

Perfect Competition

Summer 2023
Econ S-10A, Harvard University
Prof. Josh Abel

Textbook chapters 13 and 14

Market Power

- Market Power describes a firm's ability to influence the market price
- Economists usually group markets into 3 categories based on Market Power
 1. Perfect Competition:
 - Many, many firms compete
 - An individual firm is very small, so there is no Market Power
 2. Monopoly:
 - One firm supplies all quantity
 - This firm sets the price – maximal Market Power
 3. Oligopoly:
 - A “small” number of firms compete
 - Each firm can influence the price but none can control it – some market power
- These markets play out in very different ways
 - Only Perfect Competition yields an efficient market (“idealized benchmark”)
 - When firms have Market Power, government intervention can be warranted

Some Guiding Structure

- We will spend the next 2 lectures understanding these different market structures
- To do so, we must first understand how firms make decisions
- Will assume that they seek to maximize profits
 - $\text{Profit} = \text{Total Revenue} - \text{Total Cost}$
- Will first study cost
 - This depends on things like technology and input prices
- Will then study revenue
 - This depends on Demand and market structure (i.e. Market Power)

Economic Costs vs. Accounting Costs

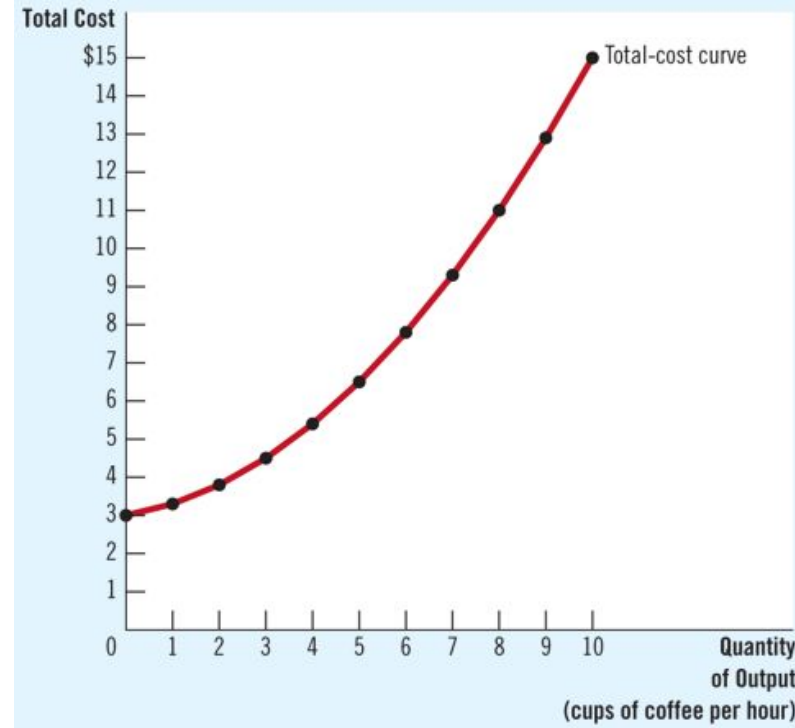
- Suppose you could earn \$100k as a programmer at Meta
- Instead, you found a start-up tech firm
 - Spend \$50k on equipment
 - Earn \$110k in revenue
- What's your profit?

Economic Costs vs. Accounting Costs

- Suppose you could earn \$100k as a programmer at Meta
- Instead, you found a start-up tech firm
 - Spend \$50k on equipment
 - Earn \$110k in revenue
- What's your profit?
 - Accountant: $\$110k - \$50k = \$60k$
 - Economist: $\$110k - \$50k - \$100k = -\$40k$
- Need to include all Opportunity Costs!
 - You gave up the opportunity to earn \$100k
 - So the start-up was a money loser

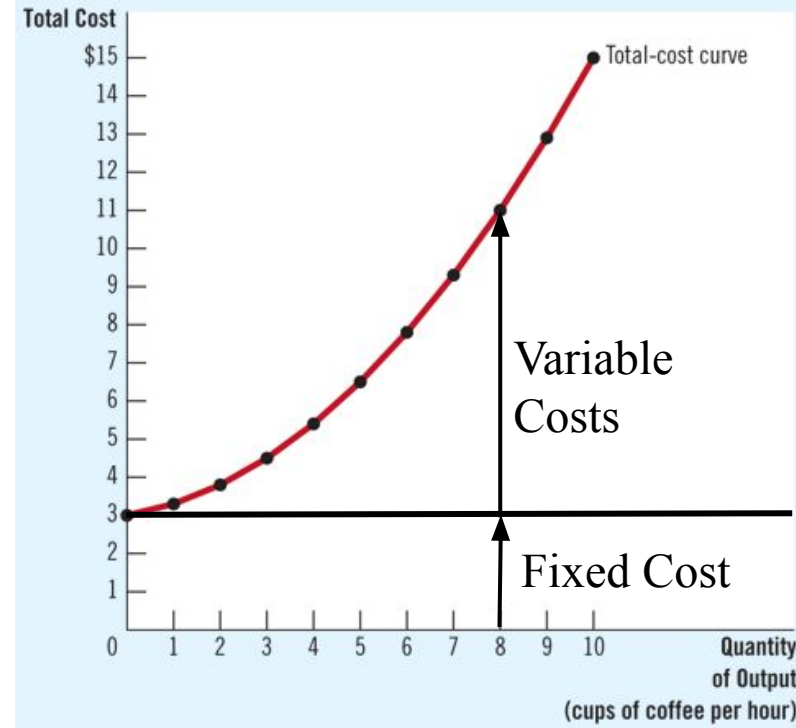
The Total Cost Curve

- Total Cost is the all-in cost of producing any specified quantity of output
- Raw materials
 - Coffee beans
 - Milk
 - Cups
- Labor
 - Baristas
 - HR department
 - Custodians
- “Capital”/Equipment (rent vs. own?)
 - Storefront
 - Coffee grinder
 - Furniture
- Opportunity Costs
 - Could have opened a law practice instead



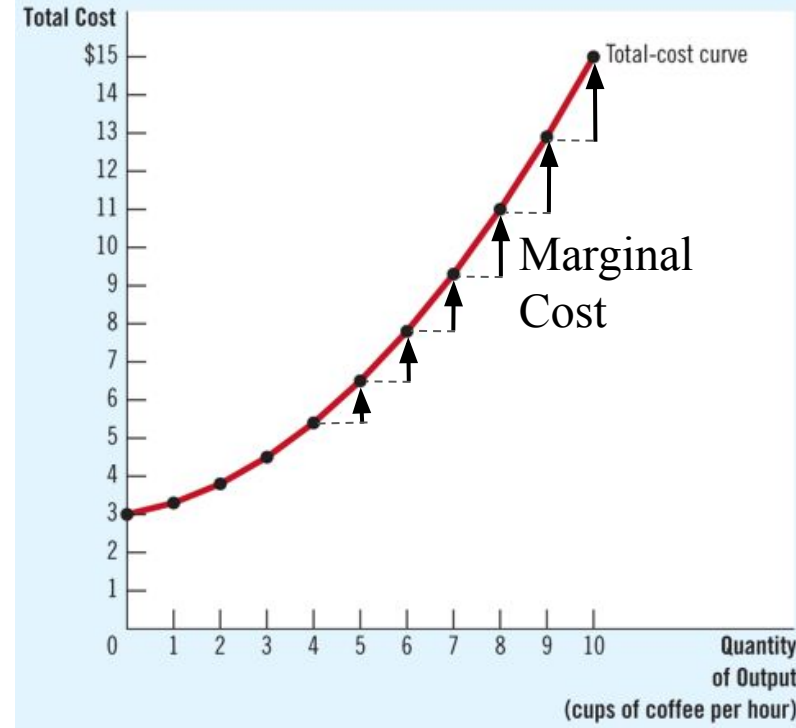
Fixed vs. Variable Costs

- A Fixed Cost (FC) is what you have to pay regardless of the quantity you produce
 - May include rent, permitting, etc.
- Variable Costs (VC) capture everything else that you do to increase production
- In the long run, all costs are variable



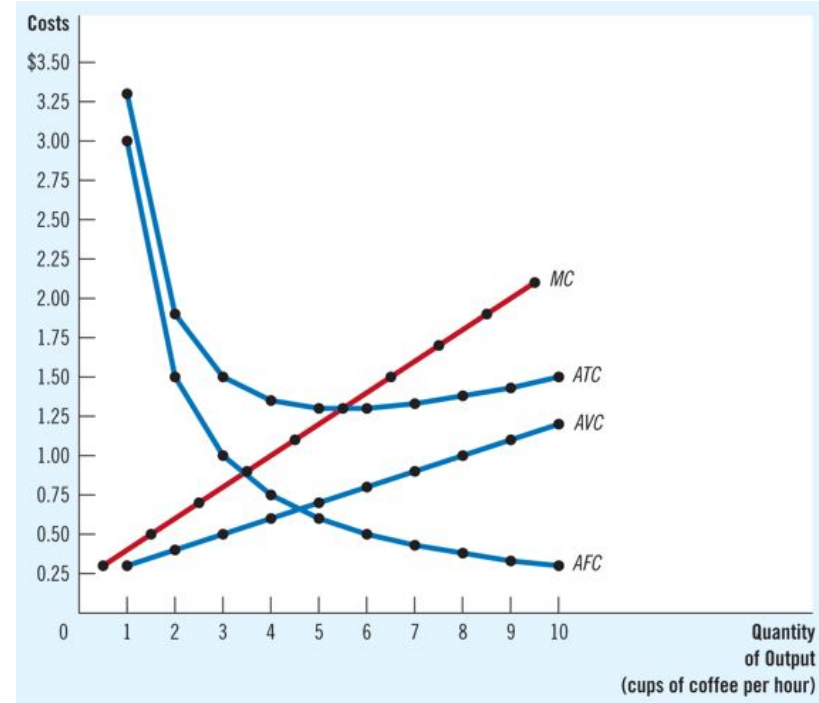
Marginal Cost

- Marginal Cost (MC) is the cost associated with increasing quantity by 1 more unit
- Marginal Cost plays a major role in how firms operate
 - As previewed a few weeks ago, the Supply Curve is often determined by Marginal Cost



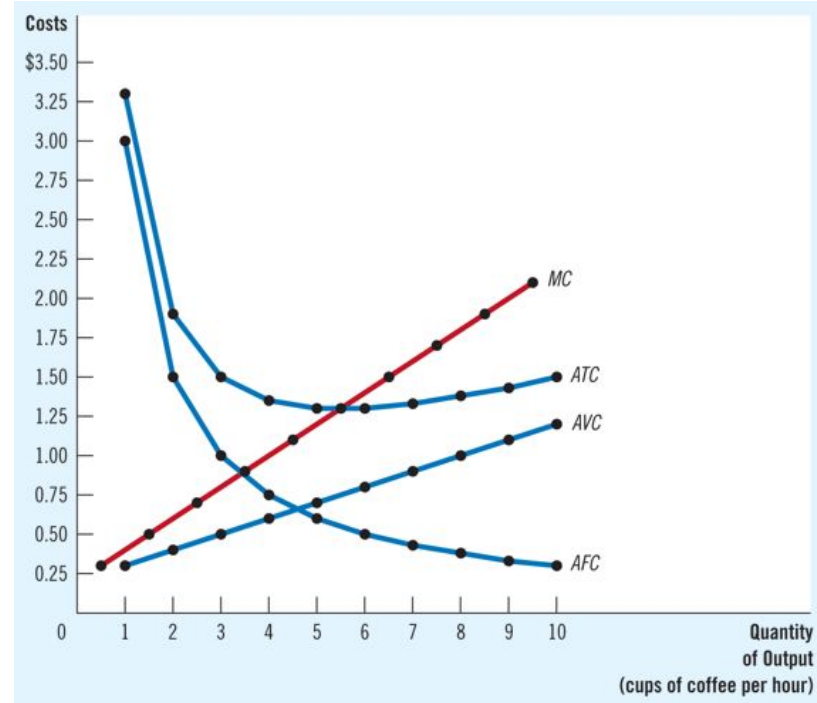
Costs Diagram

- Average Total Cost (ATC) is Total Cost divided by quantity
 - Split between Average Fixed Cost (AFC) and Average Variable Cost (AVC)
- AFC always decreases. Why?
- MC intersects minimum of ATC. Why?



Costs Diagram

- Average Total Cost (ATC) is Total Cost divided by quantity
 - Split between Average Fixed Cost (AFC) and Average Variable Cost (AVC)
- AFC always decreases. Why?
 - Fixed costs get spread over more quantity
- MC intersects minimum of ATC. Why?
 - When next unit costs more than average of previous units, it pulls the average cost up.
 - When next unit costs less than average of previous units, it pulls the average cost down.

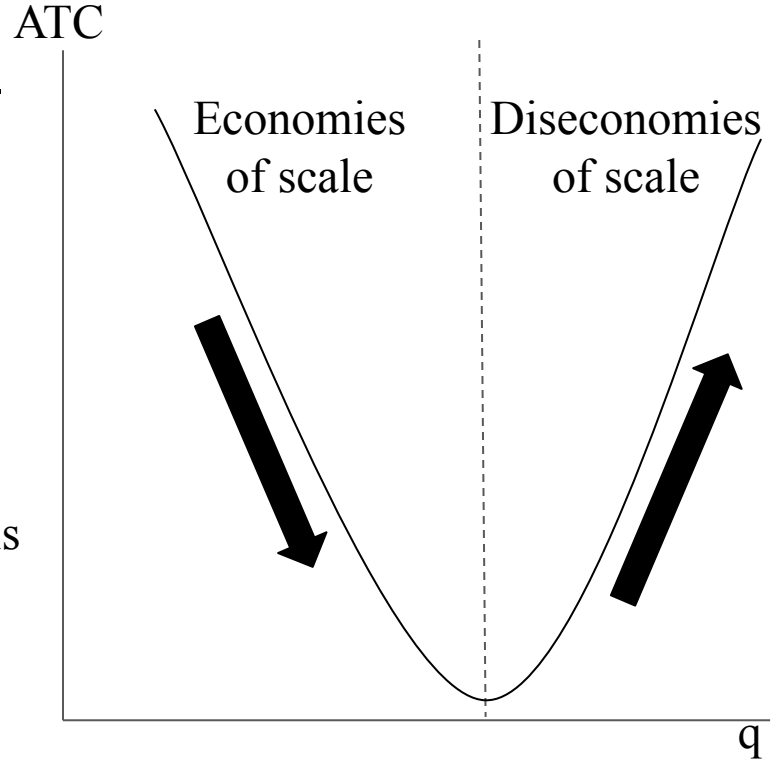


(Table for your reference)

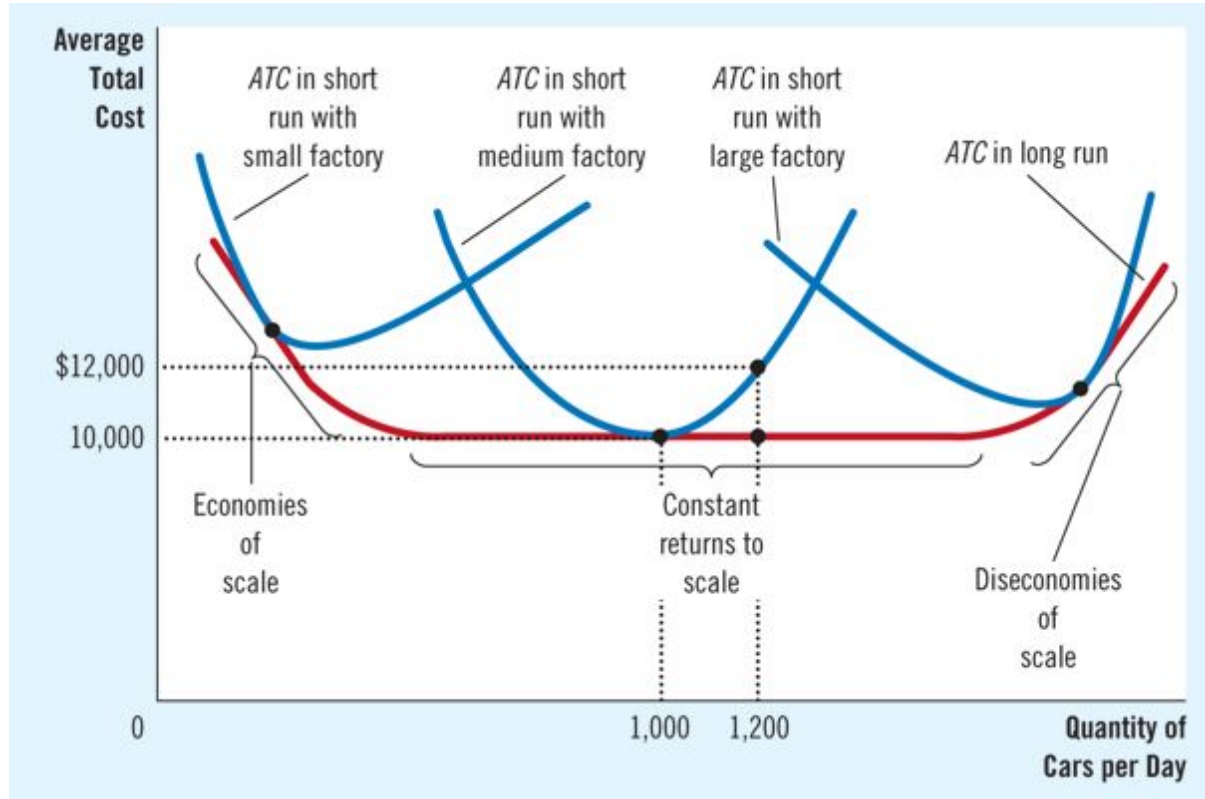
Term	Definition	Mathematical Description
Explicit costs	Costs that require an outlay of money by the firm	
Implicit costs	Costs that do not require an outlay of money by the firm	
Fixed costs	Costs that do not vary with the quantity of output produced	FC
Variable costs	Costs that vary with the quantity of output produced	VC
Total cost	The market value of all the inputs that a firm uses in production	$TC = FC + VC$
Average fixed cost	Fixed cost divided by the quantity of output	$AFC = FC/Q$
Average variable cost	Variable cost divided by the quantity of output	$AVC = VC/Q$
Average total cost	Total cost divided by the quantity of output	$ATC = TC/Q$
Marginal cost	The increase in total cost that arises from an extra unit of production	$MC = \Delta TC / \Delta Q$

Economies of Scale

- If ATC falls as q rises, that is Economies of Scale
- If ATC rises, that is Diseconomies of Scale
- Typically, we have EoS at low quantities
 - Improved specialization and flexibility
 - Learning-by-doing
 - Bulk purchases of inputs
- But when quantity gets large, DoS often sets in
 - Limited inputs such as labor, space, materials
 - Managerial/logistical complications

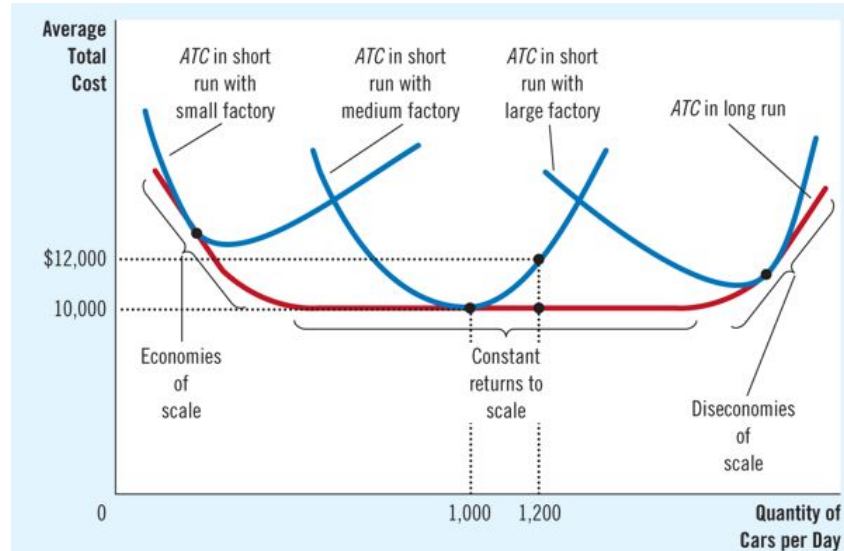


Long-Run vs. Short-Run Costs



Long-Run vs. Short-Run Costs

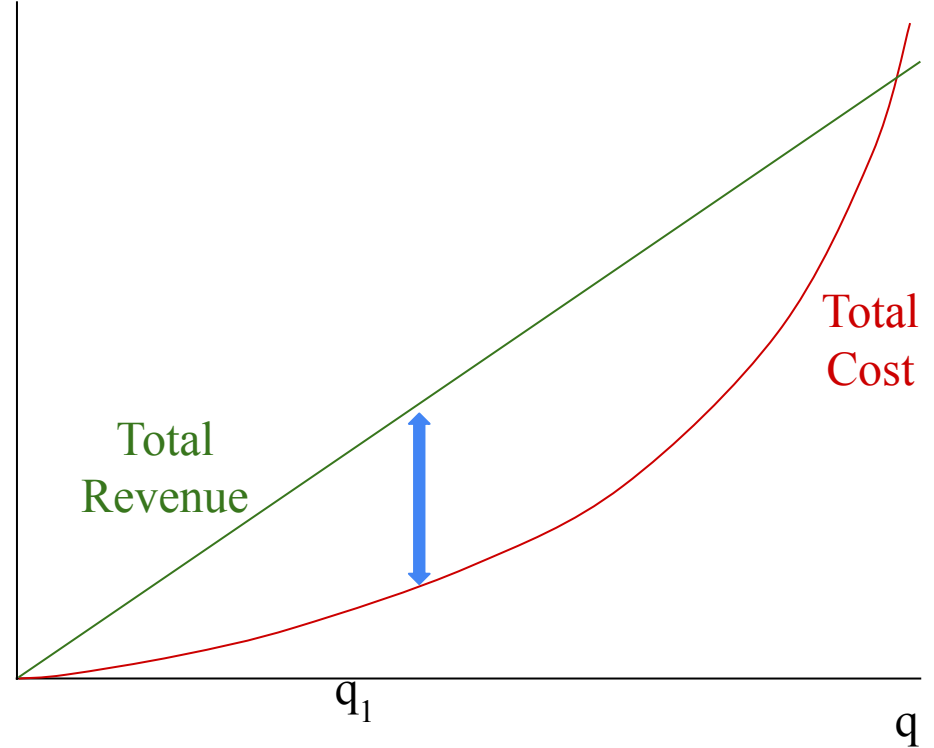
- In the short-run, you are stuck with your current factory on a single blue curve
- Your factory may not be the optimal size to produce the amount of quantity you want
 - So your costs will be high
- In the long-run, you can pick the optimal factory size for your quantity, lowering costs
- For every desired quantity, there is some optimal factory size, associated with a blue curve
- The long-run cost function is the “lower envelope” of the blues – the lowest-possible cost for each quantity



Profit Maximization

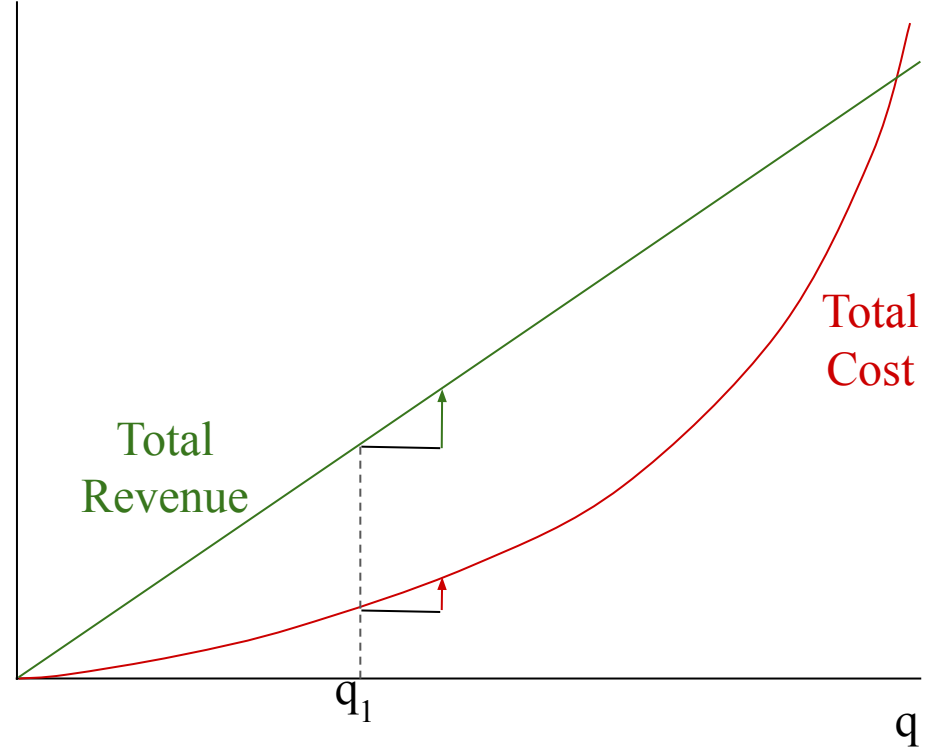
Marginal Revenue

- Profit = Total Revenue - Total Cost



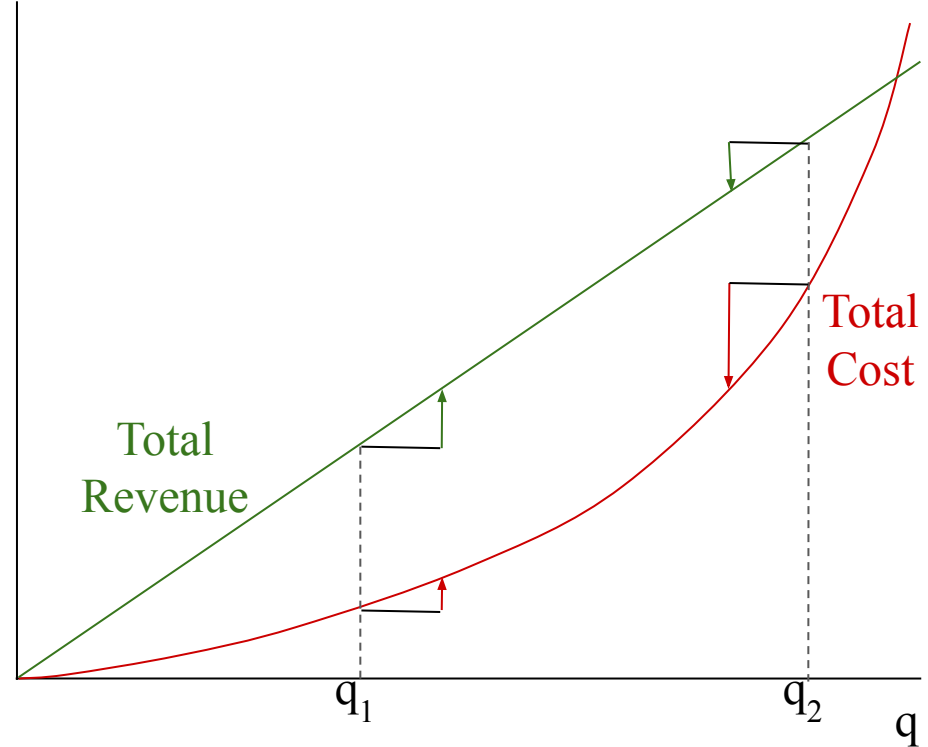
Marginal Revenue

- Profit = Total Revenue - Total Cost
- Increasing quantity by 1...
 - increases cost (by Marginal Cost)
 - increases revenue (by Marginal Revenue, MR)
- At q_1 , adding 1 unit increases profit
 - $MR > MC$
 - That means q_1 is not optimal



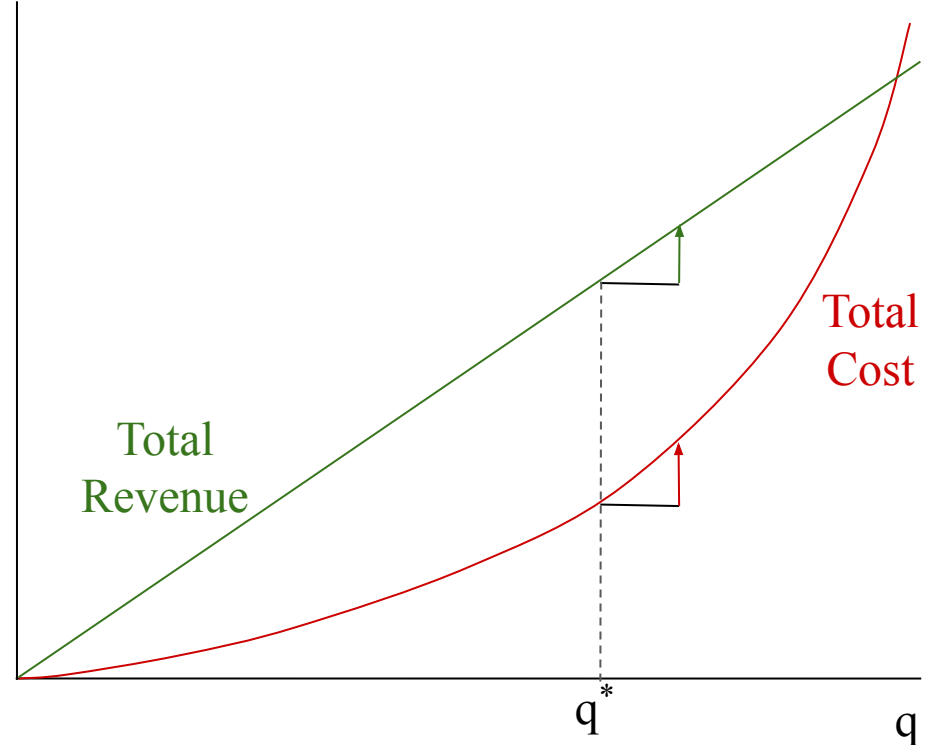
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- At q_2 , decreasing 1 unit increases profit
 - $MR < MC$
 - That means q_2 is not optimal

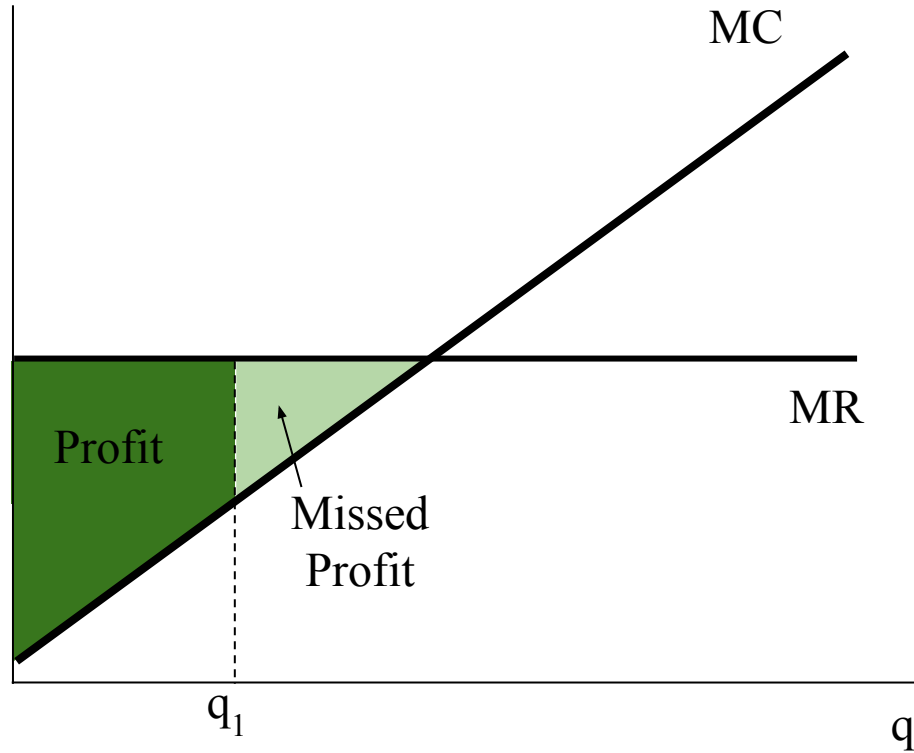


Marginal Revenue

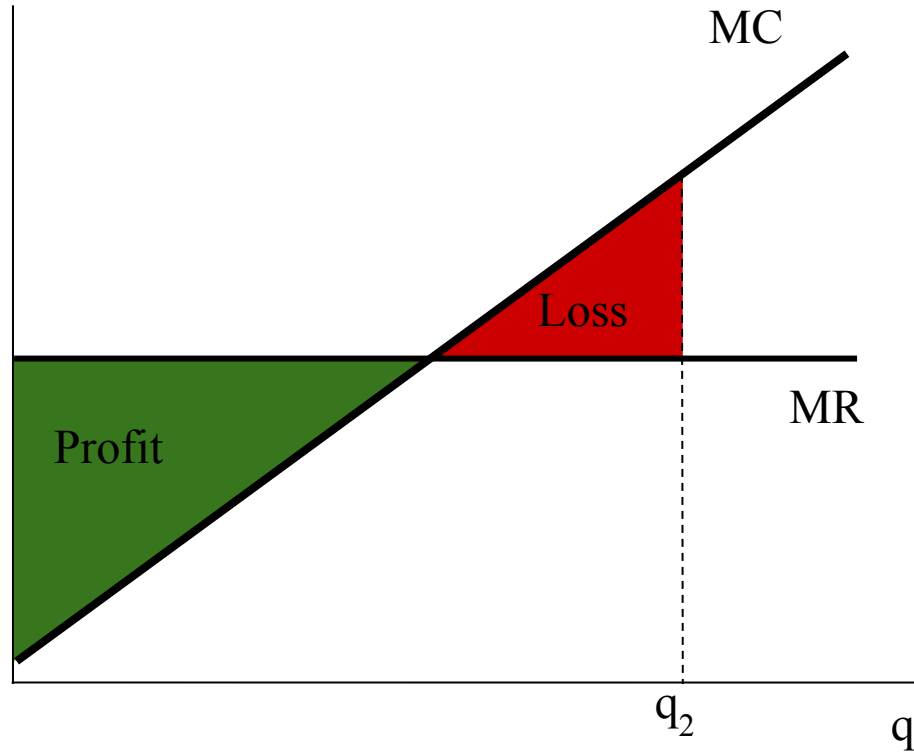
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 - $MR > MC$
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- At q_2 , decreasing 1 unit increases profit
 - $MR < MC$
 - That means q_2 is not optimal
- Only when $MR = MC$ is the firm maximizing profit



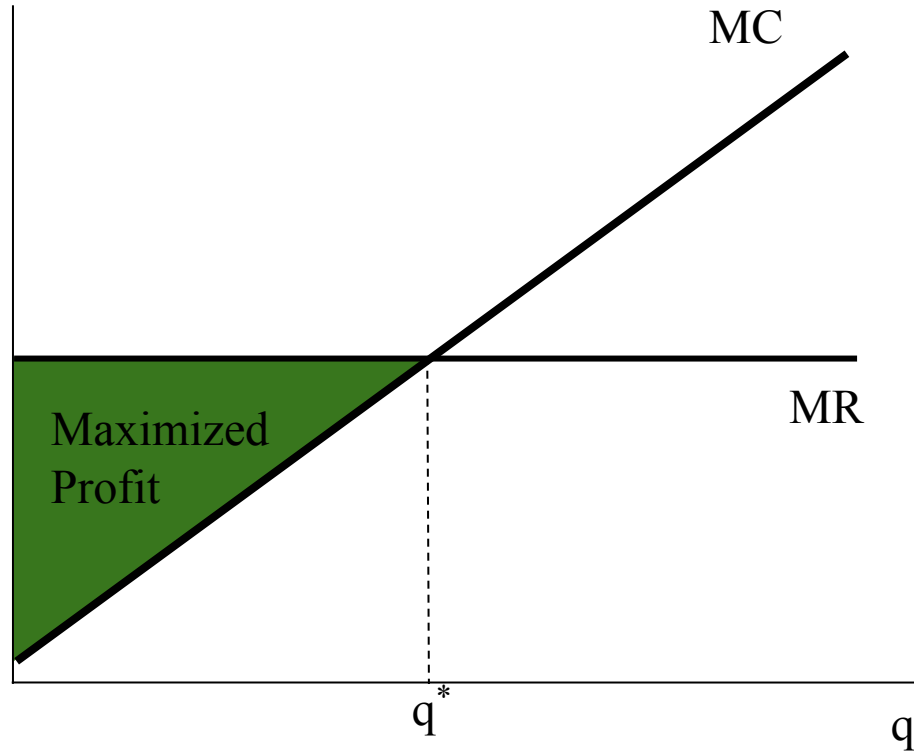
Marginal Revenue (2)



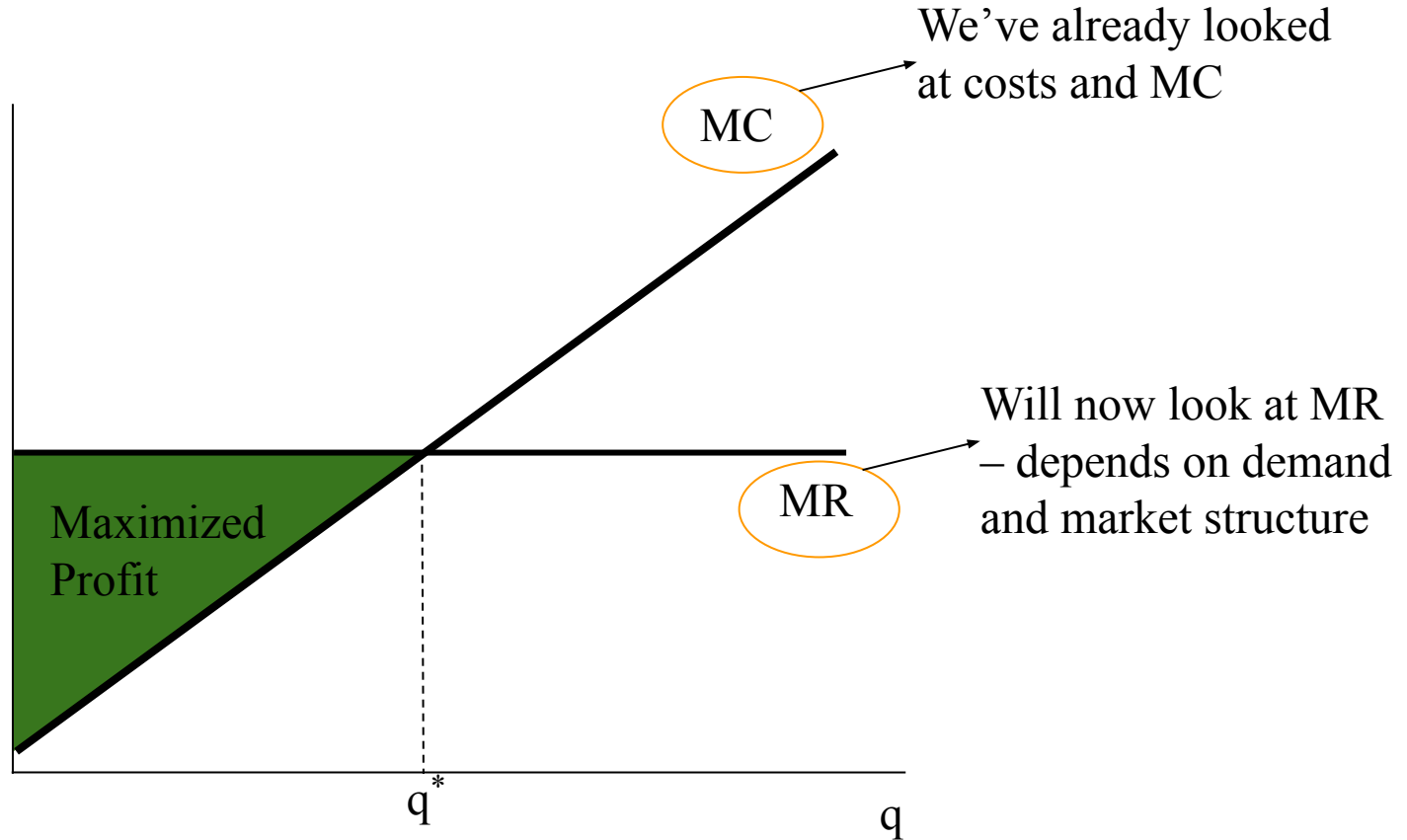
Marginal Revenue (2)



Marginal Revenue (2)



Marginal Revenue (2)



Market Power (repeated)

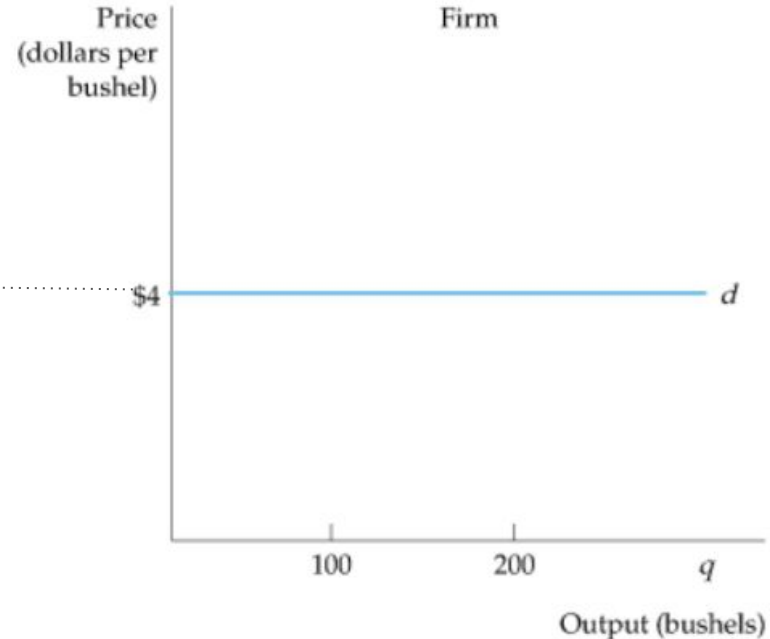
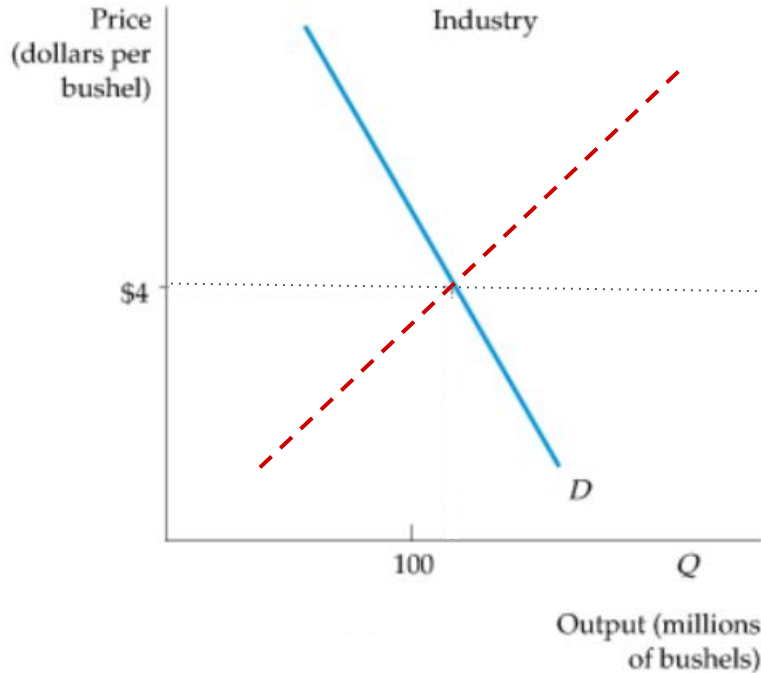
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Key assumptions of Perfect Competition

1. Firms are Price Takers
 - Individual firms are so small that they feel they cannot affect the market price
 - Market generates a price; firms “take it” as given
 - Firms produce as much quantity as they want at that price
2. Free entry and exit
 - New firms can enter industry without large costs if they think it will be profitable
 - Firms that are losing money are free to shut down without paying extra costs

Price Taking, Visualized

- *Market* Demand is downward-sloping, as usual
- Combined with market Supply, it determines a price (\$4) and quantity (~120 million)
- An individual firm, who only makes 100s of q , perceives a flat Demand Curve



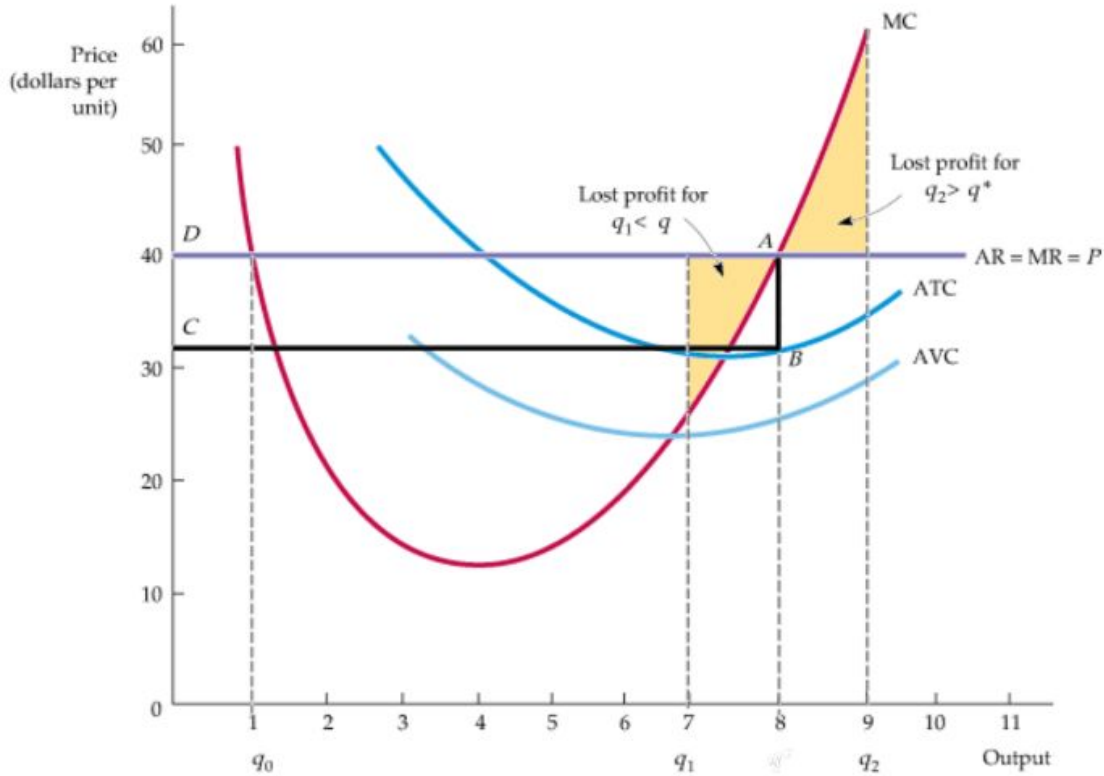
Profit Maximization for Price Takers

- Profit maximization: $MC = MR$
- MR: How much does revenue increase when you sell 1 more unit?

Profit Maximization for Price Takers

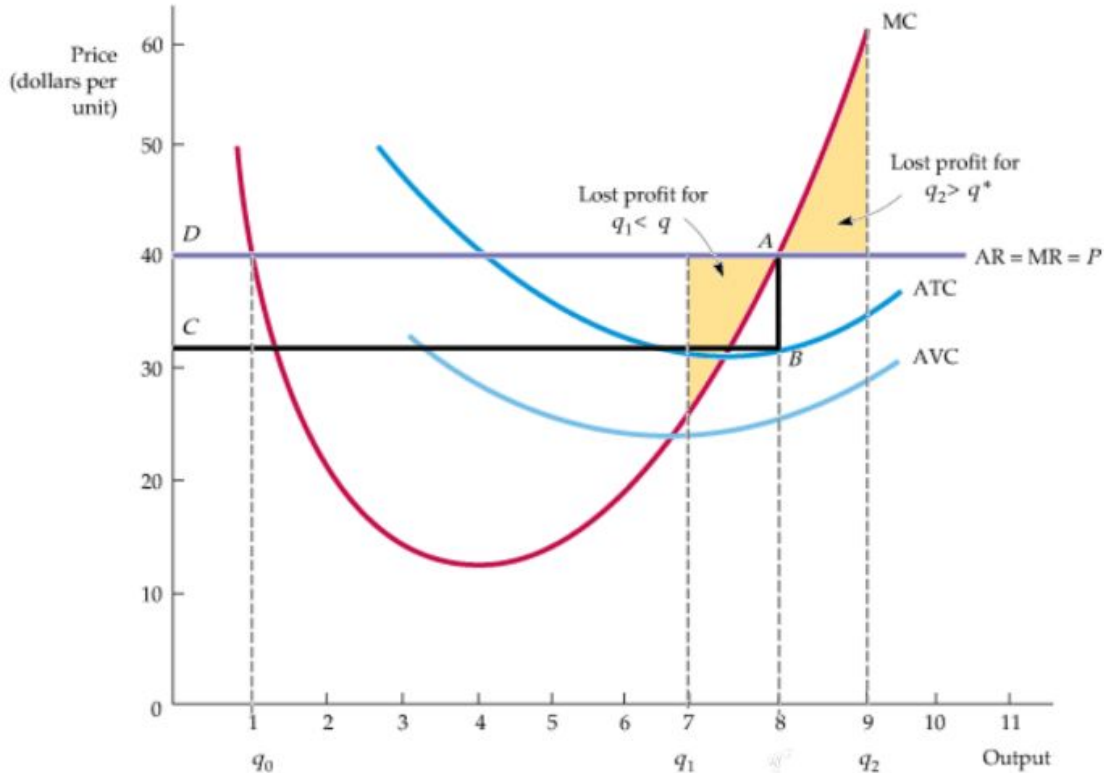
- Profit maximization: $MC = MR = P$
- MR: How much does revenue increase when you sell 1 more unit?
 - It increases by P , the price
 - And that's true for every single unit, since the price is assumed to be unaffected by the firm's quantity sold
 - As we will see later, this is different for firms with market power

Profit Maximization for Price Takers (visualization)



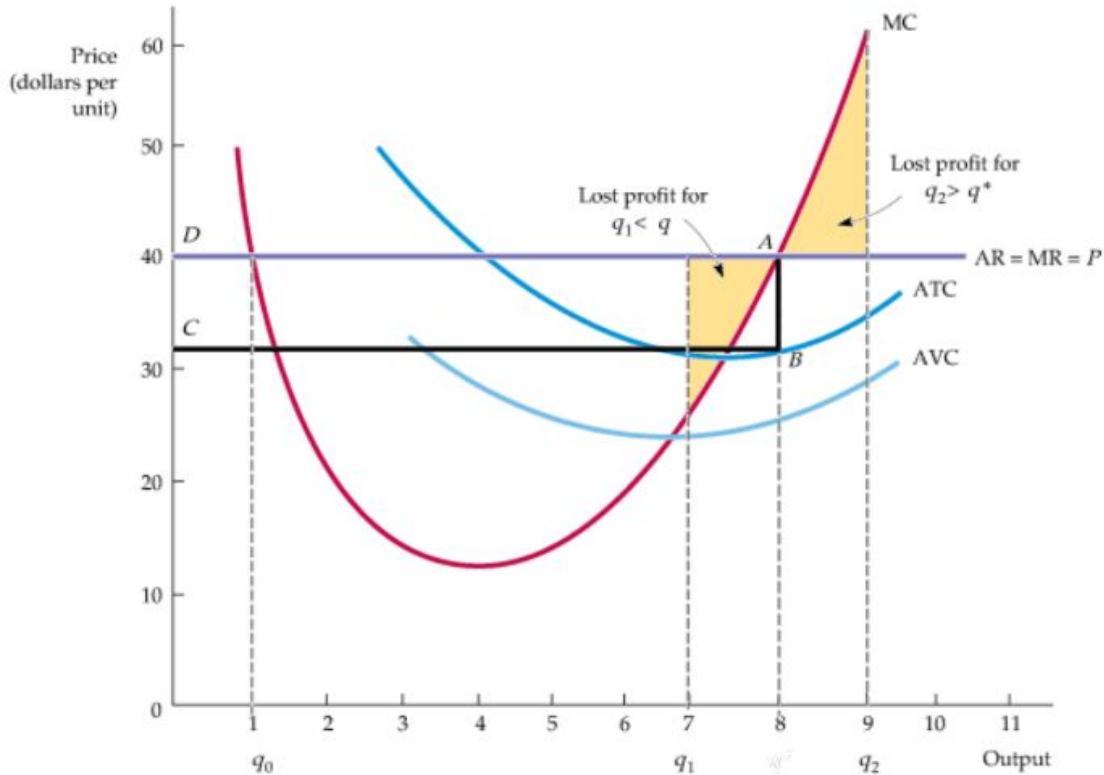
- Profit maximized at $q = 8$
 - 7 leaves profit on the table
 - 9th unit costs more than the P

Profit Maximization for Price Takers (visualization)



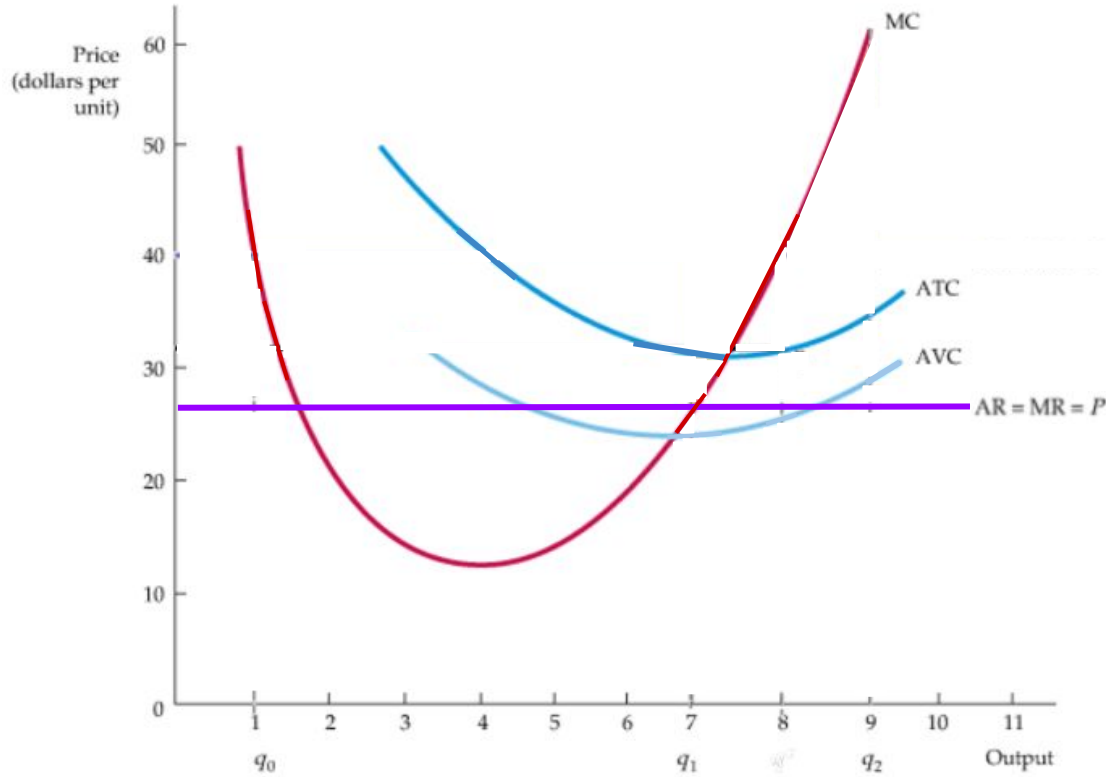
- Profit maximized at $q = 8$
 - 7 leaves profit on the table
 - 9th unit costs more than the P
- Profit = Area of rectangle ABCD
 - Profit is positive, as $P > ATC$
- In long run, will firms enter or exit?

Profit Maximization for Price Takers (visualization)



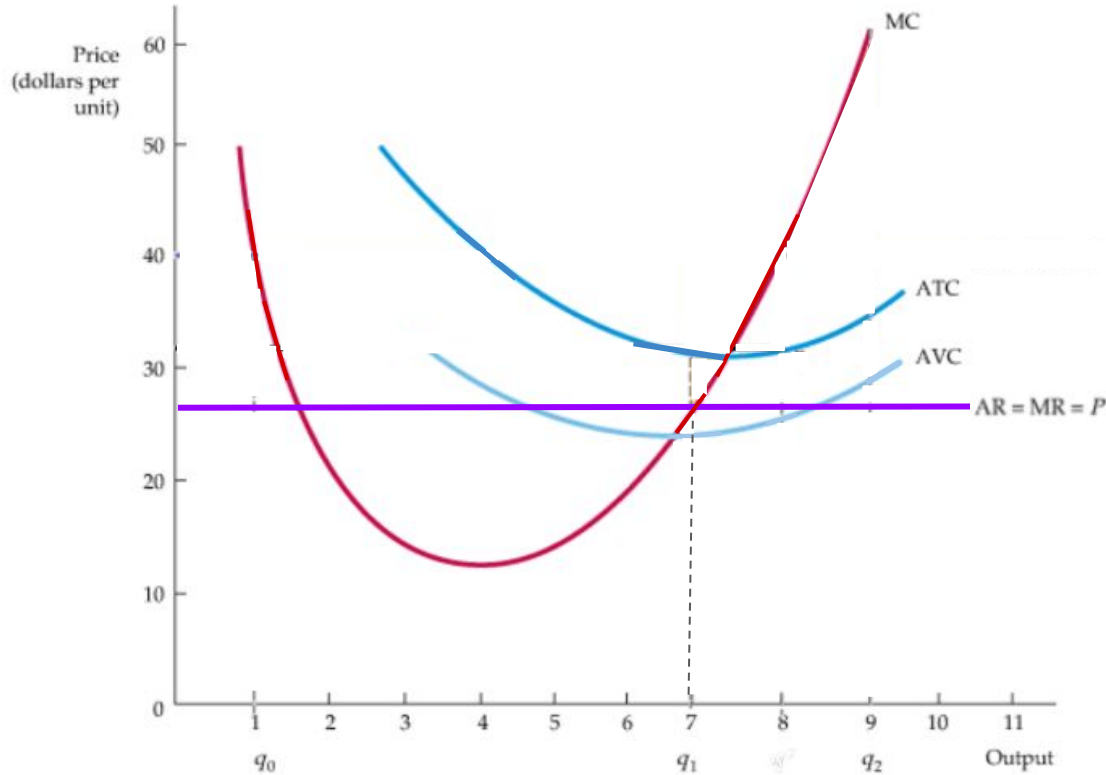
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- In long run, will firms enter or exit?
 - Enter: attracted by profits

Profit Maximization for Price Takers (visualization)



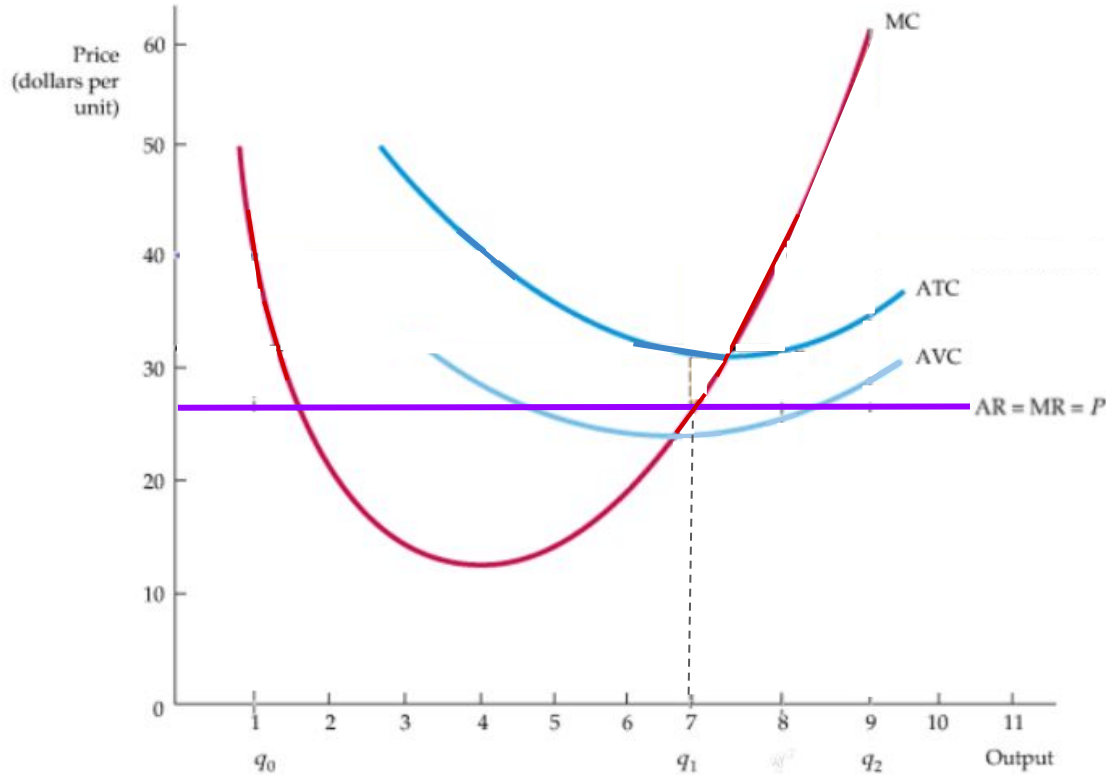
- What if $P = 29$?

Profit Maximization for Price Takers (visualization)



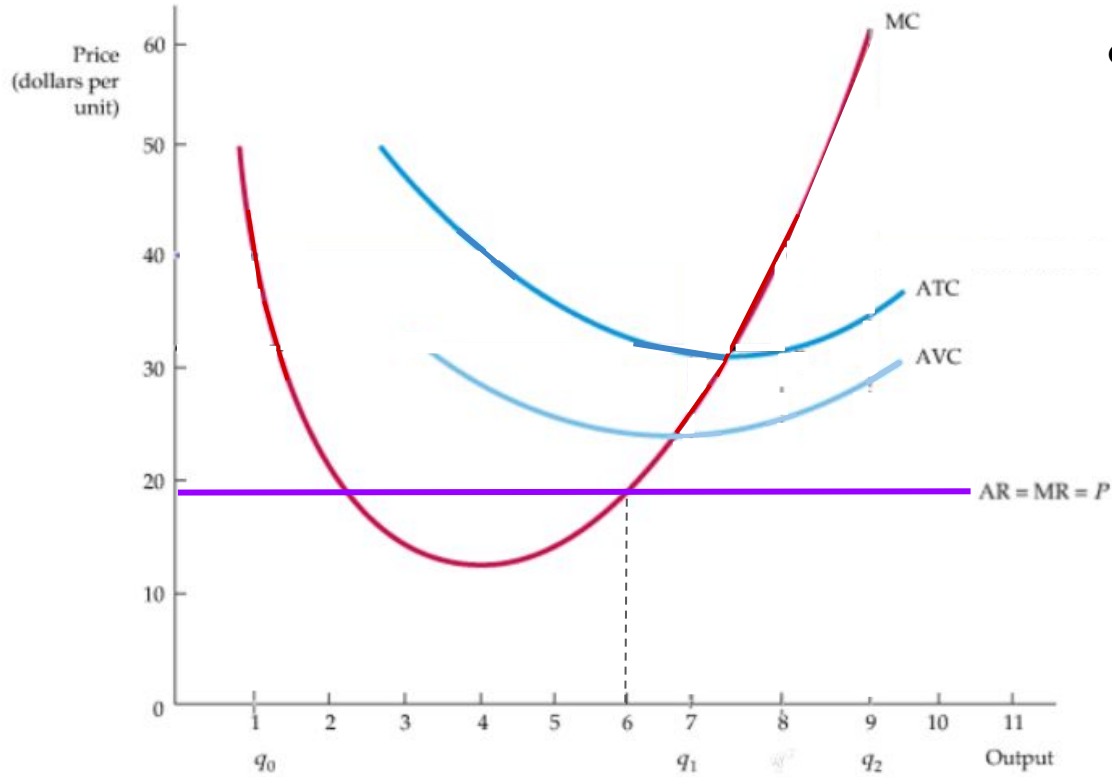
- What if $P = 29$?
 - $q = 7$
 - $ATC > P > AVC$
- Should the firm should down?

Profit Maximization for Price Takers (visualization)



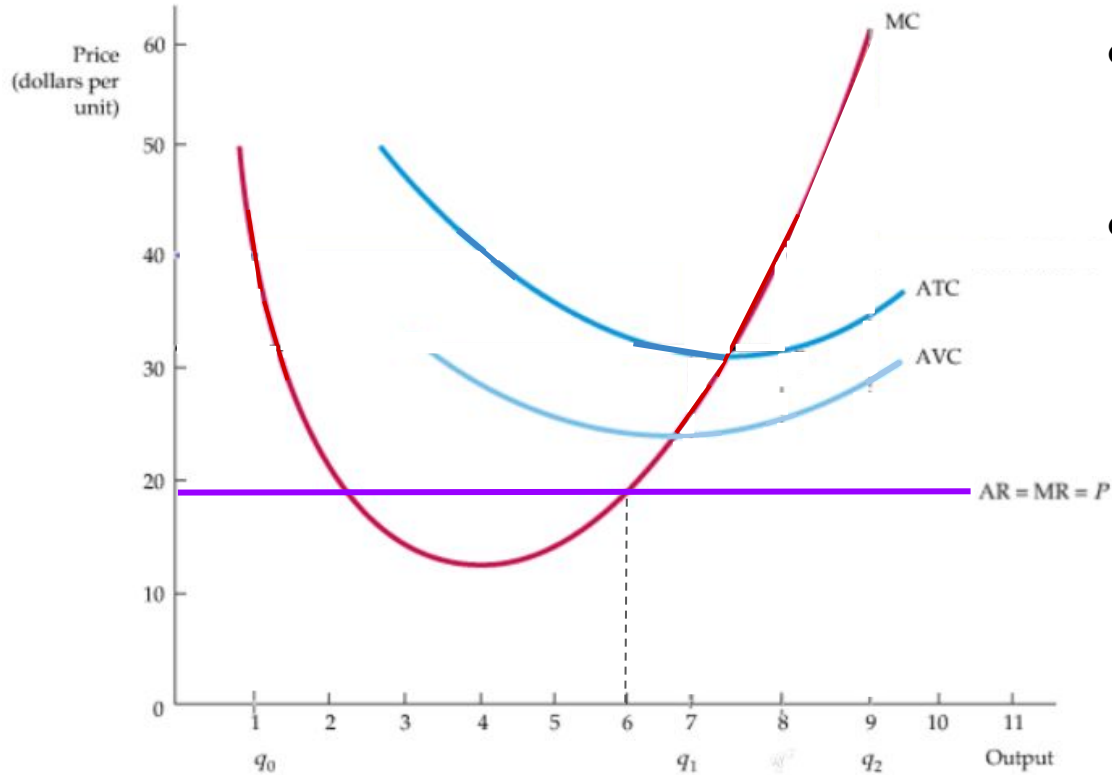
- What if $P = 29$?
 - $q = 7$
 - $ATC > P > AVC$
- Should the firm should down?
 - Long-run: yes, negative profit
 - Short-run: no, $P > AVC$
 - Can re-coup some losses
 - Fixed Costs are already paid, so should not factor into decision – just AVC
 - Can't re-coup "Sunk Costs" by shutting down

Profit Maximization for Price Takers (visualization)



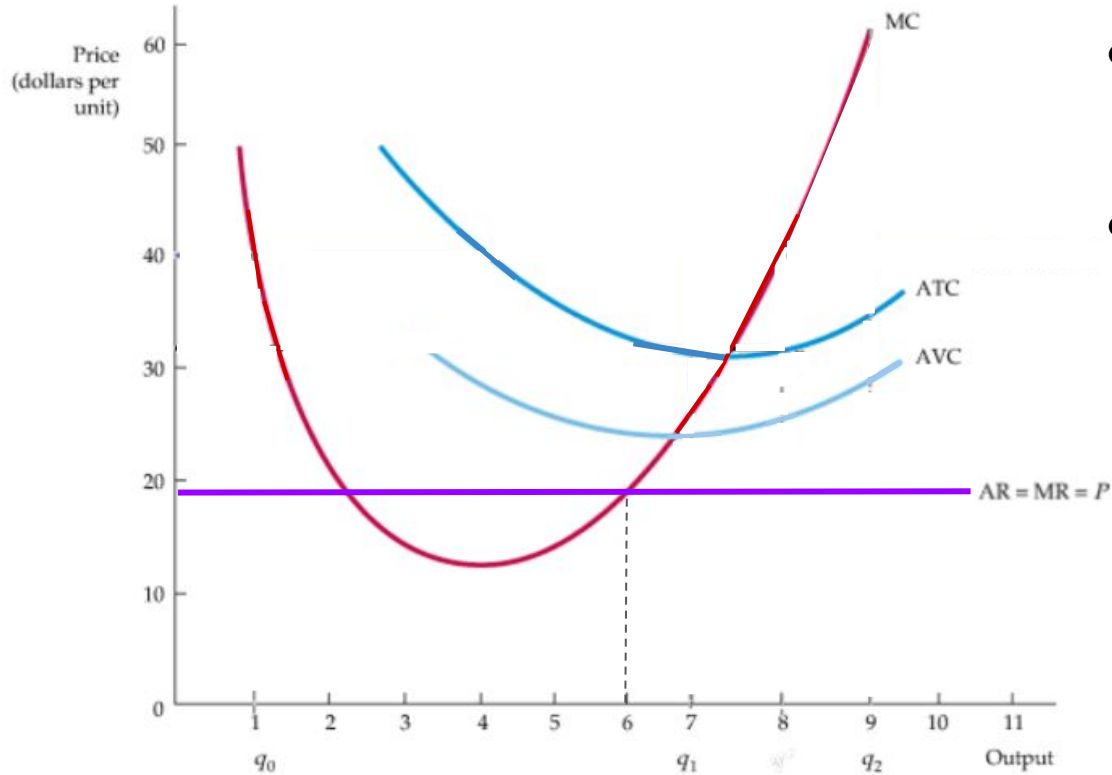
- What if $P = 19$?

Profit Maximization for Price Takers (visualization)



- What if $P = 19$?
 - $q = 6$
 - $ATC > AVC > P$
- Should the firm should down?

Profit Maximization for Price Takers (visualization)



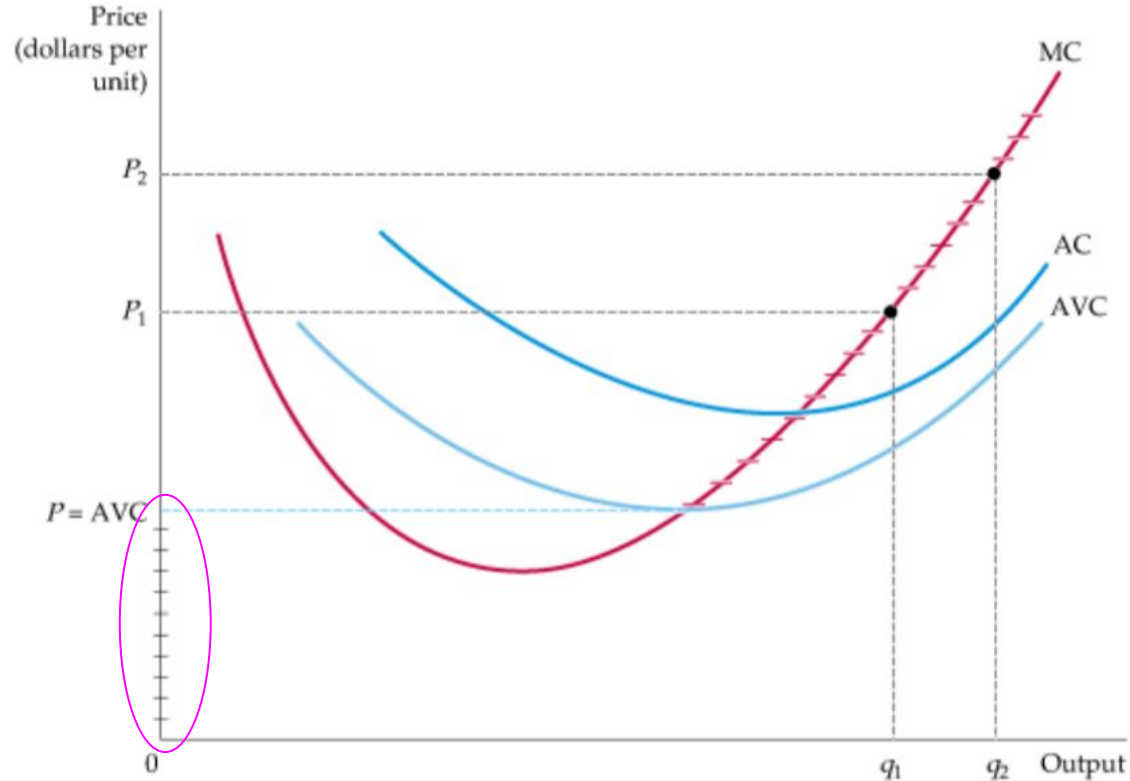
- What if $P = 19$?
 - $q = 6$
 - $ATC > AVC > P$
- Should the firm should down?
 - Yes, right away
 - Even ignoring FC, cost of producing the goods exceeds the price you get for them

Primary Results for Price Takers

1. A price taker's supply curve is the MC curve above AVC
2. In the Long-Run, price takers produce at ATC-minimizing quantity

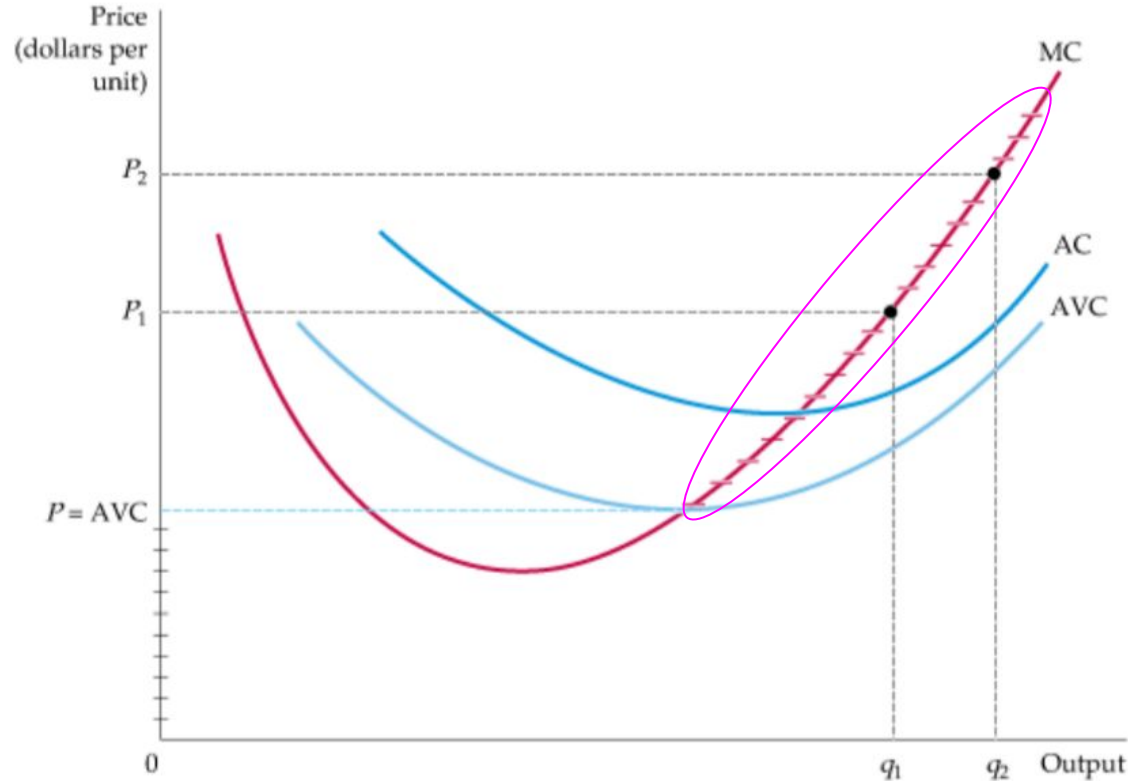
“A price taker’s supply curve is the MC curve above AVC”

- $P < AVC$: shut down ($q=0$)



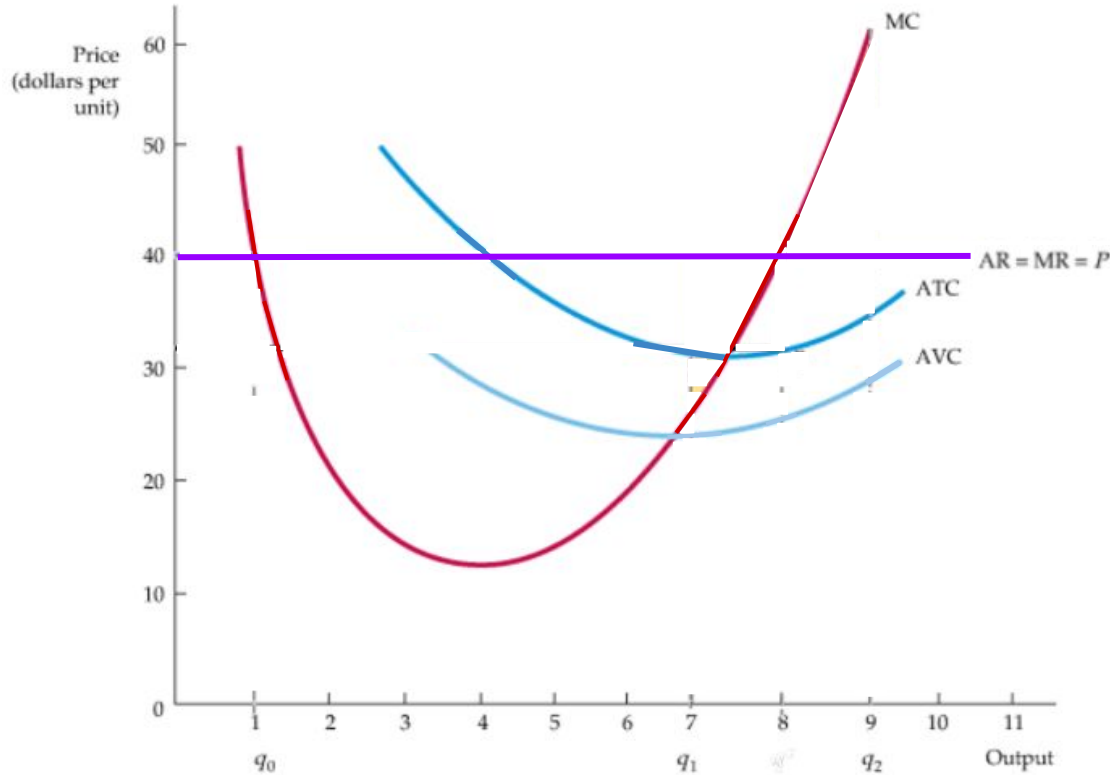
“A price taker’s supply curve is the MC curve above AVC”

- $P < AVC$: shut down ($q=0$)
- $P > AVC$: pick q such that $P = MC$
 - So MC curve shows how much q to produce for any P
 - That is exactly what a supply curve is!
- Justifies earlier discussion of market efficiency
 - Supply Curve shows MC

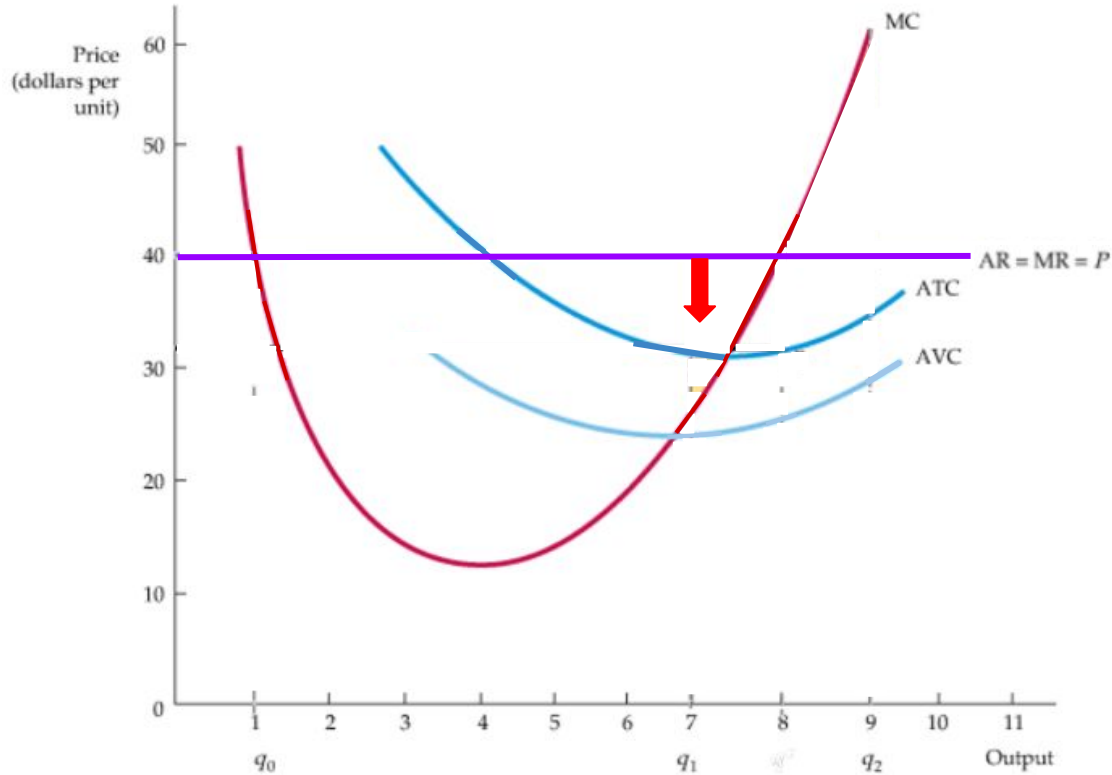


“In the Long-Run, price takers produce at ATC-minimizing quantity”

- If $P > ATC$, firms will enter

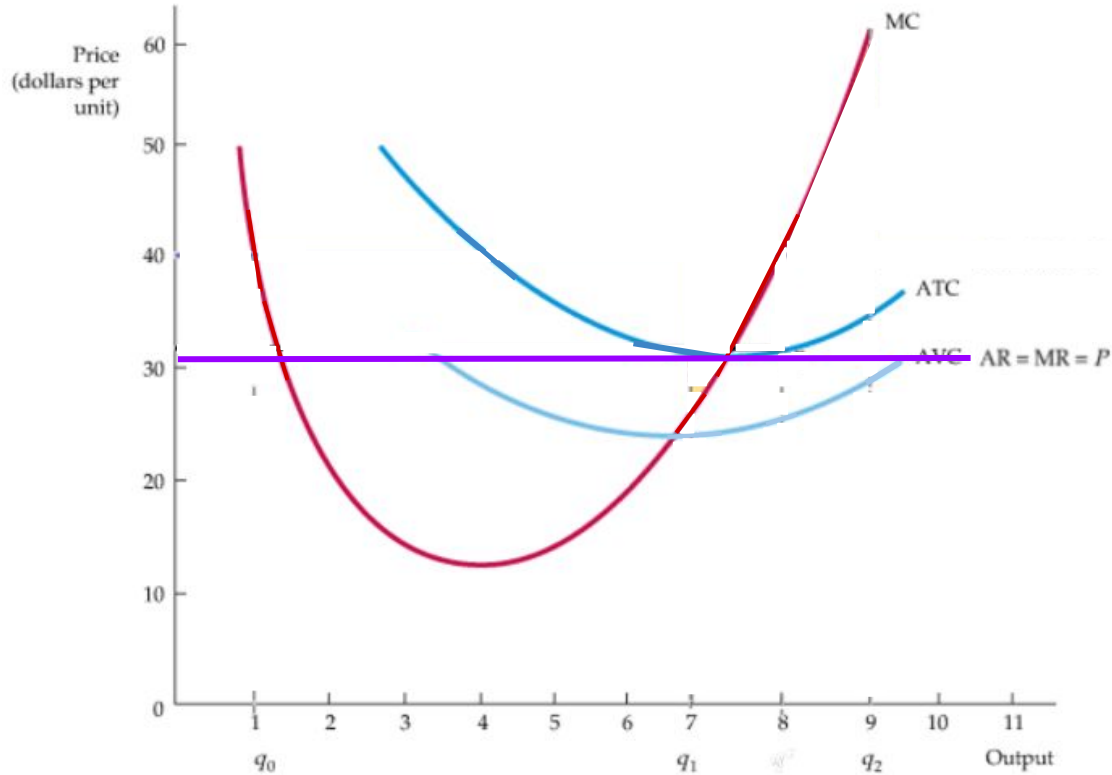


“In the Long-Run, price takers produce at ATC-minimizing quantity”



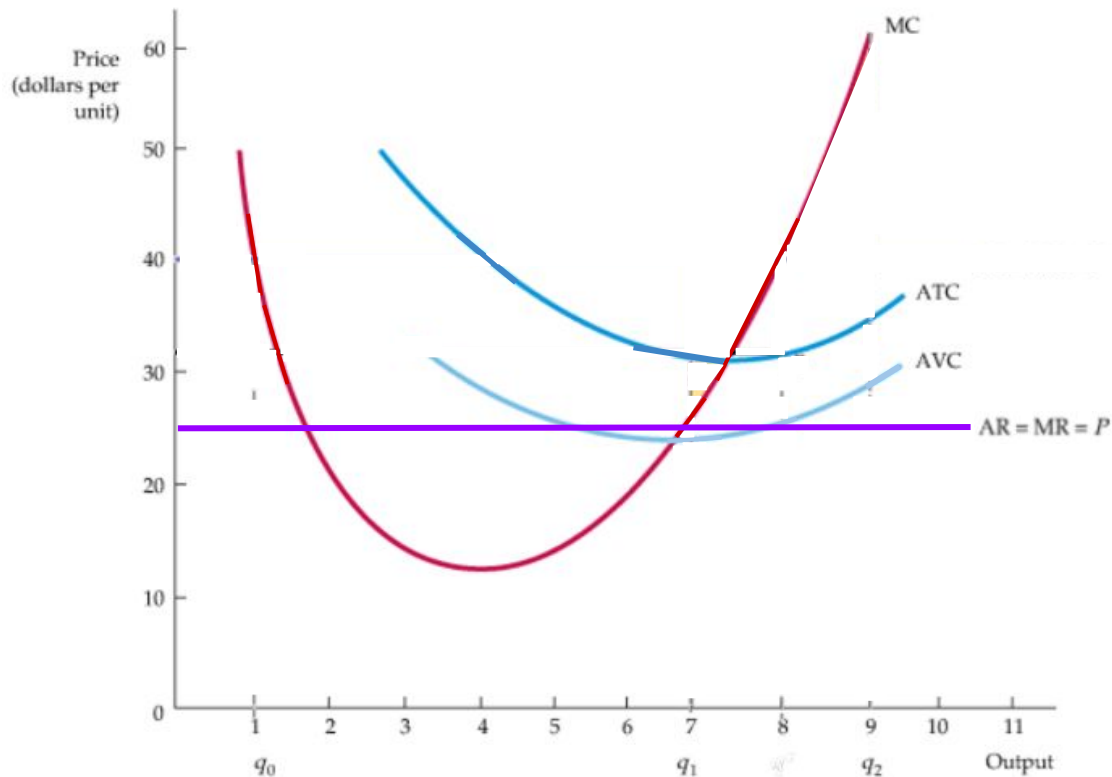
- If $P > ATC$, firms will enter
- This will increase output and lower price

“In the Long-Run, price takers produce at ATC-minimizing quantity”



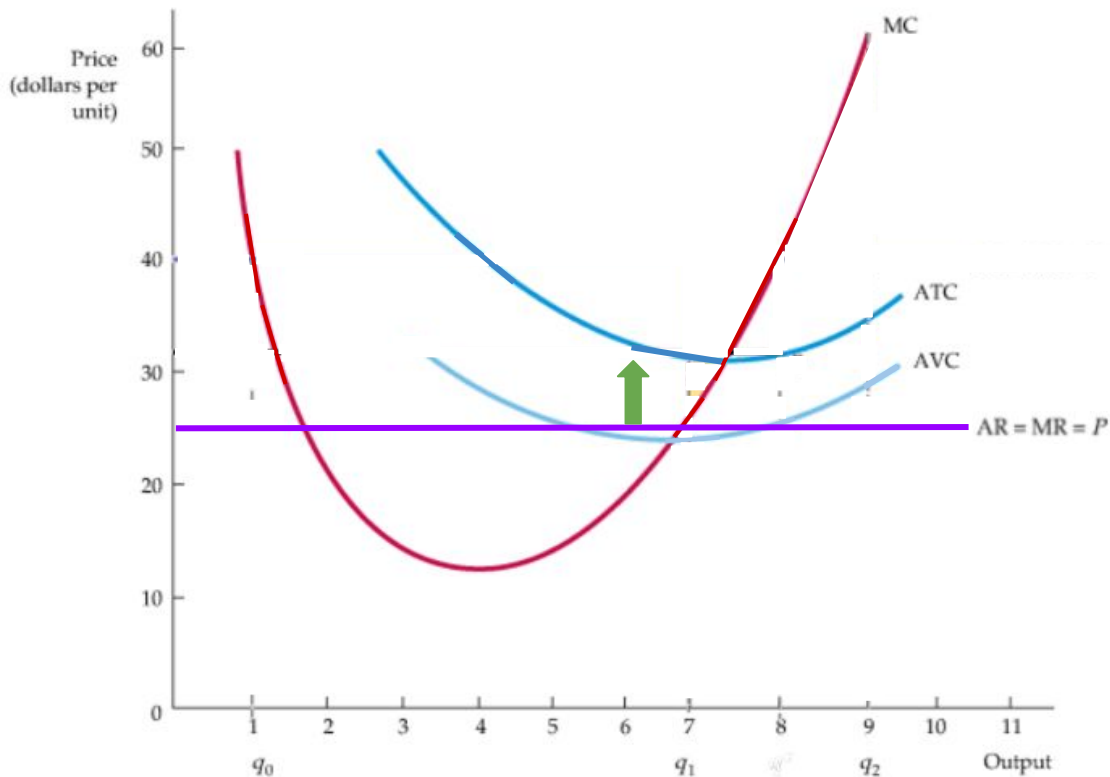
- If $P > ATC$, firms will enter
- This will increase output and lower price
- Process continues until $P=ATC=MC$
 - We showed earlier that $MC=ATC$ at minimum ATC

“In the Long-Run, price takers produce at ATC-minimizing quantity”



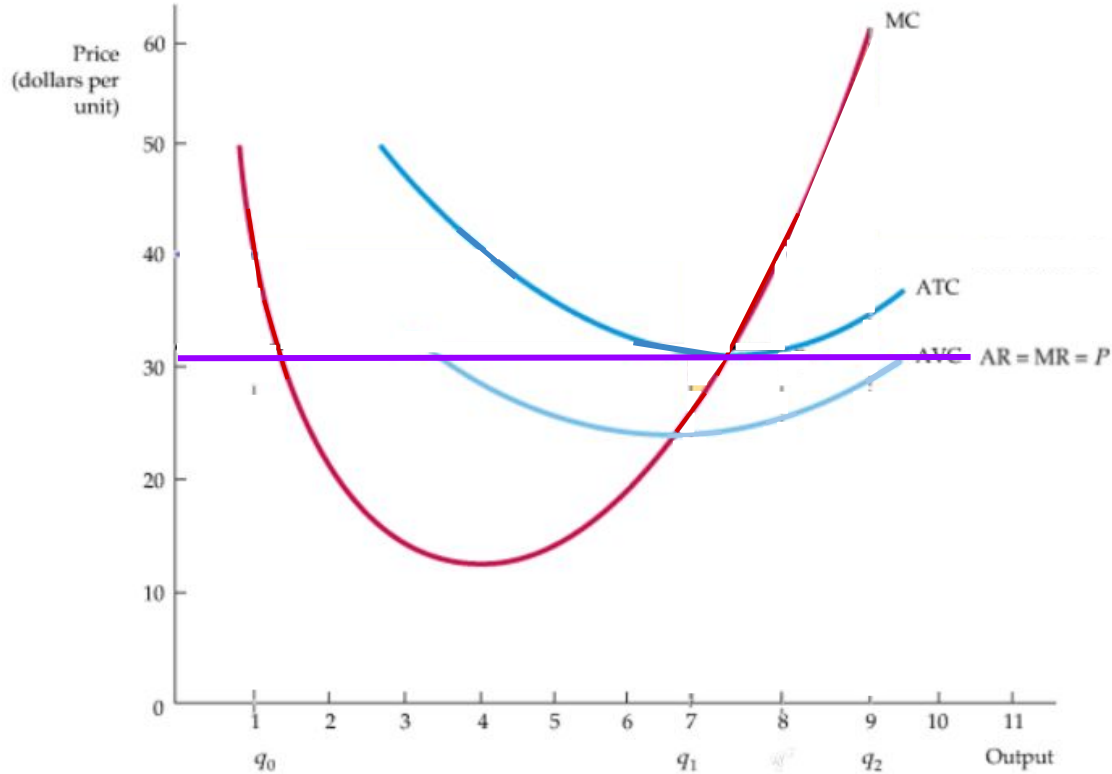
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- This will decrease output and raise price

“In the Long-Run, price takers produce at ATC-minimizing quantity”

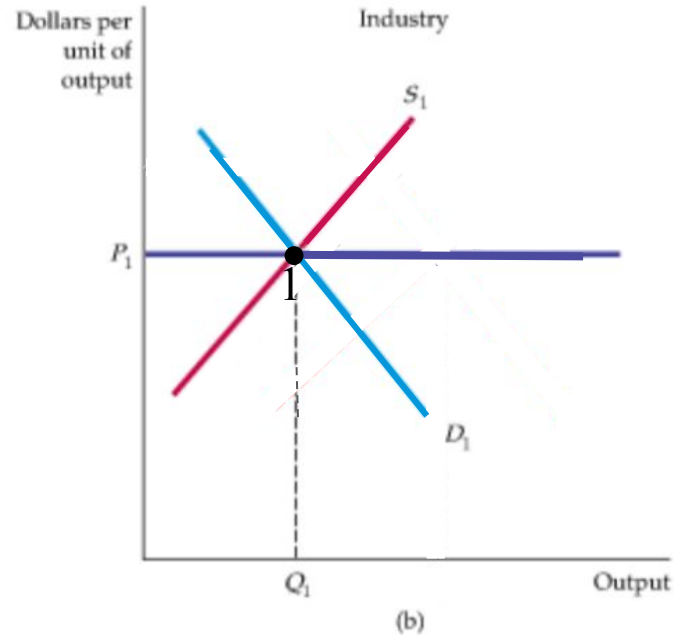
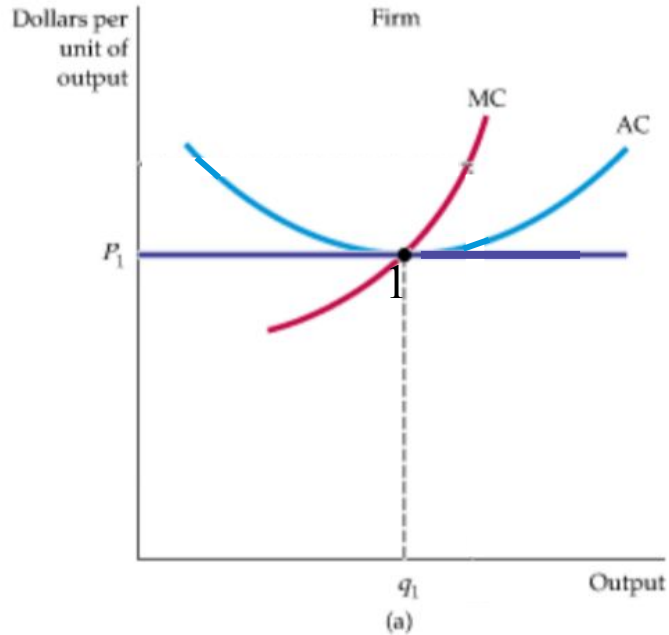


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- If $P < ATC$, firms will exit
- This will decrease output and raise price
- Process will continue until $P=ATC=MC$

Market Dynamics

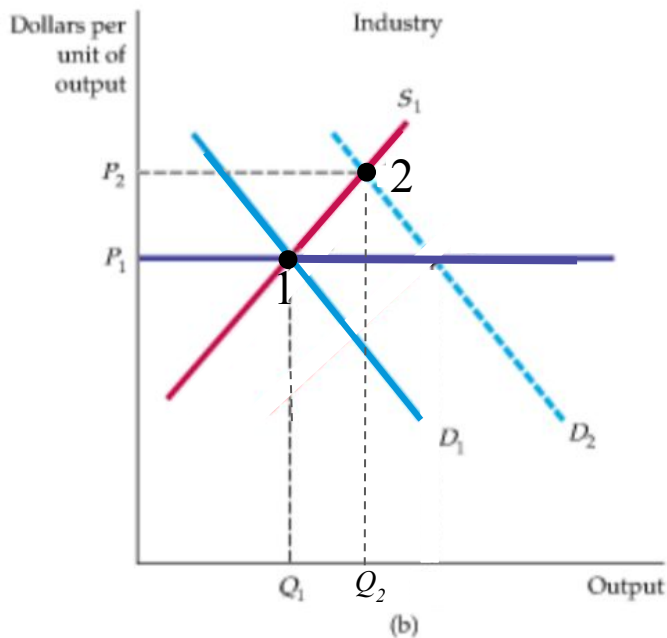
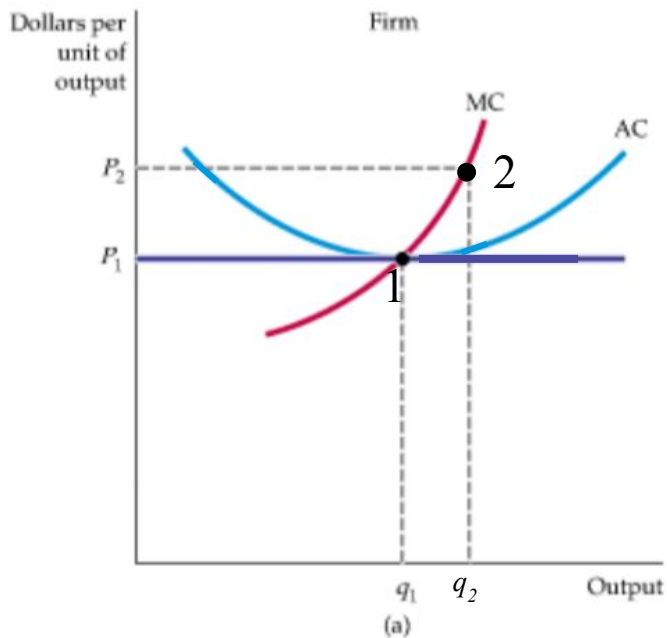
Demand Shock in Constant-Cost Industry

1. Start in LR equilibrium ($P = \min AC$)



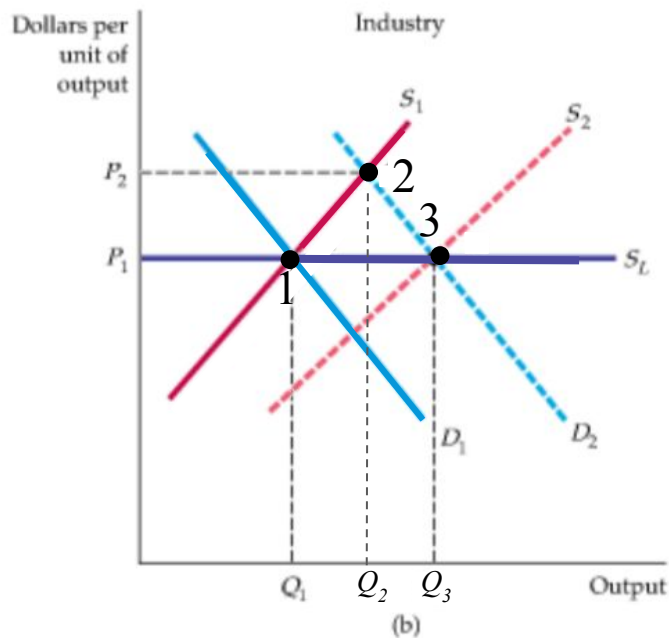
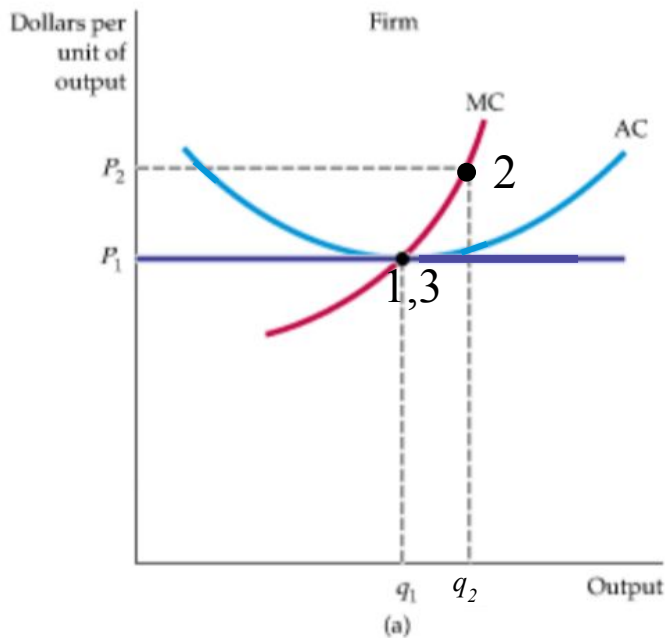
Demand Shock in Constant-Cost Industry

1. Start in LR equilibrium ($P = \min AC$)
2. Increase in demand
 - SR: no entry yet; firms raise price and produce more



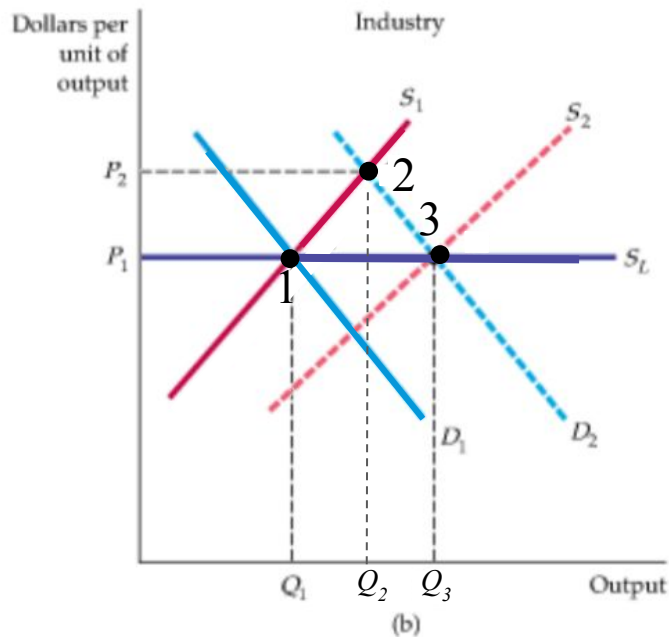
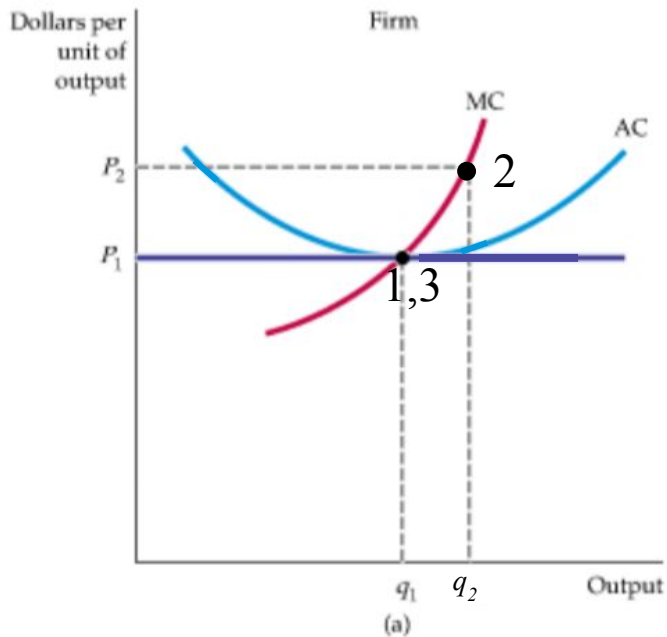
Demand Shock in Constant-Cost Industry

1. Start in LR equilibrium ($P = \min AC$)
2. Increase in demand
 - SR: no entry yet; firms raise price and produce more
3. LR: firms enter to compete away
 - Each firm returns to minimum AC



Demand Shock in Constant-Cost Industry

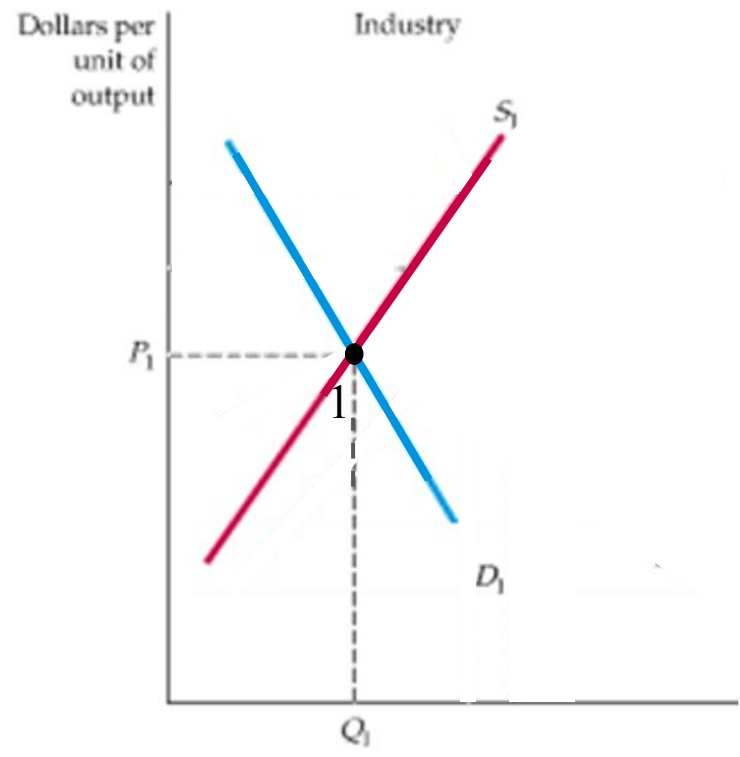
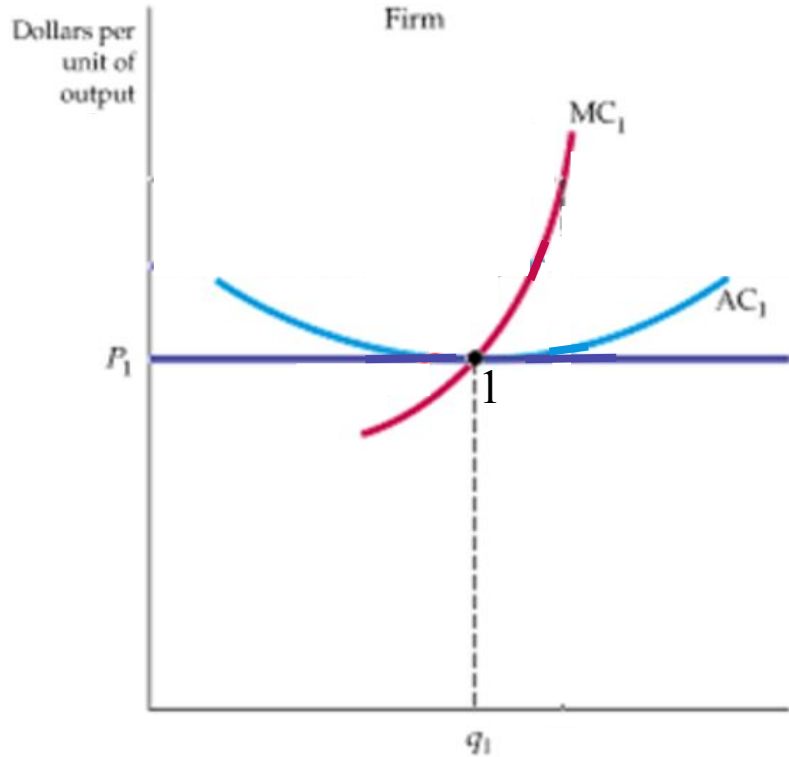
- New LR eq (3) has same price and higher market quantity as original LR eq (1)
 - LR Supply Curve is flat
- Firms produce at minimum-ATC in both LR eqs – there are just more firms after shock
- Incumbent firms earned profit in SR (2), but this was competed away by entry in new LR (3)



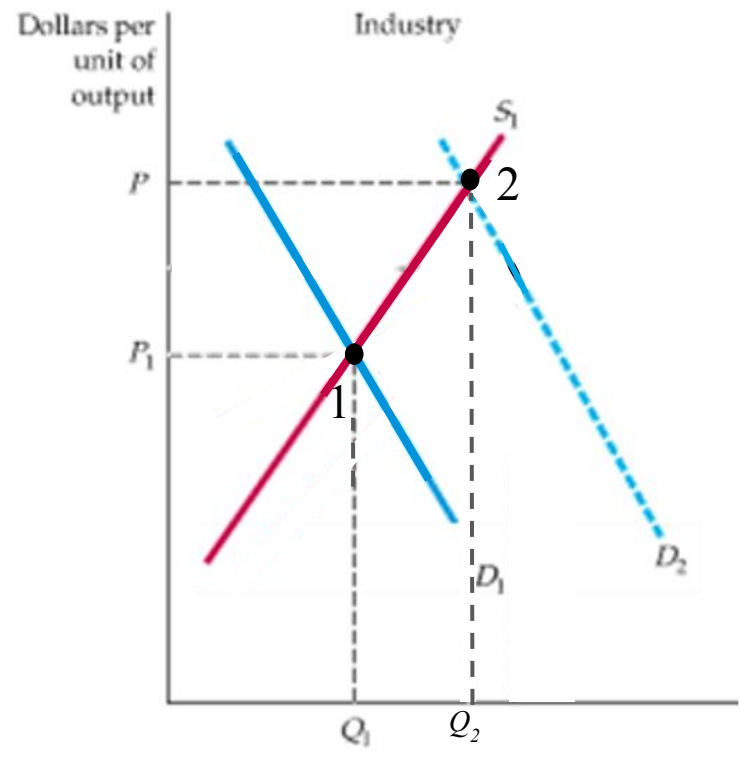
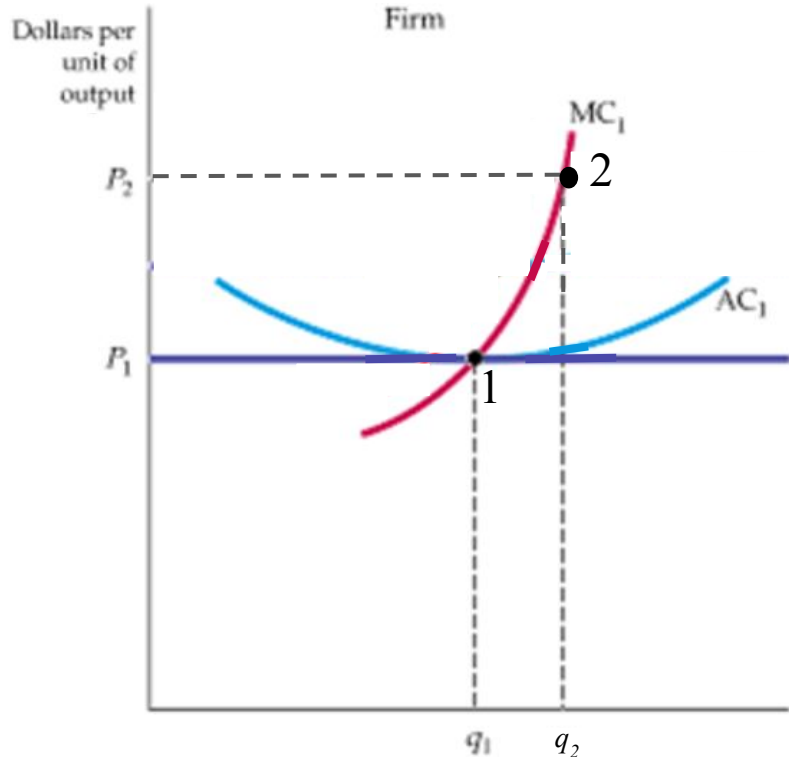
Demand Shock in Increasing-Cost Industry

- In previous example, firms' cost curves did not change as the industry equilibrium evolved
- So in the long run, price was constant (because the minimum of ATC was constant)
 - SR supply was upward-sloping, but LR supply was flat
 - In LR, demand shock goes entirely into quantity, not at all into price
- But suppose there are diseconomies of scale in the industry
 - Perhaps because firms are forced to compete for a scarce resource, like skilled workers
 - As industry expands, cost curves shift up
 - This will lead to an upward-sloping LR supply curve

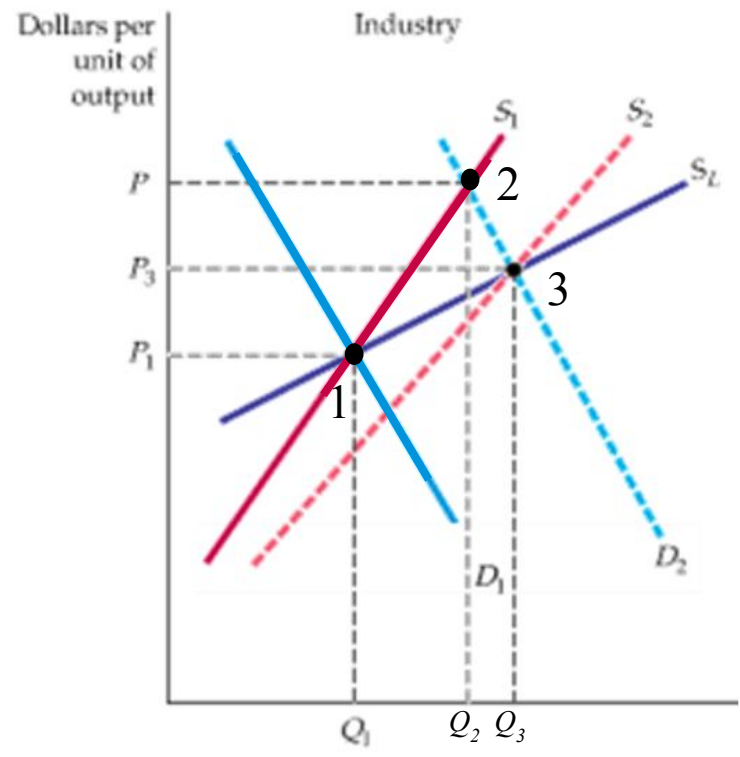
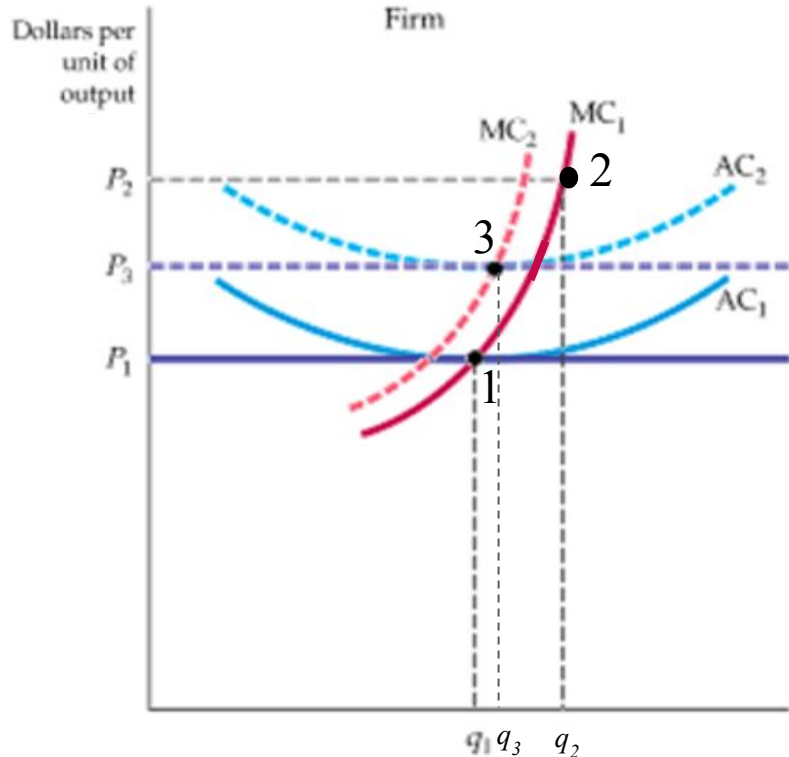
Demand Shock in Increasing-Cost Industry (2)



Demand Shock in Increasing-Cost Industry (2)



Demand Shock in Increasing-Cost Industry (2)



Demand Shock in Increasing-Cost Industry (2)

- Some of the Demand shock goes into a higher price – not just an increase in quantity
- LR Supply is not perfectly elastic anymore – but still more elastic than SR supply

