

2.7 – External Economies & Industry Supply

ECON 306 • Microeconomic Analysis • Spring 2022

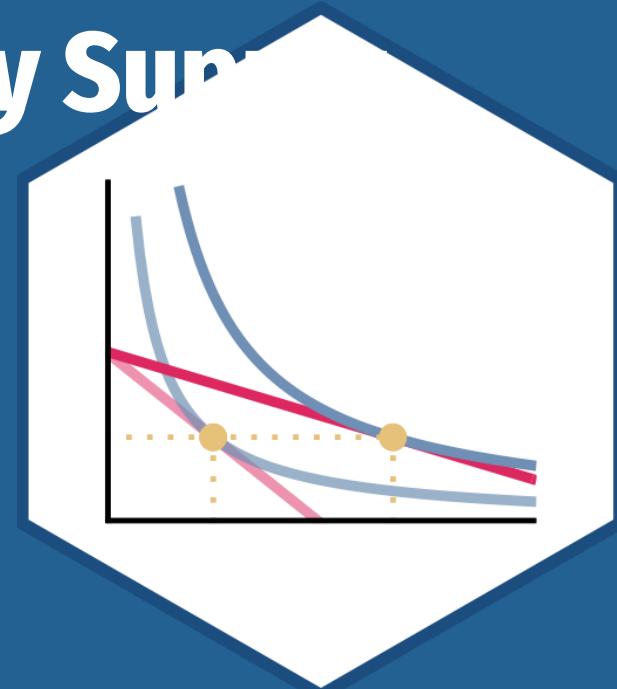
Ryan Safner

Assistant Professor of Economics

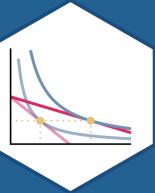
 safner@hood.edu

 [ryansafner/microS22](https://github.com/ryansafner/microS22)

 microS22.classes.ryansafner.com



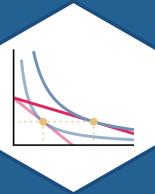
Outline



Entry Effects & External Economies

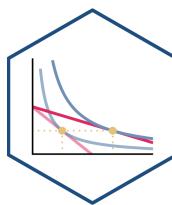
Supply Functions

Price Elasticity of Supply

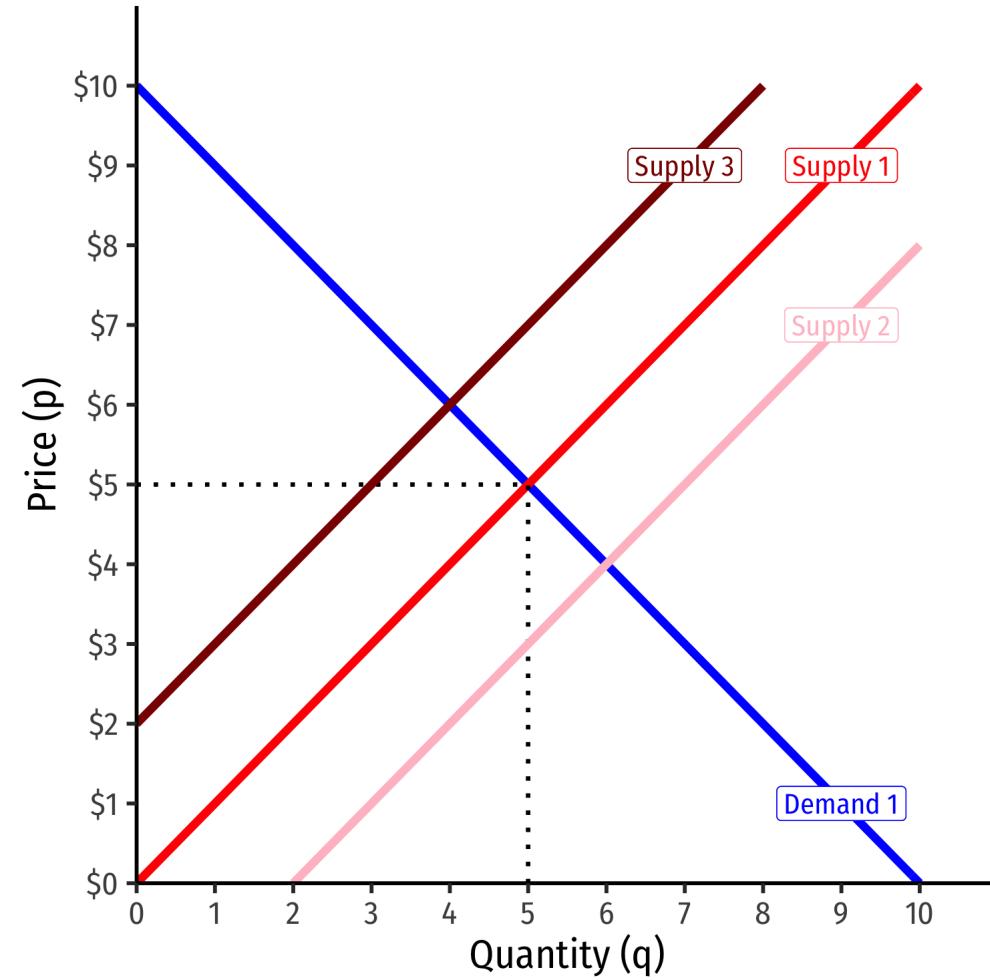


Entry Effects & External Economies

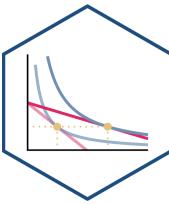
Entry/Exit Effects on Market Price



- When **all firms produce more/less**; or **firms enter or exit** an industry, this **affects the equilibrium market price**
- Think about basic supply & demand graphs:
 - **Entry:** \uparrow industry supply $\implies \uparrow q, \downarrow p$
 - **Exit:** \downarrow industry supply $\implies \downarrow q, \uparrow p$

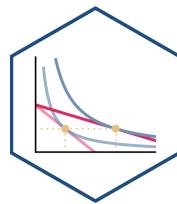


External Economies



- How large this change in price will be from entry/exit depends on industry-wide costs and **external economies**
- **Economies of scale** are *internal* to the firm (a firm's own average cost curve)
- *External* economies have to do with how the size of the *entire* industry affects *all individual firm's costs*
 - These are **externalities** that spill over across all firms in an industry

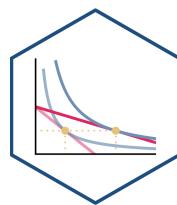
Constant Cost Industry (No External Economies) I



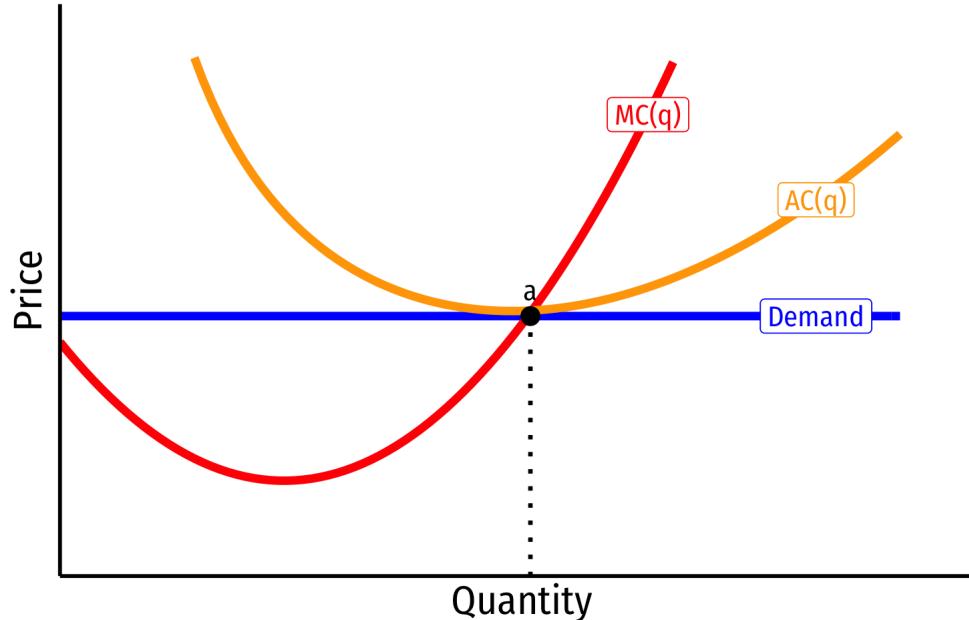
- **Constant cost industry** has *no external economies*, no change in costs as industry output increases (firms enter & incumbents produce more)
- **A *perfectly elastic* long-run industry supply curve**
- Determinants:
 - Industry's purchases are not a large share of input markets
 - Often constant marginal costs, insignificant fixed costs



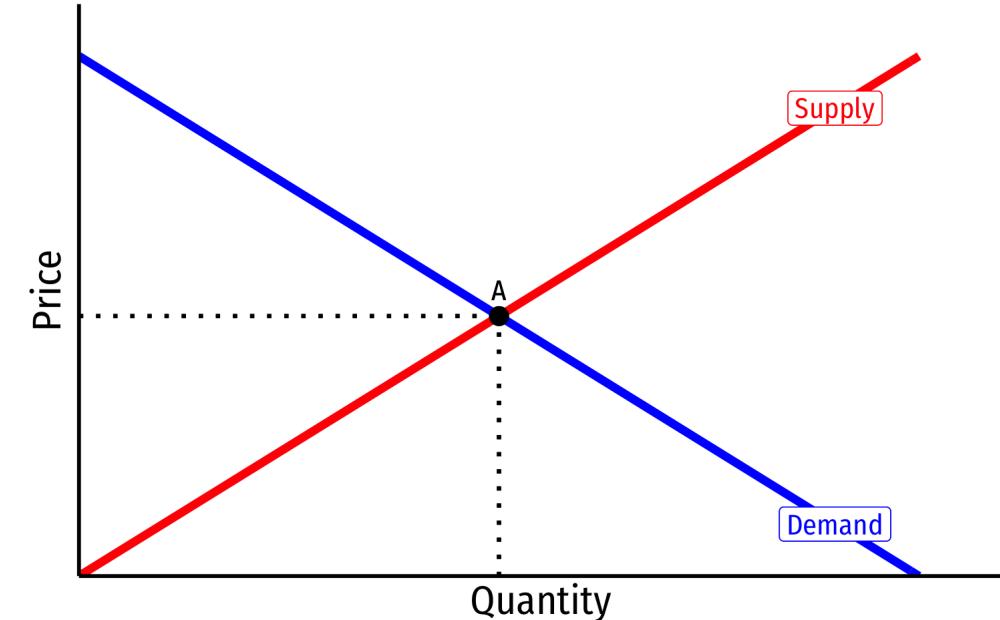
Constant Cost Industry (No External Economies) II



Representative Firm

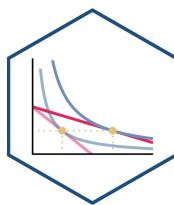


Industry

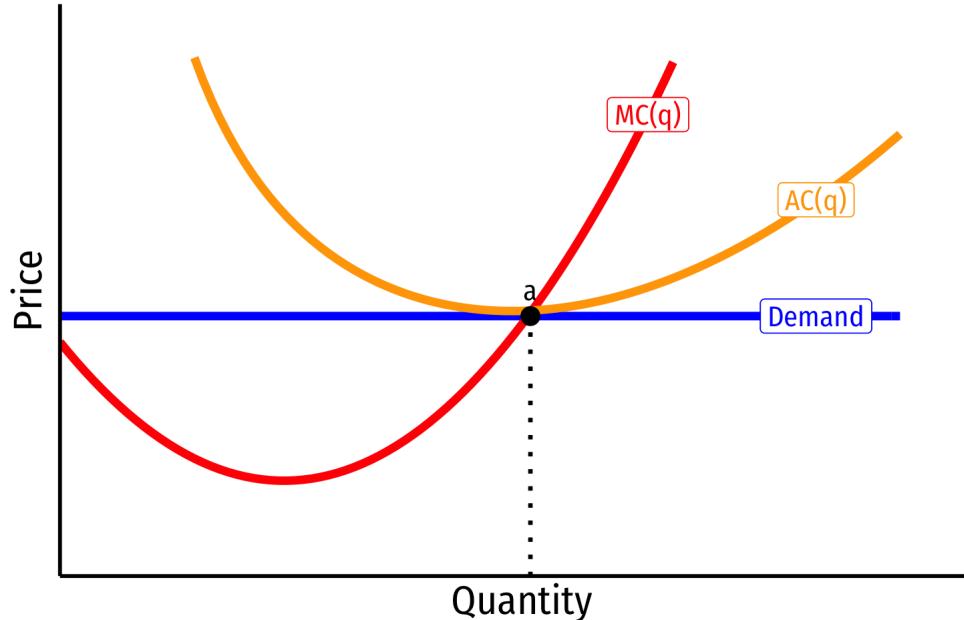


- Industry equilibrium: firms earning normal $\pi = 0$, $p = MC(q) = AC(q)$ at points **a**, **A**

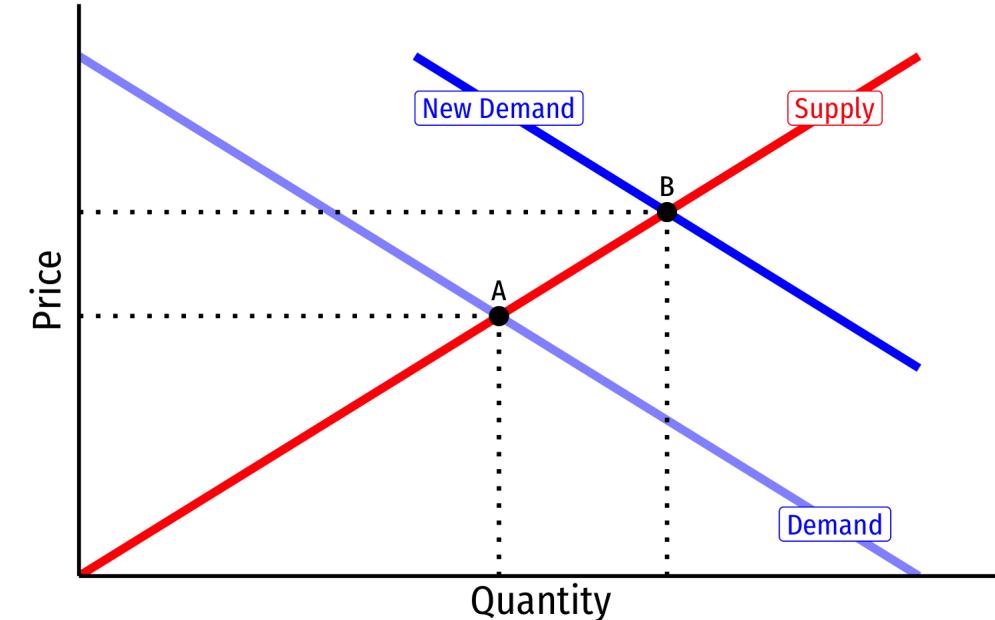
Constant Cost Industry (No External Economies) III



Representative Firm

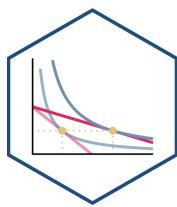


Industry

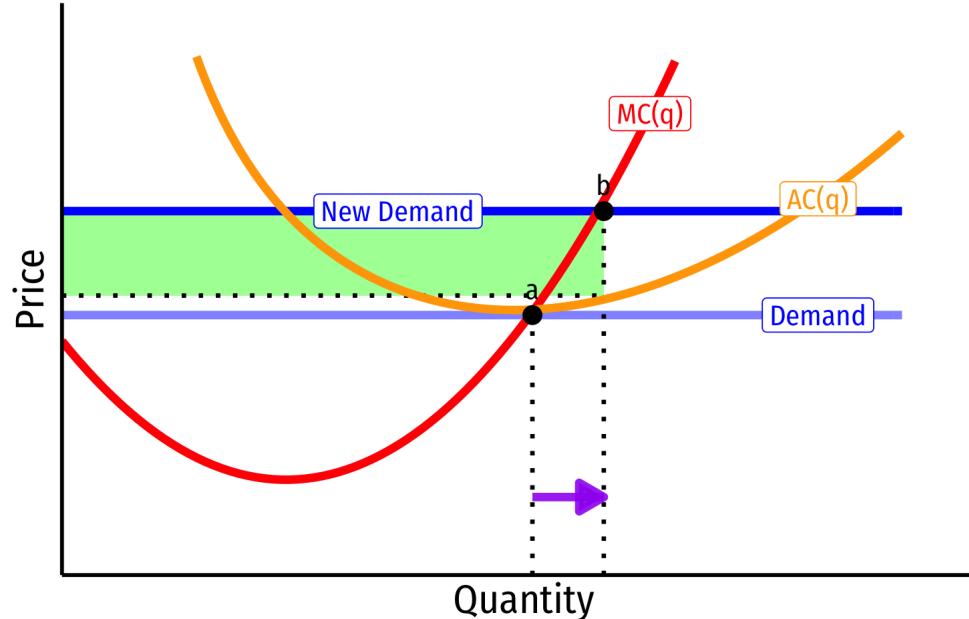


- Industry equilibrium: firms earning normal $\pi = 0$, $p = MC(q) = AC(q)$ at points **a, A**
- Consider an increase in market demand

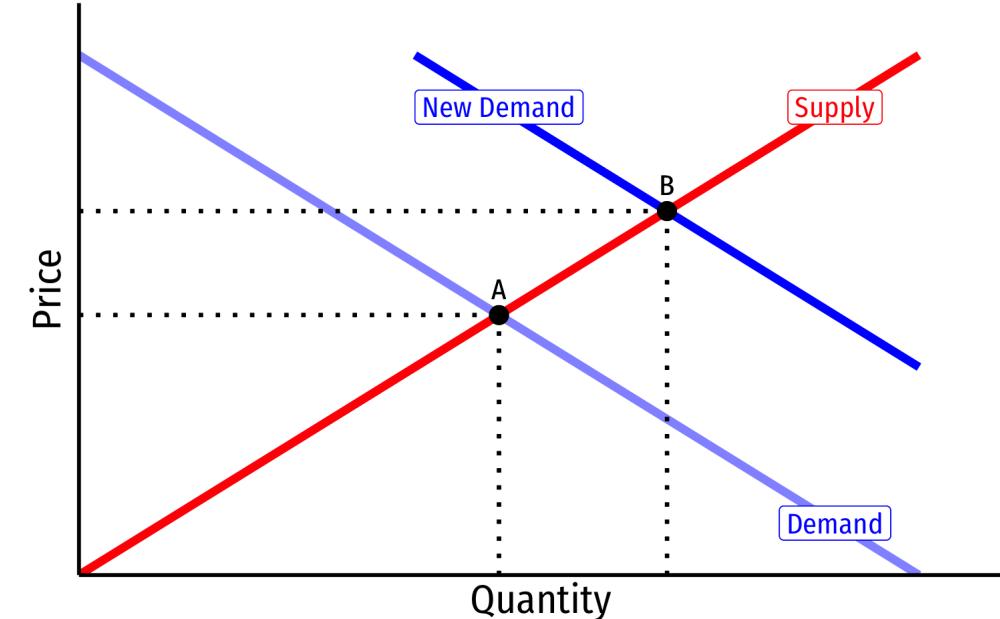
Constant Cost Industry (No External Economies) IV



Representative Firm

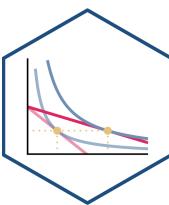


Industry

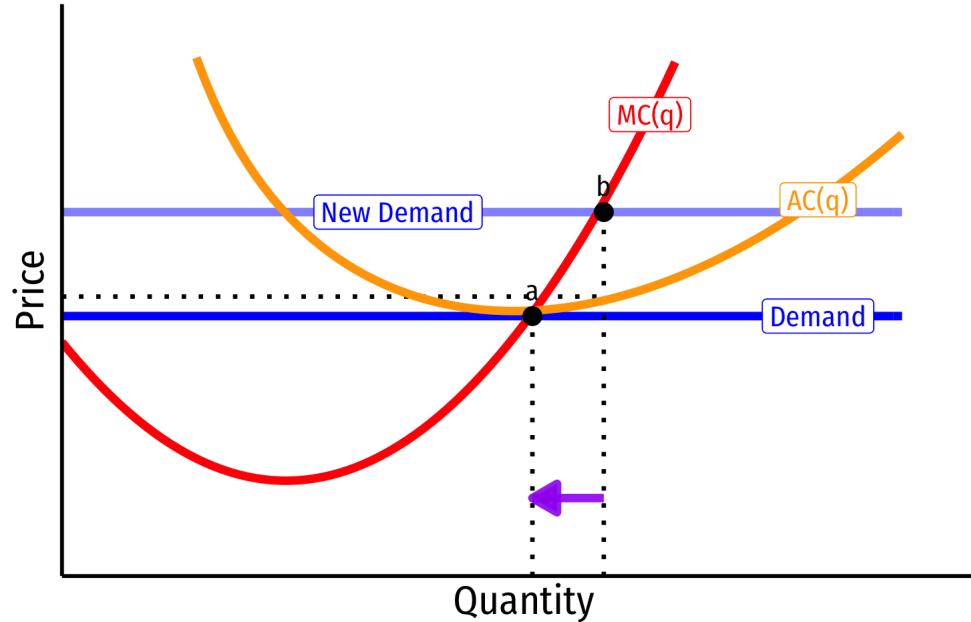


- **Short run** ($A \rightarrow B$): industry reaches new equilibrium at higher price
- Firms charge higher price, produce more output, earn π at point **b**

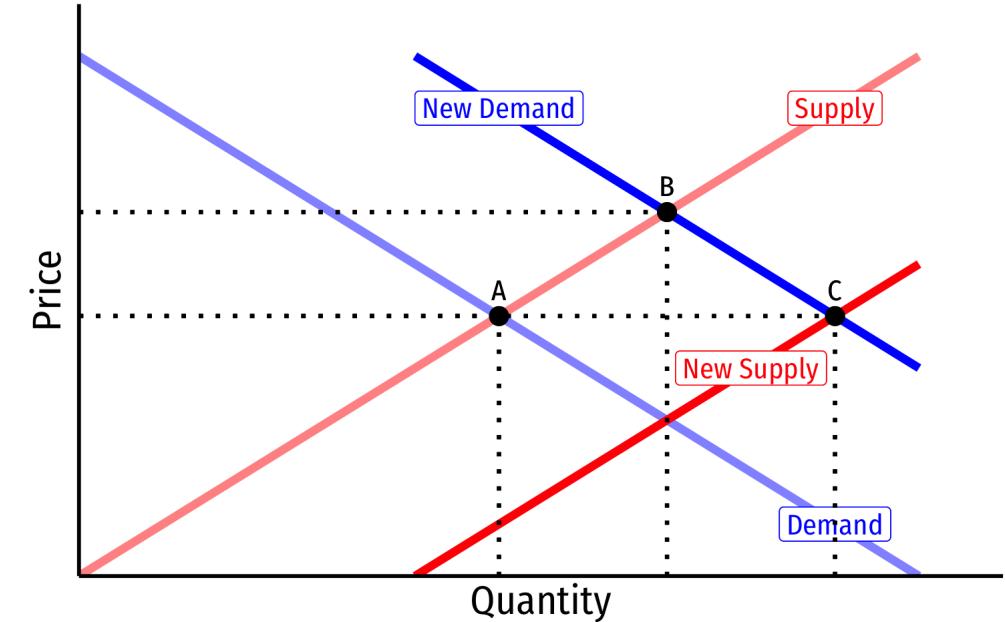
Constant Cost Industry (No External Economies) V



Representative Firm

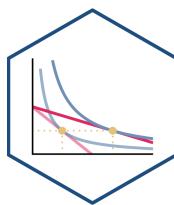


Industry

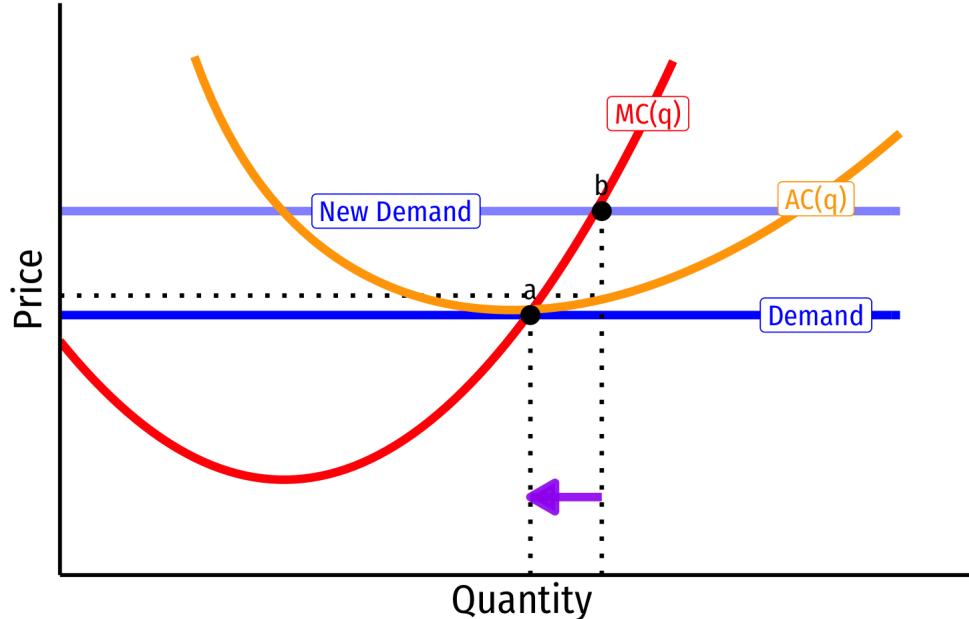


- **Long run** ($B \rightarrow C$): profit attracts **entry** \implies **industry supply** increases (pushing down price)
- No change in costs to firms in industry, new firms continue to enter until $\pi = 0$ at $p = AC(q)$ for firms
- Firms return to point **a**, original price, output, and $\pi = 0$

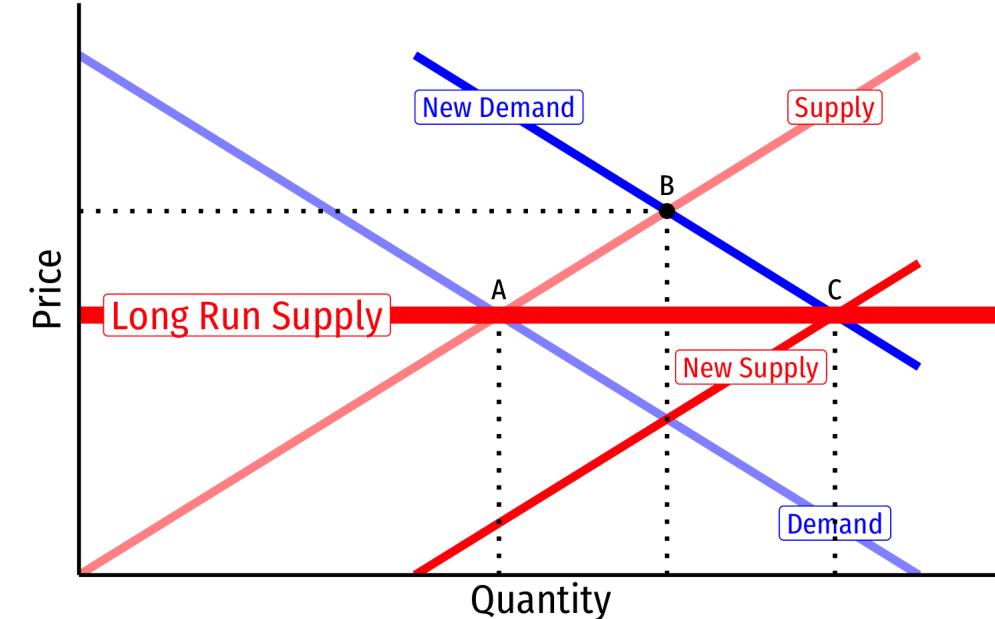
Constant Cost Industry (No External Economies) VI



Representative Firm

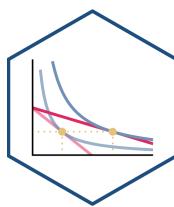


Industry



- **Long Run Industry Supply** is perfectly elastic
 - Long run price is not affected in any way by Market Demand!

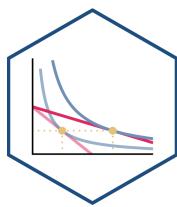
Increasing Cost Industry (External Diseconomies) I



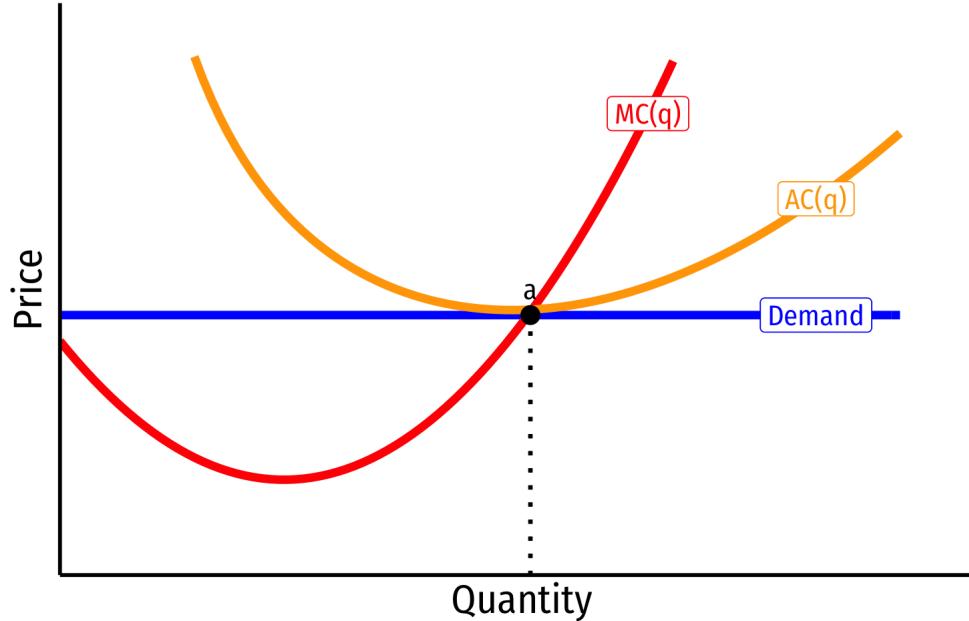
- Increasing cost industry has **external diseconomies**, costs rise for all firms in the industry as industry output increases (firms enter & incumbents produce more)
- An upward sloping long-run industry supply curve
- Determinants:
 - Finding more resources in harder-to-reach places
 - Diminishing marginal products
 - Greater complexity and administrative costs at larger scales



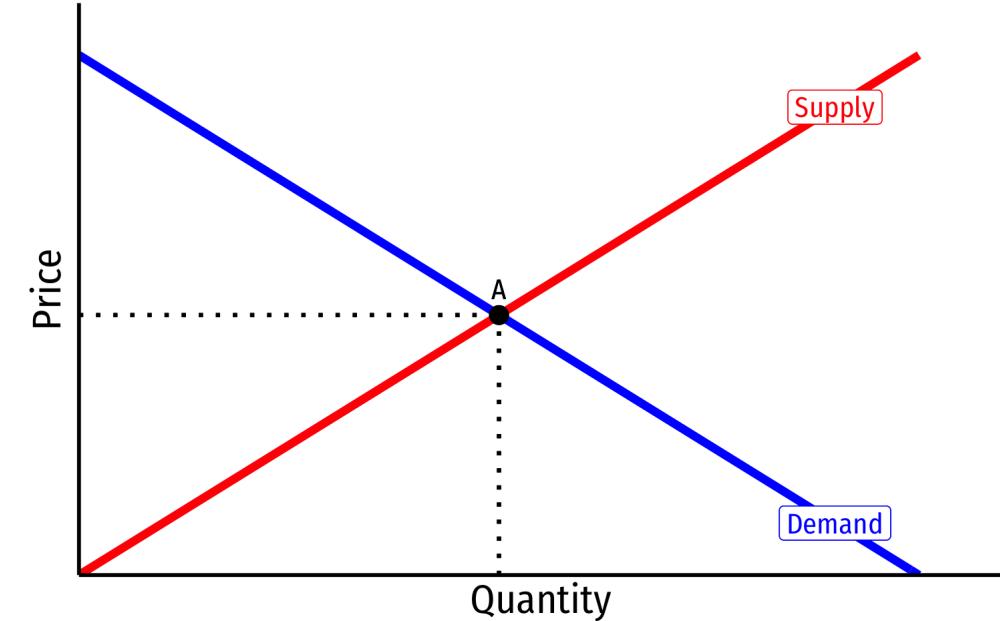
Increasing Cost Industry (External Diseconomies) II



Representative Firm

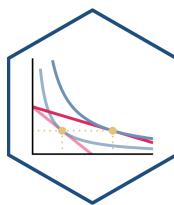


Industry

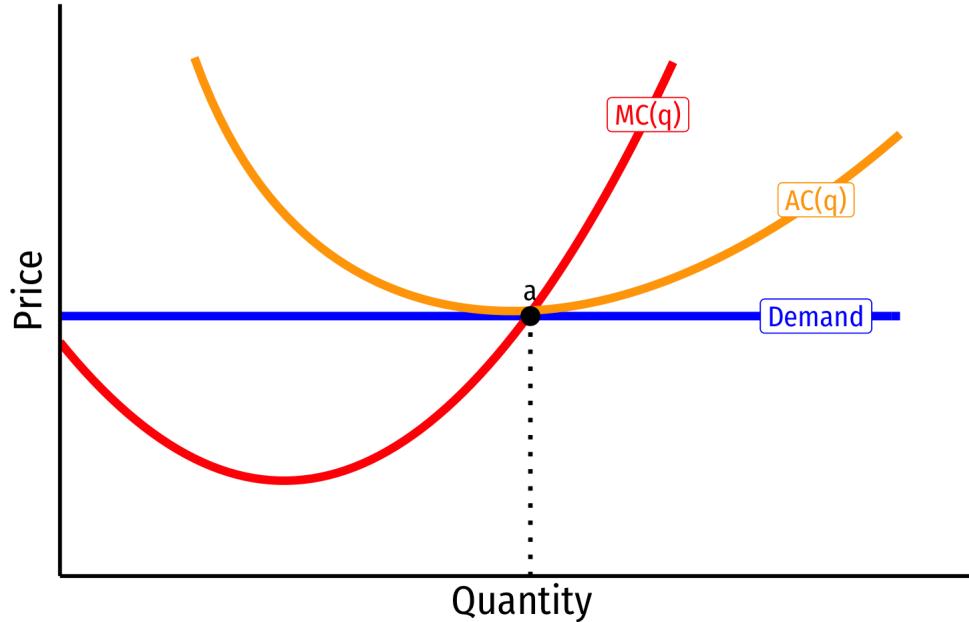


- Industry equilibrium: firms earning normal $\pi = 0, p = MC(q) = AC(q)$

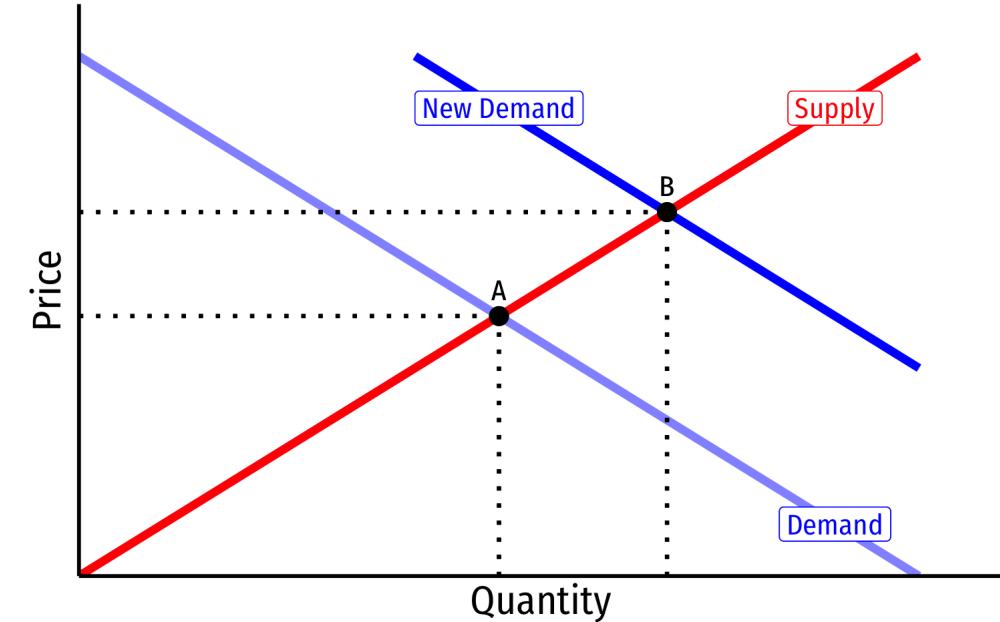
Increasing Cost Industry (External Diseconomies) III



Representative Firm

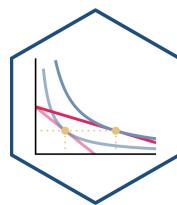


Industry

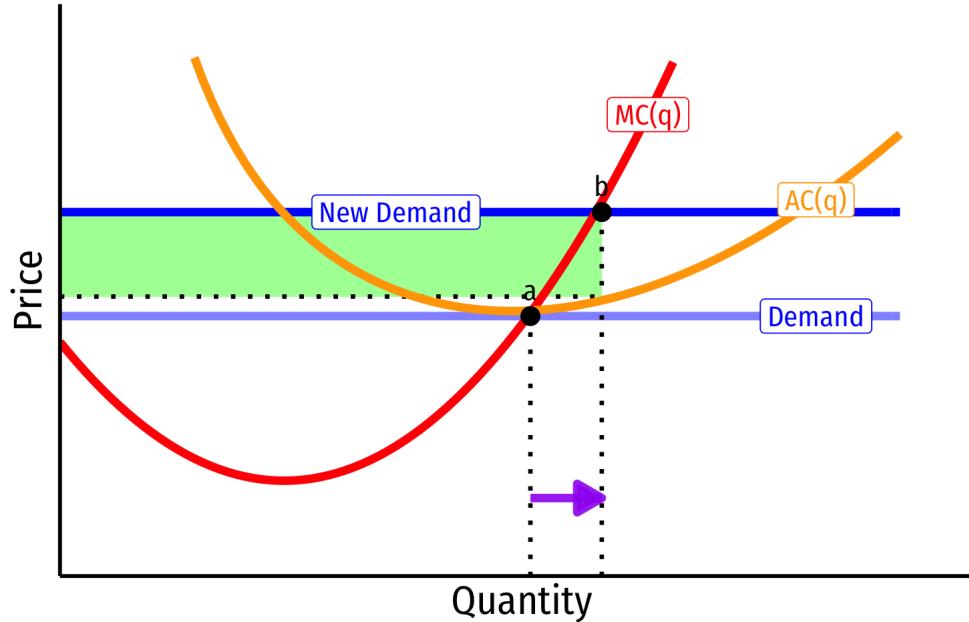


- Industry equilibrium: firms earning normal $\pi = 0, p = MC(q) = AC(q)$
- Exogenous increase in market demand

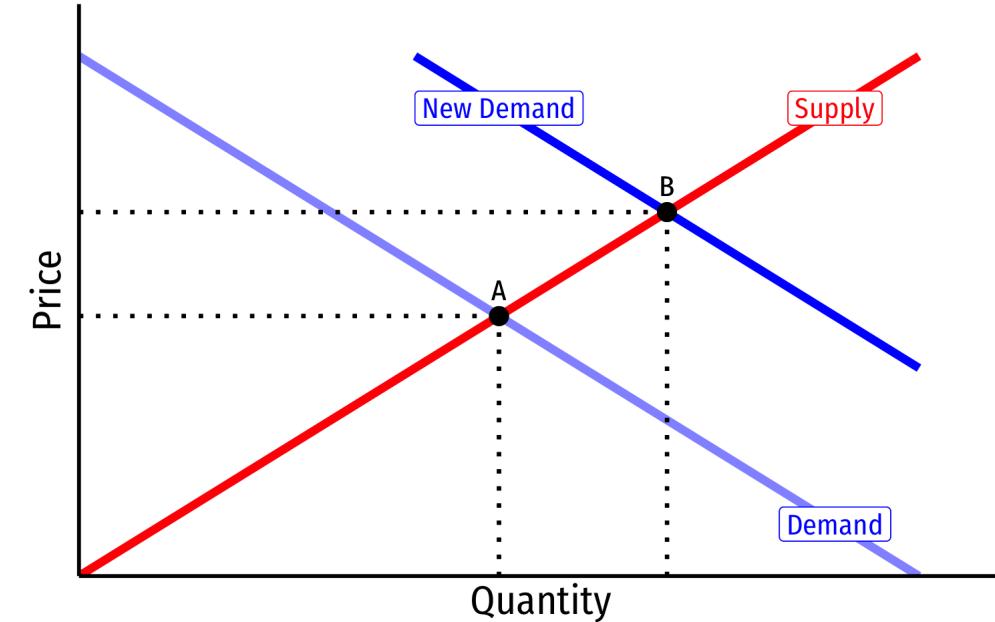
Increasing Cost Industry (External Diseconomies) IV



Representative Firm

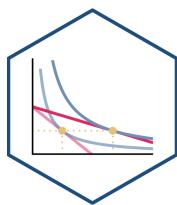


Industry

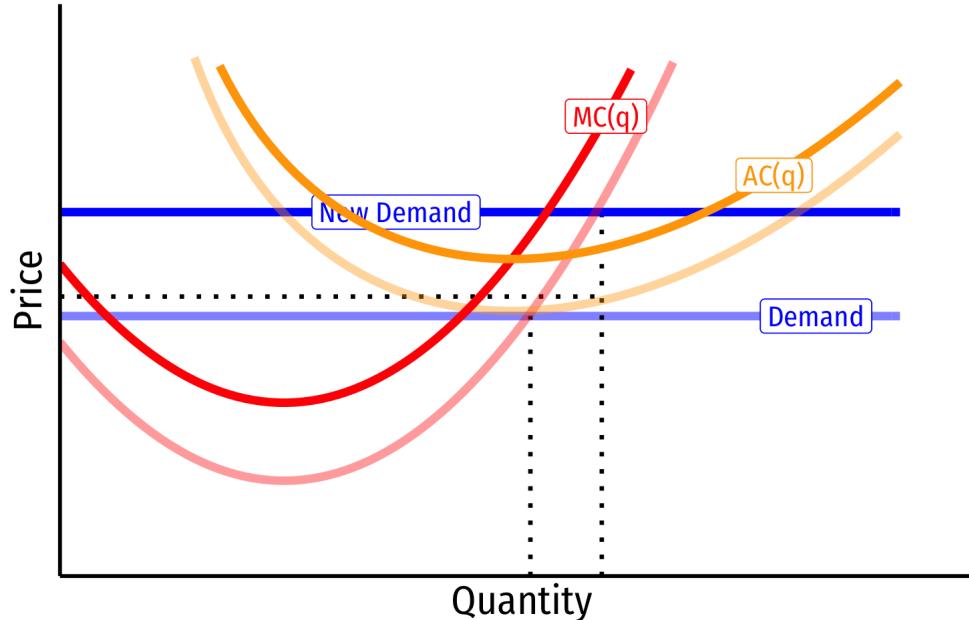


- **Short run** ($A \rightarrow B$): industry reaches new equilibrium
- Firms charge higher p^* , produce more q^* , earn π

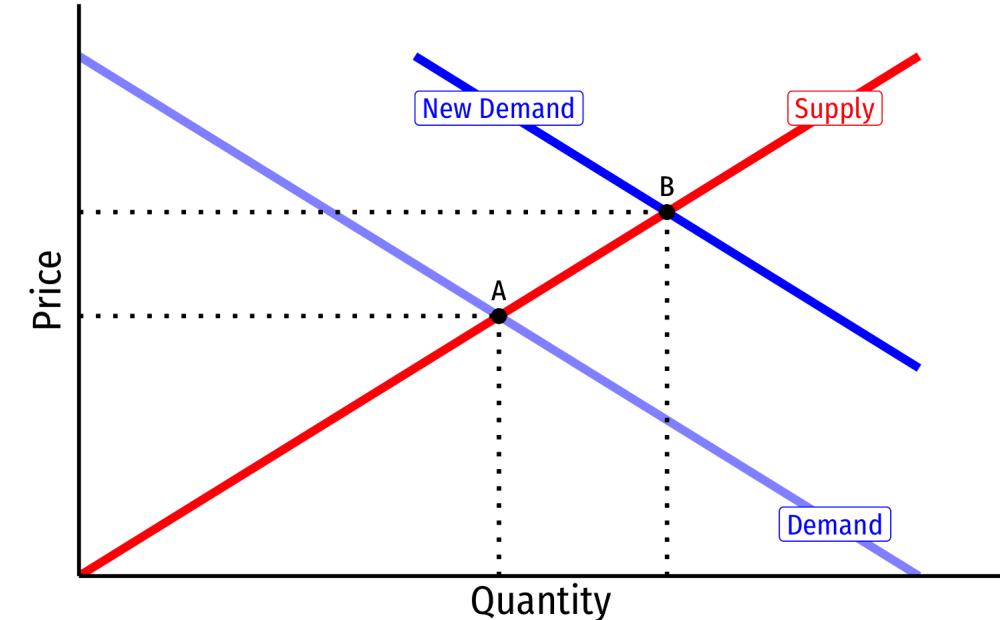
Increasing Cost Industry (External Diseconomies) V



Representative Firm

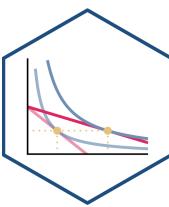


Industry

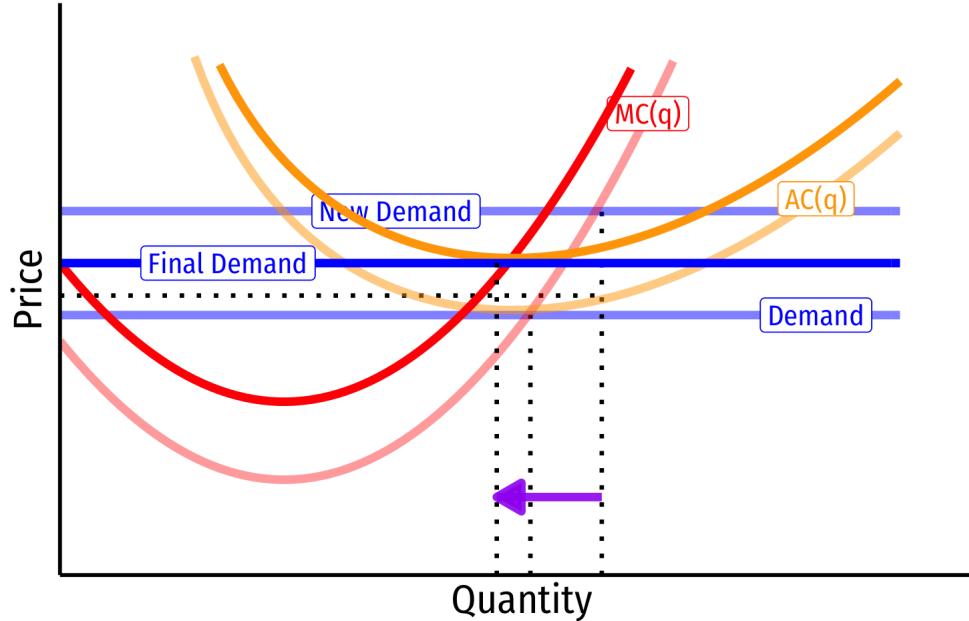


- **Long run:** profit attracts entry \implies industry supply will increase
- **But more industry-wide output increases costs ($MC(q)$, $AC(q)$) for all firms in industry**

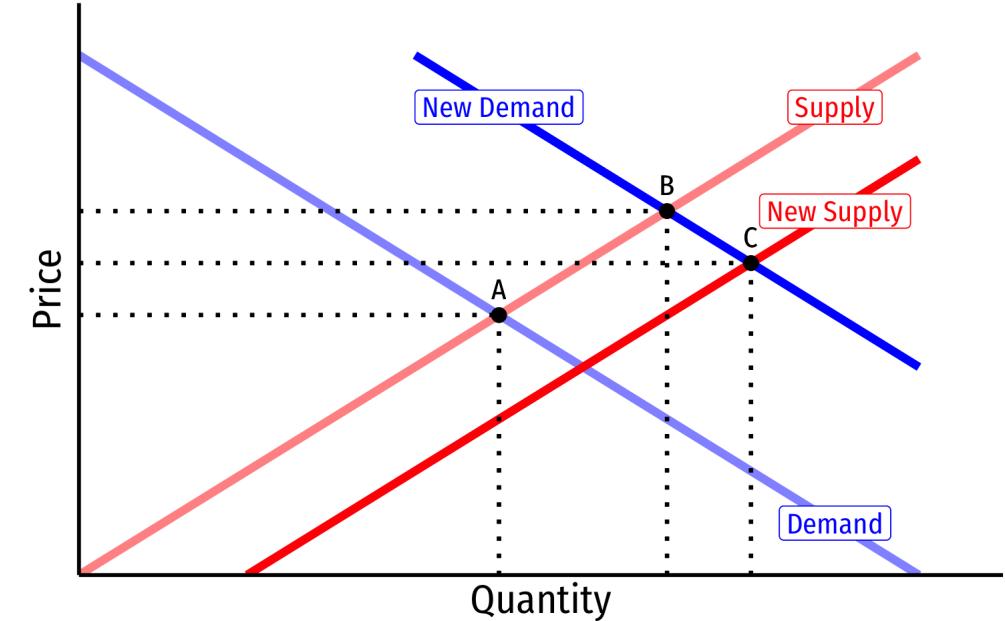
Increasing Cost Industry (External Diseconomies) VI



Representative Firm

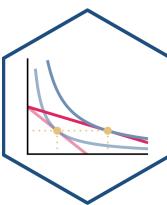


Industry

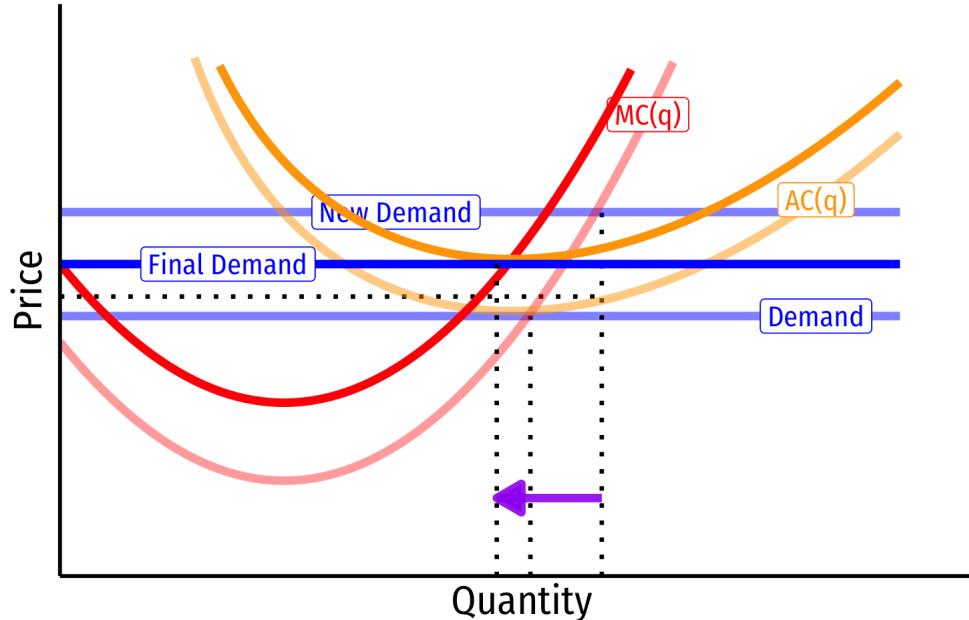


- **Long run ($B \rightarrow C$):** firms enter until $\pi = 0$ at $p = AC(q)$
- Firms charge higher p^* , produce lower q^* , earn $\pi = 0$

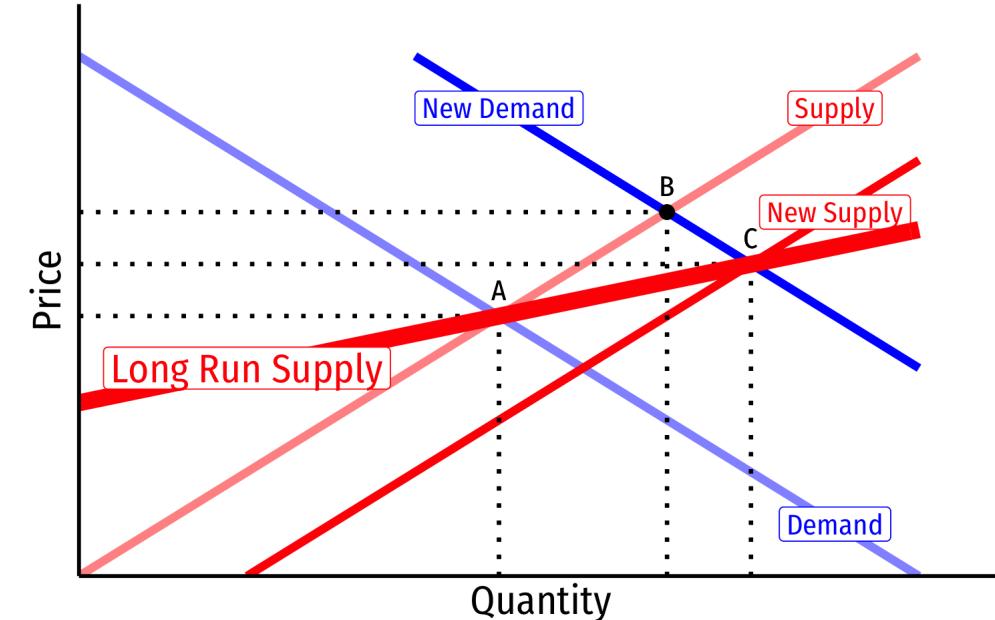
Increasing Cost Industry (External Diseconomies) VII



Representative Firm

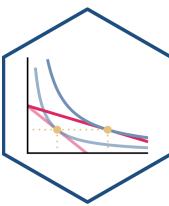


Industry



- Long run industry supply curve is upward sloping

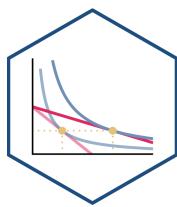
Decreasing Cost Industry (External Economies) I



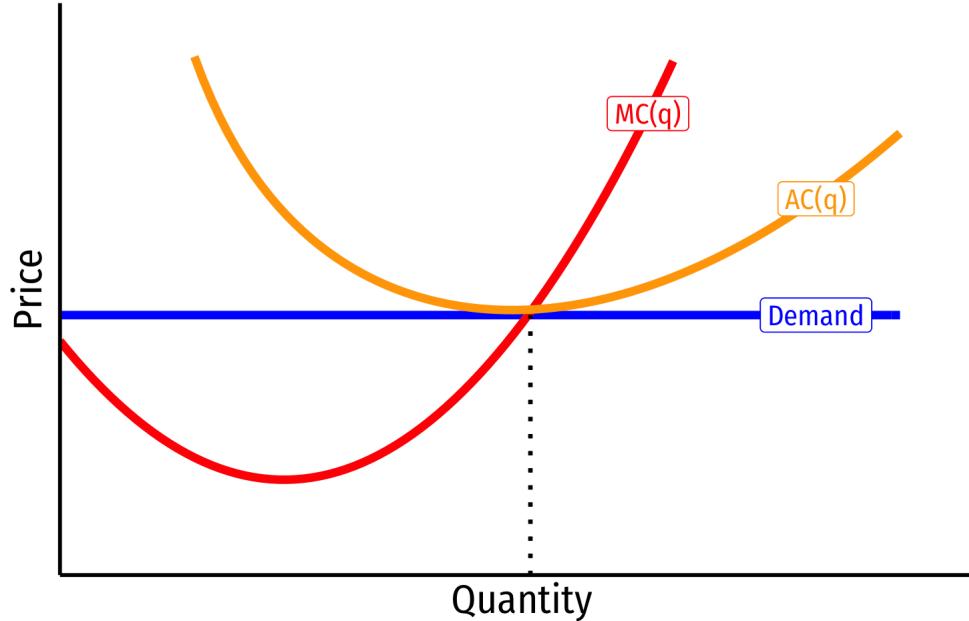
- **Decreasing cost industry** has *external economies*, costs fall for all firms in the industry as industry output increases (firms enter & incumbents produce more)
- A *downward sloping long-run industry supply curve!*
- Determinants:
 - High fixed costs, low marginal costs
 - Economies of scale
- Examples: geographic clusters, public utilities, infrastructure, entertainment
- **Tends towards "natural" monopoly**



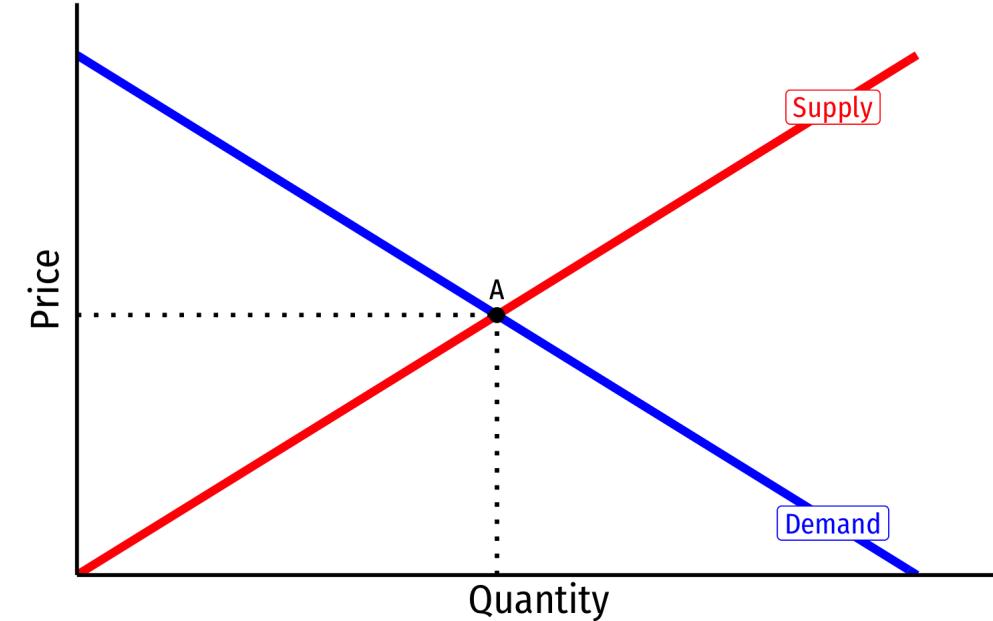
Decreasing Cost Industry (External Economies) II



Representative Firm

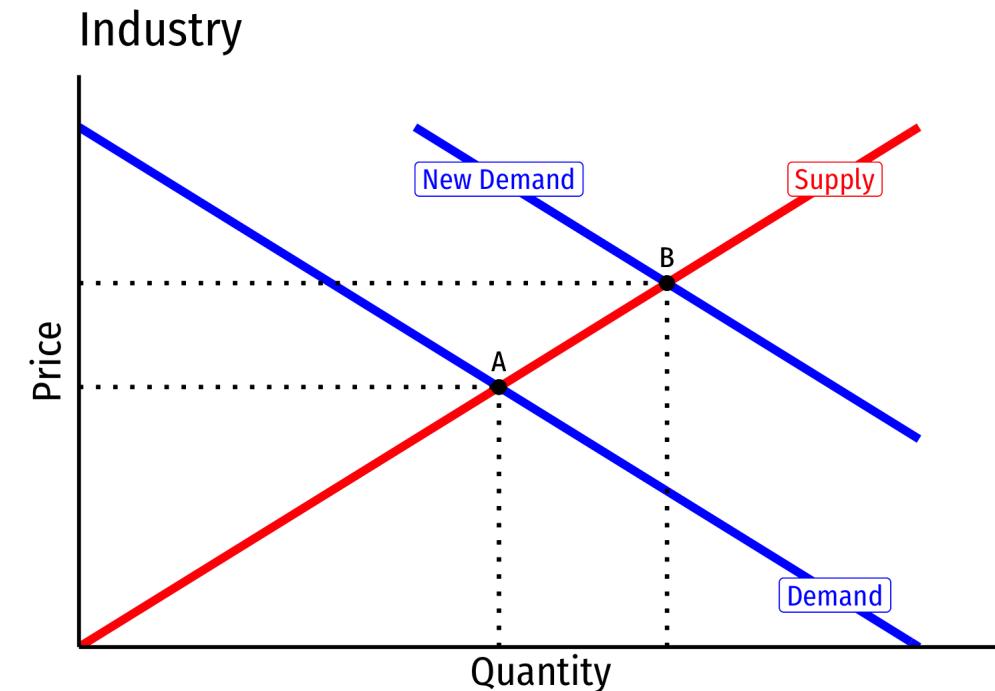
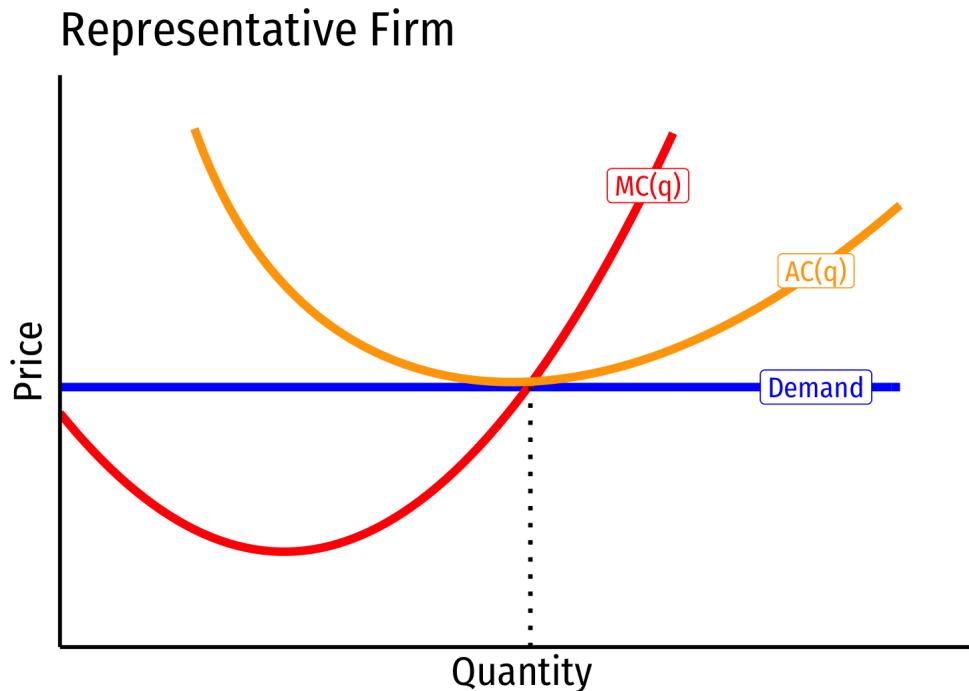
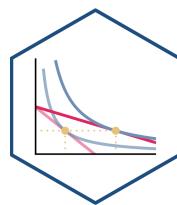


Industry



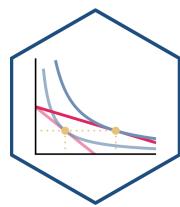
- Industry equilibrium: firms earning normal $\pi = 0, p = MC(q) = AC(q)$

Decreasing Cost Industry (External Economies) III

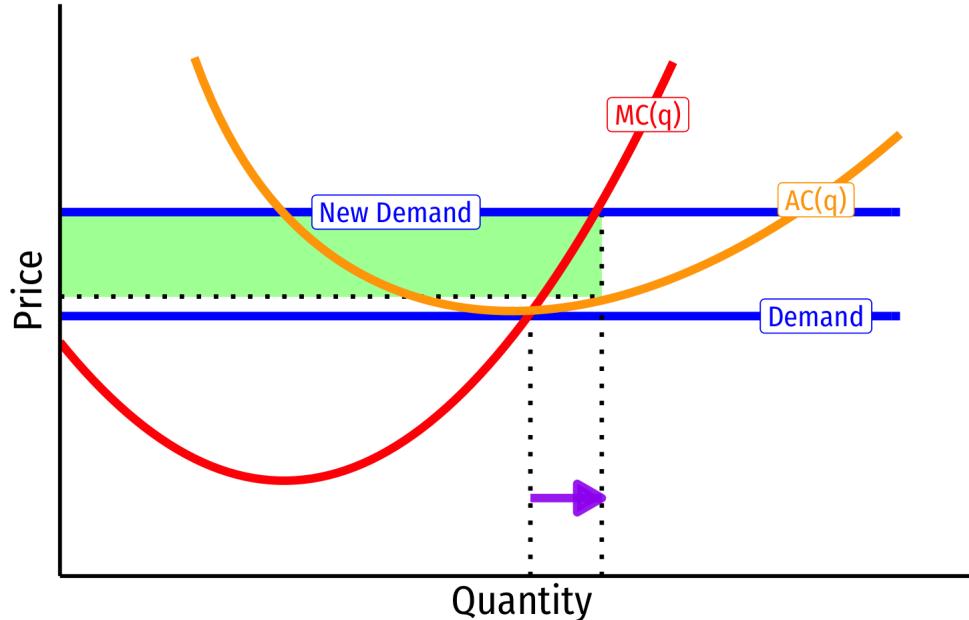


- Industry equilibrium: firms earning normal $\pi = 0, p = MC(q) = AC(q)$
- Exogenous increase in market demand

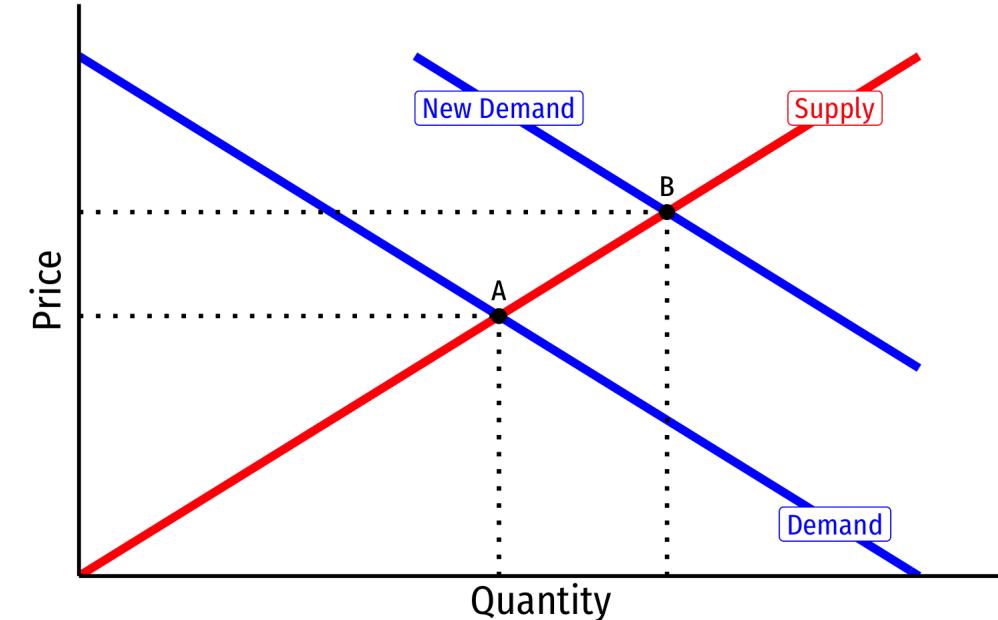
Decreasing Cost Industry (External Economies) IV



Representative Firm

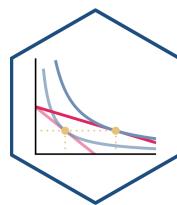


Industry

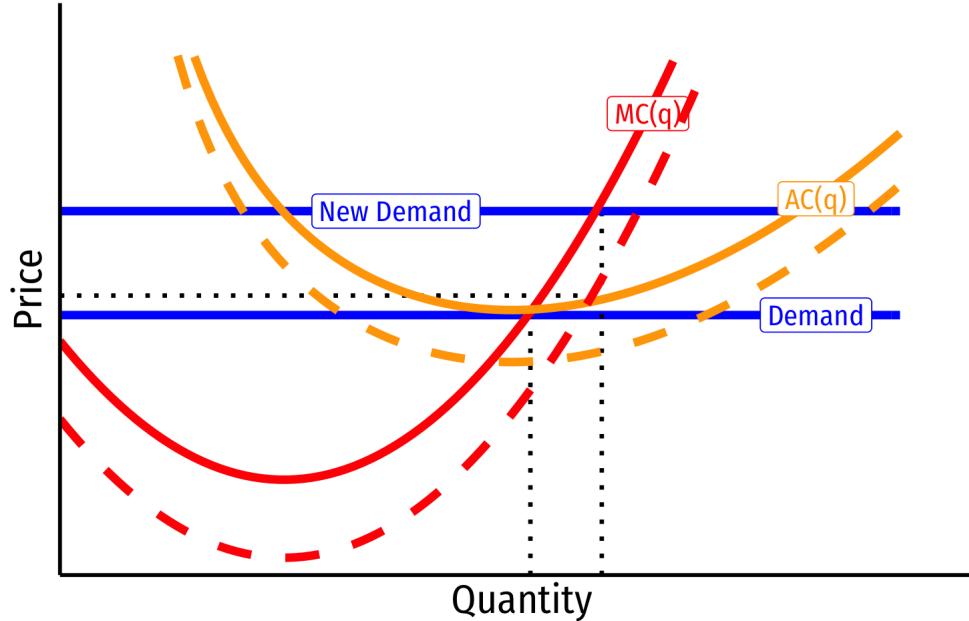


- **Short run** ($A \rightarrow B$): industry reaches new equilibrium
- Firms charge higher p^* , produce more q^* , earn π

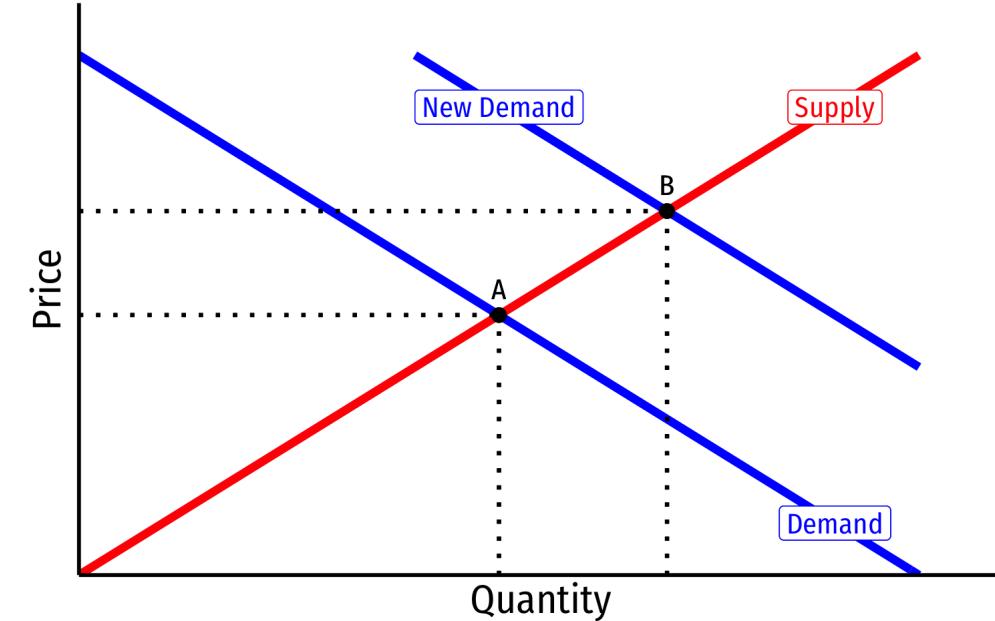
Decreasing Cost Industry (External Economies) V



Representative Firm

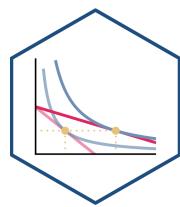


Industry

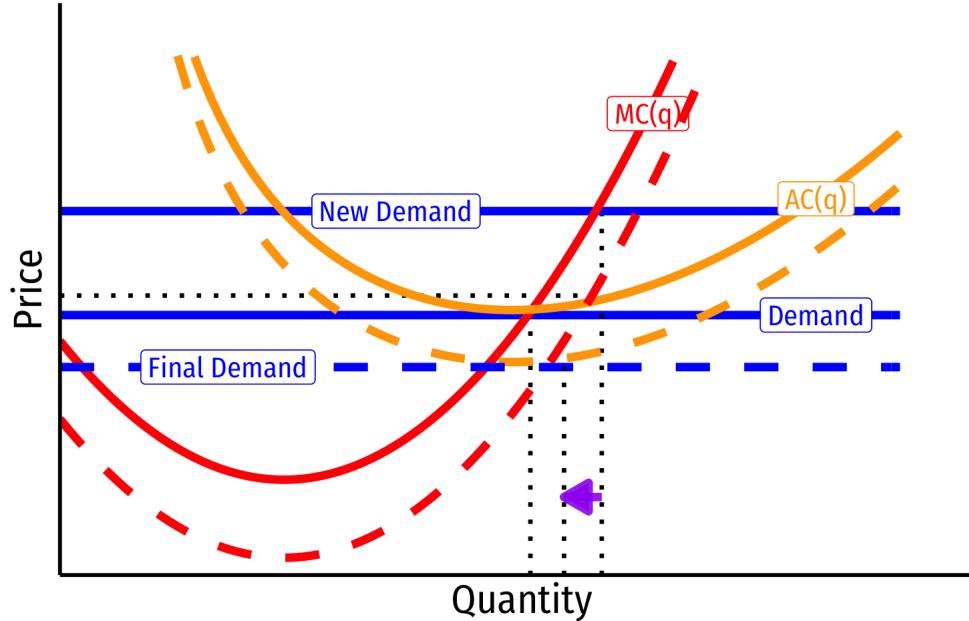


- **Long run:** profit attracts entry \implies industry supply will increase
- **But more production lowers costs (MC , AC) for all firms in industry**

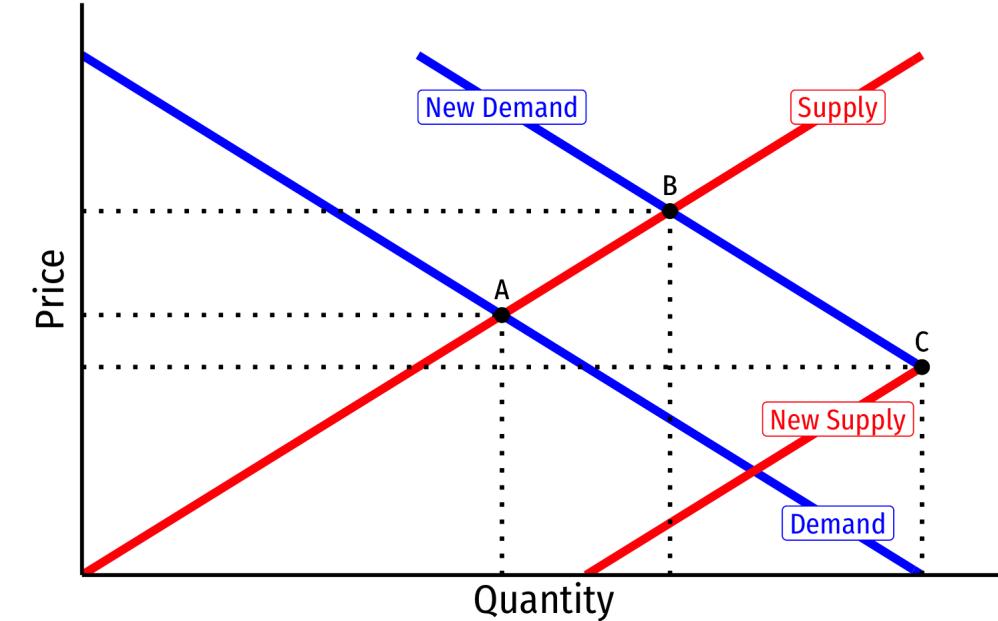
Decreasing Cost Industry (External Economies) VI



Representative Firm

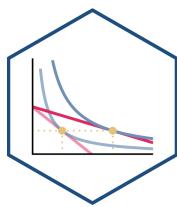


Industry

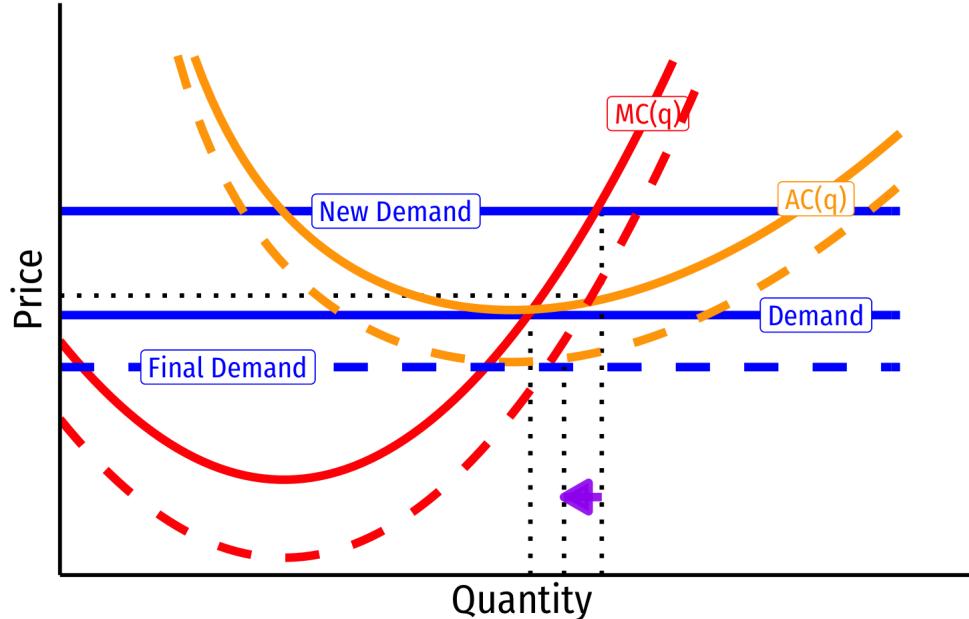


- **Long run ($B \rightarrow C$)**: firms enter until $\pi = 0$ at $p = AC(q)$
- Firms charge higher p^* , producer lower q^* , earn $\pi = 0$

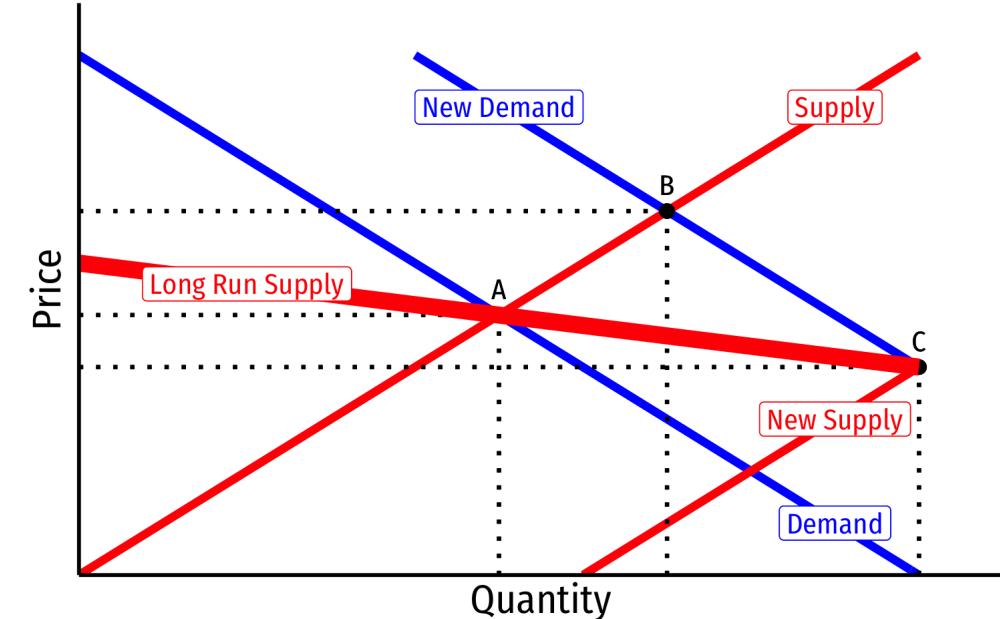
Decreasing Cost Industry (External Economies) VII



Representative Firm

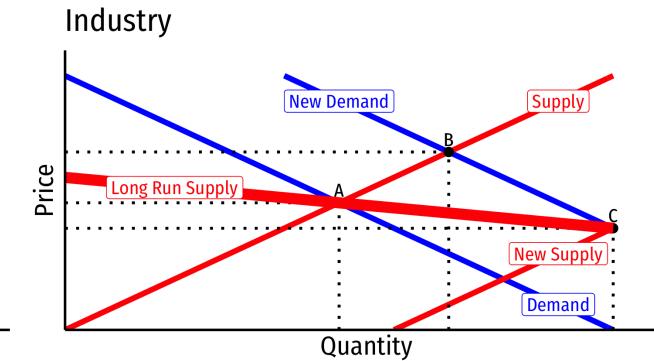
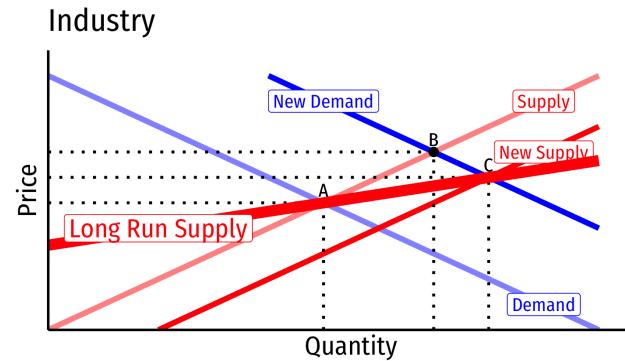
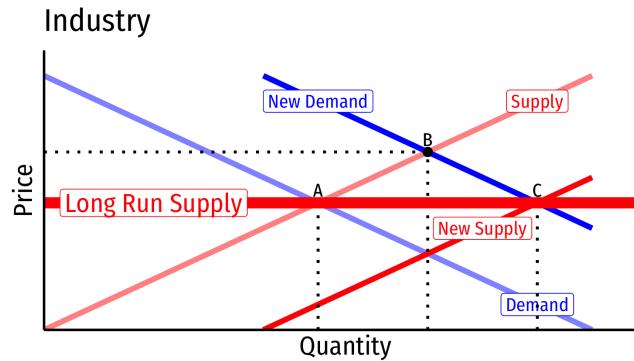
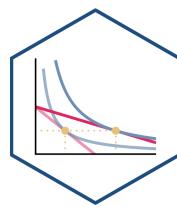


Industry

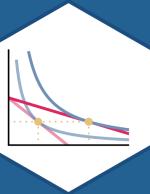


- Long run industry supply curve is downward sloping!

Comparing all Industry Types

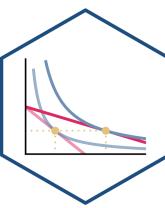


- Constant cost industry
- No external economies
- Increase in industry output has no effect on costs
- Increasing cost industry
- External diseconomies
- Increase in industry output raises all firms' costs
- Decreasing cost industry
- External economies
- Increase in industry output lowers all firms' costs



Supply Functions

Supply Function

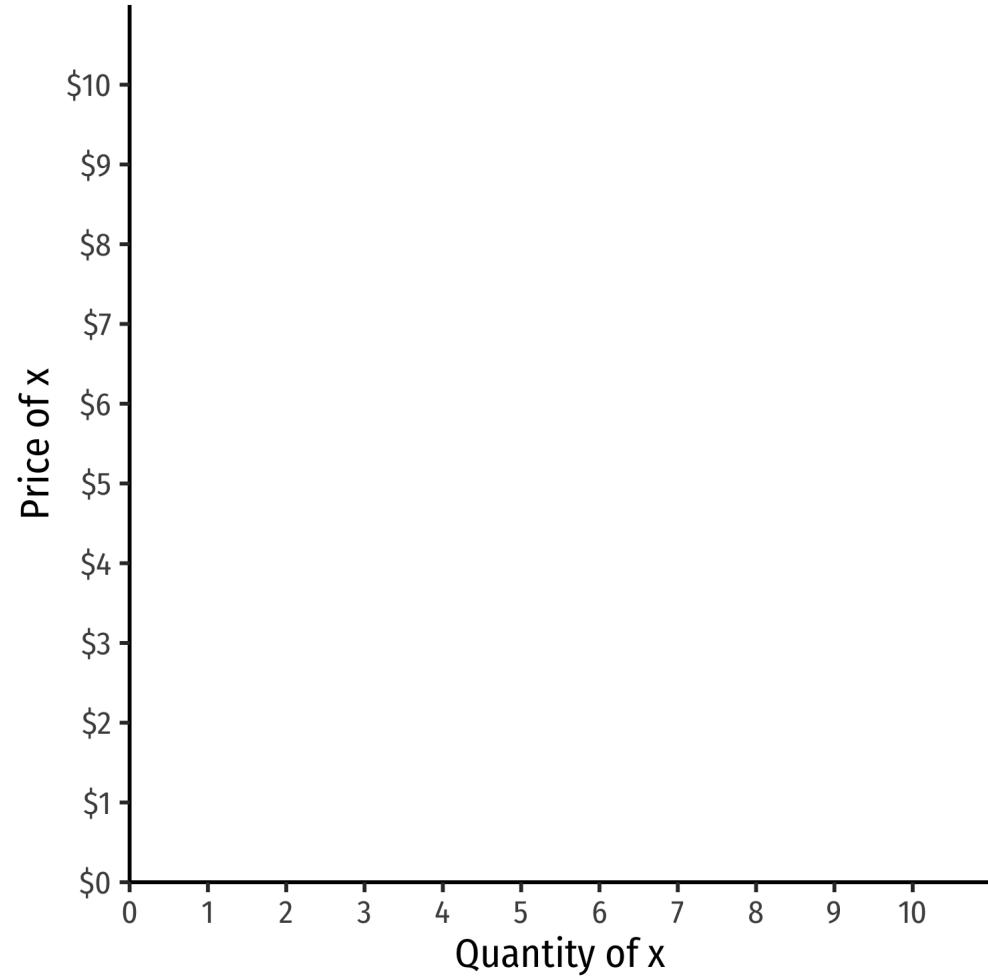


- **Supply function** relates quantity to price

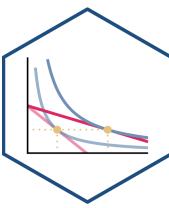
Example:

$$q = 2p - 4$$

- Not graphable (wrong axes)!



Inverse Supply Function

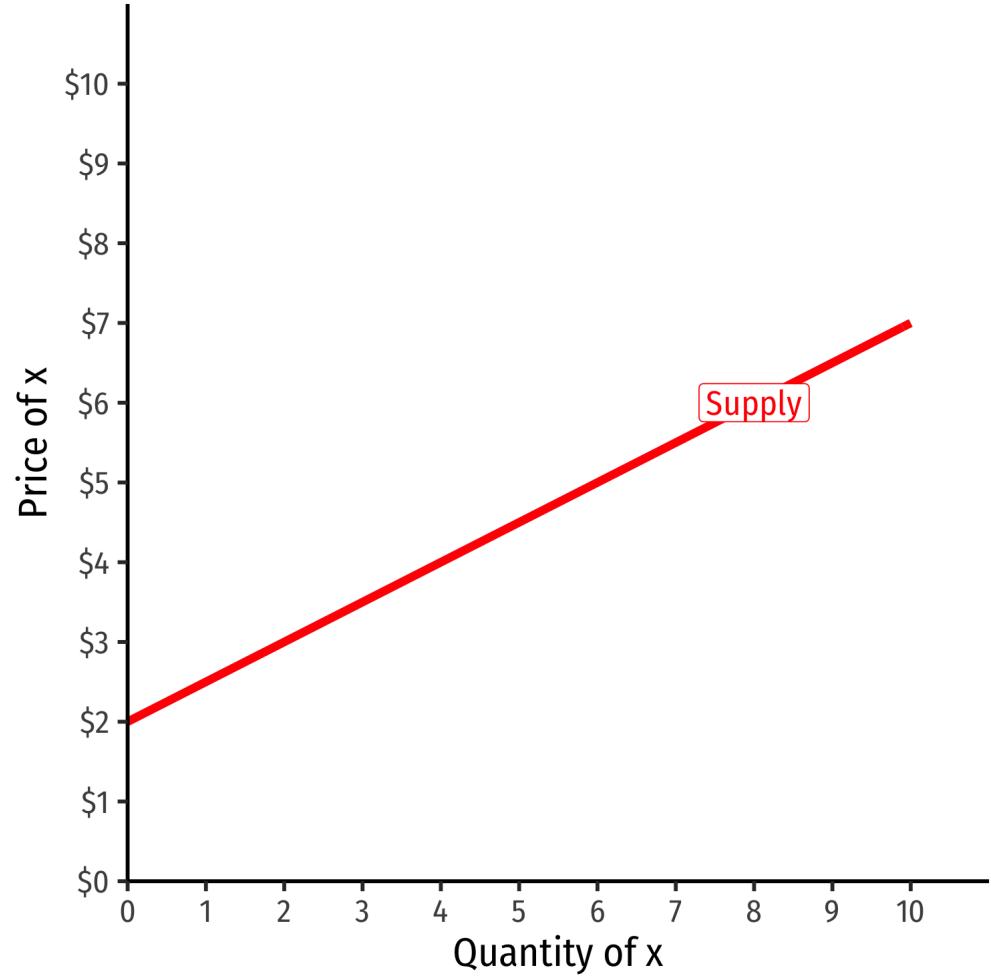


- ***Inverse supply function*** relates price to quantity
 - Take supply function, solve for p

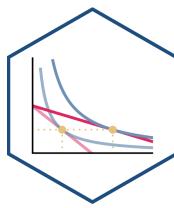
Example:

$$p = 2 + 0.5q$$

- Graphable (price on vertical axis)!



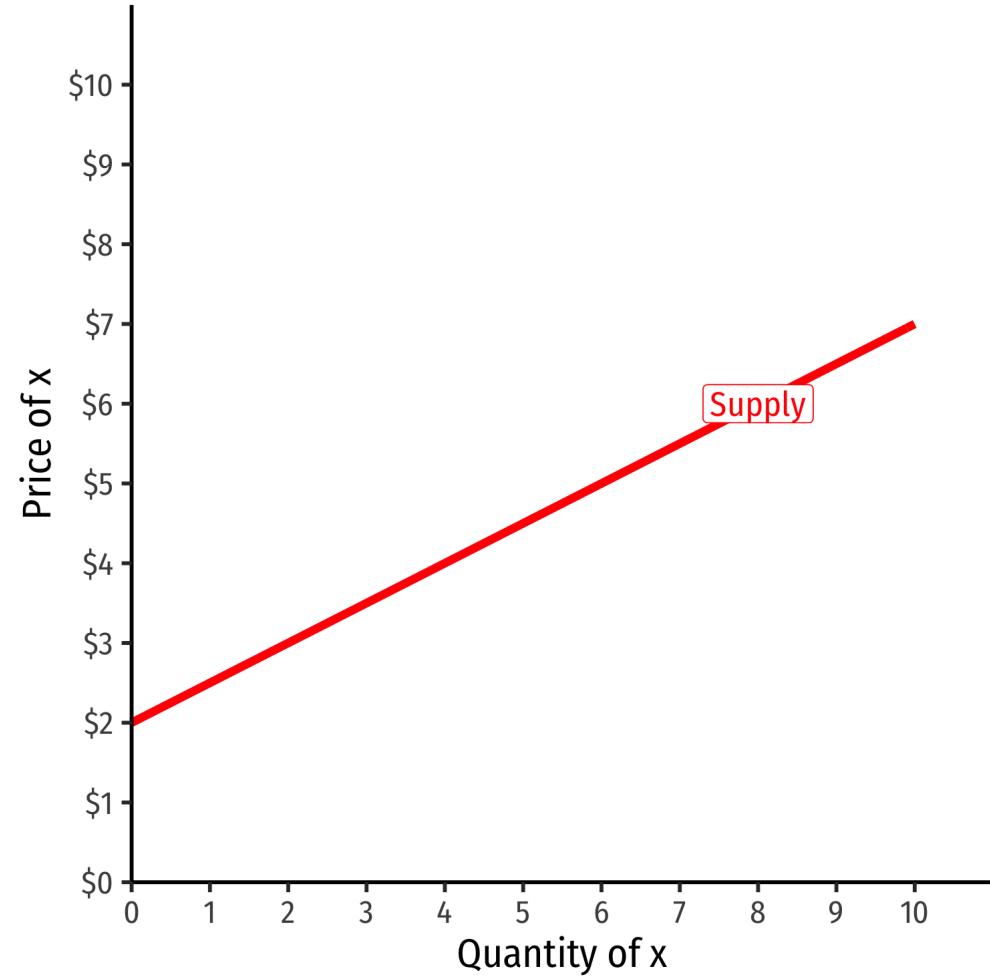
Inverse Supply Function



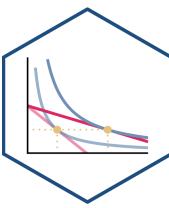
Example:

$$p = 2 + 0.5q$$

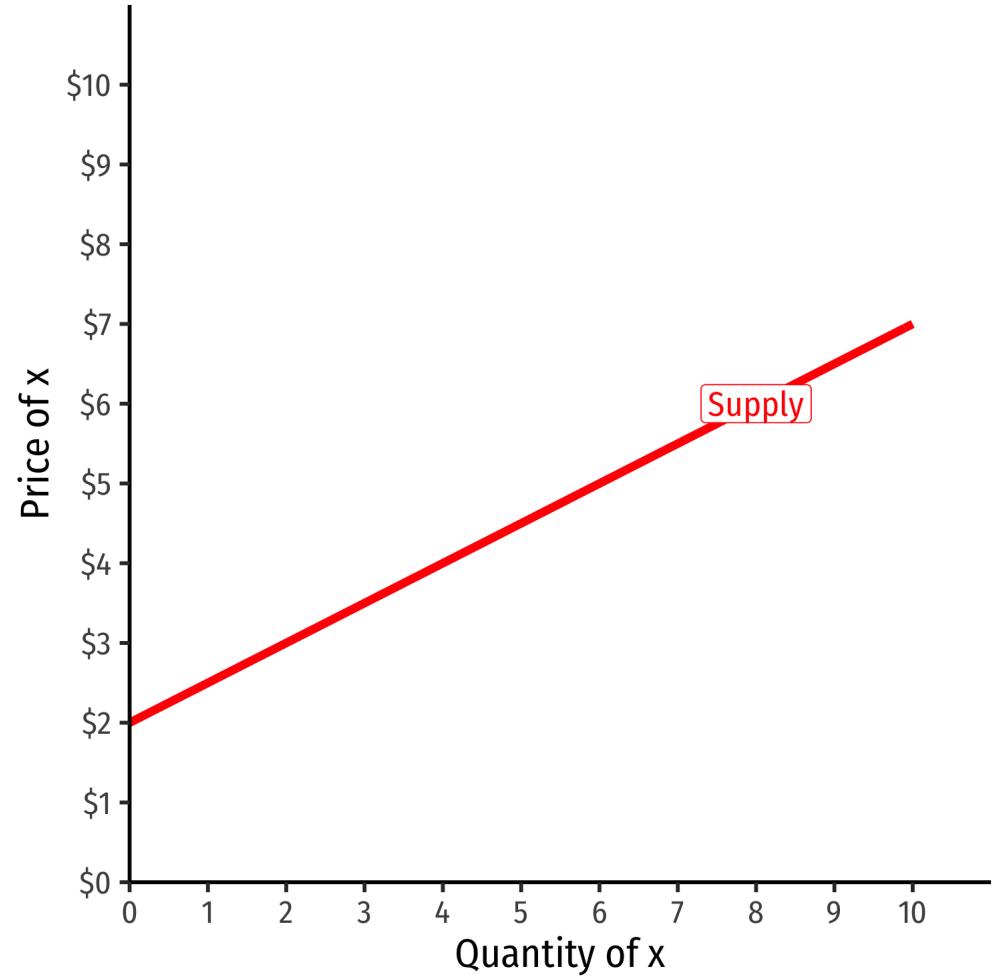
- Slope: 0.5
- Vertical intercept called the "**Choke price**": price where $q_S = 0$ (\$2), just low enough to discourage *any* sales

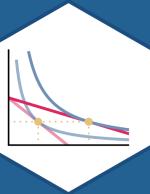


Inverse Supply Function



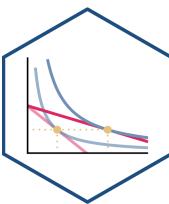
- Read two ways:
- Horizontally: at any given price, how many units firm wants to sell
- Vertically: at any given quantity, the **minimum willingness to accept (WTA)** for that quantity





Price Elasticity of Supply

Price Elasticity of Supply

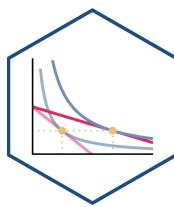


- **Price elasticity of supply** measures *how much* (in %) quantity supplied changes in response to a (1%) change in price

$$\epsilon_{qs,p} = \frac{\% \Delta q_S}{\% \Delta p}$$



Price Elasticity of Supply: Elastic vs. Inelastic

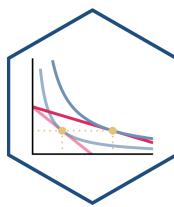


$$\epsilon_{q_s,p} = \frac{\% \Delta q_s}{\% \Delta p}$$

	"Elastic"	"Unit Elastic"	"Inelastic"
Intuitively:	Large response	Proportionate response	Little response
Mathematically:	$\epsilon_{q_s,p} > 1$	$\epsilon_{q_s,p} = 1$	$\epsilon_{q_s,p} < 1$
	Numerator > Denominator	Numerator = Denominator	Numerator < Denominator
A 1% p-change	More than 1% change in q_s	1% change in q_s	Less than 1% change in q_s

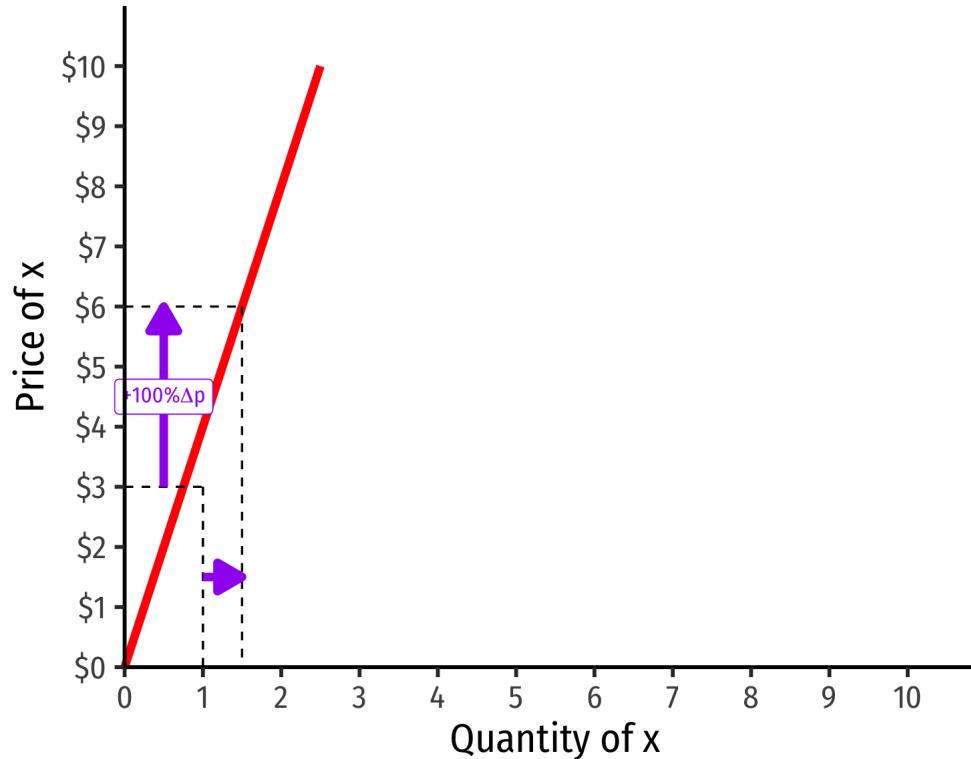
Compare to price elasticity of demand

Visualizing Price Elasticity of Supply

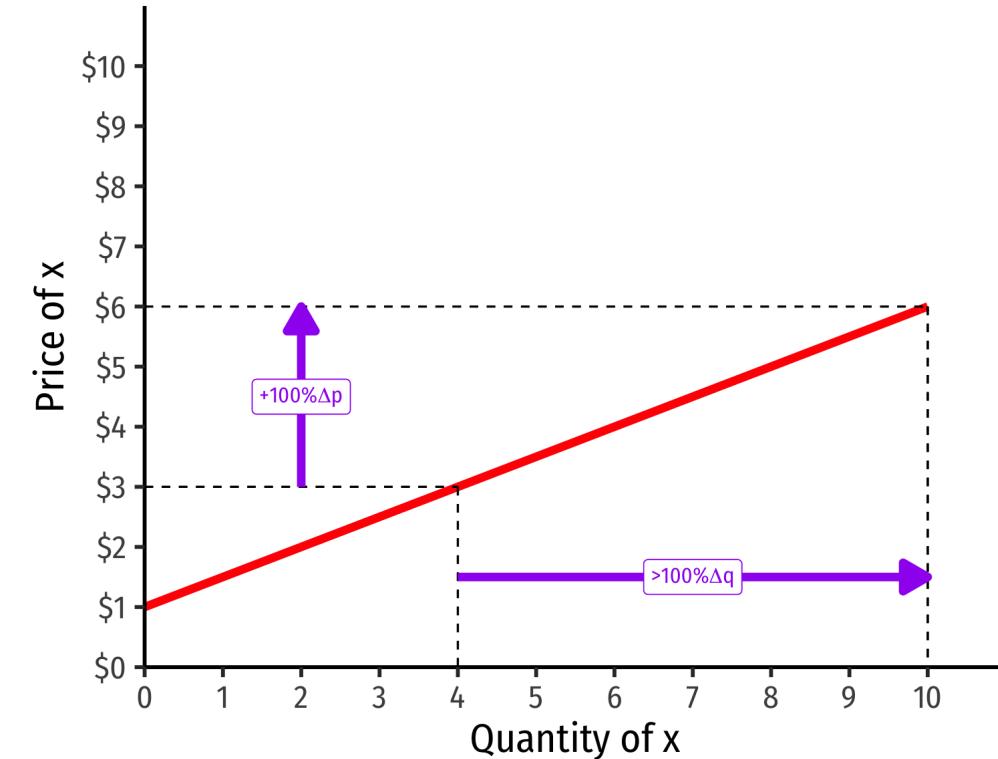


An identical 100% price increase on an:

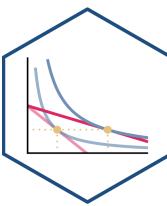
"Inelastic" Supply Curve



"Elastic" Supply Curve



Price Elasticity of Supply Formula

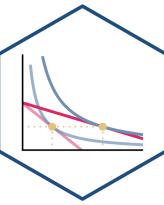


$$\epsilon_{q,p} = \frac{1}{\text{slope}} \times \frac{p}{q}$$

- First term is the inverse of the slope of the inverse supply curve (that we graph)!
- To find the elasticity at any point, we need 3 things:
 1. The price
 2. The associated quantity supplied
 3. The slope of the (inverse) supply curve



Example

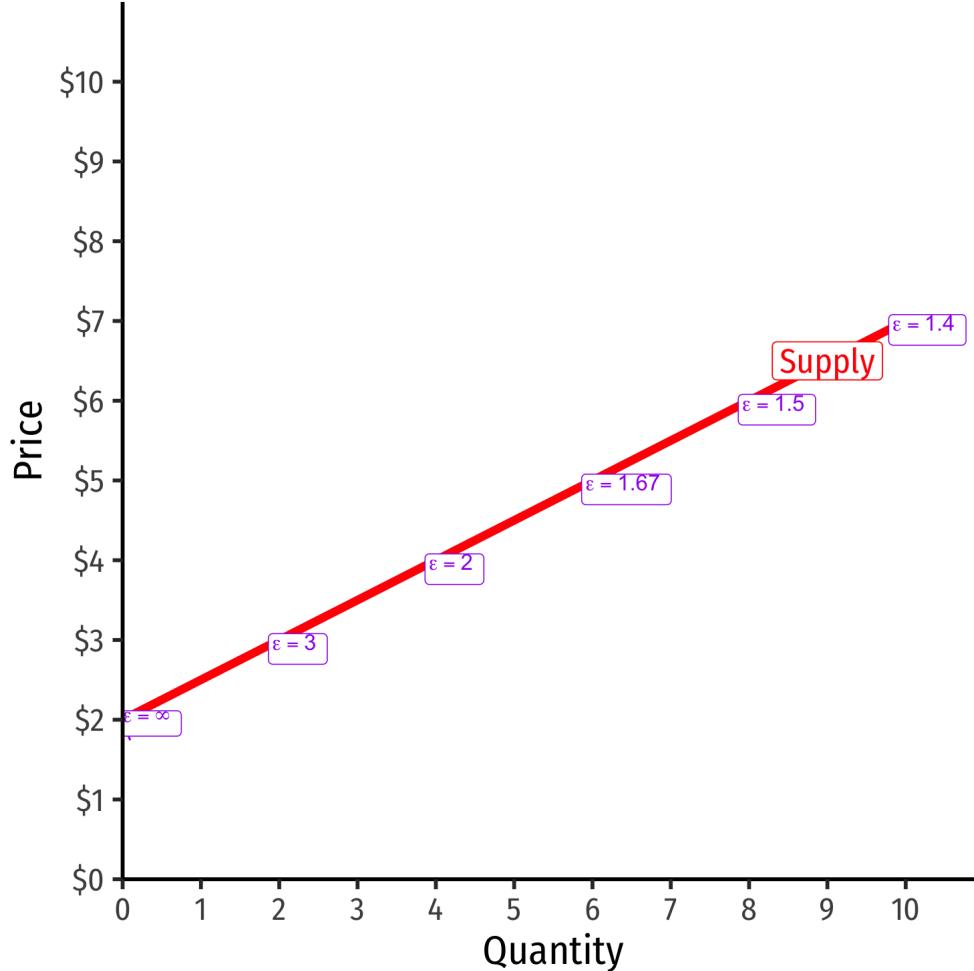
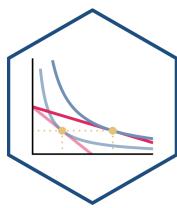


Example: The supply of bicycle rentals in a small town is given by:

$$q_S = 10p - 200$$

1. Find the inverse supply function.
2. What is the price elasticity of supply at a price of \$25.00?
3. What is the price elasticity of supply at a price of \$50.00?

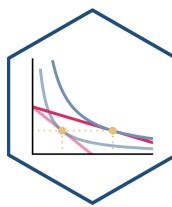
Price Elasticity of Supply Changes Along the Curve



$$\epsilon_{q,p} = \frac{1}{\text{slope}} \times \frac{p}{q}$$

- Elasticity \neq slope (but they are related)!
- Elasticity changes along the supply curve
- Often gets *less* elastic as \uparrow price (\uparrow quantity)
 - Harder to supply more

Determinants of Price Elasticity of Supply I

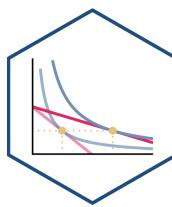


What determines how responsive your selling behavior is to a price change?

- The faster (slower) costs increase with output
 \implies less (more) elastic supply
 - Mining for natural resources vs. automated manufacturing
- Smaller (larger) share of market for inputs
 \implies more (less) elastic
 - Will your suppliers raise the price much if you buy more?
 - How much competition is there in your input markets?



Determinants of Price Elasticity of Supply II

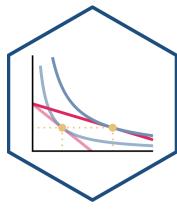


What determines how responsive your selling behavior is to a price change?

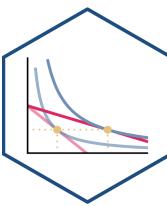
- More (less) **time to adjust** to price changes \implies more (less) elastic
 - Supply of oil today vs. oil in 10 years



Price Elasticity of Supply: Examples



Price Elasticity of Supply: Examples



reason

ALCOHOL

The FDA Is Making It Much, Much Harder for Distilleries To Produce Hand Sanitizer

Rules designed to keep alcohol safe for children are slowing down production of a product that's in short supply.

PETER SUDERMAN | 4.2.2020 11:25 AM

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(Peter Suderman)

In the midst of the COVID-19 pandemic, hand sanitizer has become an incredibly scarce resource. It's practically impossible to find any at a grocery or drug store, or to order it online. But in Washington, D.C., at least, anyone who wants a bottle can get one. All you have to do is buy a bottle of booze.

That's what I did yesterday when I ordered delivery of a pre-bottled cocktail—the delicious rye-apple brand blend, the American Trilogy—from Restorative Republic, a local distiller that makes bourbon, vodka, rye, and apple brandy. A few hours later, the bottle was delivered to my front gate—along with a smaller bottle labeled "hand cleaner."

flexport.

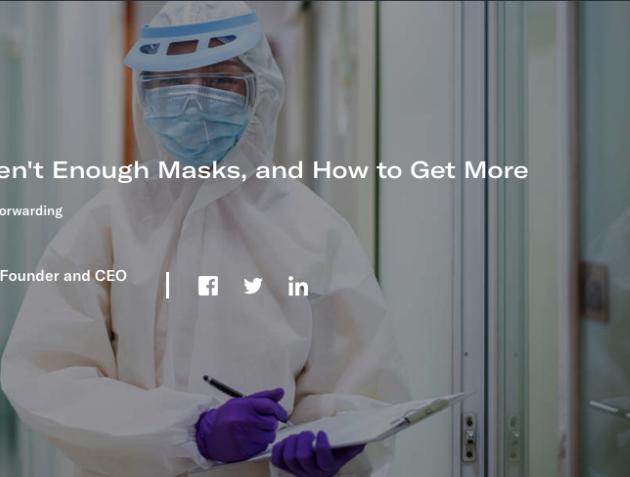
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APR. 14, 2020

Why There Aren't Enough Masks, and How to Get More

Tags: Coronavirus, Freight Forwarding

Ryan Petersen, Flexport Founder and CEO
Flexport CEO

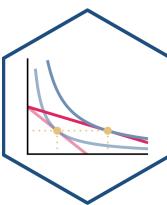


American hospitals are disastrously short of masks and other personal protective equipment (PPE), and demand will only increase. They estimate they will need 20x their ordinary supply over the next few months. In its current form, our supply chain cannot handle this demand shock.

In this blog post, I'll share my view of how this problem happened, and explore some ideas for how we can better serve our healthcare workers.

The current shortage of PPE is not due to a single cause. It has at least five components: insufficient inventory stockpiles, manufacturing capacity and quality control, international trade compliance, air uplift capacity, and working capital financing. And if we don't plan ahead, we'll have a sixth.

Price Elasticity of Supply: Examples



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The Supply of Housing Has Become LESS Elastic

by Alex Tabarrok August 15, 2019 at 7:27 am in Economics

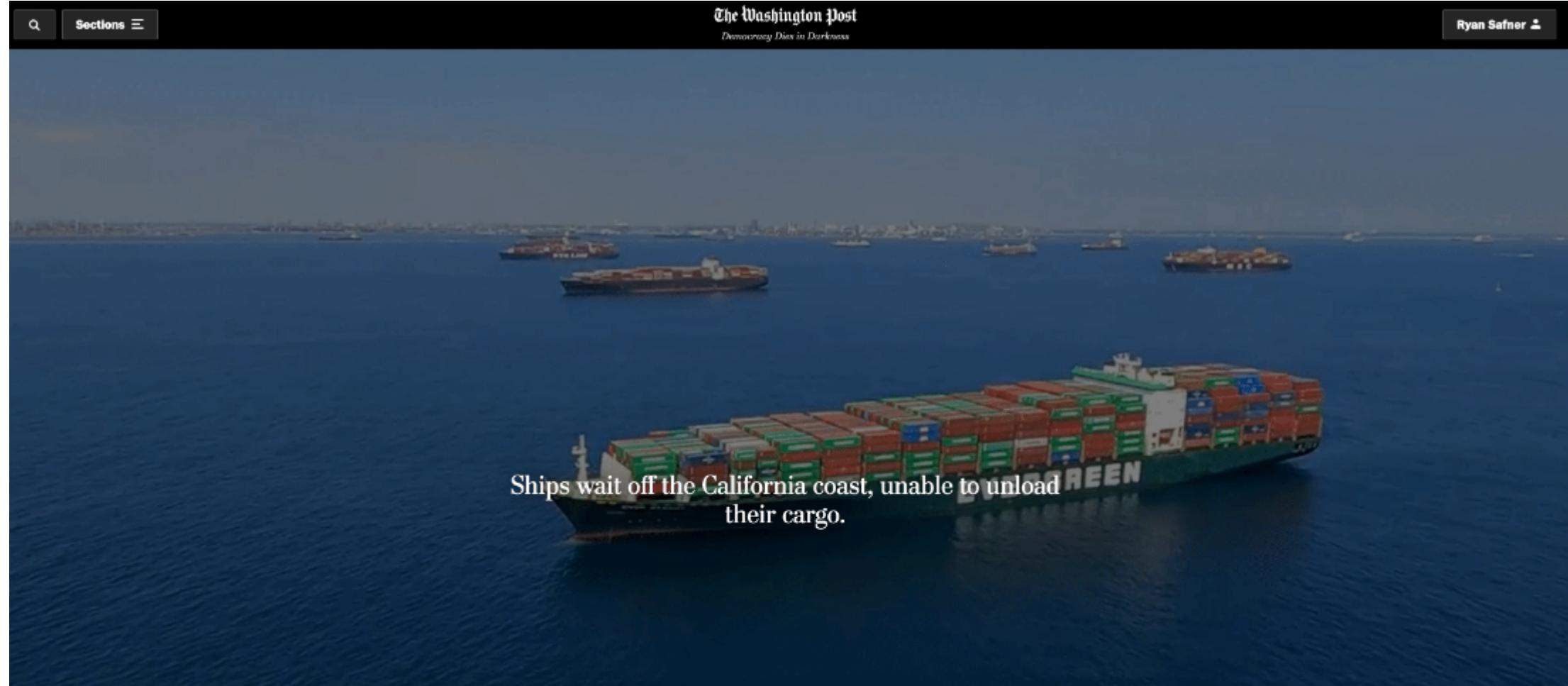
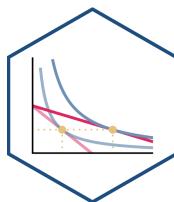
We are now well into another housing boom but as shown by [Aastveit, Albuquerque and Anundsen](#) this boom is in some ways worse than the previous 1996–2006 boom because the supply response has been lower. The first figure, for example, shows that since the trough in 2012 house prices have risen a little bit *faster* in this boom than in the 1996–2006 boom and they have risen much faster relative to income (HPI is housing price index).

Notes: The figure tracks the evolution of real house prices at a quarterly frequency (left panel) and house prices scaled by income per capita (right panel) during the two house price booms. The zero on the x-axis marks the beginning of each housing boom. We scale the series to 100 at that point. We measure real house prices with the FHFA house price index, a weighted, repeat-sales index, deflated by CPI. The solid orange line refers to the boom between 1996q4 and 2006q4, while the blue line is from 2012q2 to 2017q2.

Over the same time, however, the number of new building permits and housing starts has been lower than in the previous boom (top two panels of figure 2 below). If prices have gone up as much as before but quantity has not, it follows that the elasticity of housing supply has fallen. Occasionally it's suggested that there is an "overhang" of housing from the previous boom but that is not true. If anything, as shown in the bottom left panel, there is a decline in the housing stock relative to population.

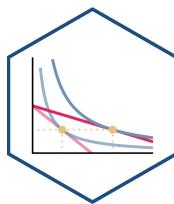
"[T]he number of new building permits and housing starts has been lower than in the previous boom...if prices have gone up as much as before but quantity has not, it follows that the elasticity of supply has fallen."

Price Elasticity of Supply: Examples



Source: Washington Post (Oct 2, 2021): "[Inside America's Broken Supply Chain](#)"

Price Elasticity of Supply: Examples



Ryan Petersen

@typesfast



Yesterday I rented a boat and took the leader of one of Flexport's partners in Long Beach on a 3 hour tour of the port complex. Here's a thread about what I learned.

9:39 AM · Oct 22, 2021



[Read the full conversation on Twitter](#)

34.6K

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