1.4 — Perfect Competition II

ECON 326 • Industrial Organization • Spring 2023

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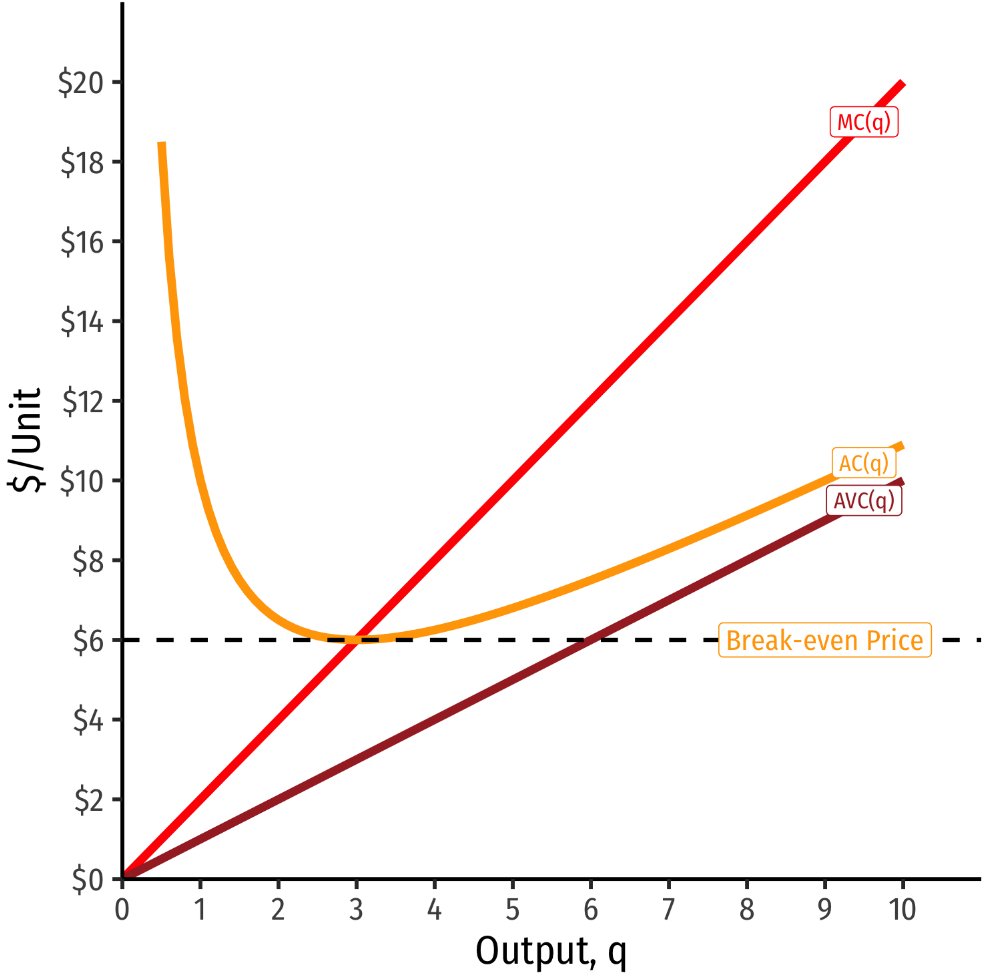
ioS23.classes.ryansafner.com

Outline

Firm's *Long Run* Supply Decisions

Firm Decisions in the Long Run I



- $AC(q)_{min}$ at a market price of $6
  - Firm earns **"normal" economic profits**
- At any market price **below** $6.00, firm earns **losses**
  - Short Run: firm shuts down if $p < AVC(q)$
- At any market price **above** $6.00, firm earns **"supernormal" profits** (>0)

Firm Supply Decisions in the Short Run vs. Long Run

- **Short run**: firms that shut down $(q^* = 0)$ stuck in market, incur fixed costs $\pi = -f$

Firm Supply Decisions in the Short Run vs. Long Run

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- **Long run**: firms earning losses $(\pi<0)$ can **exit** the market and earn $\pi=0$

  - No more fixed costs, firms can sell/abandon f at $q^*=0$

Firm Supply Decisions in the Short Run vs. Long Run

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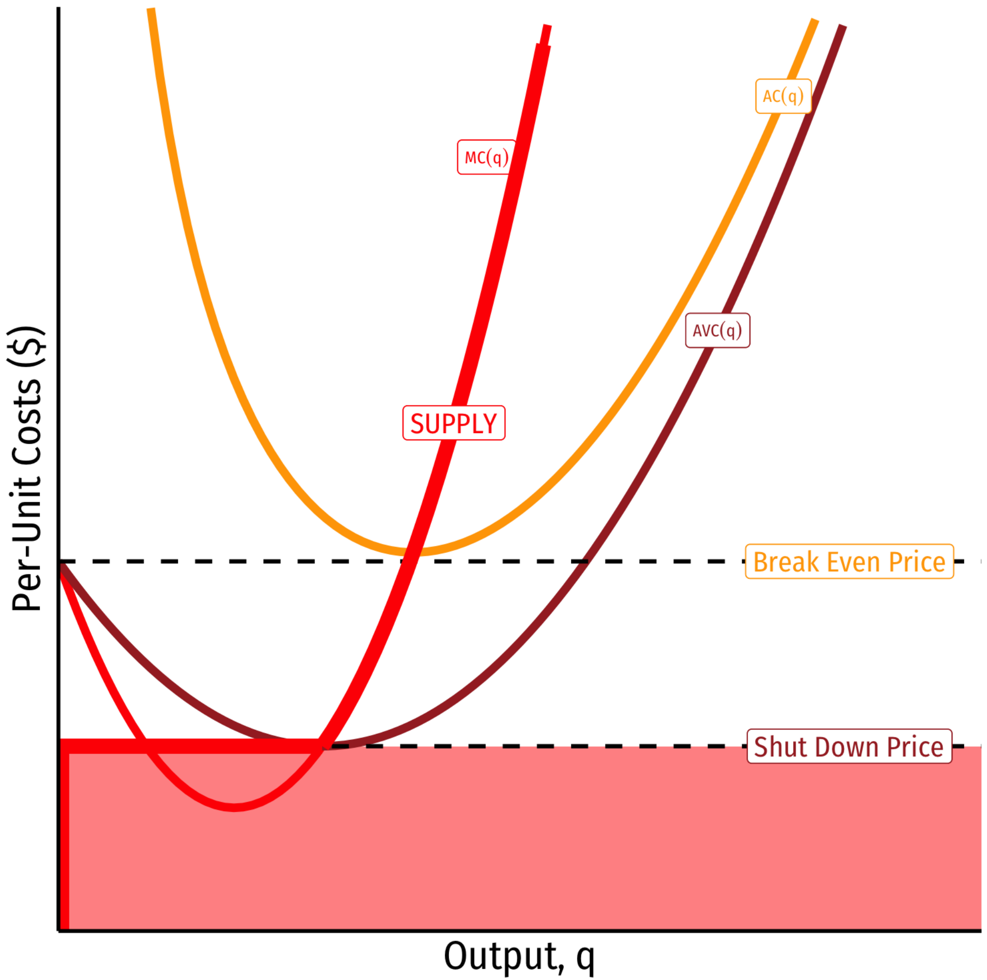
- **Long run**: firms earning losses $(\pi < 0)$ can **exit** the market and earn $\pi = 0$

    - No more fixed costs, firms can sell/abandon f at $q^* = 0$

- Entrepreneurs not *currently* in market can **enter** and produce, if entry would earn them $\pi > 0$

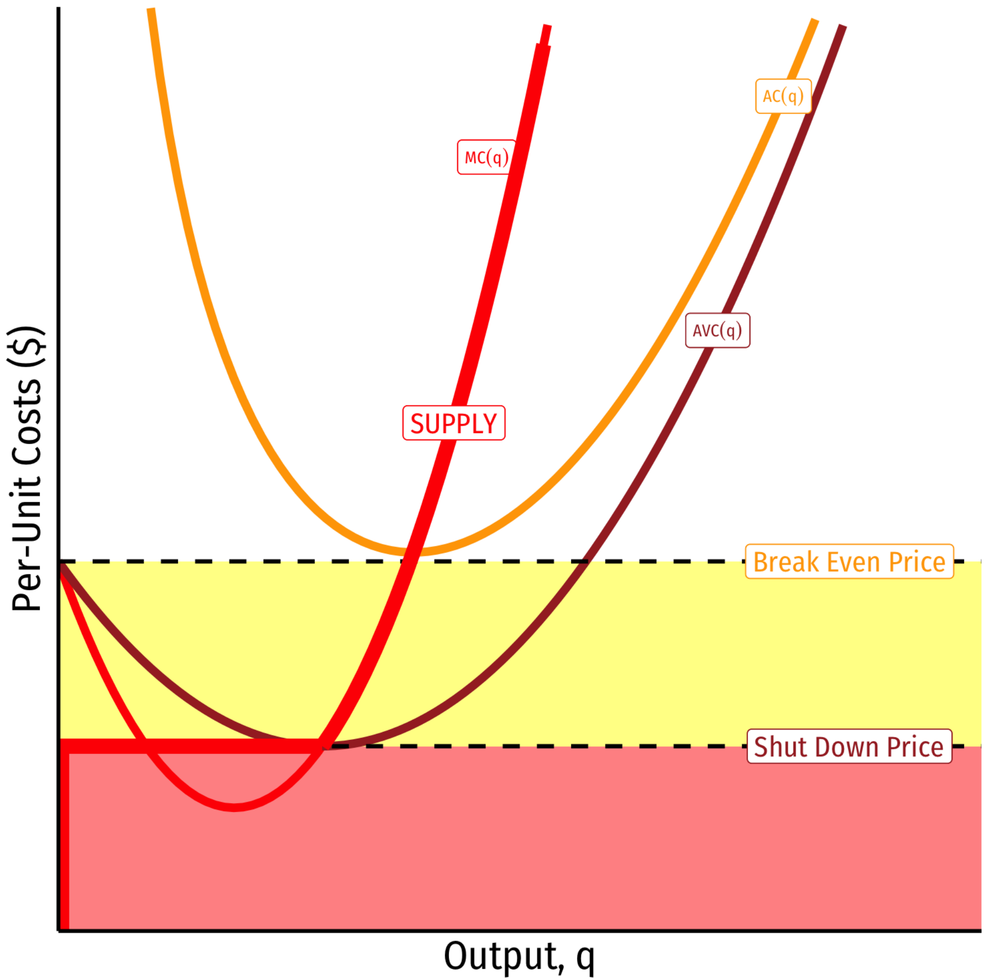
Firm's Long Run Supply: Visualizing



When $p < AVC$

- Profits are *negative*
- **Short run**: **shut down** production
  - Firm loses more π by producing than by not producing
- **Long run**: firms in industry **exit** the industry
  - *No* new firms will *enter* this industry

Firm's Long Run Supply: Visualizing



When $AVC < p < AC$

- Profits are *negative*
- **Short run**: **continue** production
  - Firm loses *less* π by producing than by *not* producing
- **Long run**: firms in industry **exit** the industry
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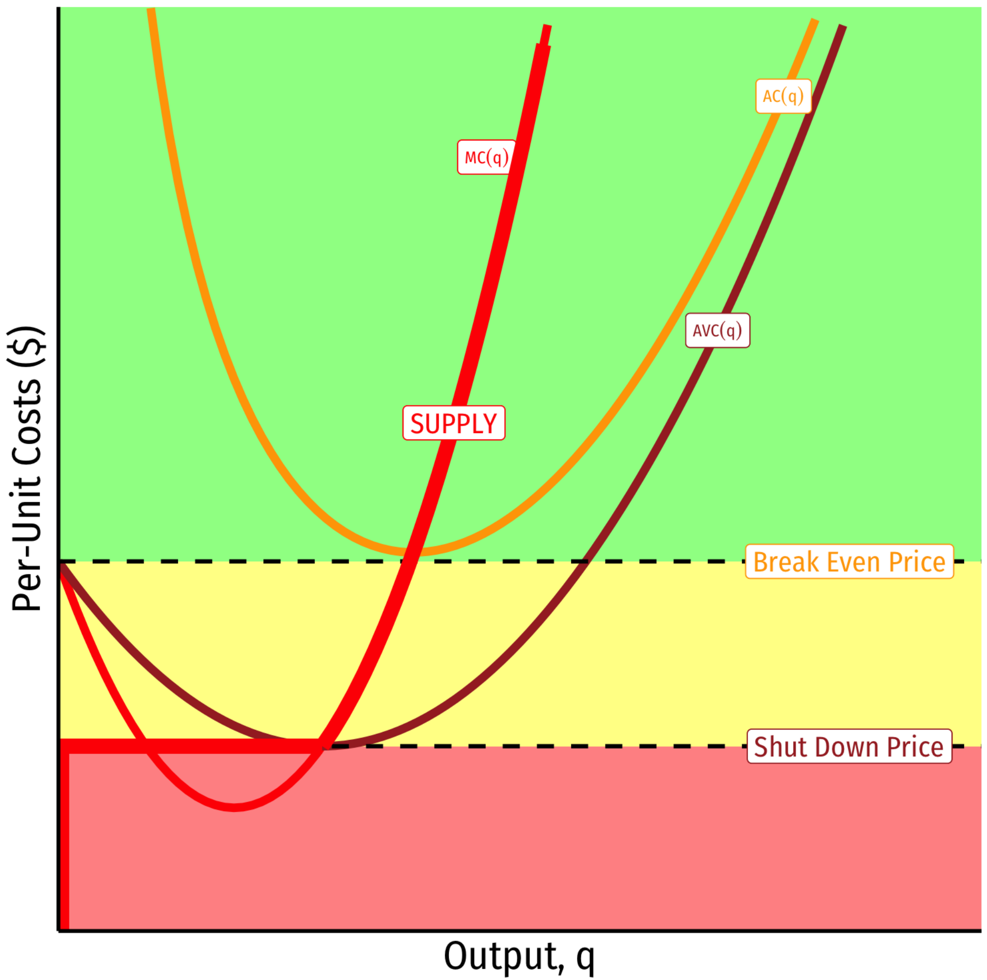
Firm's Long Run Supply: Visualizing



When $AC < p$

- Profits are *positive*
- **Short run**: **continue** production
  - Firm earning profits
- **Long run**: firms in industry **stay** in industry
  - **New** firms will **enter** this industry

Profit Maximization Rules for Firms:

1. Choose q^* such that $MR(q) = MC(q)$

2. Profit $\pi = q[p - AC(q)]$

3. Shut down in *short run* if $p < AVC(q)$

$$AVC(q)_{min} = MC(q)$$

Firm's short run supply curve:

$$\begin{cases} p = MC(q) & \text{if } p \geq AVC \\ q = 0 & \text{If } p < AVC \end{cases}$$

4. Exit in *long run* if `\\(p<AC(q)\\)`

$$AC_{min}(q) = MC(q)$$

Market Entry and Exit

Exit, Entry, and Long Run Industry Equilibrium I

- Now we must combine **optimizing** *individual* firms with *market-wide* adjustment to **equilibrium**

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Exit, Entry, and Long Run Industry Equilibrium I

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- Since $\pi = [p - AC(q)]q$, in the **long run**, profit-seeking firms will:

  - **Enter** markets where $p > AC(q)$
  - **Exit** markets where $p < AC(q)$

Exit, Entry, and Long Run Industry Equilibrium II

- **Long-run equilibrium**: entry and exit ceases when $p = AC(q)$ for all firms, implying **normal economic profits** of $\pi = 0$

Exit, Entry, and Long Run Industry Equilibrium II

- **Long-run equilibrium**: entry and exit ceases when $p = AC(q)$ for all firms, implying **normal economic profits** of $\pi = 0$

- **Long run economic profits for all firms in a *competitive* industry are 0**

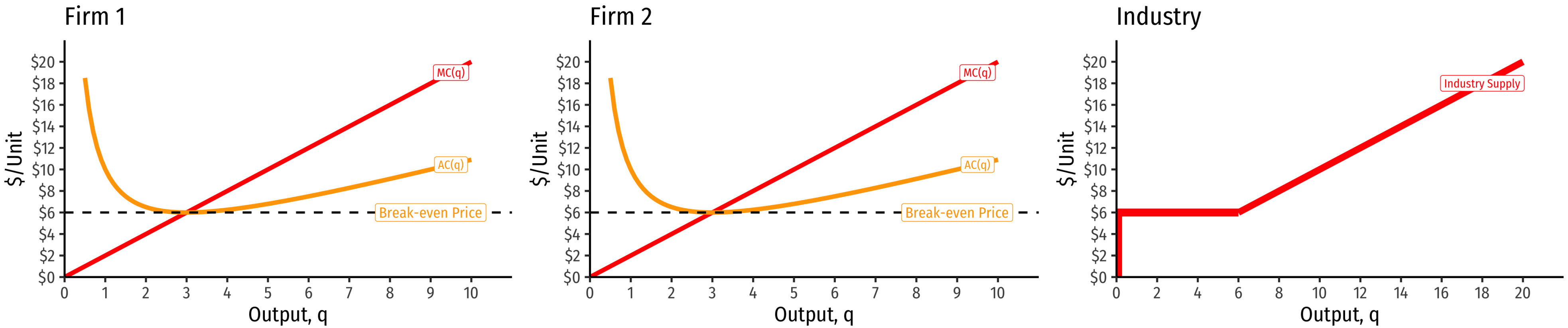
- Firms must earn an *accounting* profit to stay in business

Deriving the Industry Supply Curve

The Industry Supply Curve

- **Industry supply curve**: horizontal sum of all individual firms' supply curves
    - recall: $(MC(q)$ curve above $AVC_{min})$ (shut down price)
- To keep it simple on the following slides:
    - assume no fixed costs, so $AC(q) = AVC(q)$
    - then industry supply curve is sum of individual $MC(q)$ curves above $AC(q)_{min}$

Industry Supply Curves (Identical Firms)



- Industry supply curve is the horizontal sum of all individual firm's supply curves
  - Which are each firm's marginal cost curve above its breakeven price

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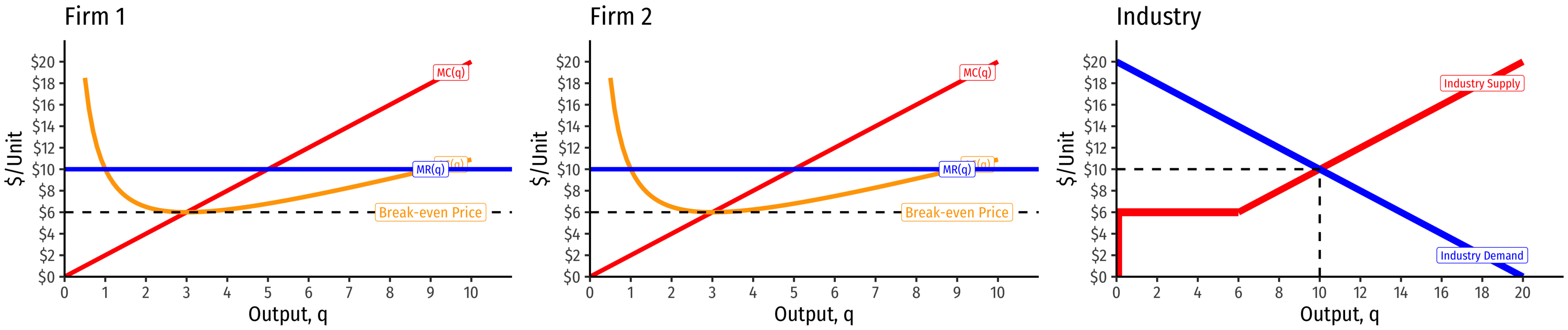
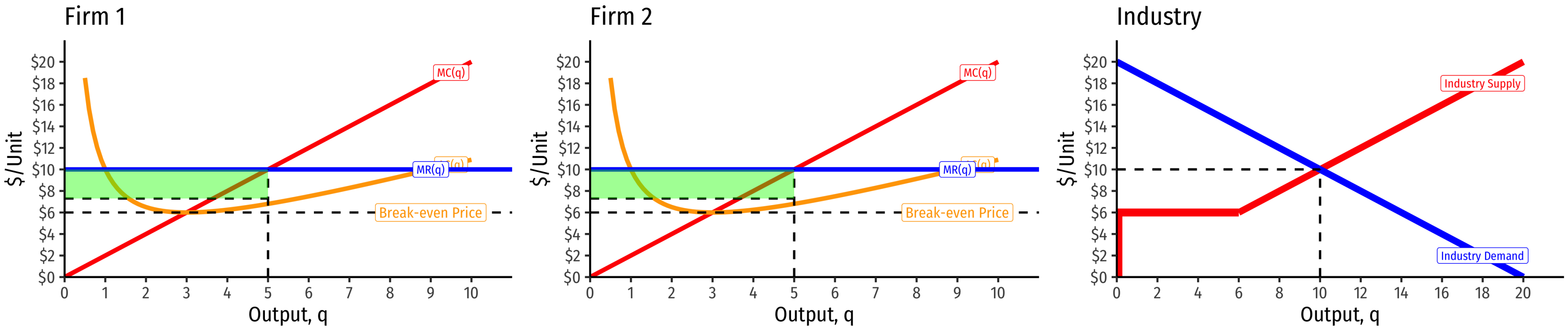


- Industry demand curve (where equal to supply) sets market price, demand for firms

Industry Supply Curves (Identical Firms)



- **Short Run**: each firm is earning **profits** $p > AC(q)$
- **Long run**: induces entry by firm 3, firm 4, $\cdots$, firm n
- **Long run industry equilibrium**:

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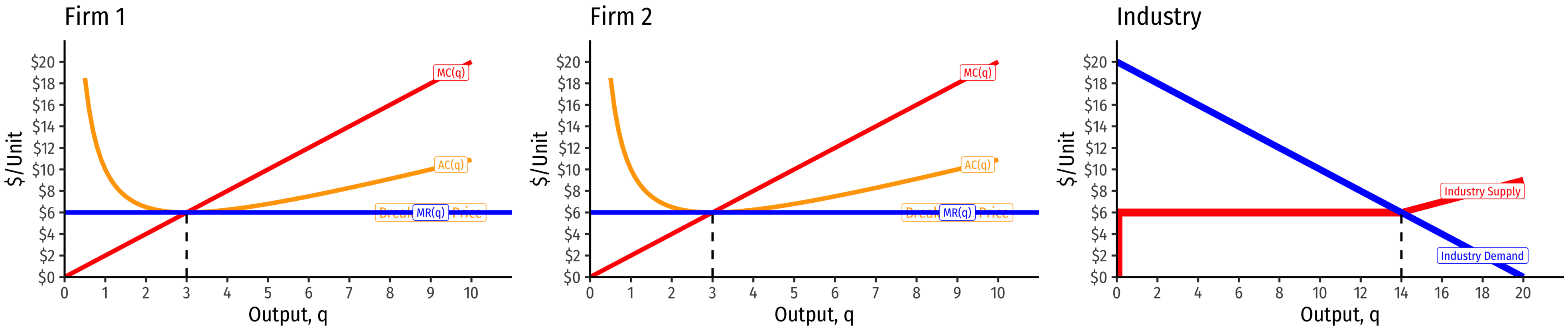


- **Short Run**: each firm is earning **profits** $p > AC(q)$
- **Long run**: induces entry by firm 3, firm 4, $\cdots$, firm n
- **Long run industry equilibrium**: $p = AC(q)_{min}, \pi = 0$ at $p =$ \$6; supply becomes more **elastic**

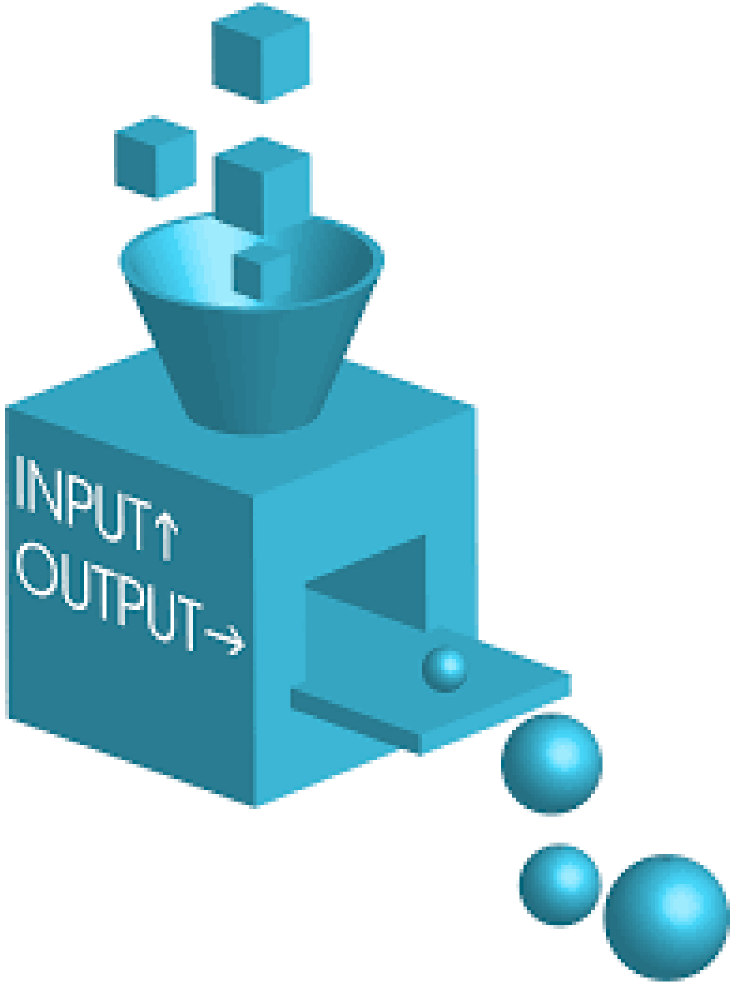
Economic Rents, Profits, & Competition

Back to Zero Economic Profits

- Recall, we've essentially defined a **firm** as a completely **replicable recipe** (**production function**) of resources

$$q = f(L, K)$$

- **"Any idiot"** can enter market, buy required (L, K) at prices (w, r), produce q^* at market price p and earn the market rate of π



Back to Zero Economic Profits

- Zero long run economic profit $\neq$ industry *disappears*, just **stops growing**

- Less attractive to entrepreneurs & start ups to enter than other, more profitable industries

- These are **mature** industries (again, often commodities), the backbone of the economy, just not *sexy*!

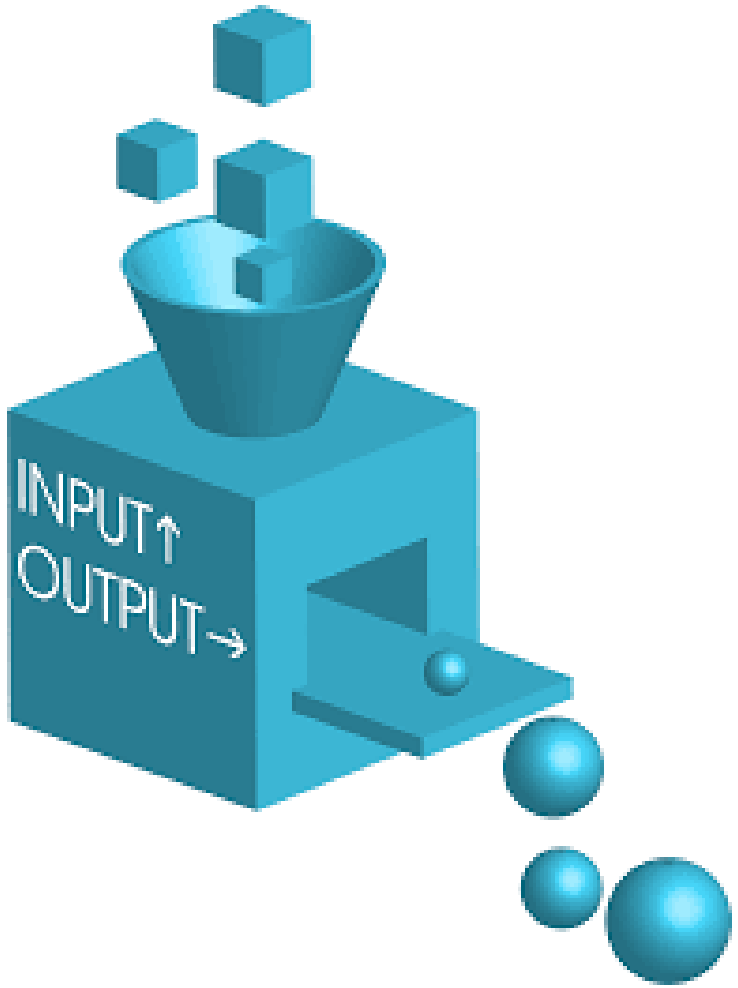
Back to Zero Economic Profits

- All factors are paid their market price
  - i.e. their **opportunity cost** — what they could earn *elsewhere* in economy
- Firms earn **normal market rate of return**
  - No *excess* rewards (economic profits) to attract *new* resources into the industry, nor *losses* to push resources out of industry

Back to Zero Economic Profits

- But we've so far been imagining a market where every firm is *identical*, just a recipe “any idiot” can copy

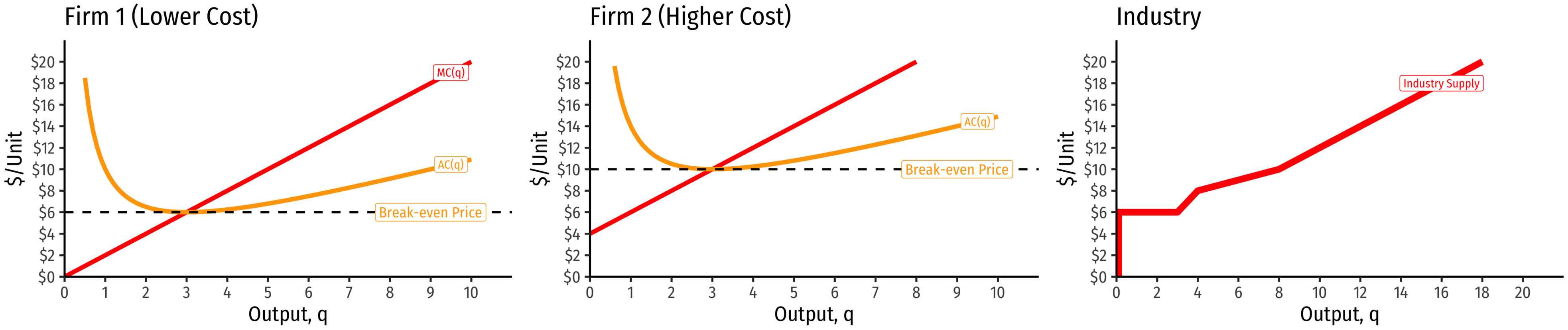
- What about if firms have *different* technologies or costs?



Industry Supply Curves (*Different* Firms) I

- Firms have **<u>different</u> technologies/costs** due to relative differences in:
  - Managerial talent
  - Worker talent
  - Location
  - First-mover advantage
  - Technological secrets/IP
  - License/permit access
  - Political connections
  - Lobbying
- Let's derive **industry supply curve** again, and see how this may affect profits

Industry Supply Curves (*Different* Firms) II



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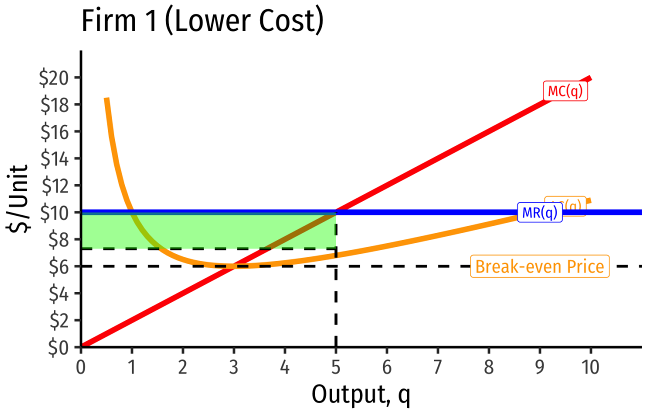
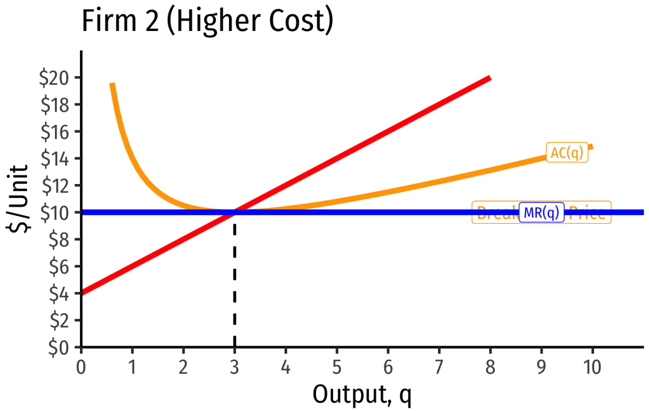
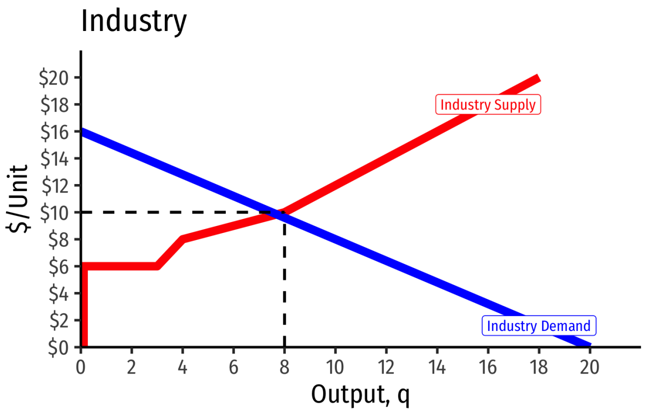
Industry Supply Curves (*Different* Firms) II







- Industry demand curve (where equal to supply) sets market price, demand for firms
- **Long run industry equilibrium**: $p = AC(q)_{min}, \pi = 0$ for **marginal (highest cost) firm** (Firm 2)
- Firm 1 (lower cost) appears to be earning **profits**...(we'll come back to this)

Economic Rents and Zero Economic Profits I

- **Long-run equilibrium** $p = AC(q)_{min}$ **of the *marginal (highest-cost)* firm**
- **The marginal firm earns normal economic profit (of zero)**
  - Otherwise, if $p > AC(q)$ for that firm, would induce *more* entry into industry!
- Generalized, **No-Profitable Entry Condition**: in equilibrium, no firm can earn positive profits by entering the industry

Economic Rents and Zero Economic Profits I

- "Inframarginal" (lower-cost) firms are using resources that earn economic rents
  - returns **higher** than their opportunity cost (what is needed to bring them into *this* industry)
- Economic rents arise from **relative differences** between resources

Economic Rent

- **Economic rent**: a return or payment for a resource above its normal market return (opportunity cost)
- Has no allocative effect on resources, entirely “inframarginal”
- A windfall return that resource owners get for free

Sources of Economic Rents

- **Some factors are relatively scarce *in the whole economy***
  - (talent, location, secrets, IP, licenses, being first, political favoritism)

Firms Using Resources with Economic Rents

- **Inframarginal** firms that employ these scarce factors gain a **short-run profits** from having lower costs/higher productivity

- ...But what will happen to the prices for their scarce factors over time?

Economic Rents Examples

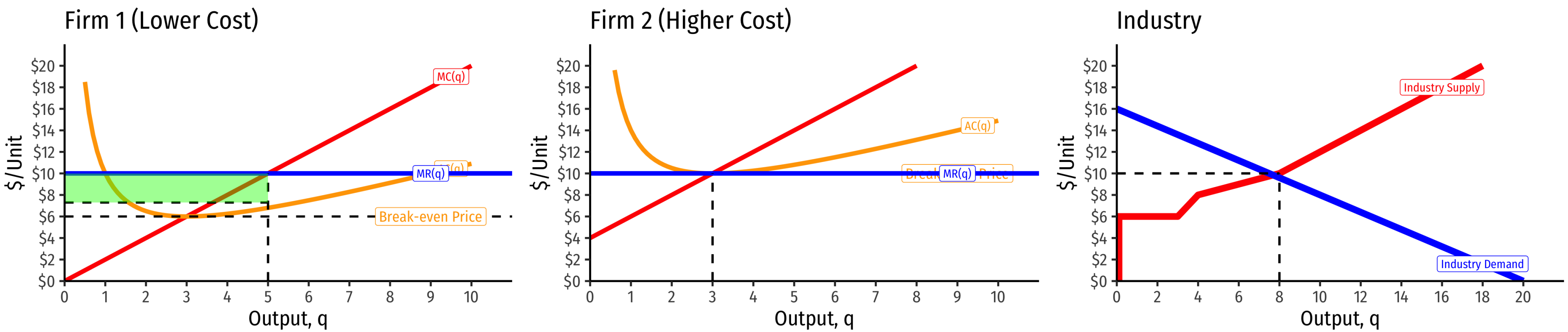
Economic Rents and Zero Economic Profits

- In a competitive market, over the long run, **profits are dissipated through competition**
  - Rival firms willing to pay for the scarce factor to gain an advantage
- Competition over acquiring the scarce factors **pushes up their prices**
  - i.e. higher costs to firms of using the factor!
- **Rents are included in the opportunity cost (price) for inputs over long run**
  - Must pay a factor enough to keep it *out of other uses*

Economic Rents and Zero Economic Profits

- From the firm’s perspective, over the long-run, **rents are included in the price (opportunity cost) of the scarce factor**
    - Must pay a factor enough to keep it out of other uses
- Firm does not earn the rents, they raise firm's costs and squeeze profits to zero!

Economic Rents Reduce Firms’ Profits Over Long Run



- **Short Run**: firm that possesses scarce rent-generating factors has lower costs, perhaps short-run profits

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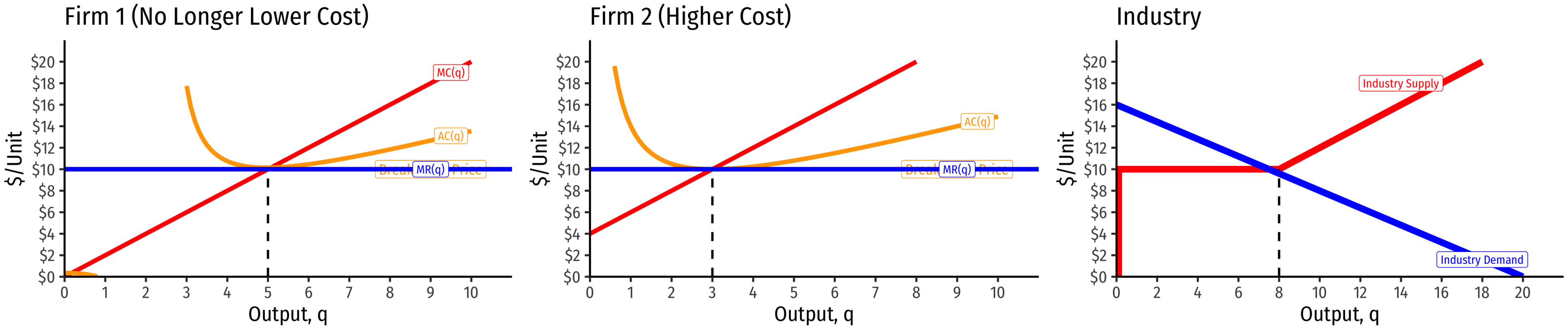


- **Short Run**: firm that possesses scarce rent-generating factors has lower costs, perhaps short-run profits
- **Long run**: competition over those factors pushes up their prices, **raising costs to firm**, until its profits go to zero as well
  - Increase in *fixed* cost (scarce factor), raising AC(q), which now includes rents (more info in appendix)

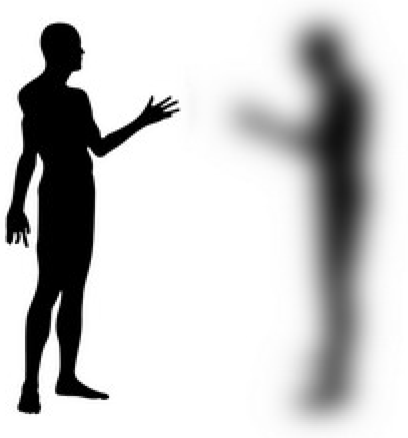
Economic Rents Go To Resource Owners

- **Owners of scarce factors** (workers, landowners, inventors, etc) **earn the rents as higher income for their services** (wages, land rent, interest, royalties, etc).

- Often induces competition to supply alternative factors, which *may* dissipate the rents (to zero)
    - More workers invest in becoming talented, try to create new inventions, build new land, etc.

Recall: Accounting vs. Economic Point of View

- Recall **"economic point of view"**:
- Producing *your* product pulls scarce resources *out of other productive uses* in the economy
- **Profits attract resources**: pulled out of other (less valuable) uses
- **Losses repel resources**: pulled away to other (more valuable) uses
- **Zero profits keep resources where they are**
  - Implies **society is using resources optimally**



Example

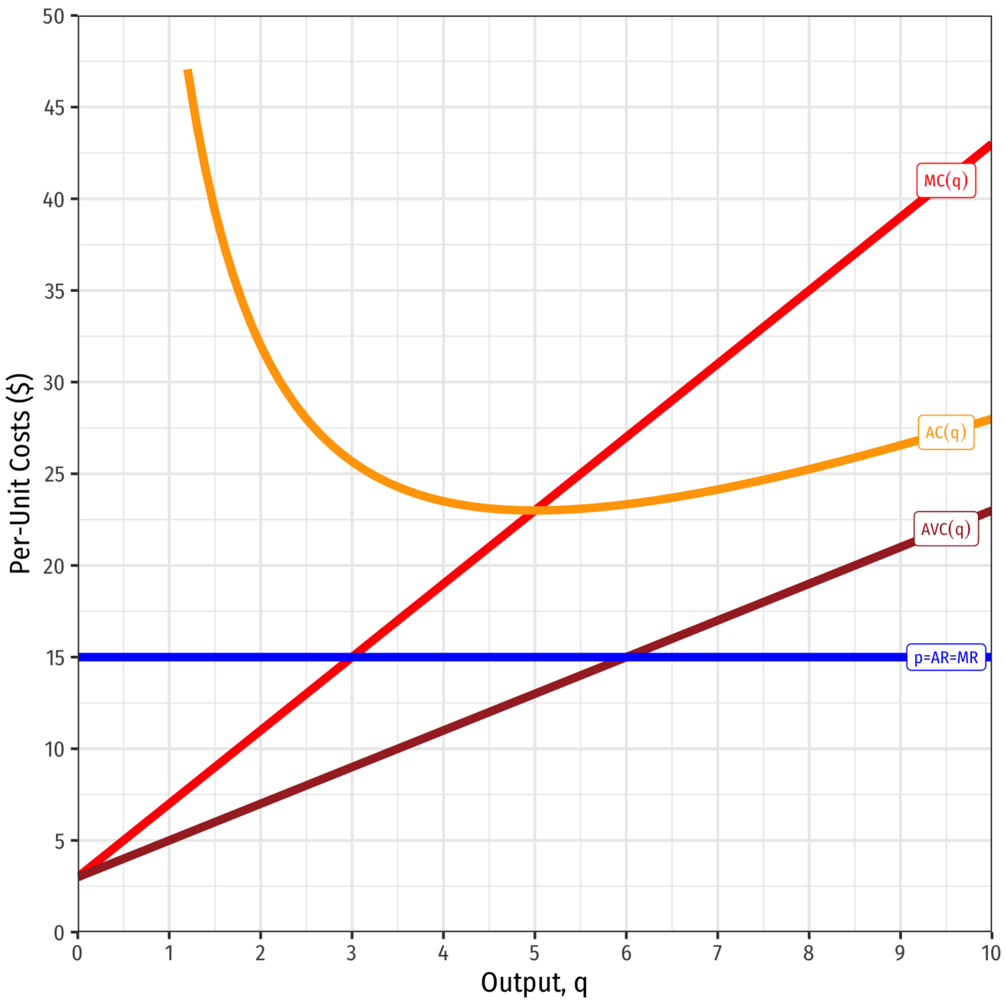
Example: Daniel's Midland Archers has the following cost structure for producing archery bows:

$$C(q) = 2q^2 + 3q + 50$$
$$MC(q) = 4q + 3$$

Suppose the market is very competitive and the current market price is \$15.

1. How many bows should the firm produce?
2. How much profit will it earn per day?
3. At what price would the firm break even?
4. At what price should the firm shut down in the short run?
5. Write equations for firm's short-run supply curve and long-run supply curve.

Example: Visualized



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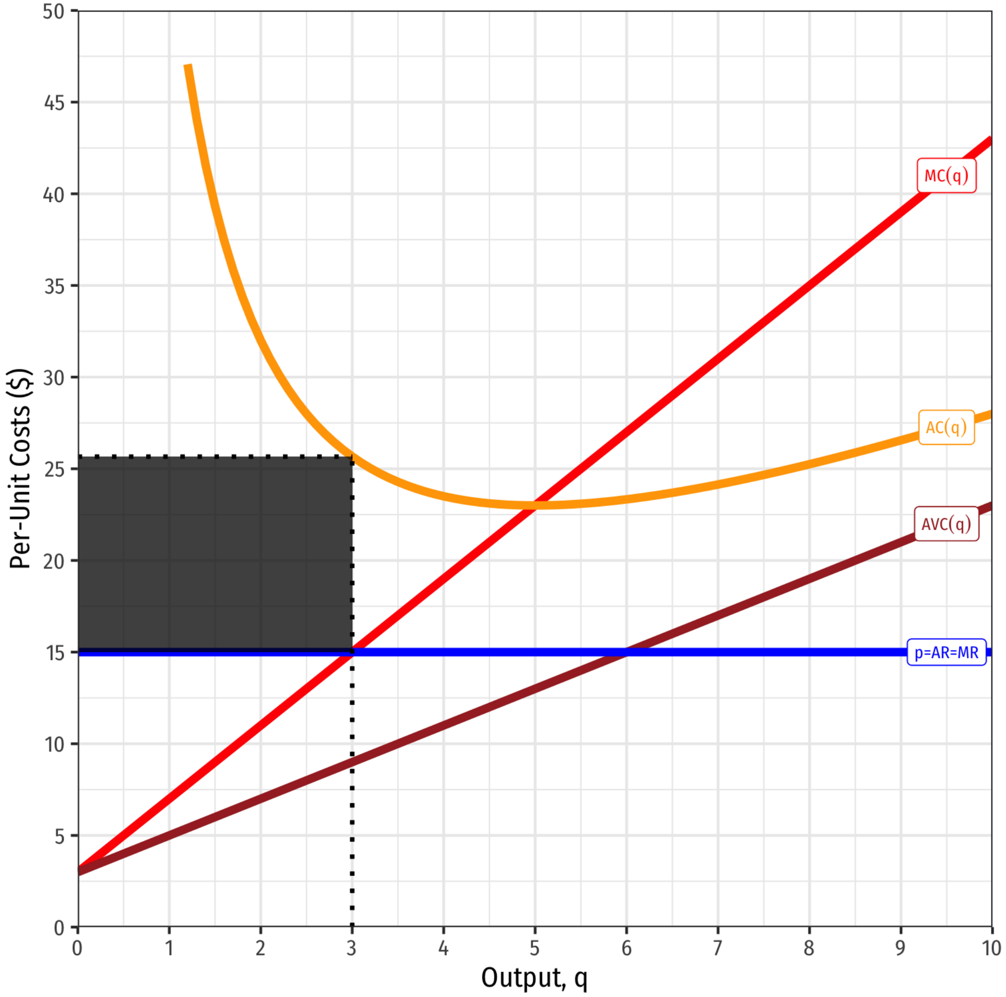

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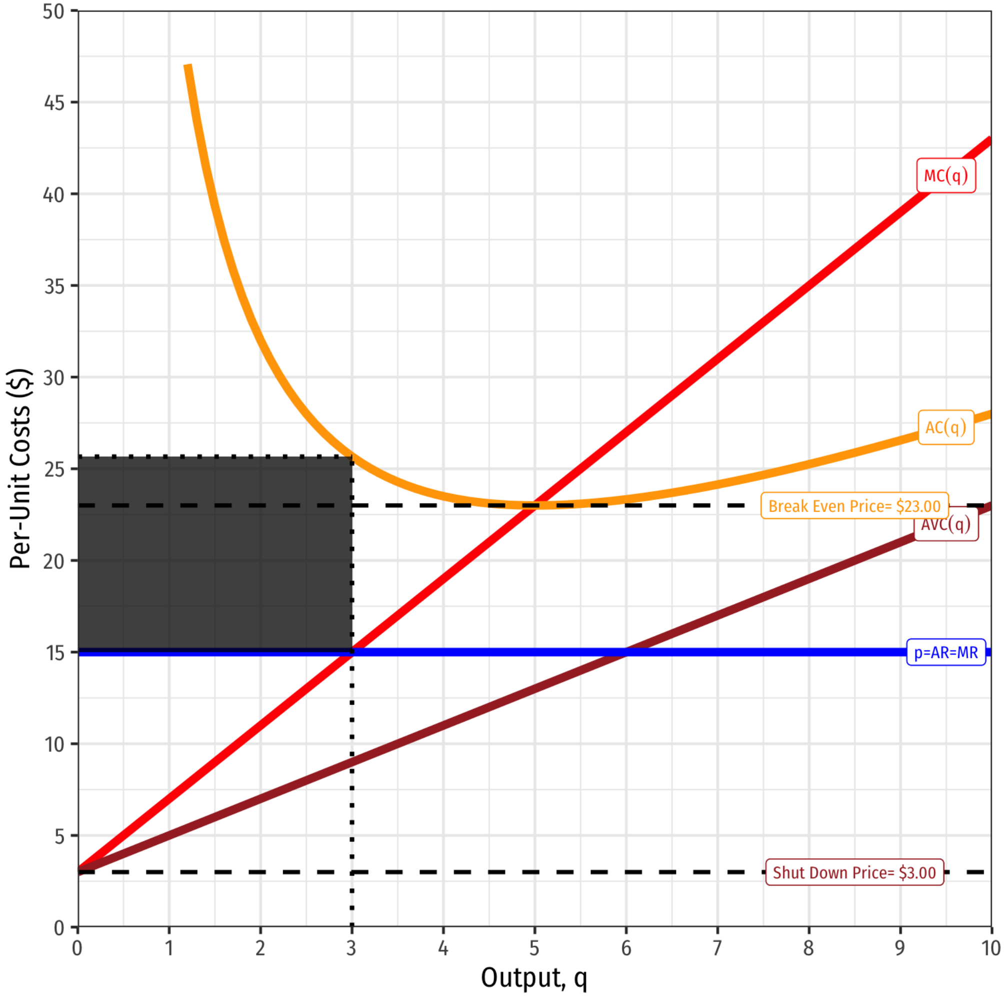

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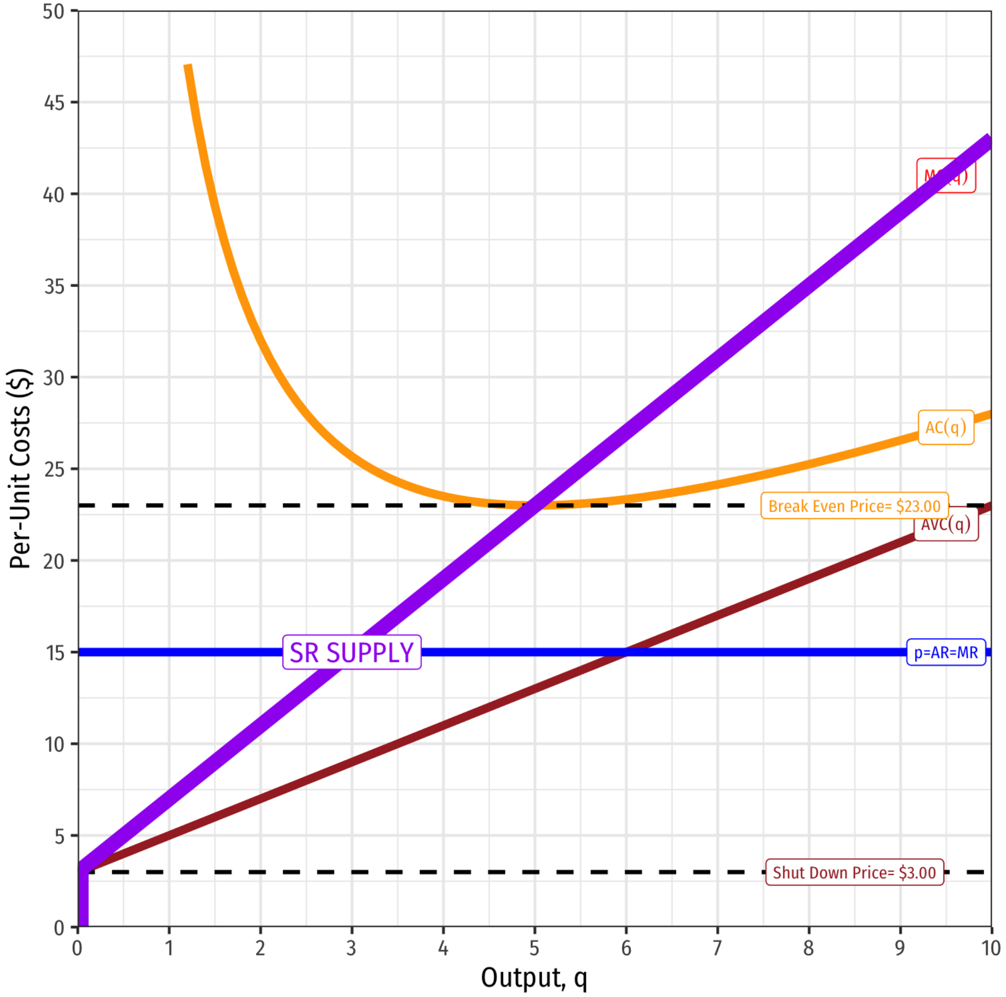
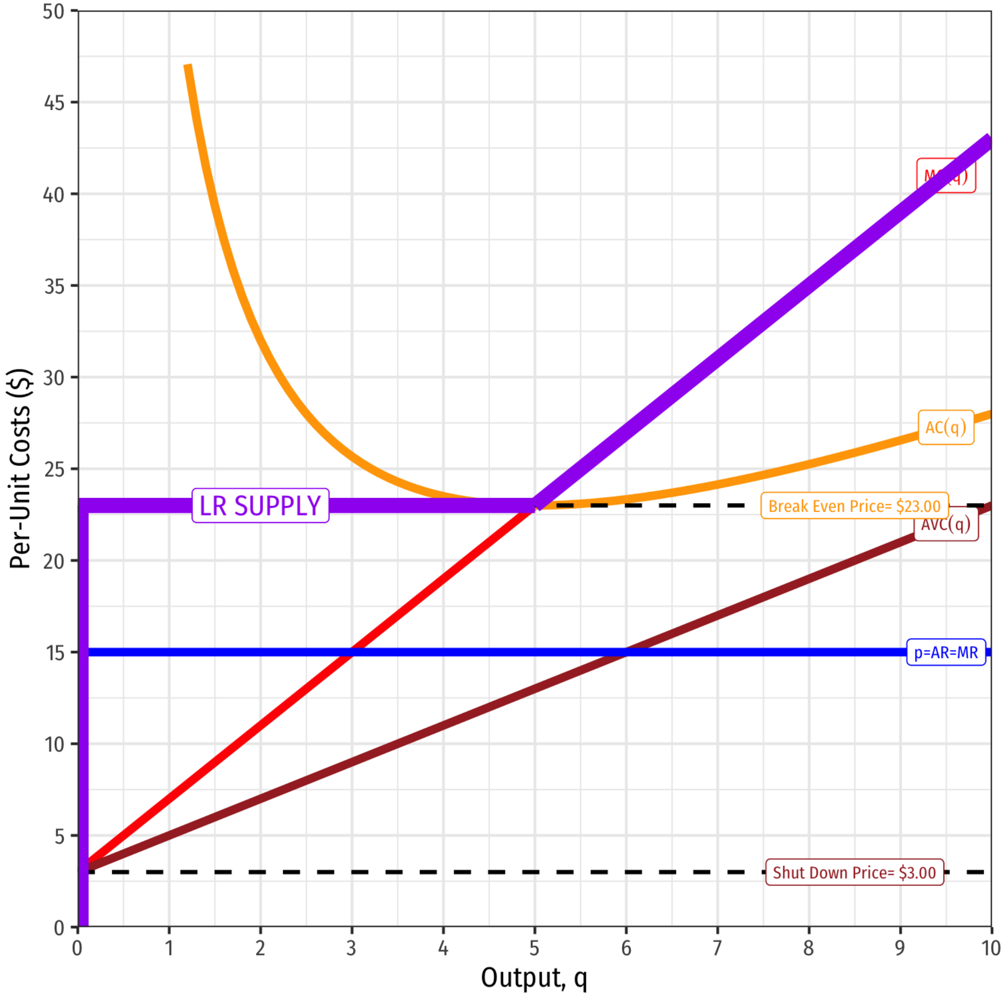
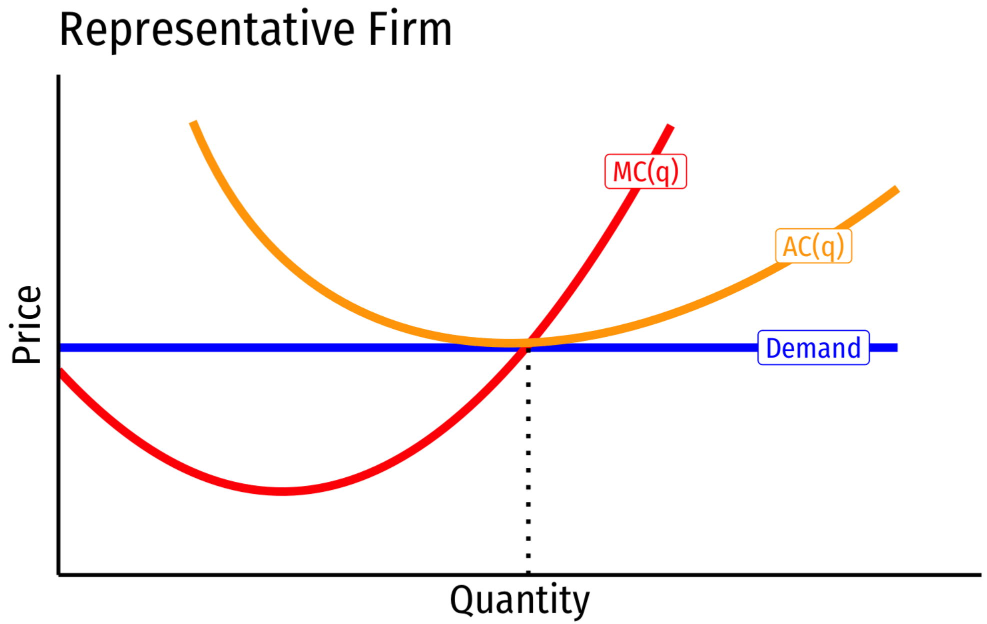


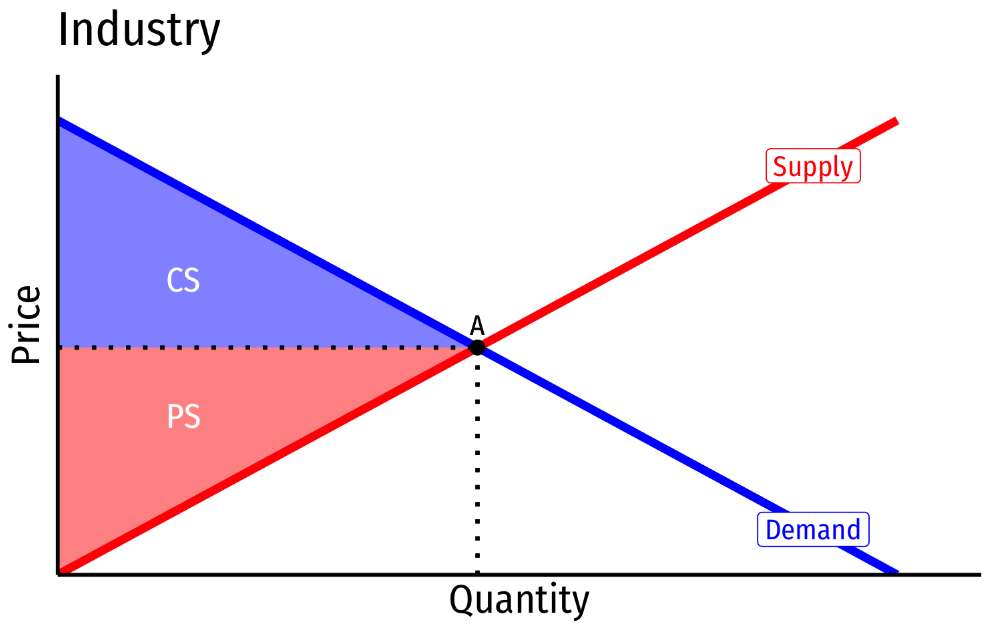
Example: Visualized



Welfare Effects of Perfect Competition

Perfectly Competitive Market

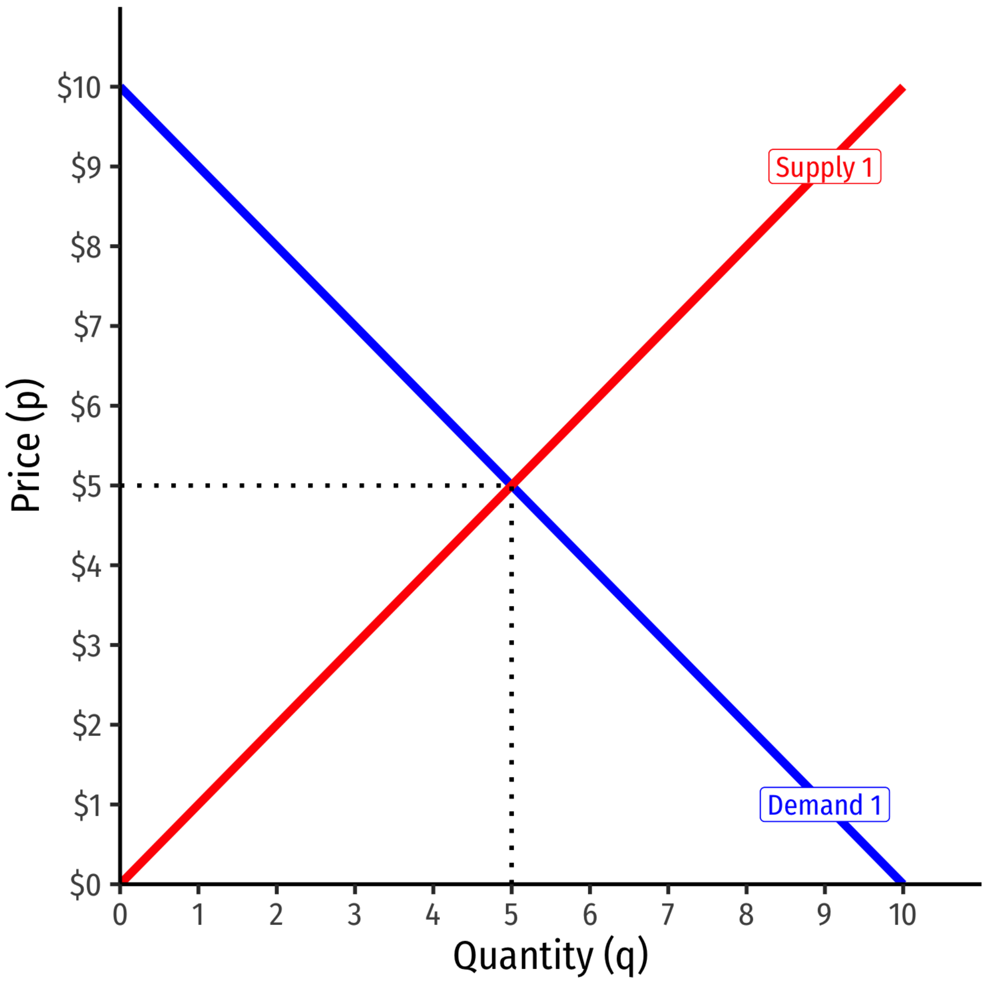




- In a **competitive market** in **long run equilibrium**:
  - **Economic profit** is driven to $0; resources (factors of production) optimally allocated
  - **Allocatively efficient**: $p = MC(q)$, maximized CS + PS
  - **Productively efficient**: $p = AC(q)_{min}$ (otherwise firms would enter/exit)

Market-Clearing Prices

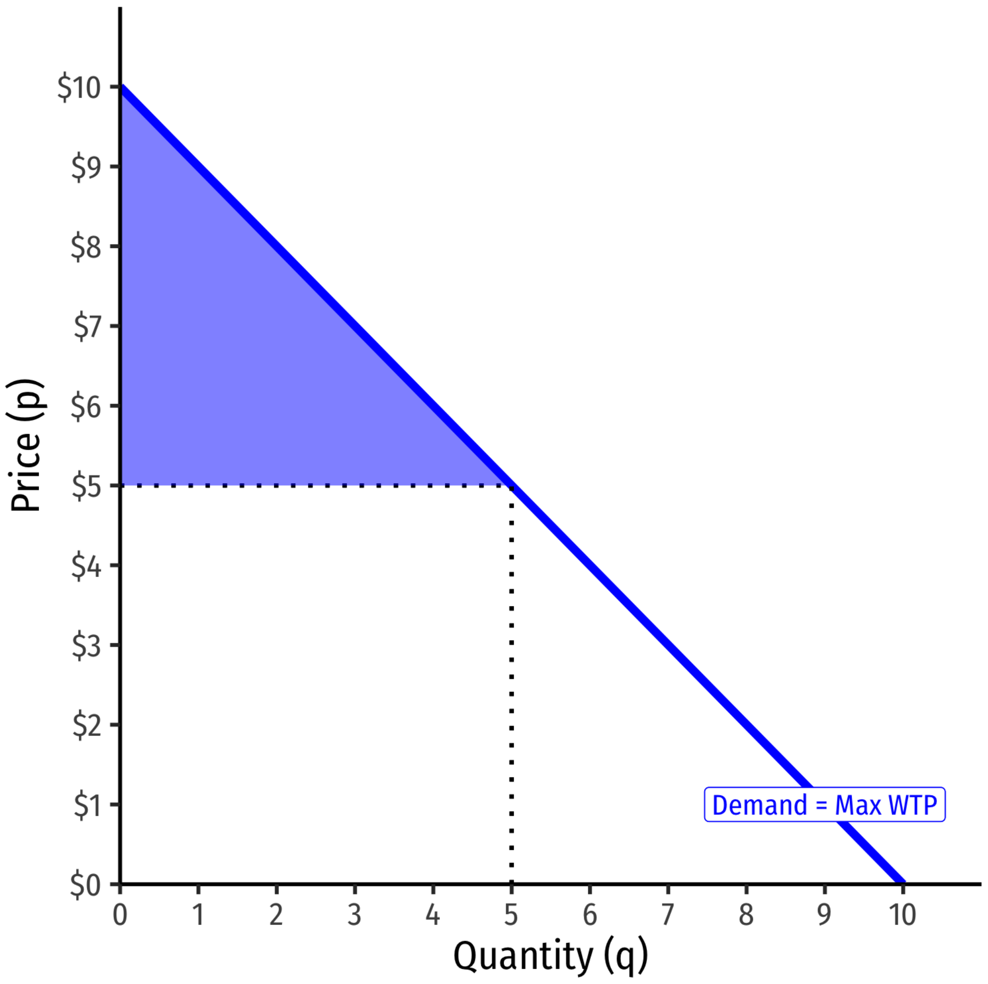
- Supply and demand set the market-clearing price for all units exchanged (bought and sold)



Consumer Surplus I

- **Demand function** measures how much you would *hypothetically* be willing to pay for various quantities
    - "reservation price"
- You often *actually* pay (the market-clearing price, p^*) a lot less than your reservation price
- The difference is **consumer surplus**

$$CS = WTP - p^*$$

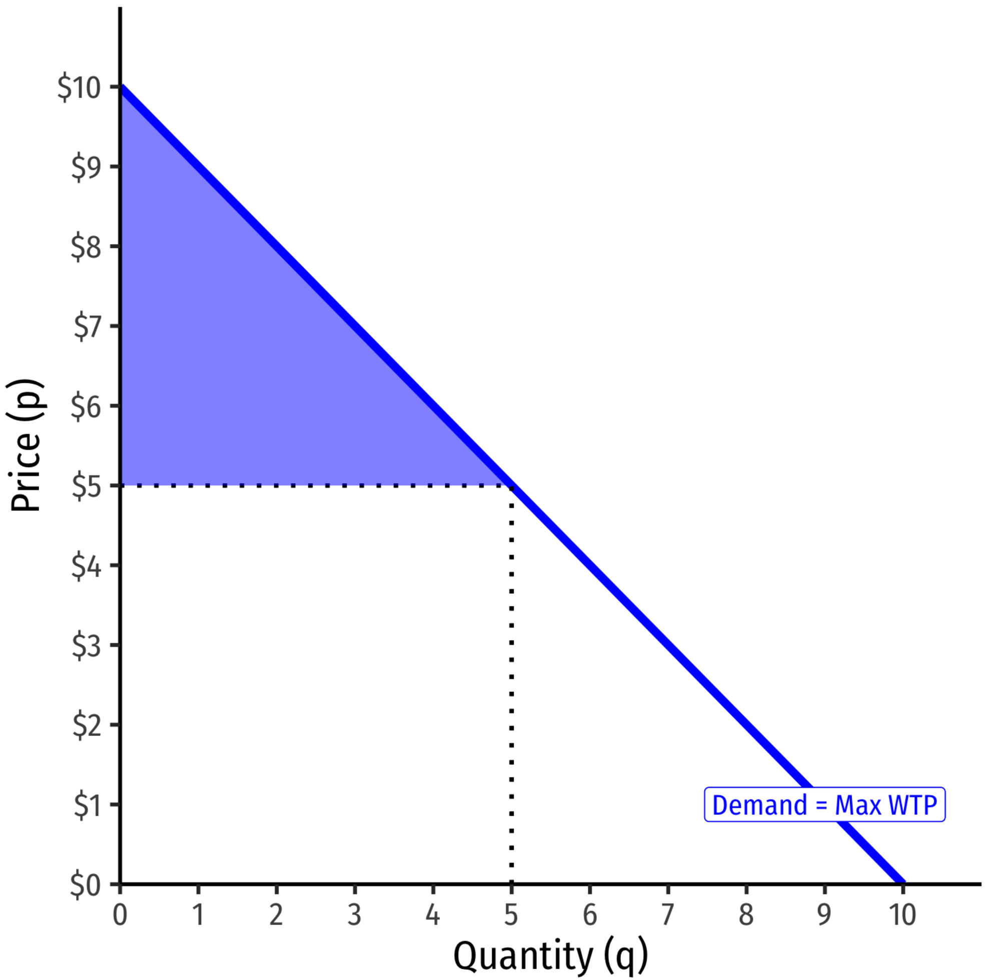


Consumer Surplus II

$$CS = \frac{1}{2}bh$$

$$CS = \frac{1}{2}(5-0)(\$10-\$5)$$

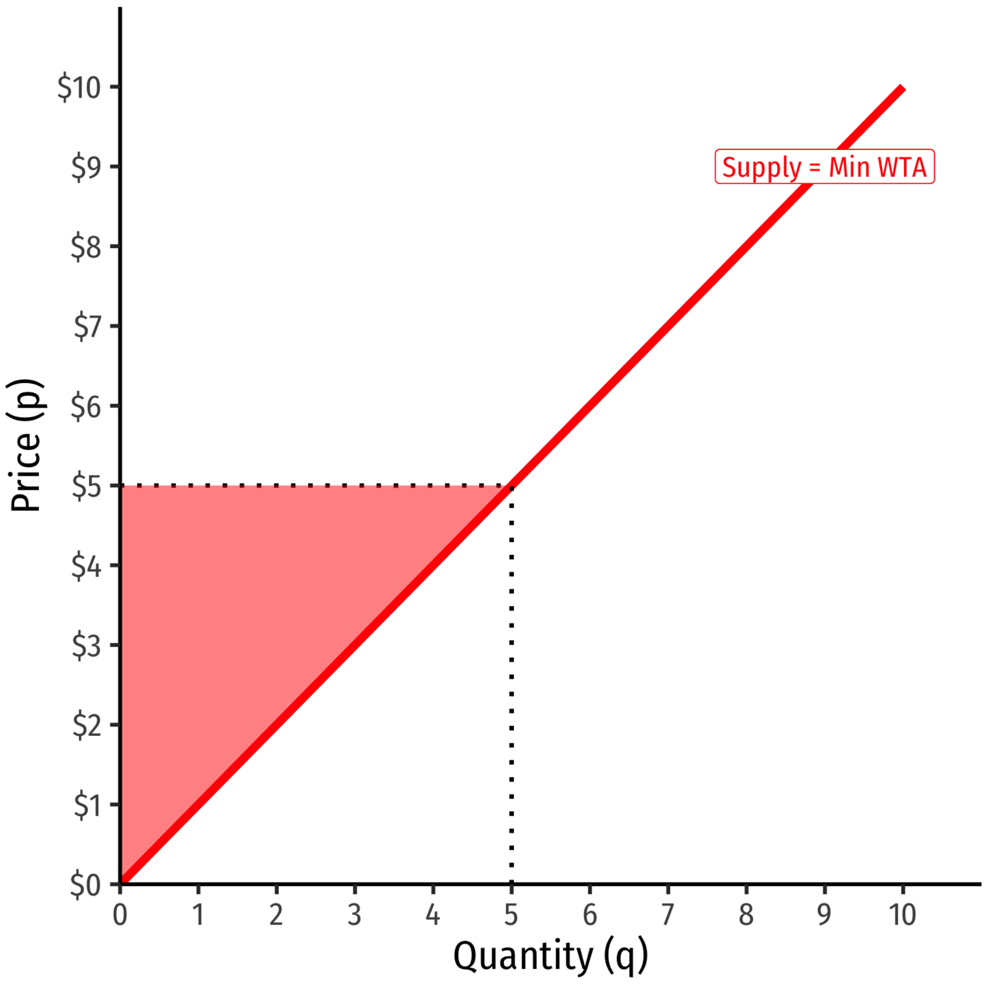
$$CS = \$12.50$$



Producer Surplus I

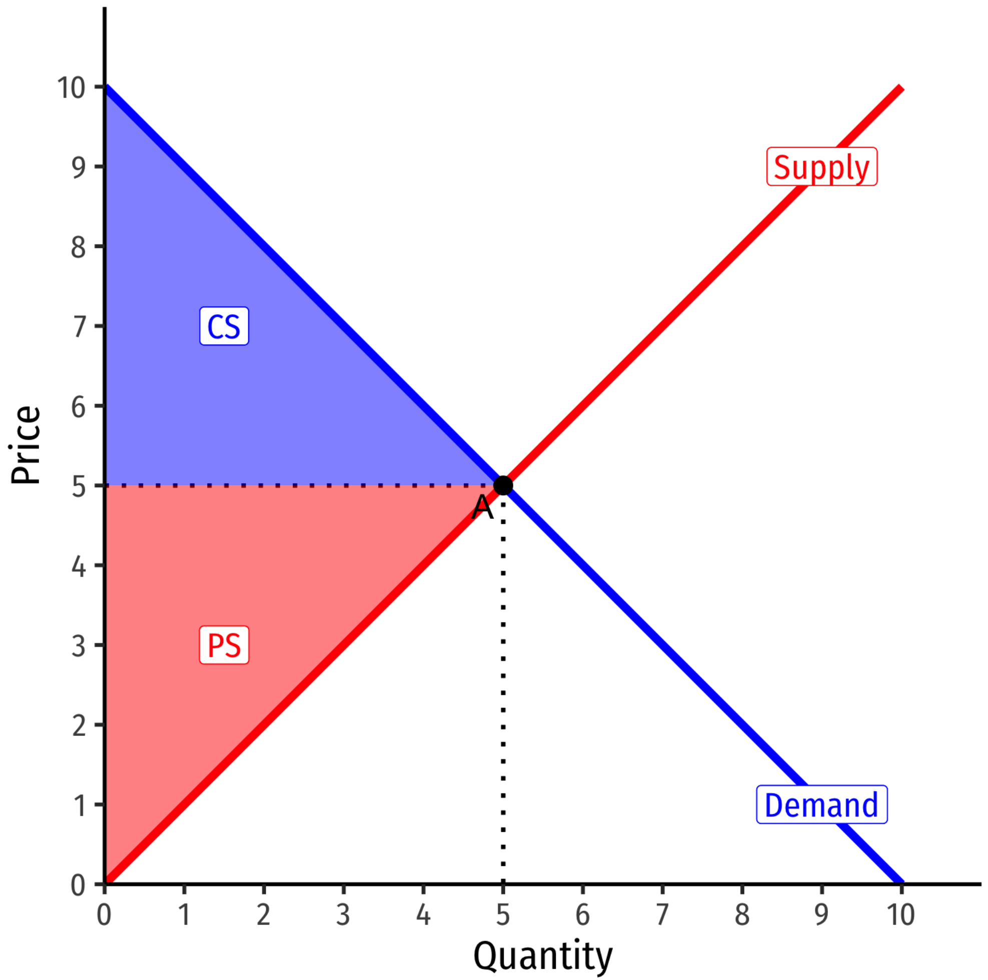
- **Supply function** measures how much you would *hypothetically* be willing to accept to sell various quantities
    - "reservation price"
- You often *actually* receive (the market-clearing price, p^*) a lot more than your reservation price
- The difference is **producer surplus**

$$PS = p^* - WTA$$



Market Efficiency in Competitive Equilibrium I

- **Allocative efficiency**: resources are allocated to highest-valued uses
  - Goods produced up to the point where $MB = MC \; (p = MC)$
- All potential gains from trade are fully exhausted



Market Efficiency in Competitive Equilibrium II

- **Economic surplus** = Consumer surplus + Producer surplus
- Maximized in competitive equilibrium
- Resources flow away from those who value them the lowest to those that value them the highest
- **The social value of resources is maximized by allocating them to their highest valued uses!**