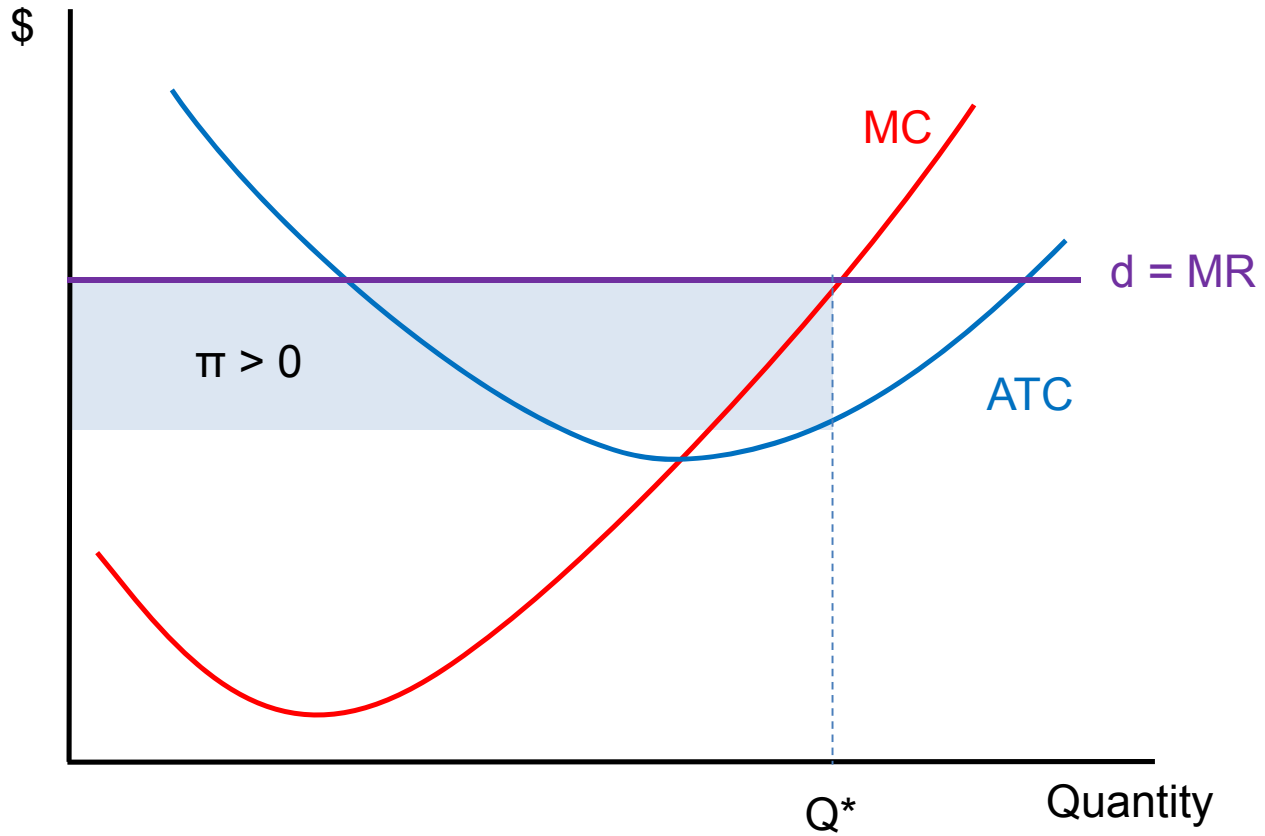
Finding Profit

Is $\pi > 0$ or < 0?



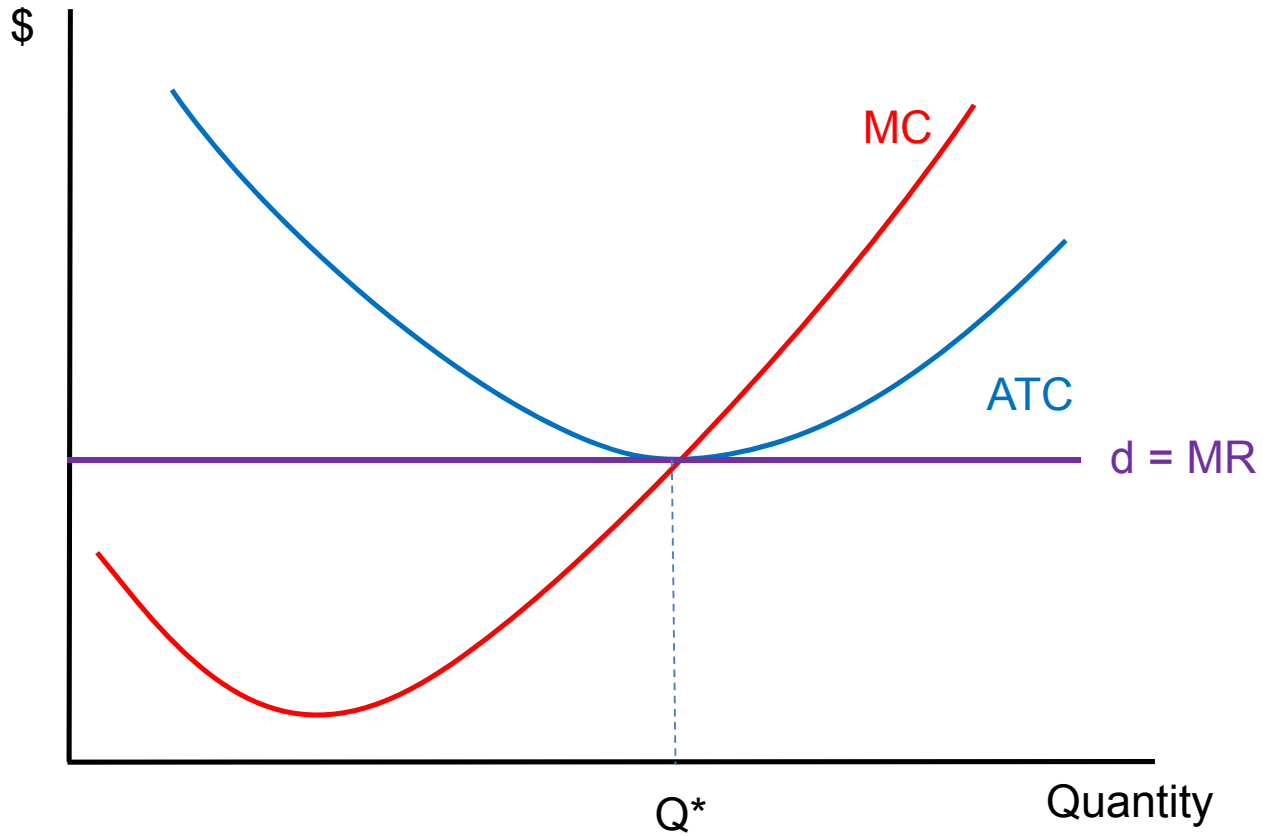
Finding Profit

$\pi > 0$



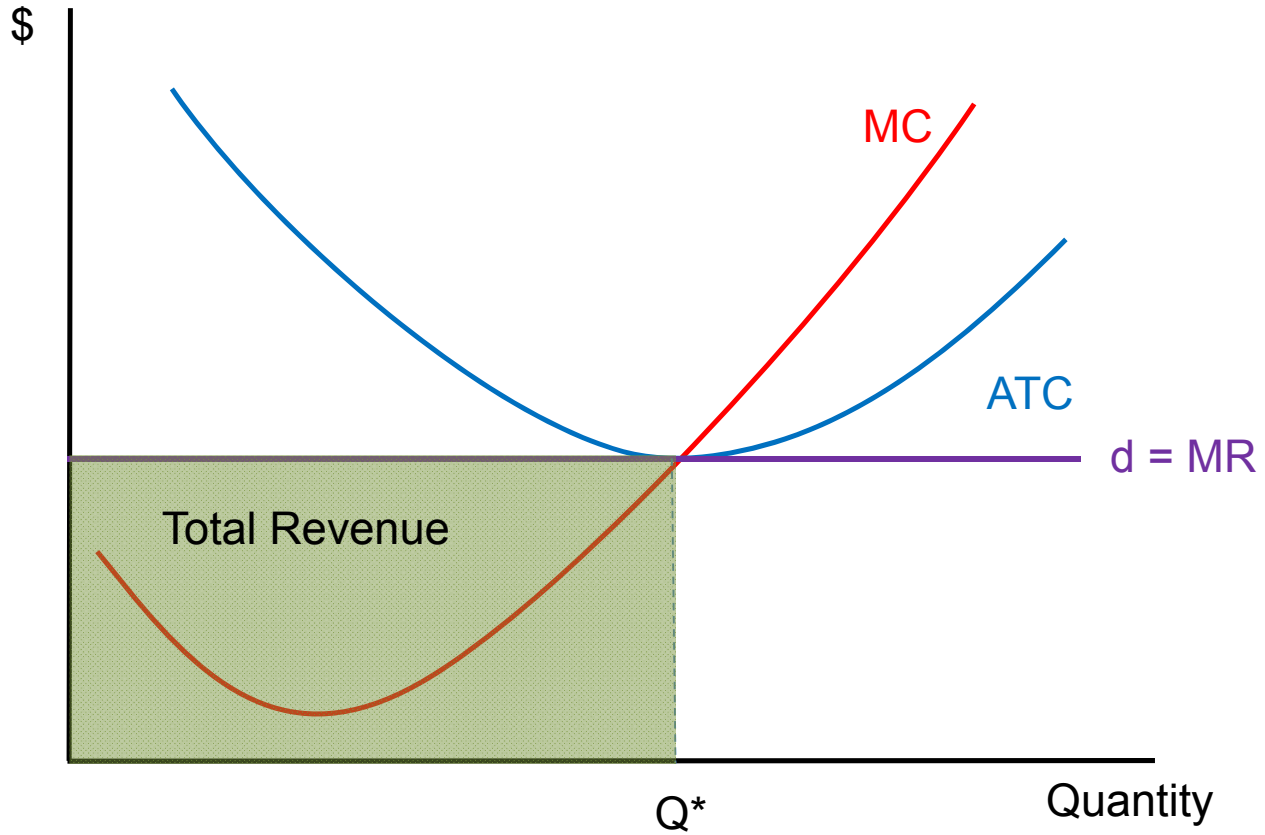
Finding Profit

Profits Now? First find revenues



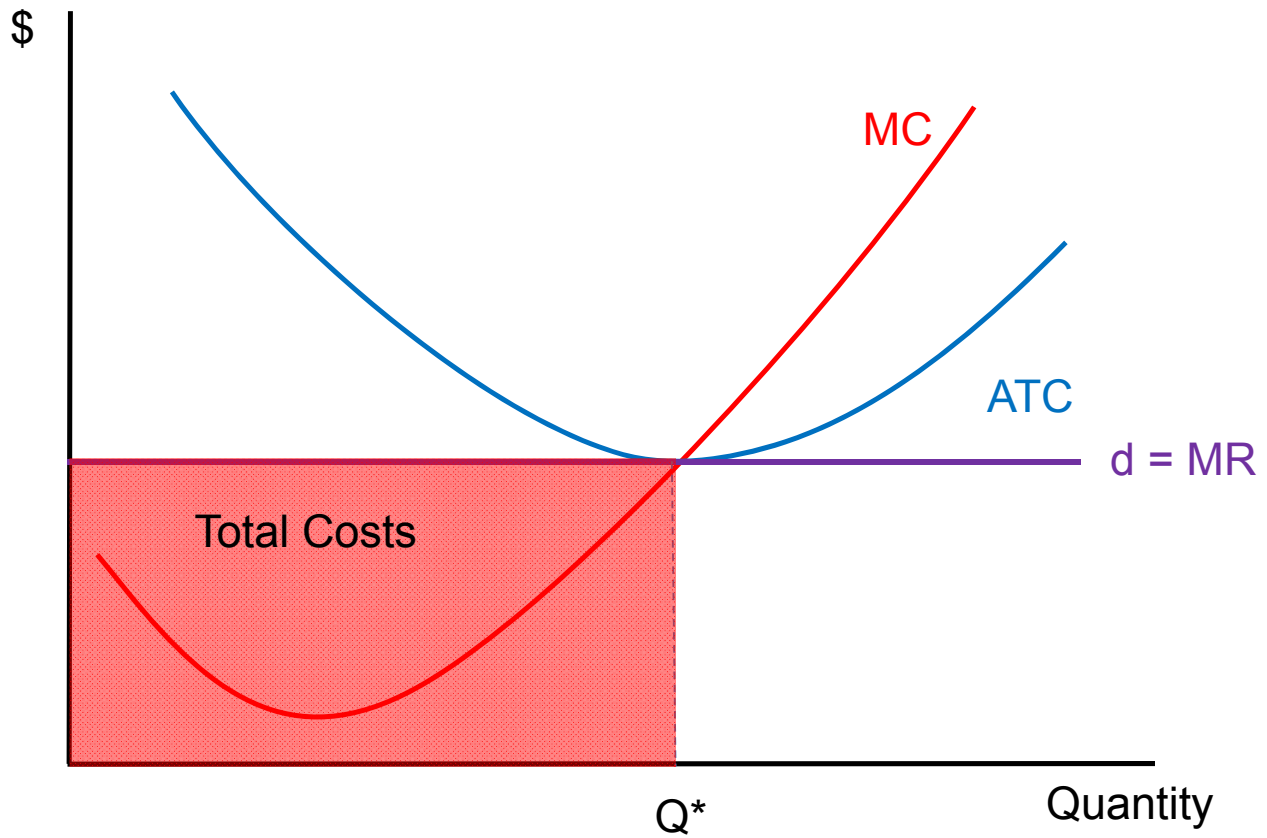
Finding Profit

Profits Now? Now find costs



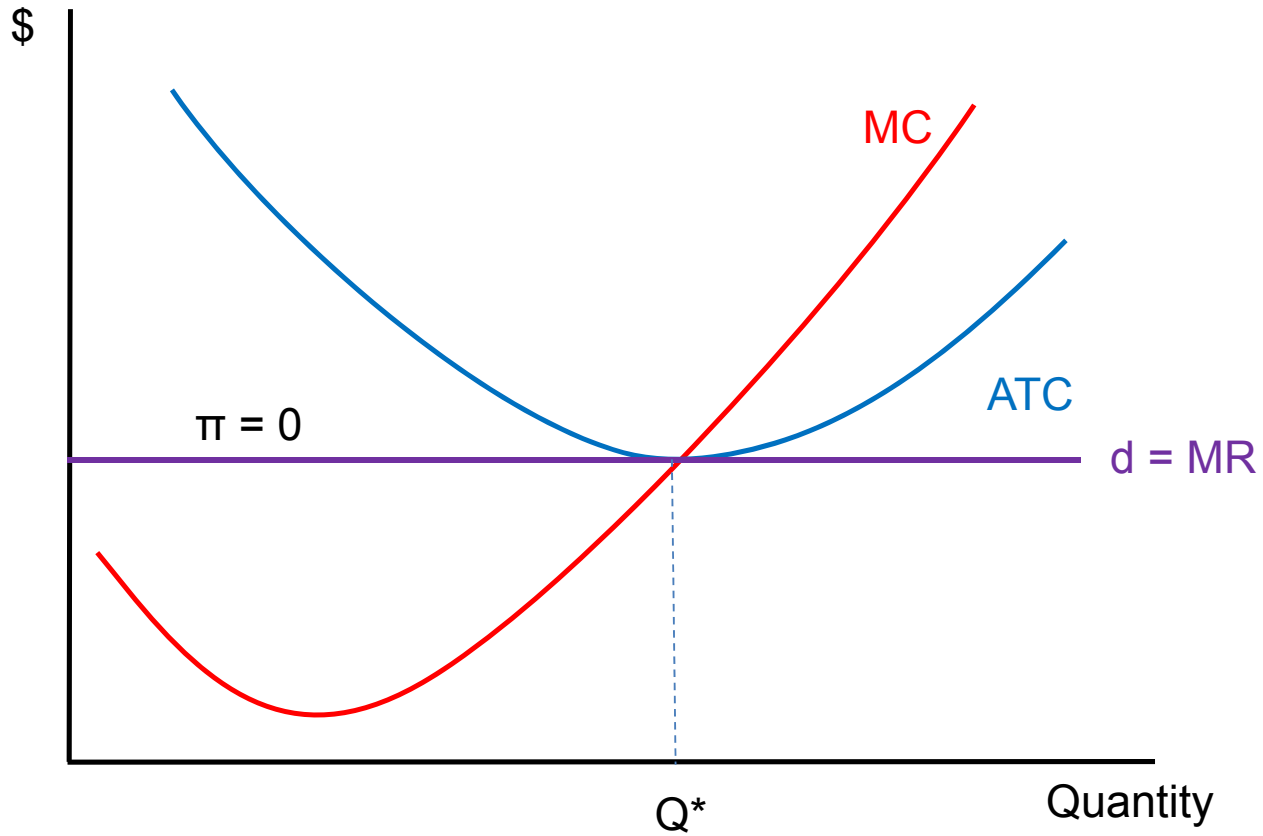
Finding Profit

Profits Now?



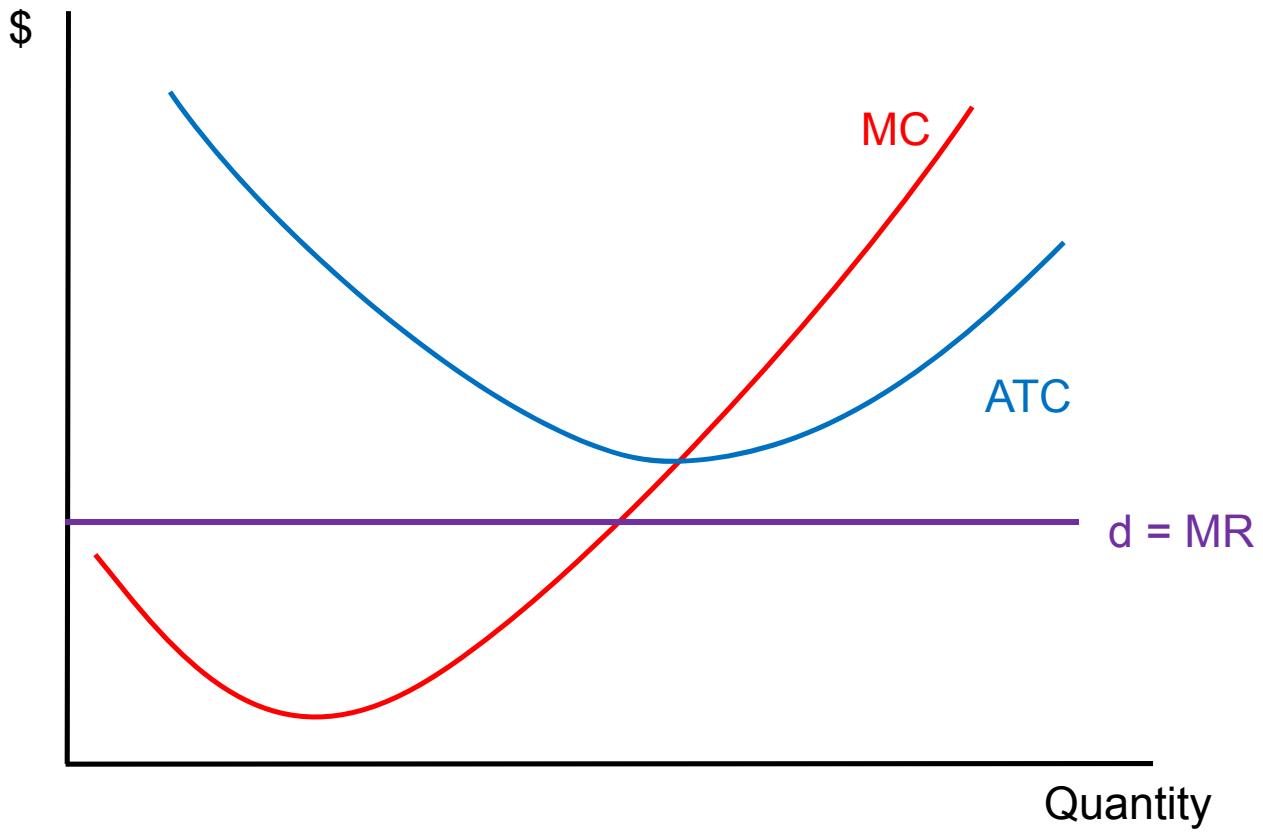
Finding Profit

No Profits to Be Found



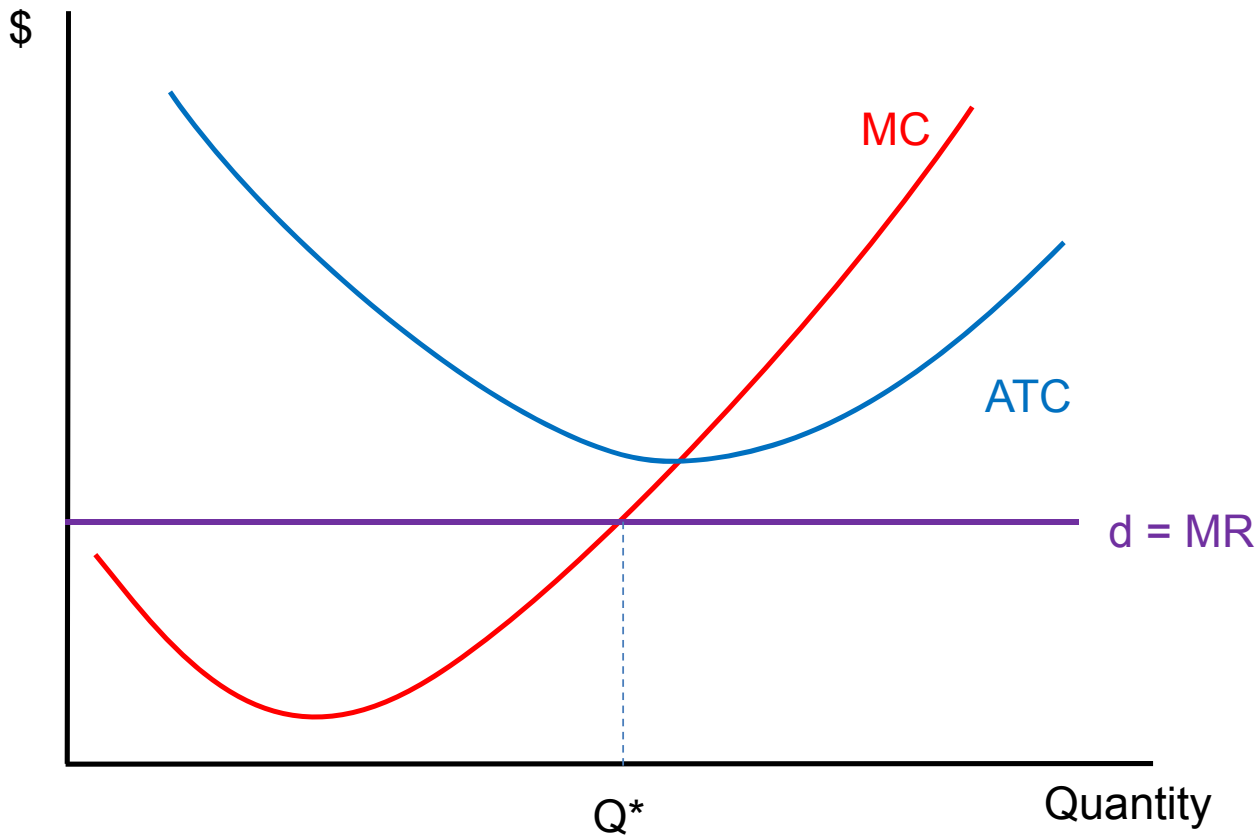
Finding Profit

Price Falls. Profits Now? What is profit maximizing Q?



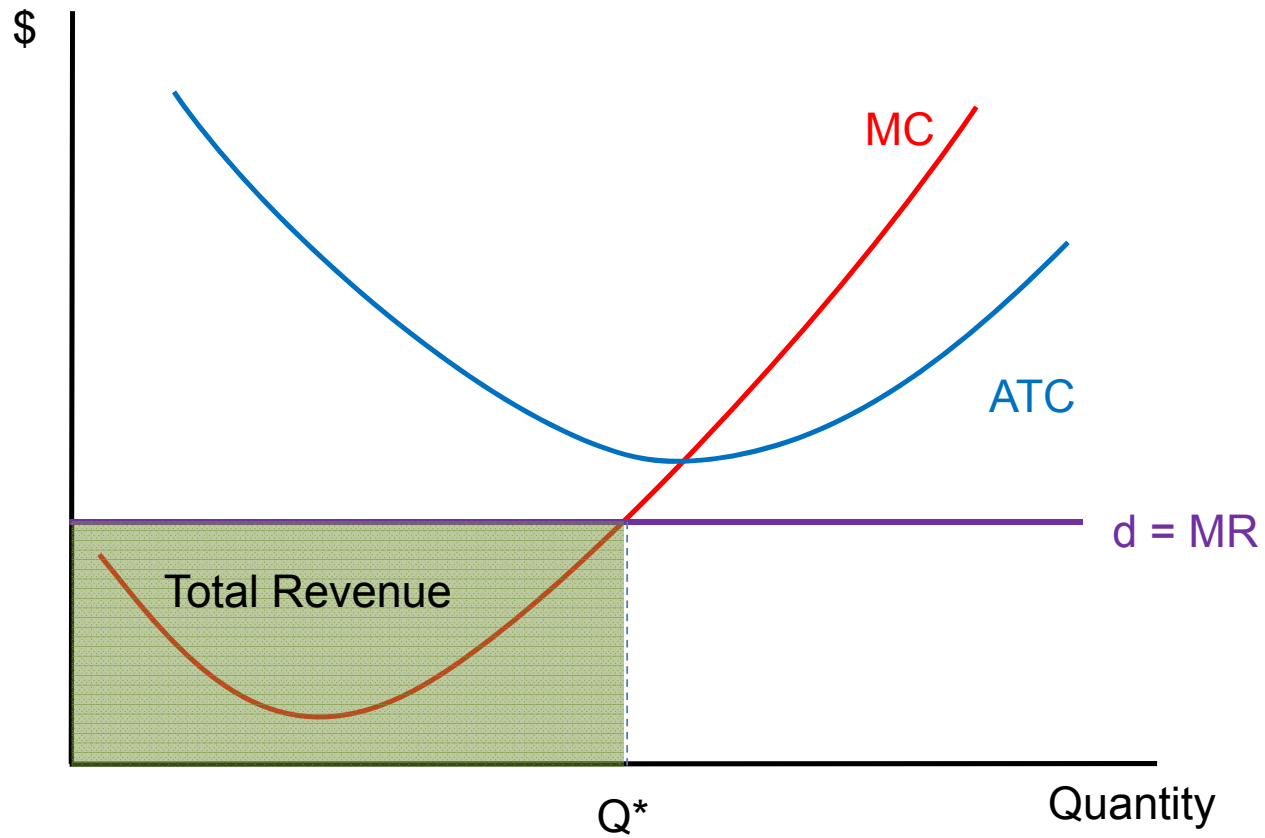
Finding Profit

Profits Now? Find total revenue



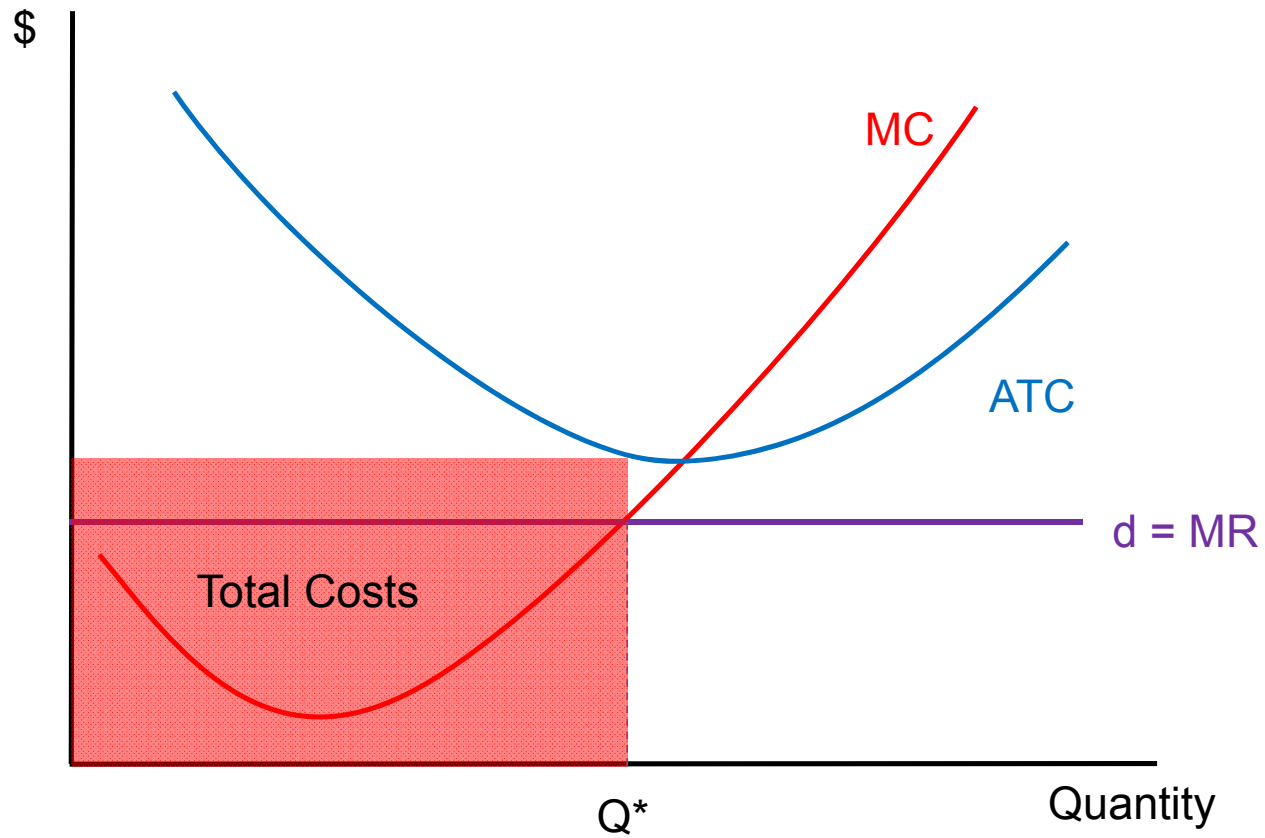
Finding Profit

Profits Now? Find total costs



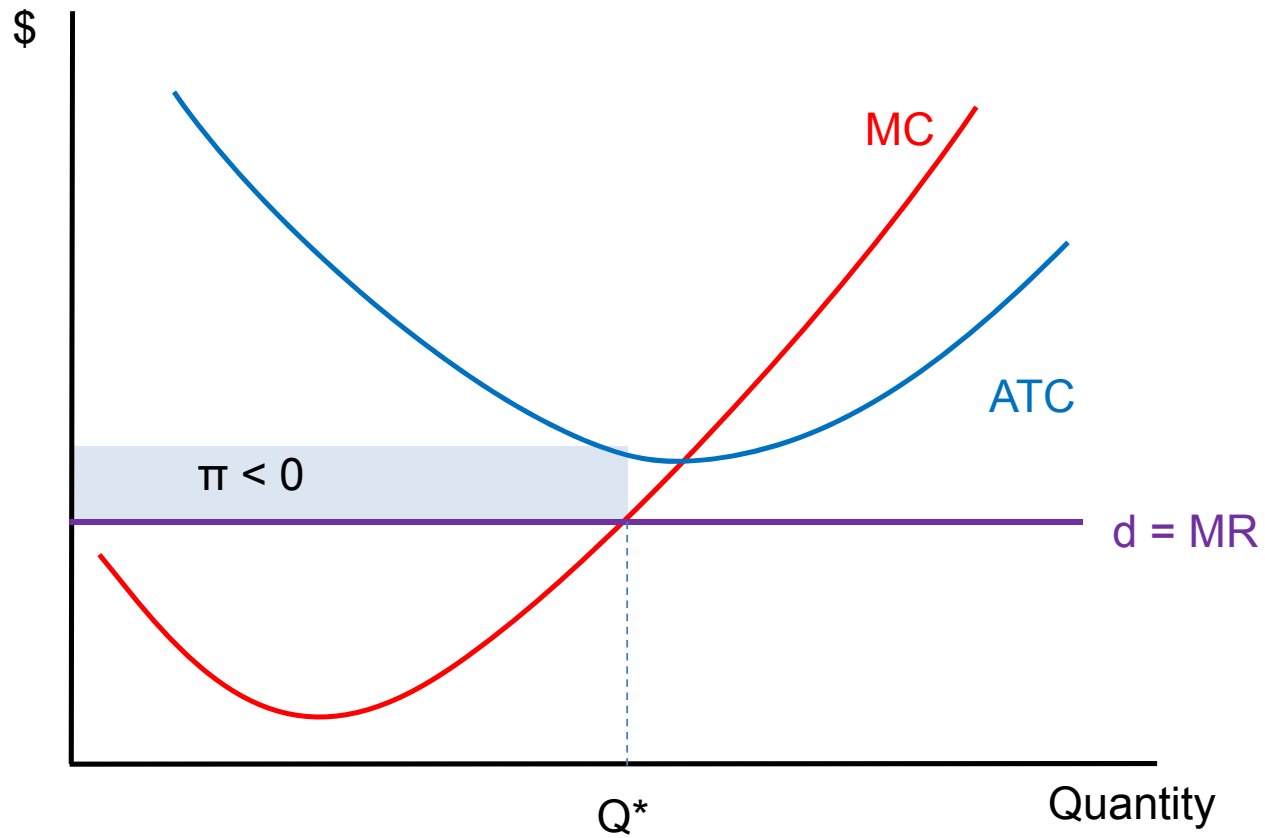
Finding Profit

$\pi > 0$? or $\pi < 0$?



Finding Profit

Profits are negative



In the Short Run, Should the Firm Shut Down if $\pi < 0$?

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- Profits in the short run, with output is $\pi_{operate} = TR - TC = TR - FC - VC$

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$$\pi_{operate} > \pi_{shutdown}$$

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Review: Keeping the Short-Run Curves Straight

- Maximize profit where $MR = MC$
- Profit is $Q * (P - ATC)$
- Operate if $P > AVC$

Short Run Perfect Competition

Describing Supply from First Principles

In the short run

- Firm's supply curve
- Industry's supply curve
- Producer surplus for a firm
- Producer surplus for the industry

Finding a Firm's Short Run Supply Curve

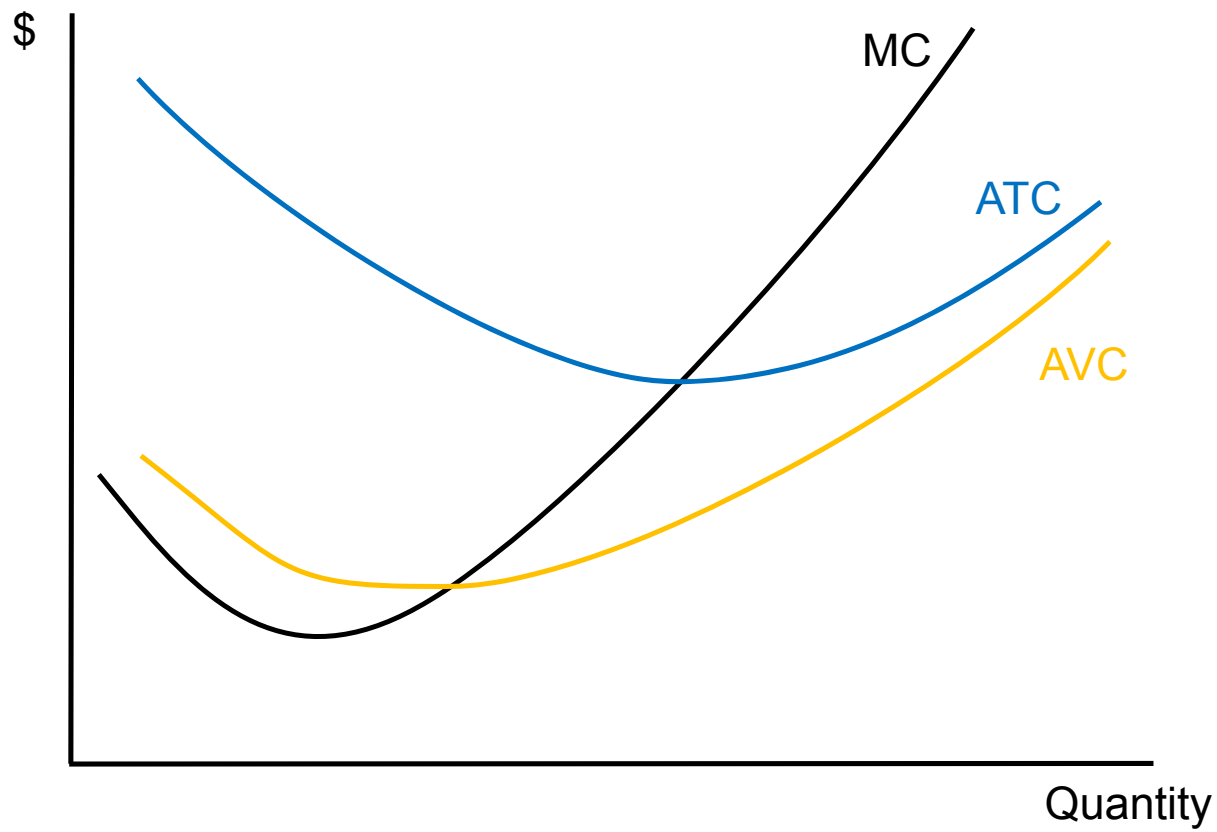
- We now know that the firm supplies only when $TR > VC$
- What does this imply about MC?

$$
\begin{aligned}
TR &> VC \\
P * Q &> VC \\
MC * Q &> VC \\
MC &> VC/Q \\
MC &> (AVC * Q)/Q \\
MC &> AVC
\end{aligned}
$$

$\rightarrow$ Firm supplies only when $MC > VC/Q$

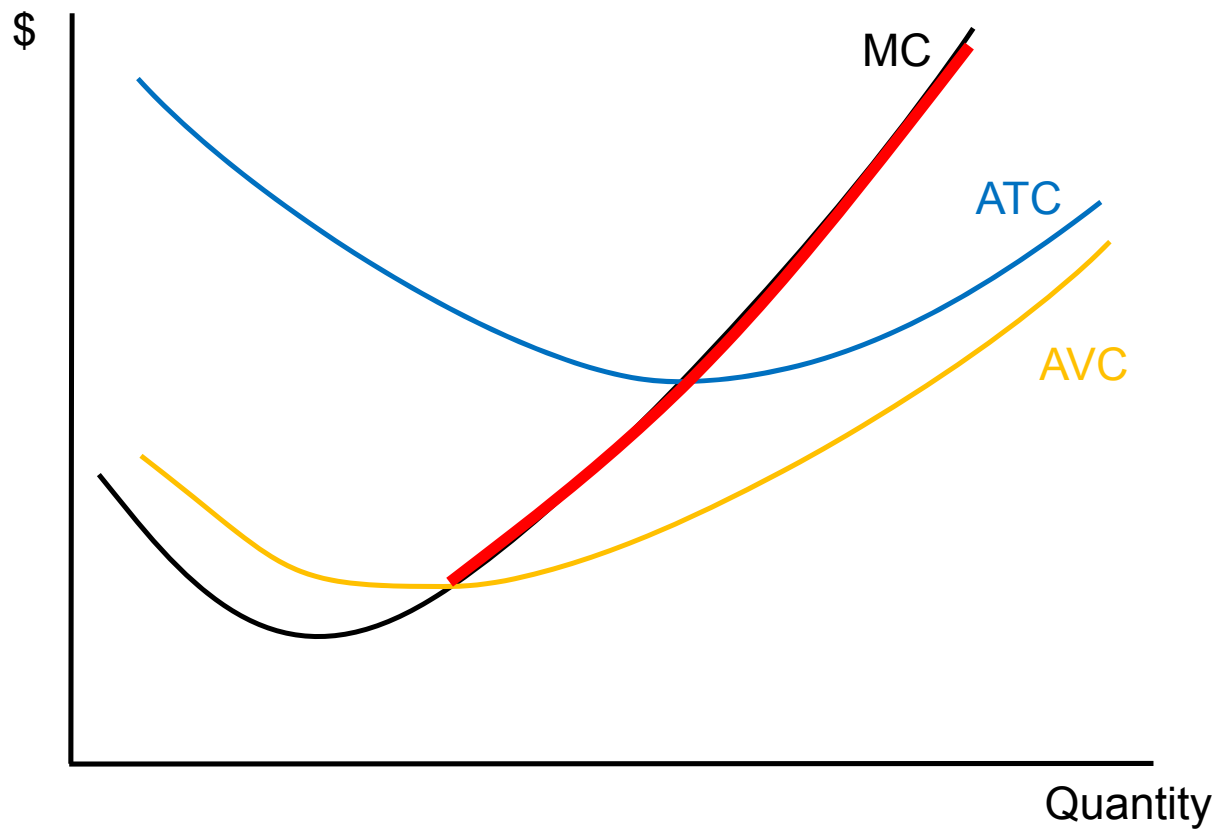
Finding a Firm's Short Run Supply Curve

What Quantities Would the Firm Produce?



Finding a Firm's Short Run Supply Curve

An Individual Firm's Supply Curve

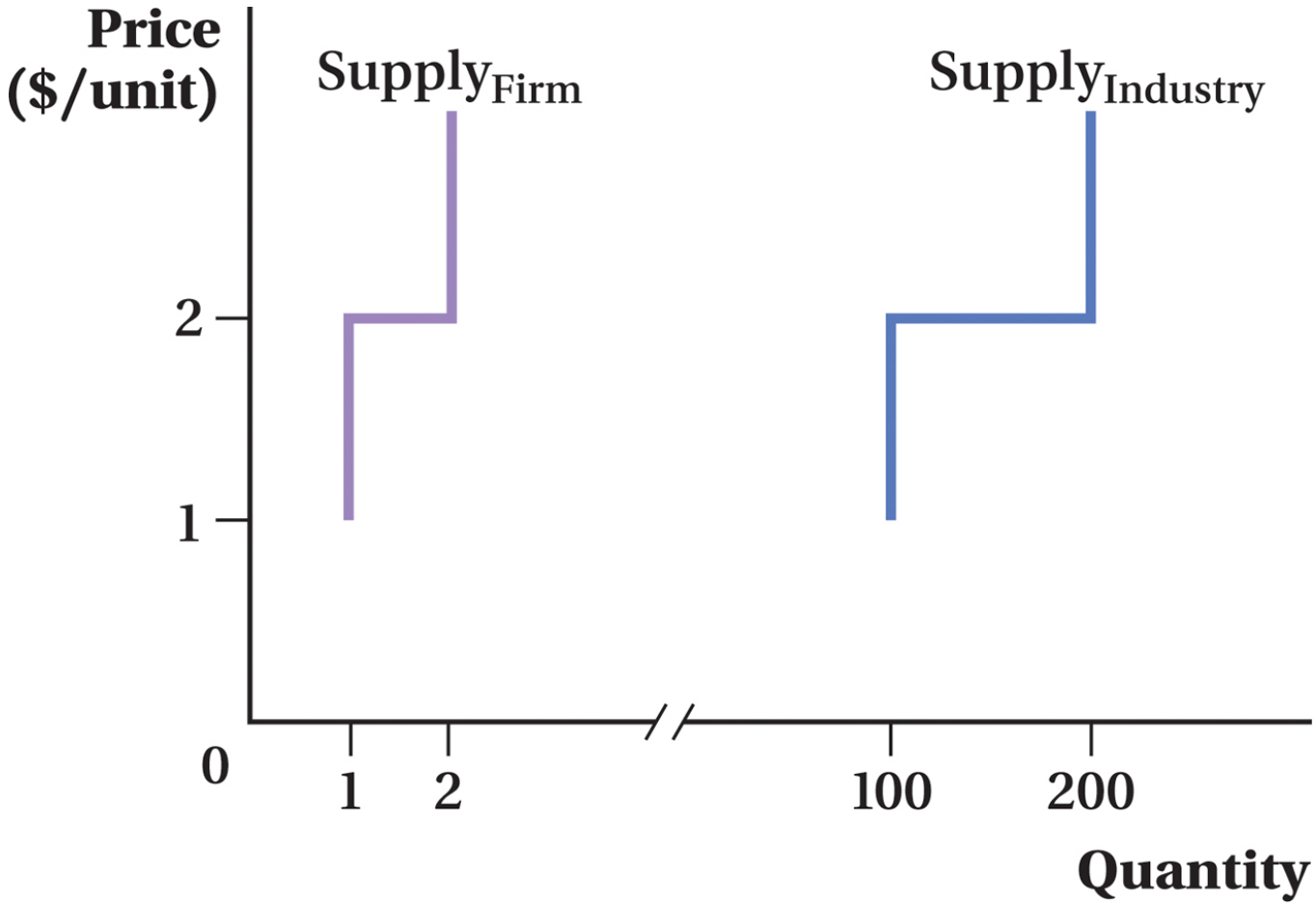


Finding Industry Supply

- Recall that we found market demand by summing individual demands
- Now we find market supply by adding firm supply, given prices
- Find market supply
  - Firm A: $Q_A = f(P)$
  - Firm B: $Q_B = g(P)$
  - Market supply: $Q_M = f(P) + g(P)$

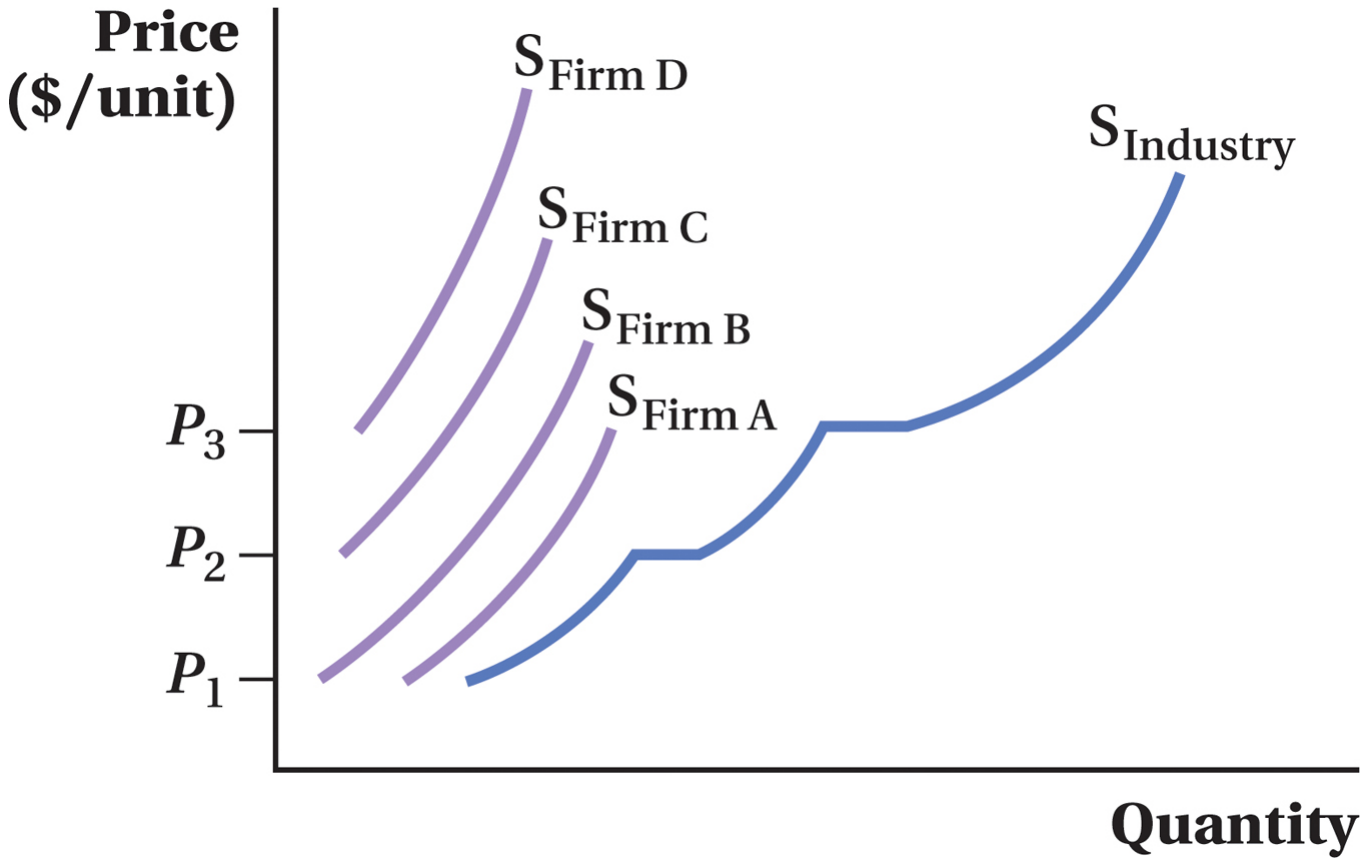
Finding Industry Supply in Pictures

When Firms Have the Same Supply Curve: Here 100 Firms



Finding Industry Supply in Pictures

When Firms Have Different Supply Curves



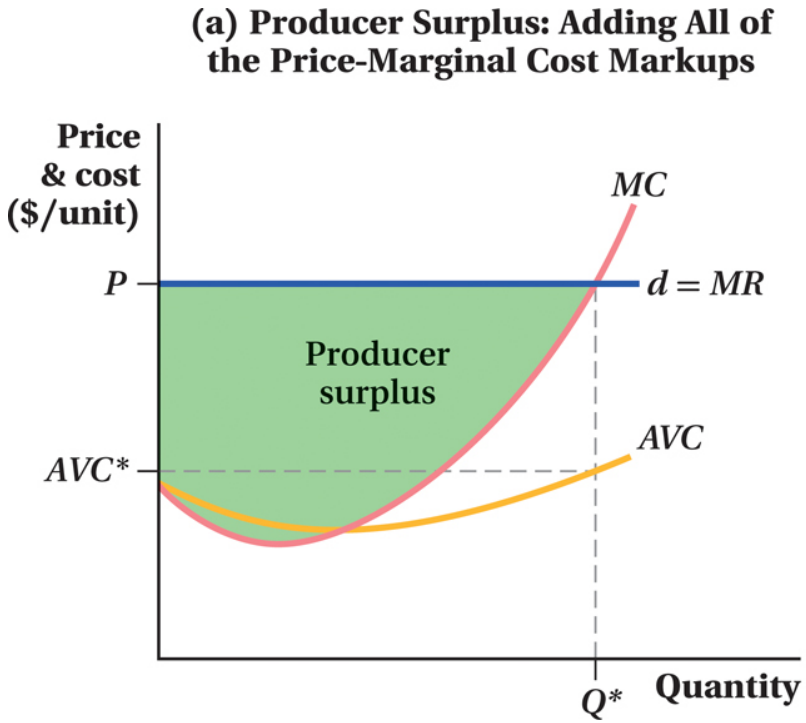
Adding Up Market Supply

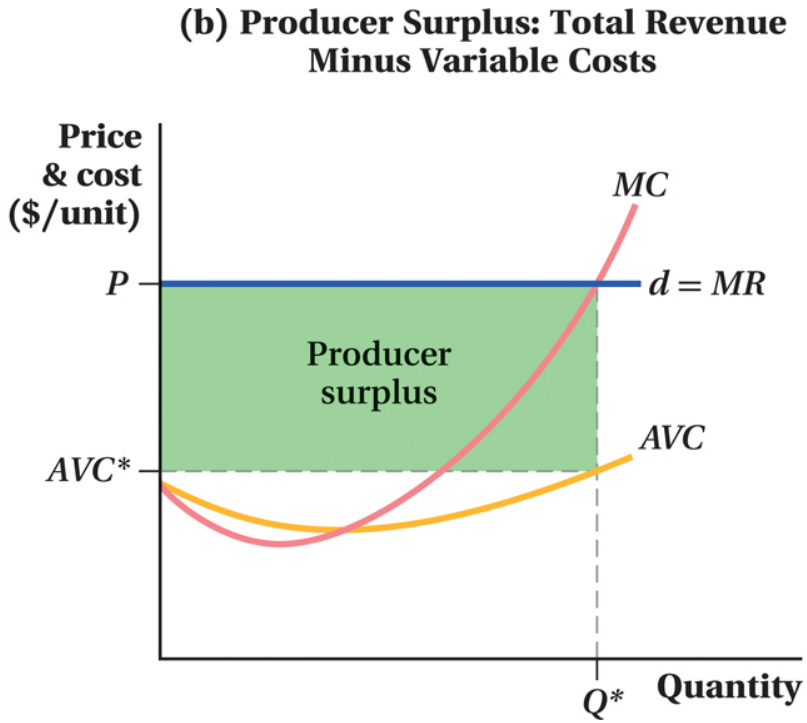
- Supply starts at lowest price is that offered by any firm
- Total quantity at any price is Q offered by all firms

Producer Surplus from a Competitive Firm

- Like before, the sum of the benefit from each unit
- Two equivalent ways to think about this
  - The difference between market price and supply
  - The difference between $Q * AVC$ and PQ

Producer Surplus for a Firm: Pictures





Producer Surplus vs. Profit

- Profit: $\pi =$

Producer Surplus vs. Profit

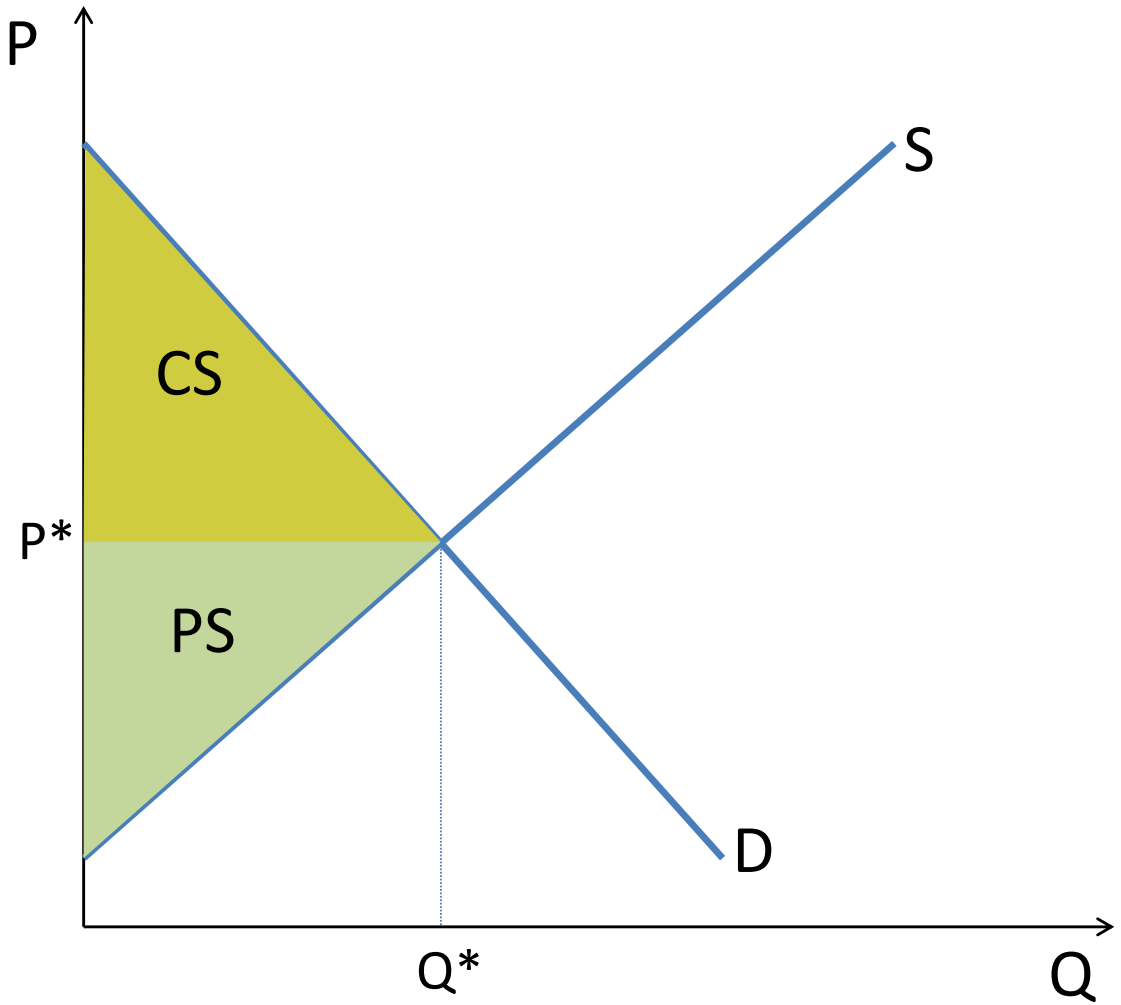
- Profit: $\pi = TR - TC = TR - (FC + VC)$

Producer Surplus vs. Profit

- Profit: $\pi = TR - TC = TR - (FC + VC)$
- Surplus: $PS = TR - VC$

Remember, $\pi \neq PS$

Producer Surplus for a Competitive Industry



Perfect Competition in the Long Run

Entry in the Long Run

- Free entry $\equiv$ when firms can easily enter the market
  - No legal barriers
  - No technical barriers
- Long run profits
  - Difference between price and long-run total cost
  - $\pi = P * Q - LATC * Q = Q * (P - LATC)$

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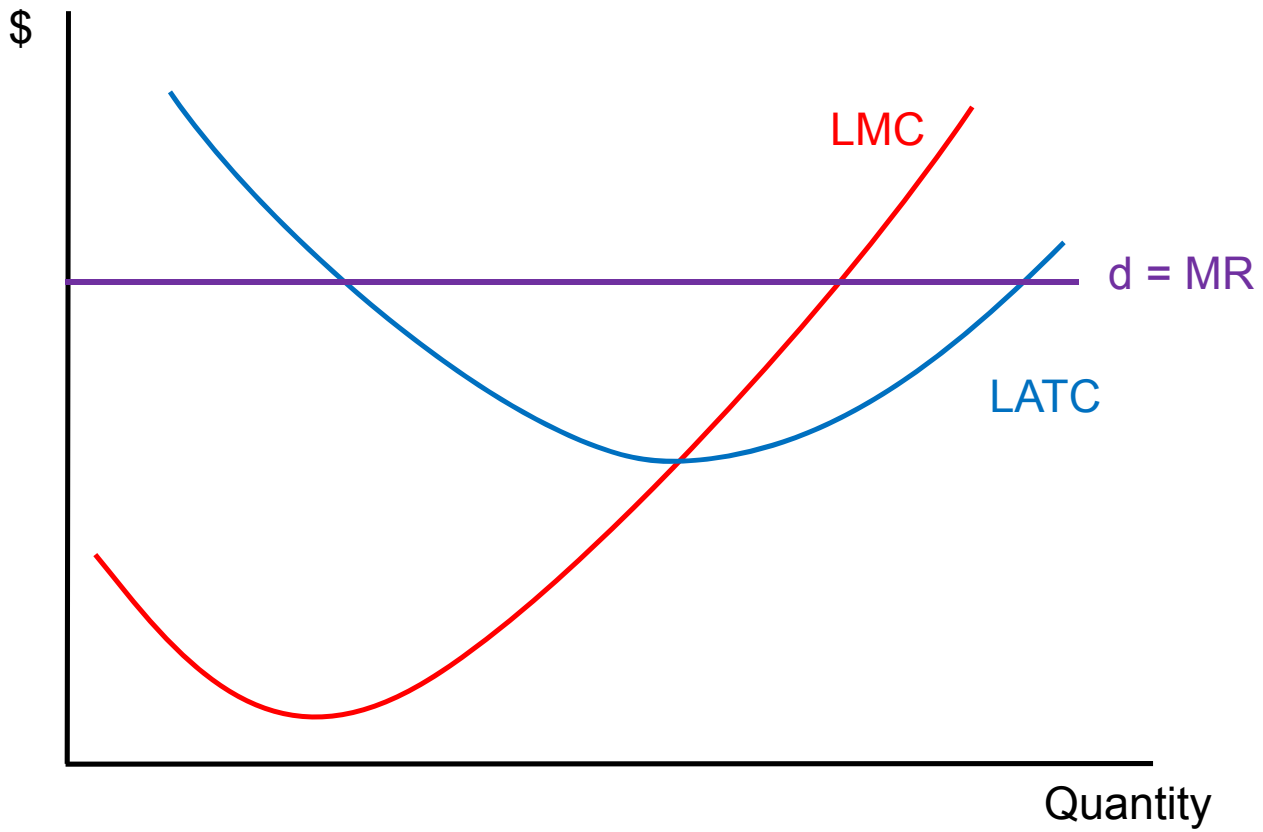
- When $\pi > 0$, we anticipate entry by new firms, until $\pi = 0$
- Long-run competitive equilibrium $\equiv$ point at which $P = LATC$, and there are no gains to entry for additional firms

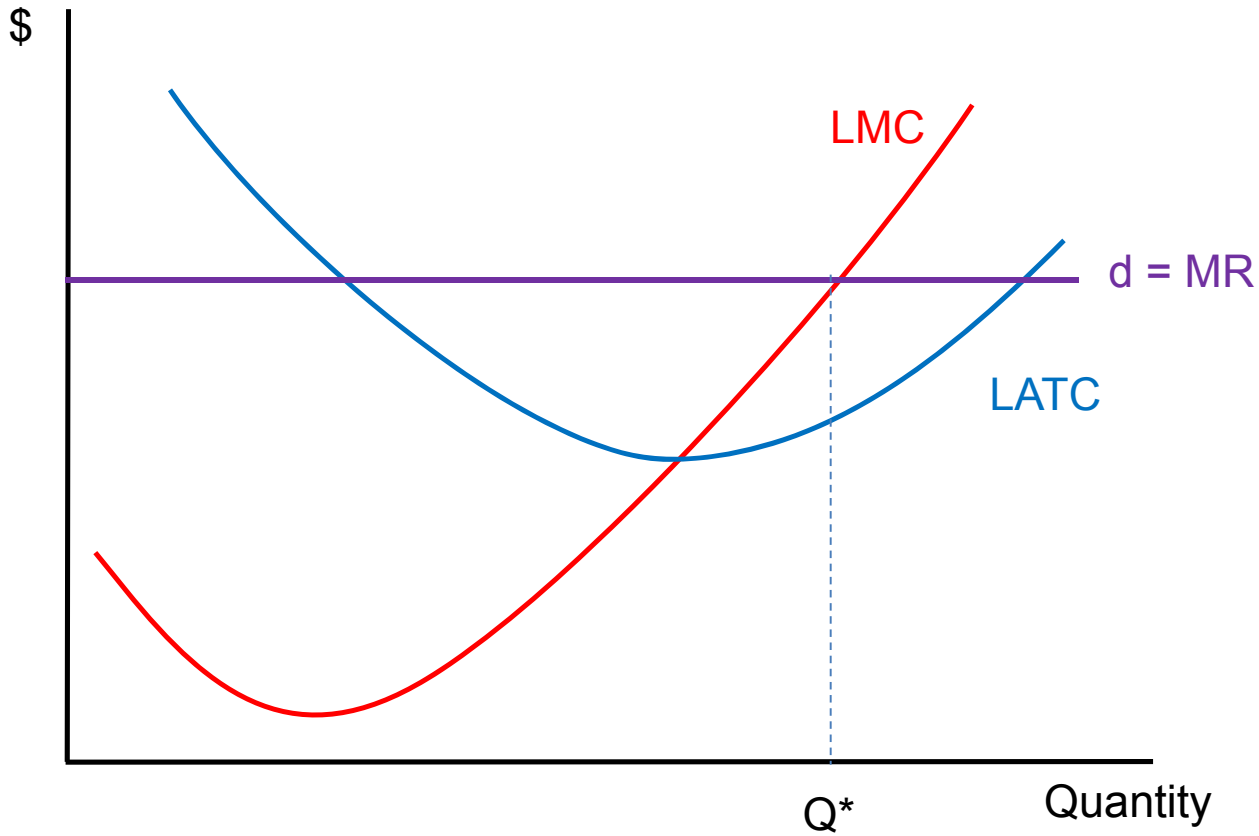
Profits and Entry

What is the long-run profit-maximizing Q?



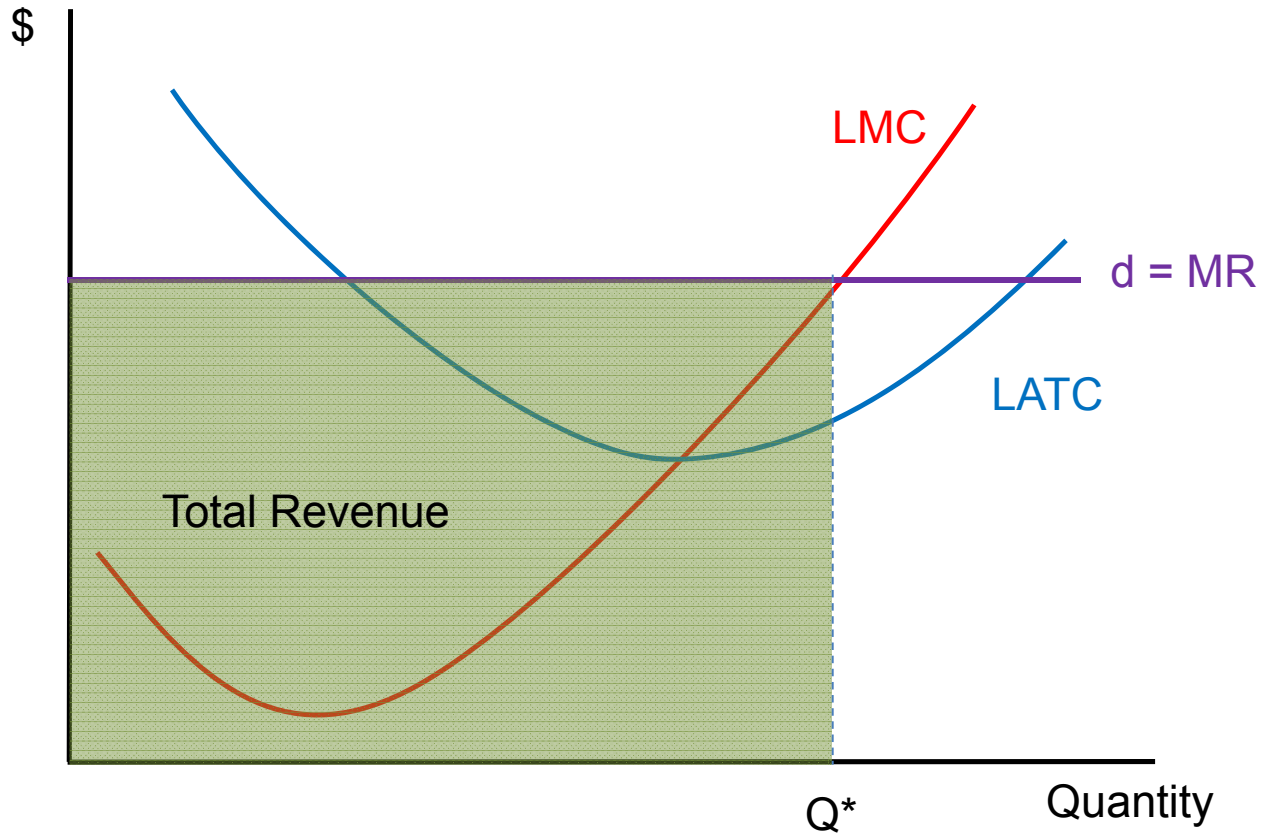
Profits and Entry

And where are total revenues?



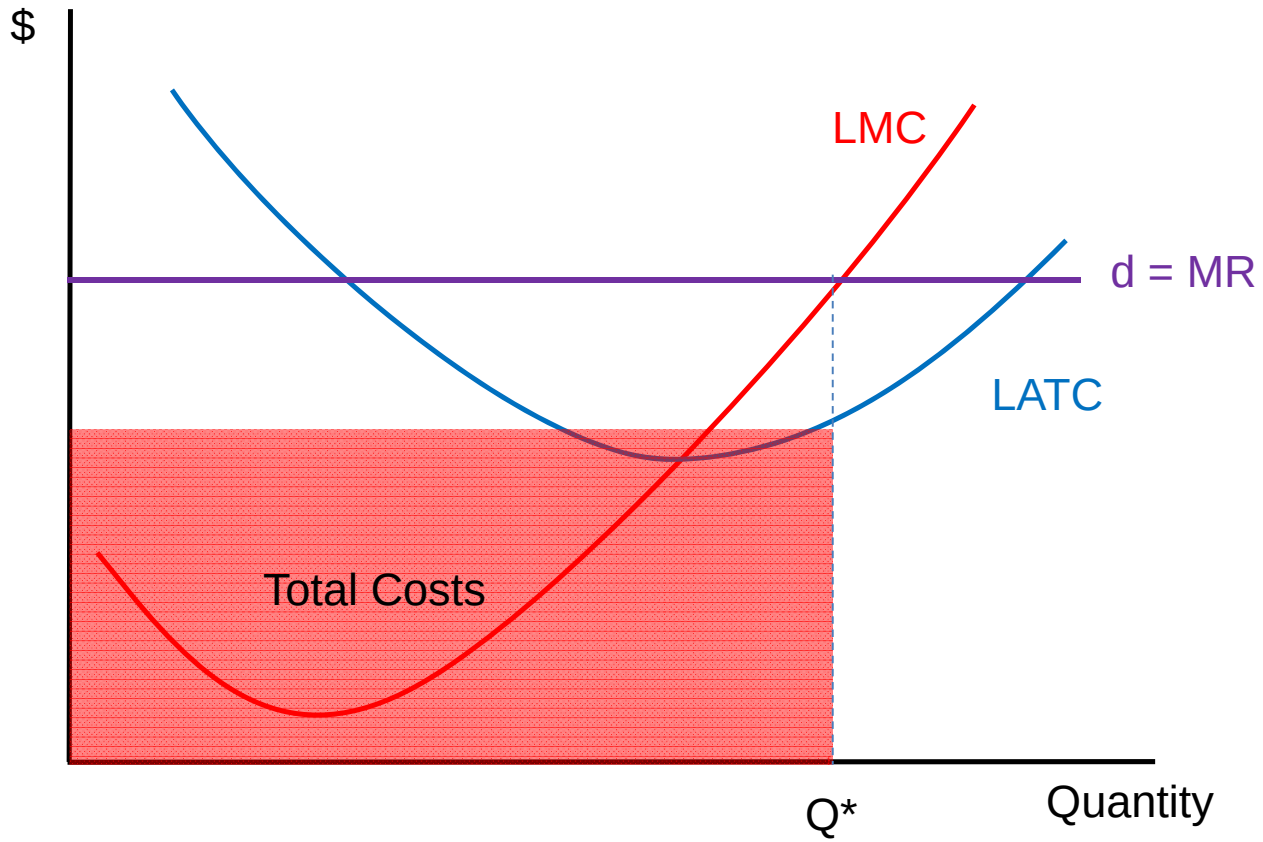
Profits and Entry

Total costs?



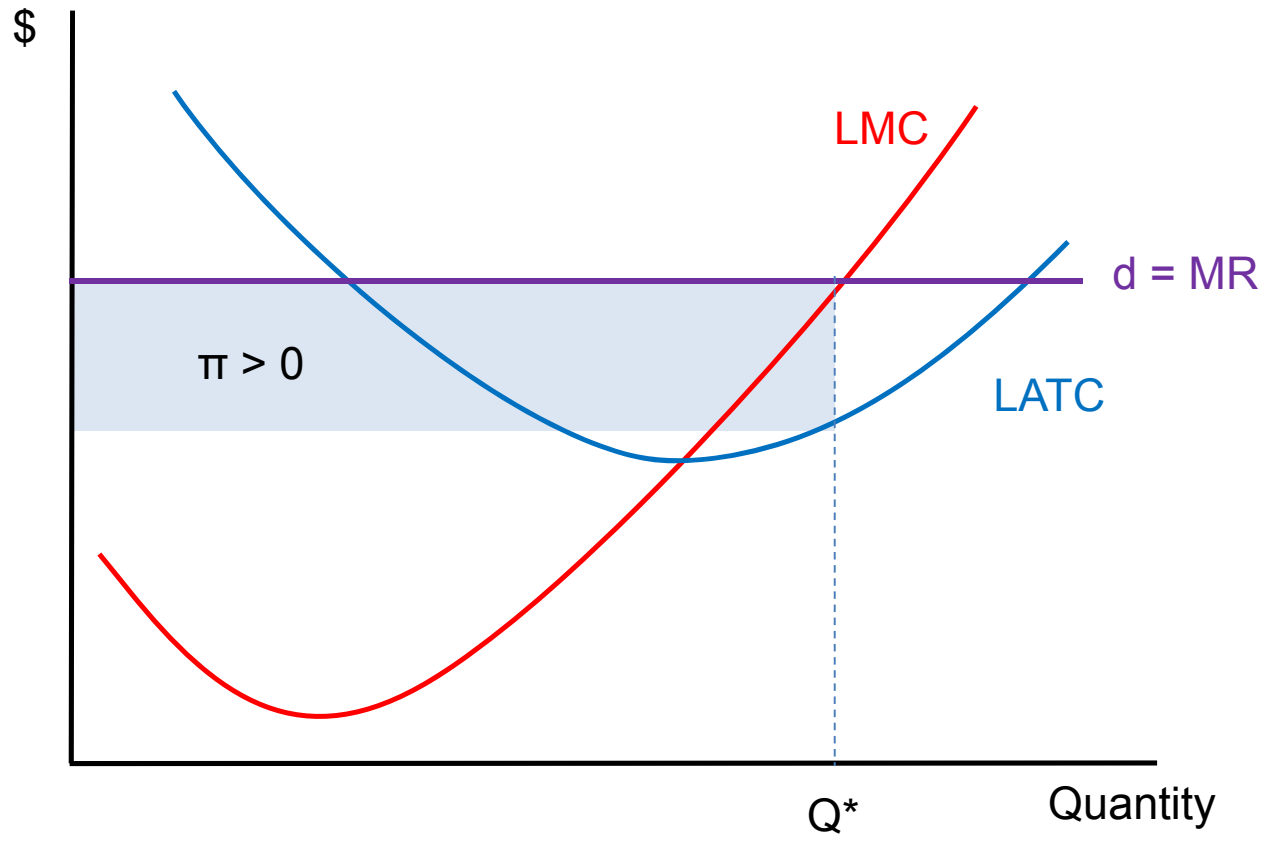
Profits and Entry

Where is profit?



Profits and Entry

Positive profits: Stay in business



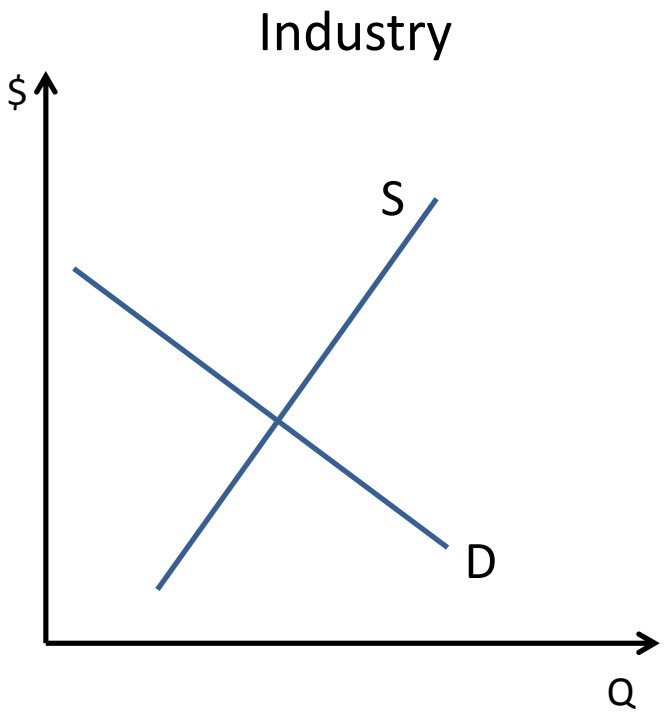
If economic profit exists, what should other firms do?

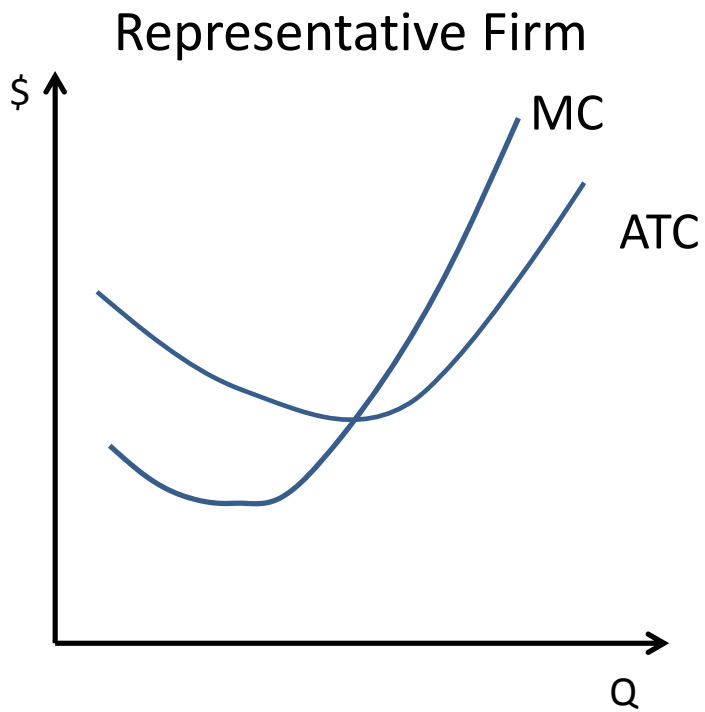
Long-Run Exit

- Free exit $\equiv$ ability of firm to exit an industry without legal or technical barriers
- When should a firm exit the market? When $P < LATC$

What Happens When Demand Increases?

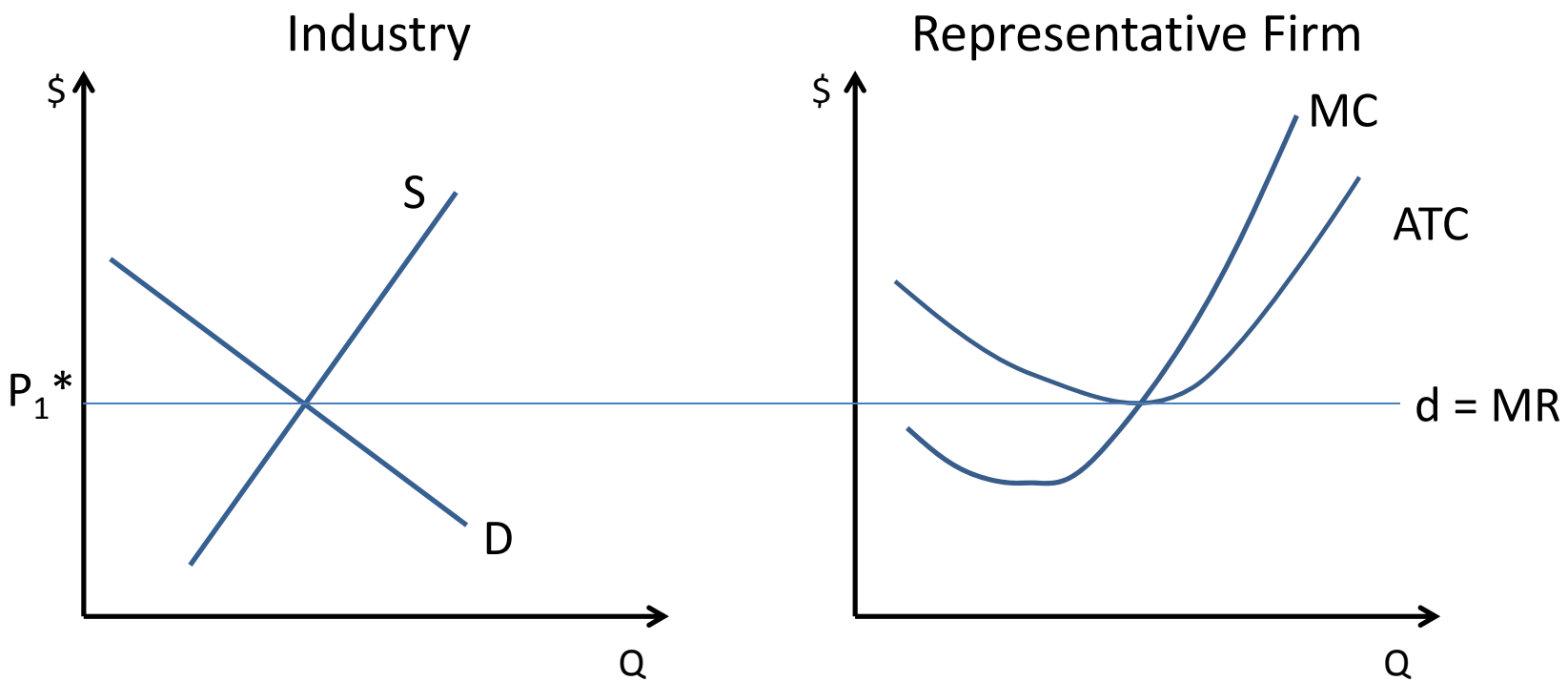
Original Equilibrium





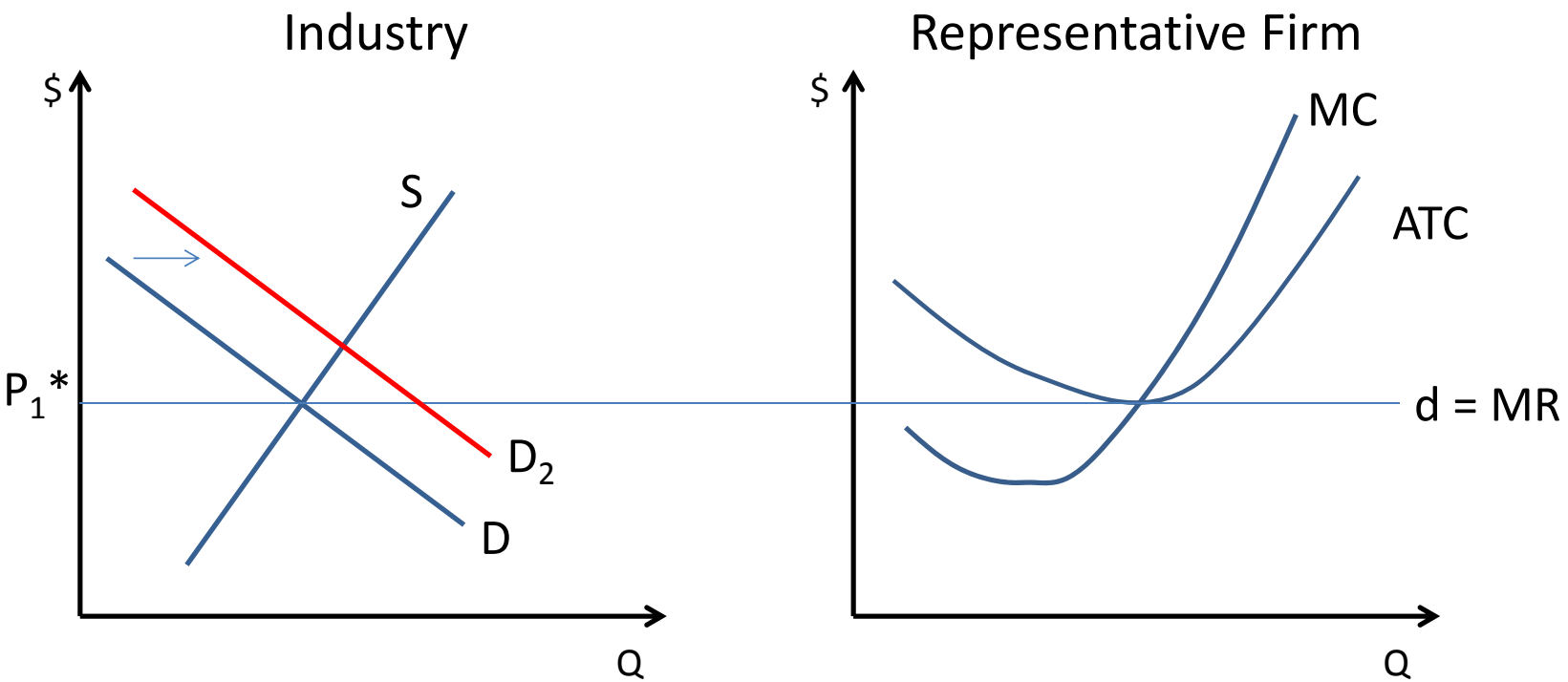
What Happens When Demand Increases?

Note Zero Profits



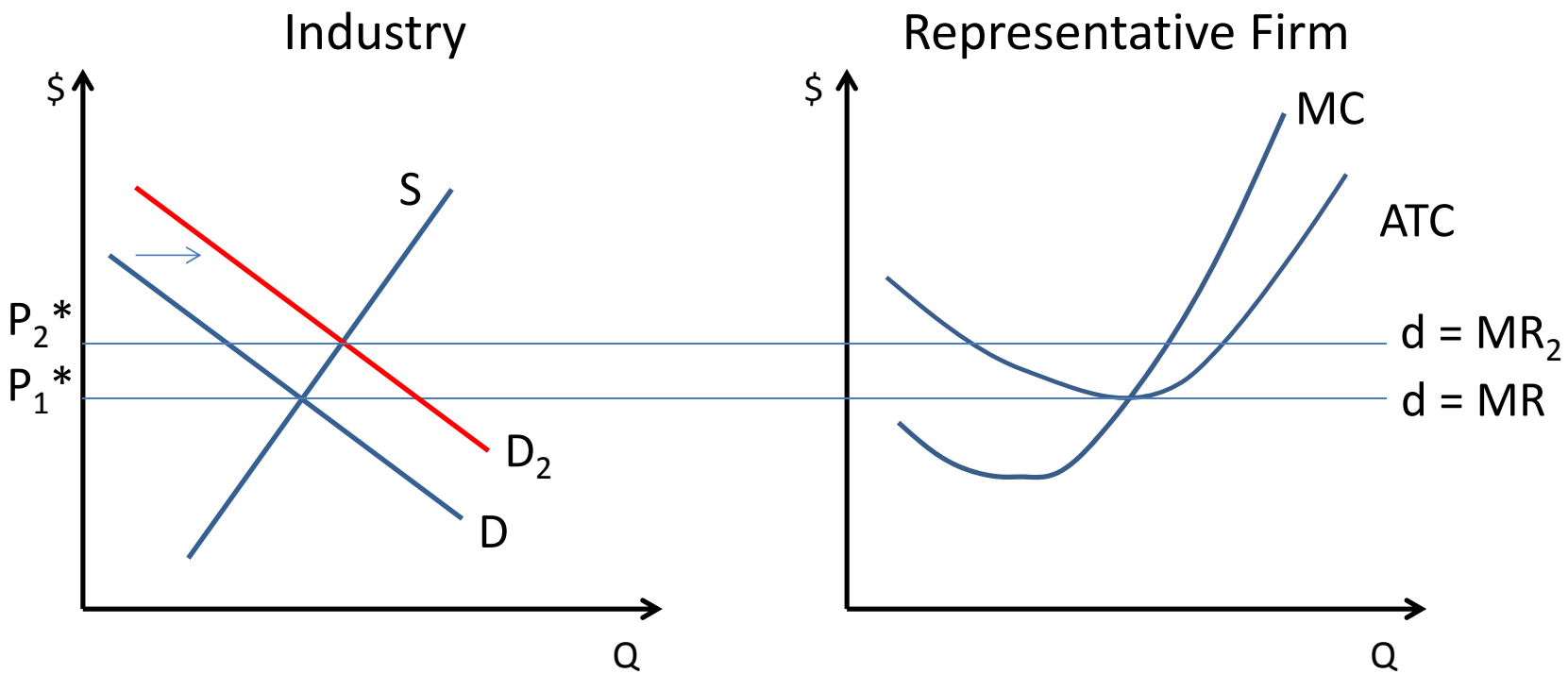
What Happens When Demand Increases?

Demand Increases. Profits?



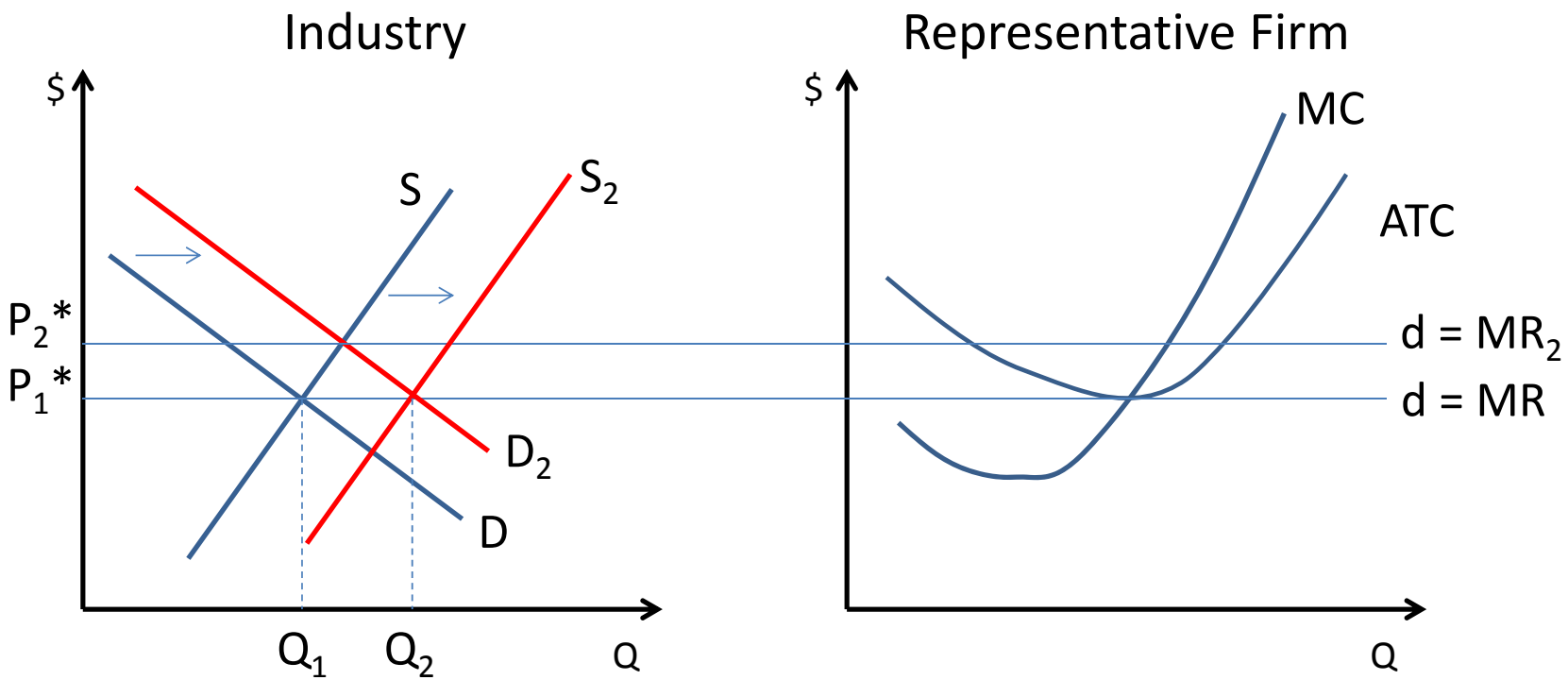
What Happens When Demand Increases?

Firms Enter, Prices and Profits Fall



What Happens When Demand Increases?

Supply Increases to Offset Change in Demand



Finding the Long-Run Supply Curve

Recap: Suppose demand increases. What happens

- in the short run to prices?

Finding the Long-Run Supply Curve

Recap: Suppose demand increases. What happens

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- in the long run to firm entry?

Finding the Long-Run Supply Curve

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- in the long run to firm entry? increases
- and in the long run to prices?

Finding the Long-Run Supply Curve

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$\rightarrow$ the long-run supply curve is perfectly elastic

Finding the Long-Run Supply Curve

Suppose costs fall. What happens

- in the short run to prices?

Finding the Long-Run Supply Curve

Suppose costs fall. What happens

- in the short run to prices? decrease
- in the short run to firm profits?

Finding the Long-Run Supply Curve

Suppose costs fall. What happens

- in the short run to prices? decrease
- in the short run to firm profits? possibly increase, if lower costs not passed to consumers
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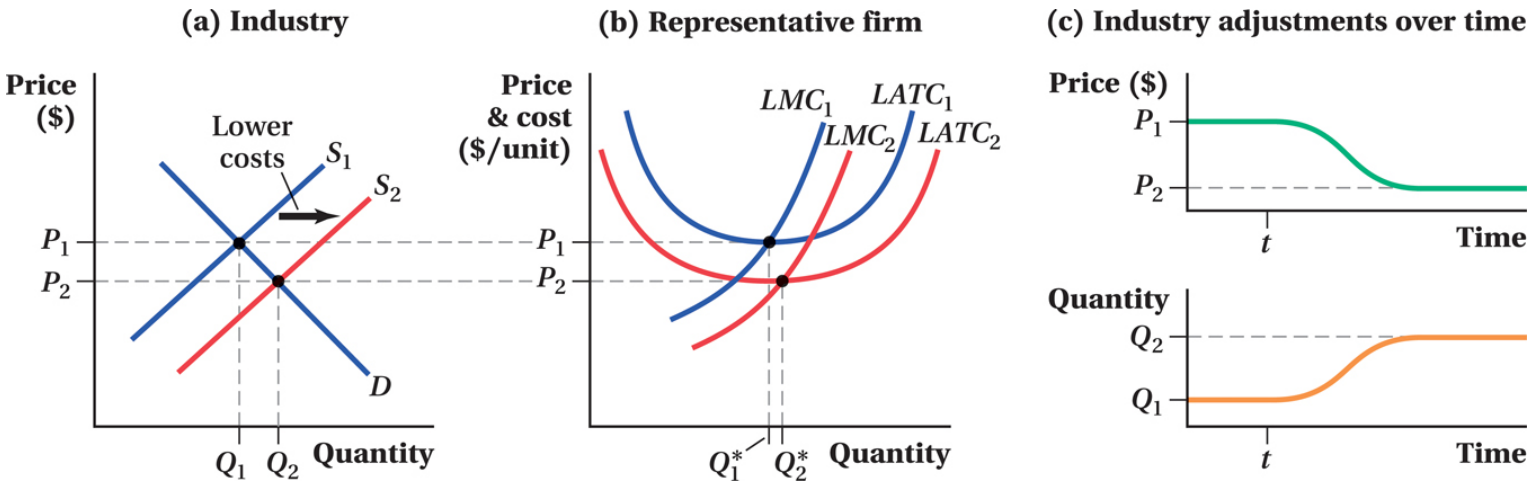
When Costs Fall



In Sum, In the Long Run

- Firms can enter
- Firms can exit
- Profits are zero
- $P = LATC$
- Supply is perfectly elastic

Long Run Supply and Demand Shifts

Suppose the market for the pain reliever aspirin is in long-run equilibrium at a price of \$3/bottle. New scientific research links aspirin with a reduced risk of heart disease.

1. In the short run, what happens to the price of aspirin? Explain using a diagram for both the industry and the representative firm.
2. In the short run, how do firms respond to the change in price described in (1)? What will happen to profits? Explain using the same diagrams.
3. Given the situation described in (2), what can we expect to happen to the number of aspirin producers in the long run?

Recap of Today

- Market structure and perfect competition in the short run
- Profit maximization in a competitive market
- Perfect competition in the short run
- Perfect competition in the long run

Next Class

- Turn in Problem Set 9
- Market Power and Monopoly: Chapter 9