3.5 — Marshallian Economics: Supply

ECON 452 • History of Economic Thought • Fall 2020

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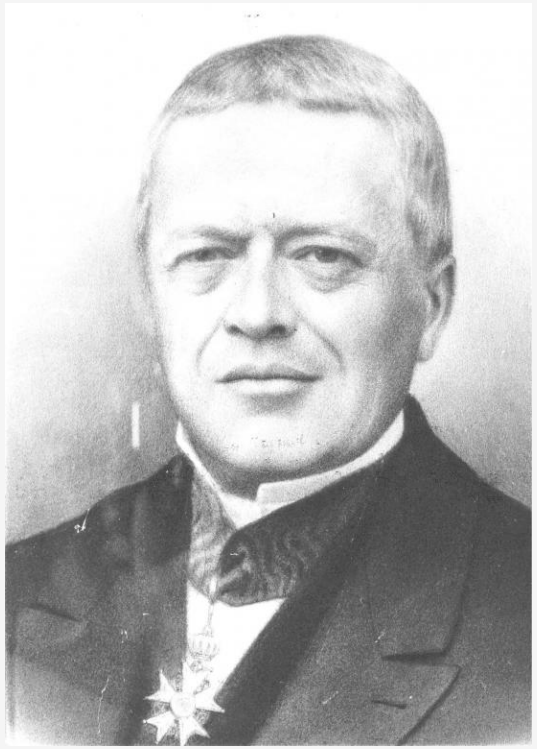
Outline

Theory of the Firm



Antoine Augustin Cournot

1801-1877

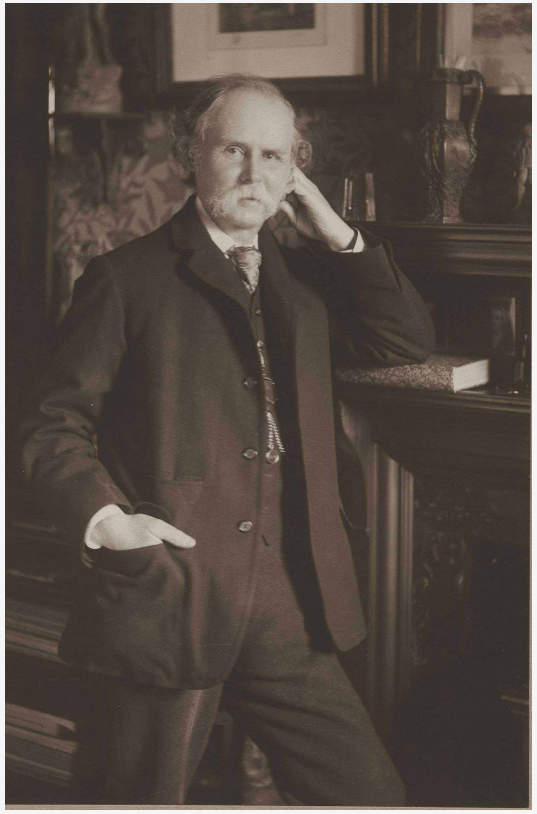
- It was Cournot who (in 1838!) devised the $MR = MC$ rule for profit-maximization

$$R'(p) = f(p) + pf'(p)$$

- Marshall adopted Cournot's approach but focused on equilibrium in terms of total revenues and total costs rather than marginal conditions
  - Marginal revenue would have to be "rediscovered" in 1920s with "imperfect competition"

$$\pi = R(q) - C(q)$$

Alfred Marshall: Contributions to Supply

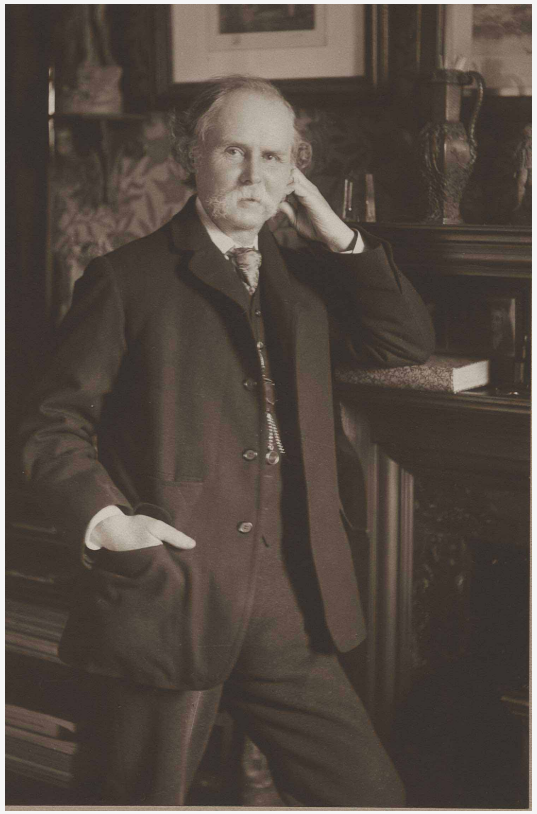


Alfred Marshall

1842-1924

- Marshall made two key contributions:
  1. Theory of the firm and industrial organization
  2. The role of *"time"* in determining supply and cost in production

Alfred Marshall: Representative Firm



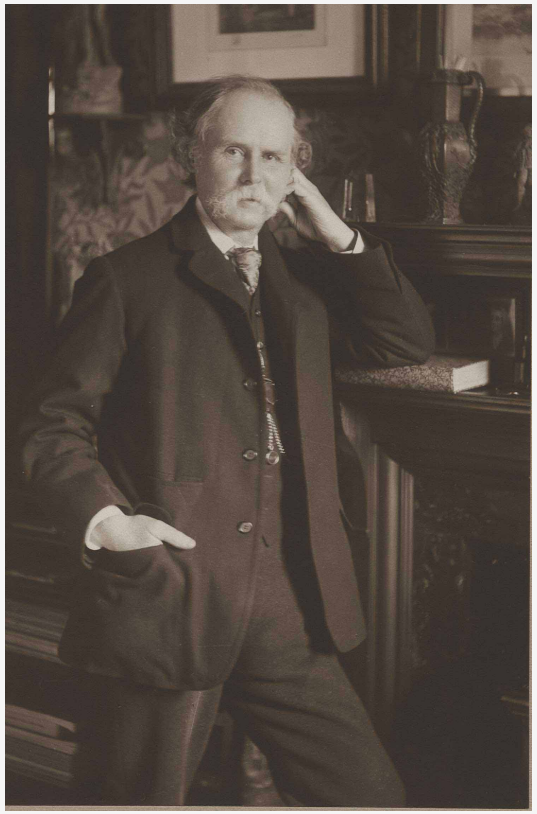
Alfred Marshall

1842-1924

"But here we may read a lesson from the young trees of the forest as they struggle upwards through the benumbing shade of their older rivals. Many succumb on the way, and a few only survive; those few become stronger with every year...and at last in their turn they tower above their neighbours...but sooner or later age tells on them all. Though the taller ones have a better access to light and air than their rivals, they gradually lose vitality; and one after another they give place to others, which, though of less material strength, have on their side the vigour of youth," (p.506 in *Reader*).

"When therefore we are considering the broad results which the growth of wealth and population exert on the economies of production...our conclusions [are] not very much affected by the fact that many of these economies depend directly on the size of the individual establishments engaged in the production, and that in almost every trade there is a constant rise and fall of large businesses, at any one moment some firms being in the ascending phase and others in the descending" (p.506 in *Reader*).

Alfred Marshall: Representative Firm



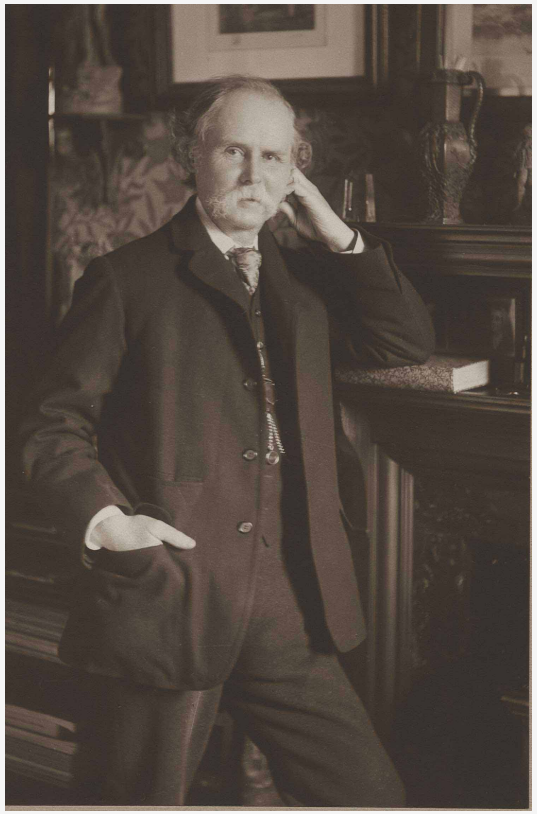
Alfred Marshall

1842-1924

> "These results will be of great importance when we come to discuss the causes which govern the supply price of a commodity. We shall have to analyse carefully the normal cost of producing a commodity, relatively to a given aggregate volume of production; and for this purpose we shall have to study *the expenses of a representative producer* for that aggregate volume...our representative firm must be one which has had a fairly long life, and fair success, which is managed with normal ability, and which has normal access to the economies, external and internal, which belong to that aggregate volume of production...," (p.507 in *Reader*).
>
> "We cannot see this by looking at one or two firms taken at random: but we can see it fairly well by selecting, after a broad survey, a firm, whether in private or joint-stock management...that represents, to the best of our judgment, this particular average, (ibid)."

The Time Periods of Production

Alfred Marshall: On Time



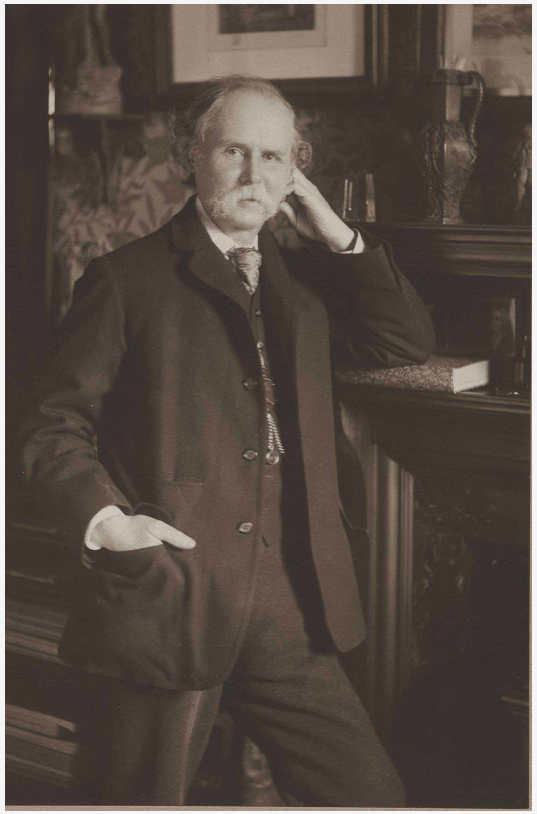
Alfred Marshall

1842-1924

> "The element of time is a chief cause of those difficulties in economic investigations which make it necessary for man with his limited powers to go step by step...in breaking it up, he segregates those disturbing causes, whose wanderings happen to be inconvenient, for the time in a pound called *Ceteris Paribus*. The study of some group of tendencies is isolated by the assumption *other things being equal*: the existence of other tendencies is not denied, but their disturbing effect is neglected for a time. The more the issue is thus narrowed, the more exactly can it be handled: but also the less closely does it correspond to real life.," (p.516 in *Reader*).

Marshall, Alfred, 1890, *Principles of Economics*

Alfred Marshall: On Time and Production Periods



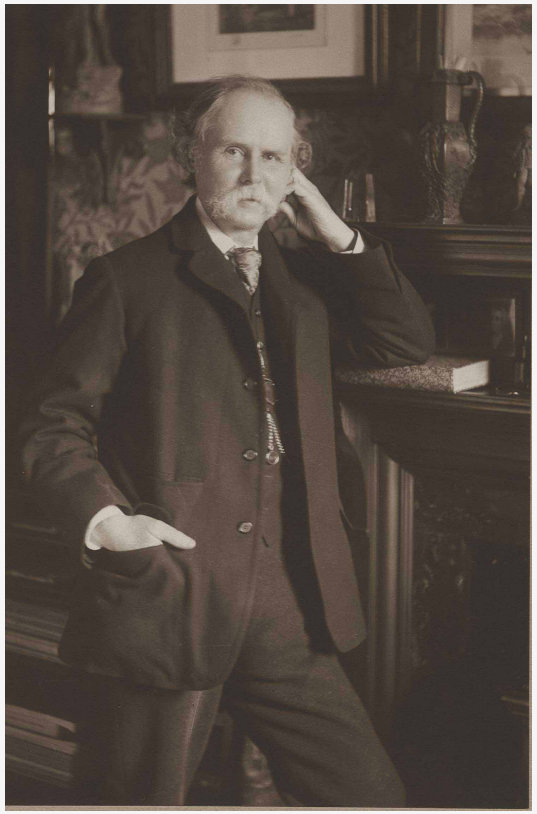
Alfred Marshall

1842-1924

"To go over the ground in another way. Market values are governed by the relation of demand to stocks actually in the market; with more or less reference to 'future' supplies...the current supply is in itself partly due to the action of producers in the past; and this action has been determined on as the result of a comparison of the prices which they expect to get for their goods with the expenses to which they will be put in producing them," (pp.516-517 in *Reader*).

"For short periods people take the stock of appliances for production as practically fixed; and they are governed by their expectations of demand...in long periods they set themselves to adjust the flow of these appliances to their expectations of demand," (pp.517 in *Reader*).

Alfred Marshall: On Time and Production Periods

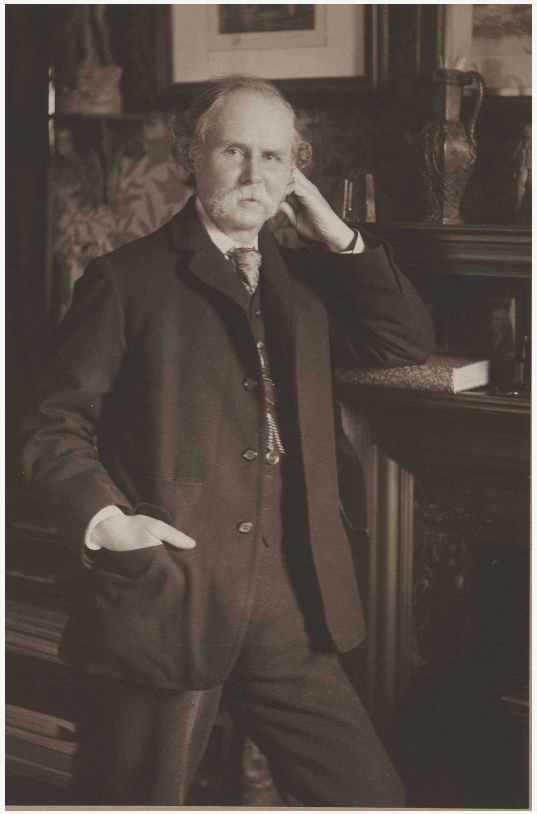


Alfred Marshall

1842-1924

> "To sum up them as regards short periods. The supply of specialized skills and ability, of suitable machinery and other material capital, and of the appropriate industrial organization has not time to be fully adapted to demand; but the producers have to adjust their supply to the demand as best they can with the appliances already at their disposal...In long periods on the other hand all investments of capital and effort in providing the material plant and the organization of business, and in acquiring trade knowledge and specialized ability, have time to be adjusted to the incomes which are expected to be earned by them: and the estimates of those incomes therefore directly govern supply, and are the true long-period normal supply price of the commodities produced." (pp.519-5207 in *Reader*)

Alfred Marshall: On Time and Production Periods



Alfred Marshall

1842-1924

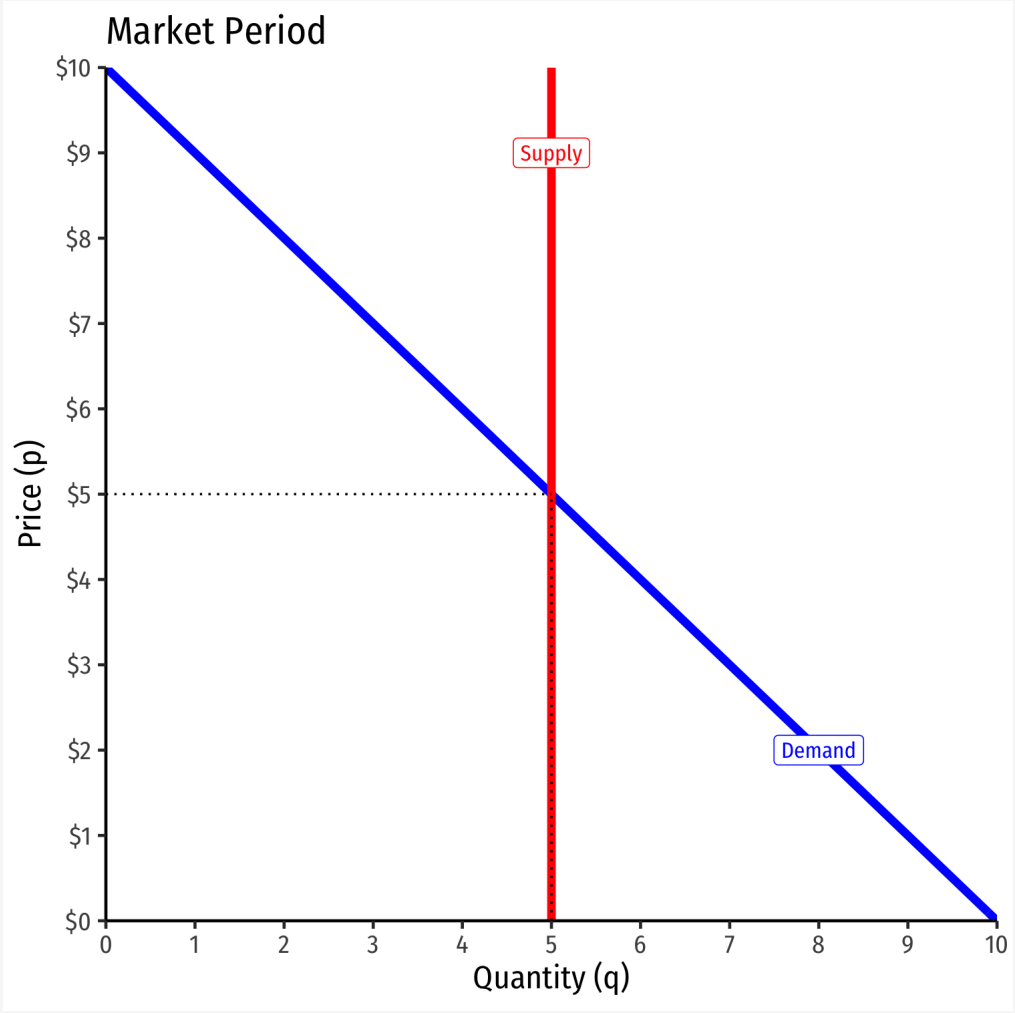
> "Of course there is no hard and sharp line of division between 'long' and 'short' periods. Nature has drawn no such lines in th eeconomic conditions of actual life..."
>
> "Four classes stand out. In each, price is governed by the relations between demand and supply." (p.520 in *Reader*)

1. The market period
2. The short period
3. The long period
4. The secular period

Marshall, Alfred, 1890, *Principles of Economics*

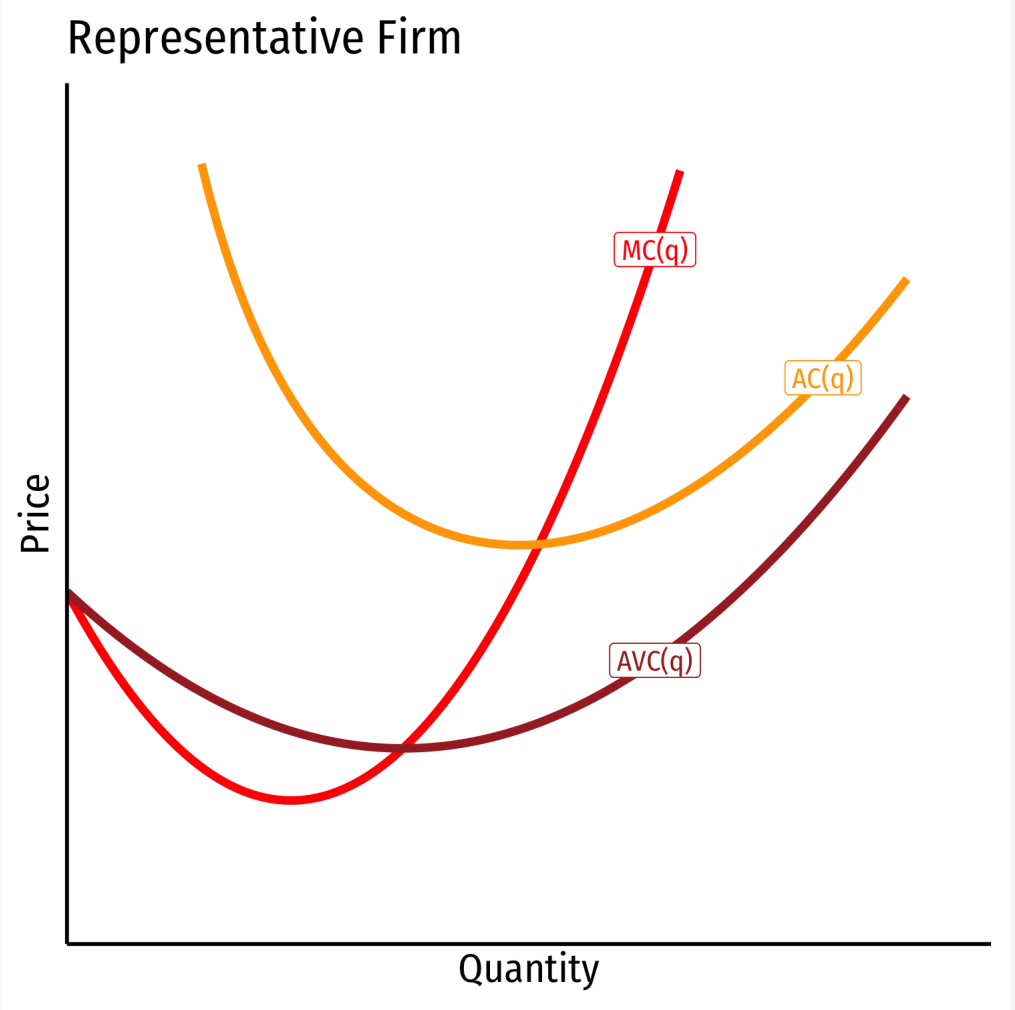
The Market Period

- **Market period**
- Supply is perfectly inelastic
- **Example**: a farmers' market, a farmer shows up with a fixed stock of goods to sell



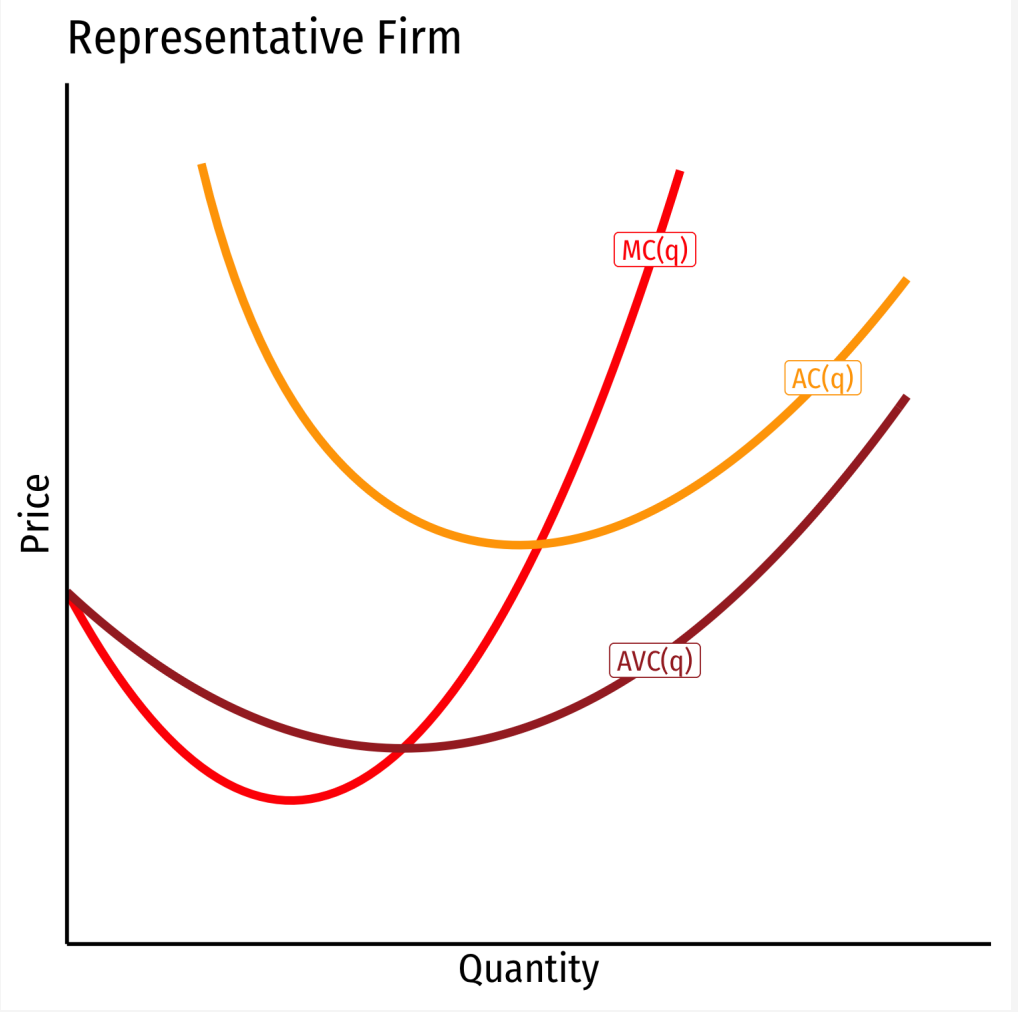
The Short Run

- **Short-run**: some factors of production treated as fixed
- Supply of both firm and industry is determined by diminishing returns
- Divide firm costs into **fixed costs** and **variable costs** (“prime costs”)
    - Some factors of production are fixed (we often assume capital), others are variable
    - Gives rise to fixed costs: payments to unchangeable fixed factors



The Short Run

- Supply of both firm and industry is determined by diminishing returns
- Firms will operate at a loss in the short run if they can cover their variable costs
  - $p > AVC(q*)$
- Firms will *shut down* production in short-run if they cannot cover their variable costs
  - $p < AVC(q*)$



The Short Run

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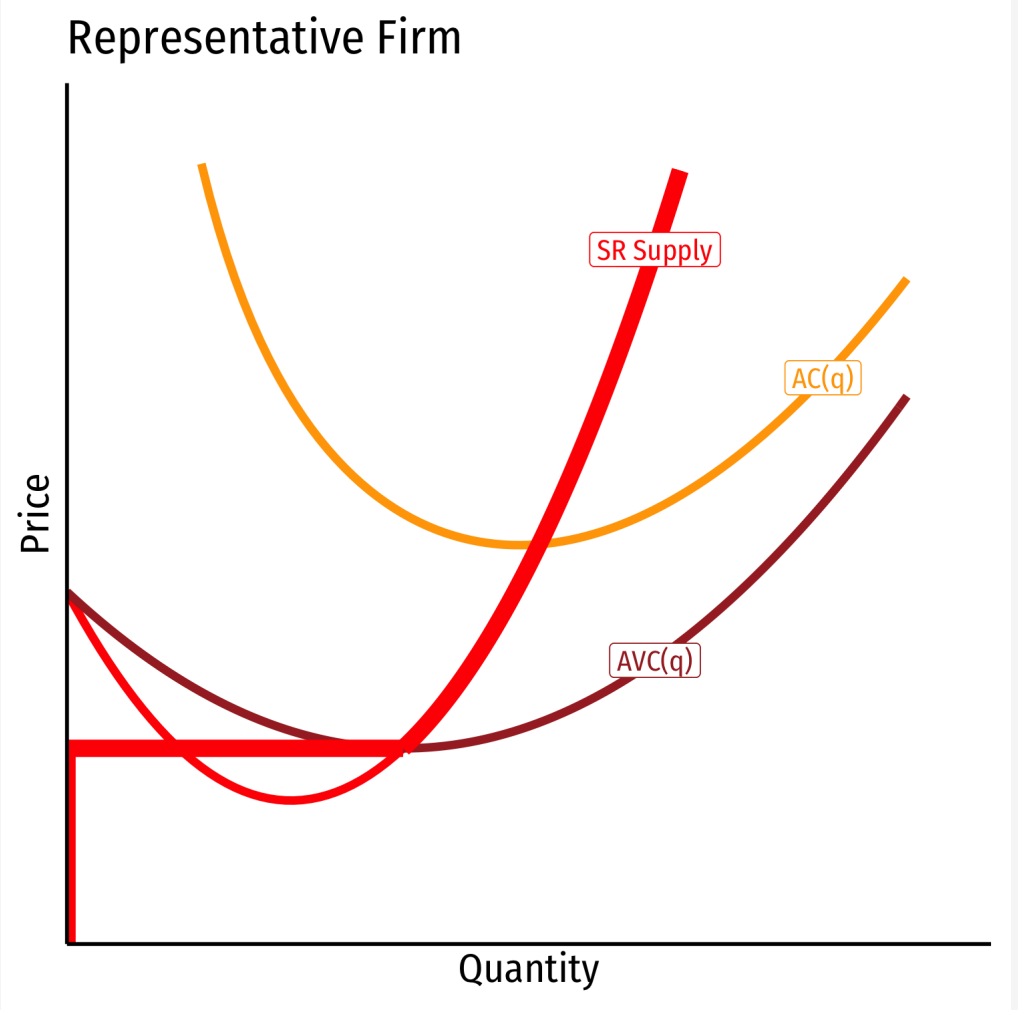
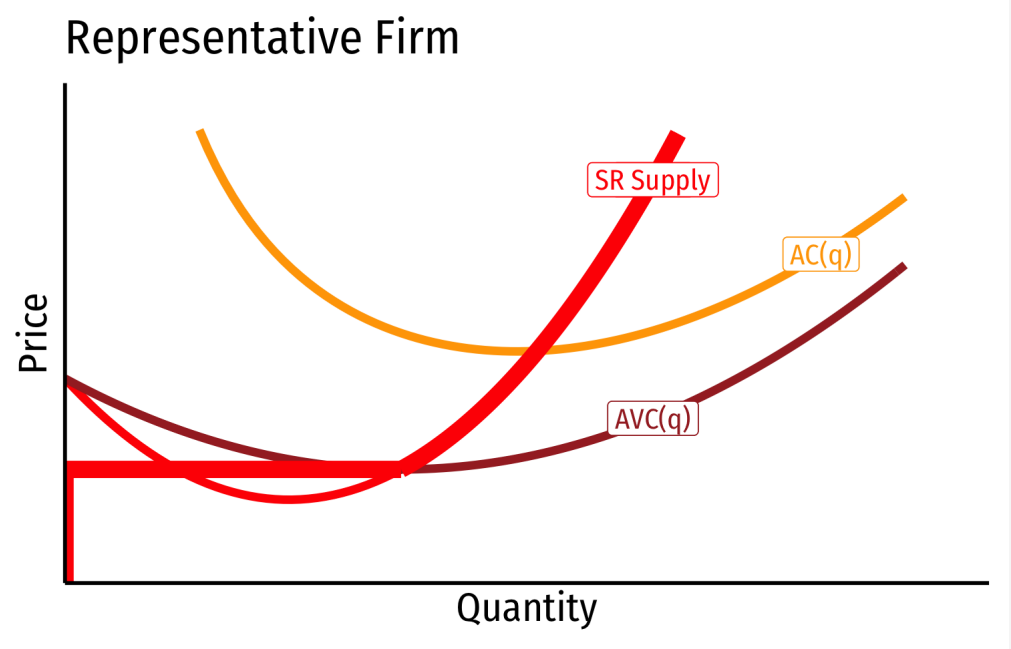
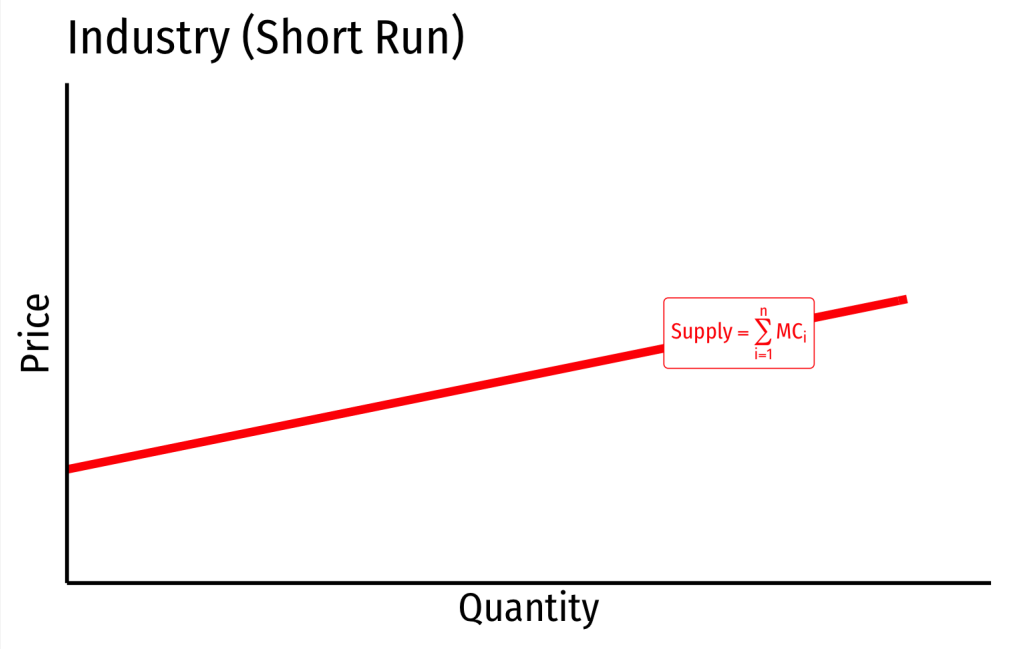
  - $p > AVC(q*)$
- Firms will *shut down* production in short-run if they cannot cover their variable costs
  - $p < AVC(q*)$
- Firm's supply curve is its marginal cost curve above the average variable cost curve



The Short Run

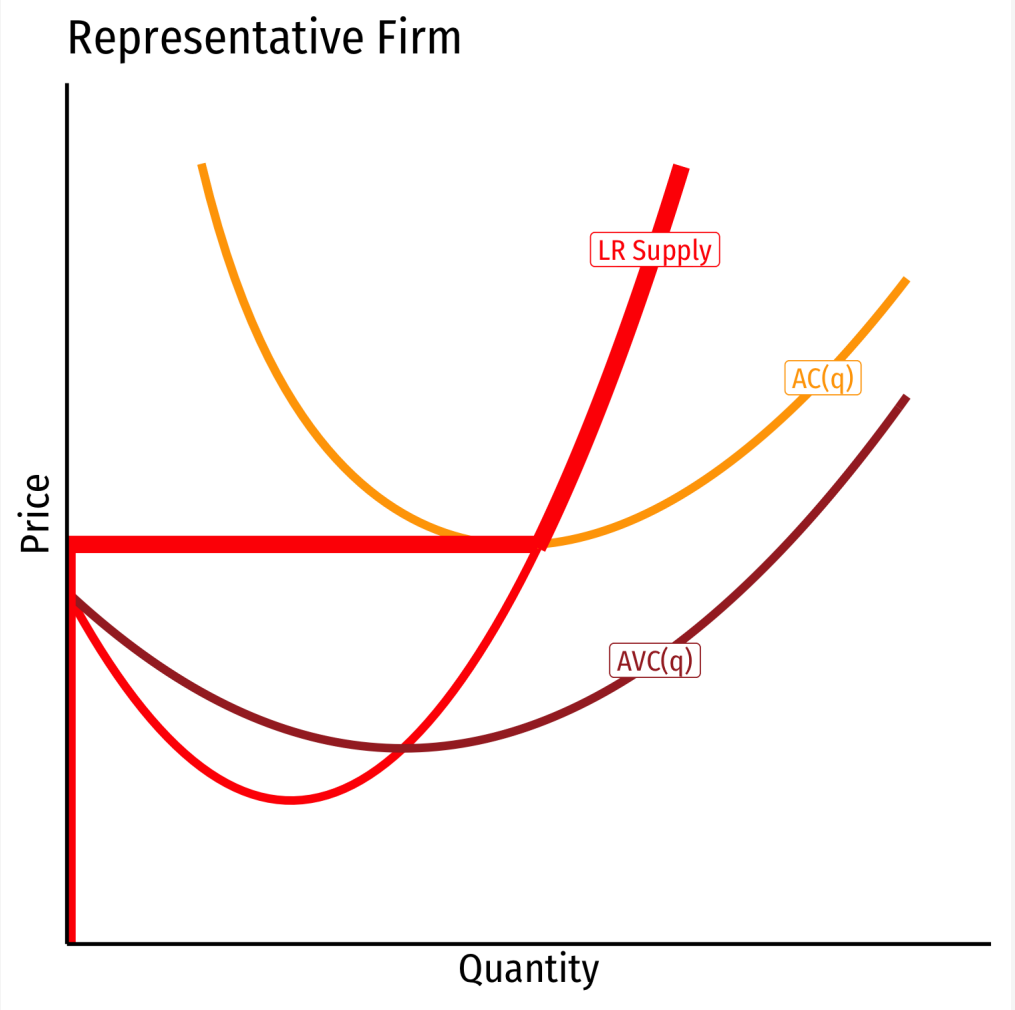




- Industry supply curve is the horizontal firm of firm's supply curves (above shut down price)

The Long Run

- Firms can change all of their inputs (i.e. capital)
- More resources will flow in if representative firm is profitable (entry)
- Resources will flow out if representative firm is unprofitable (exit)
- Marshall would not correctly derive long run (AC, MC, etc.) curves for firms, discovered in 1920s-1930s

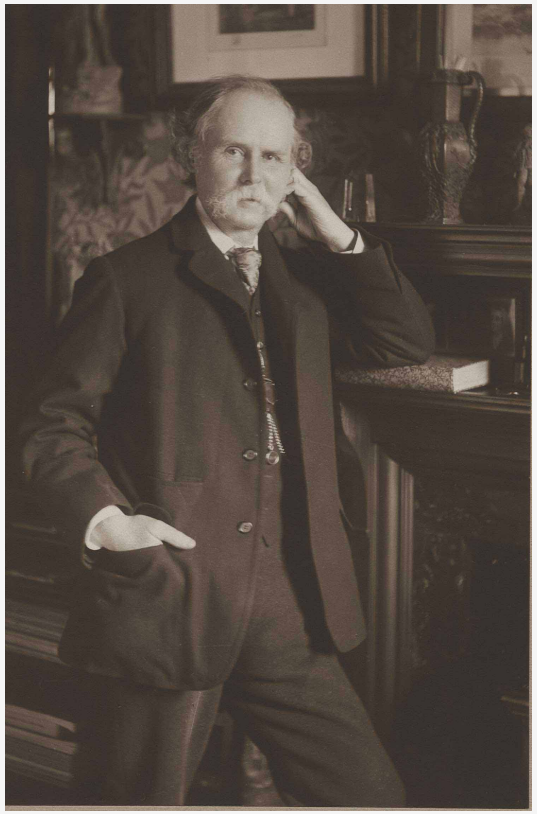


Quasi-Rents

Quasi-Rents

- Ricardo: land rents are **price-determined** (by demand), not price-determining (part of cost) (“rent is high because the price of corn is high”)
    - assumed the supply of land is fixed
    - land on (extensive) margin is free (no rent), no opportunity cost
    - land rents adjust to equalize all profit opportunities on different grades of land to 0
- Mill & others: land does have opportunity cost, an upward-sloping supply curve
    - to a firm, rent is price-determining, a cost that firm must pay to landowner for use
    - in long run, rental payment is equal to its opportunity cost

Quasi-Rents

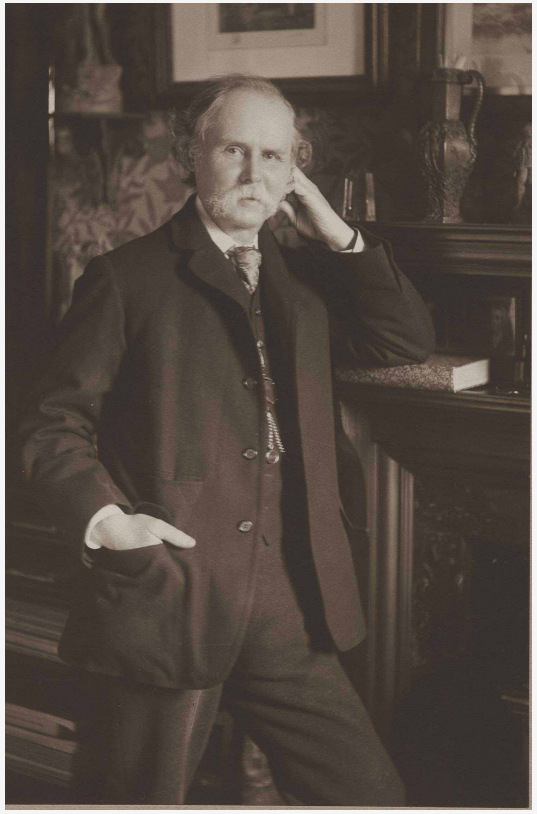


Alfred Marshall

1842-1924

- Points out that whether a payment to a factor of production is price-determined or price-determining **depends on the *time* period under consideration**!
  - Which affects the **elasticity of factor supply**: longer (shorter) run $\Longrightarrow$ more (less) elastic supply

Quasi-Rents

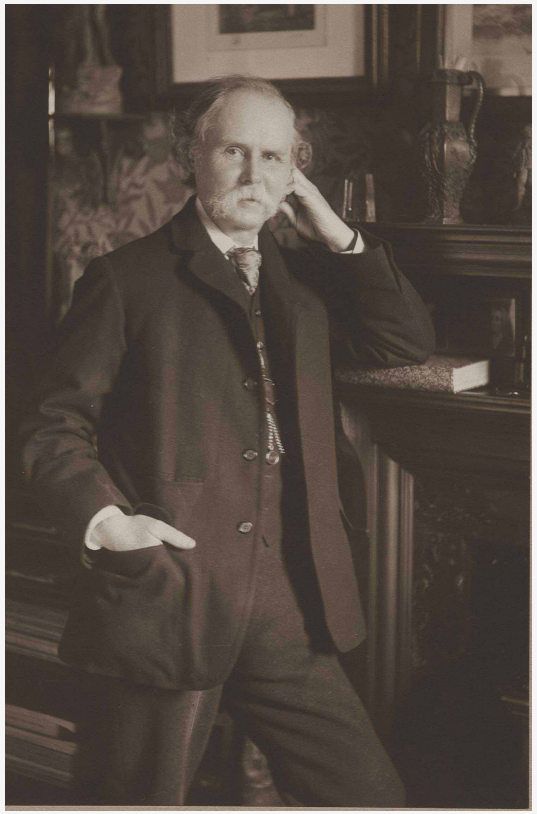


Alfred Marshall

1842-1924

- Also depends on analytical perspective
- **From the perspective of a *firm***:
  - Rents are always price-determining
  - A **cost of production**, payment that firm has to make to a factor owner, enough to pull the factor out of other uses (i.e. opportunity cost)

Quasi-Rents

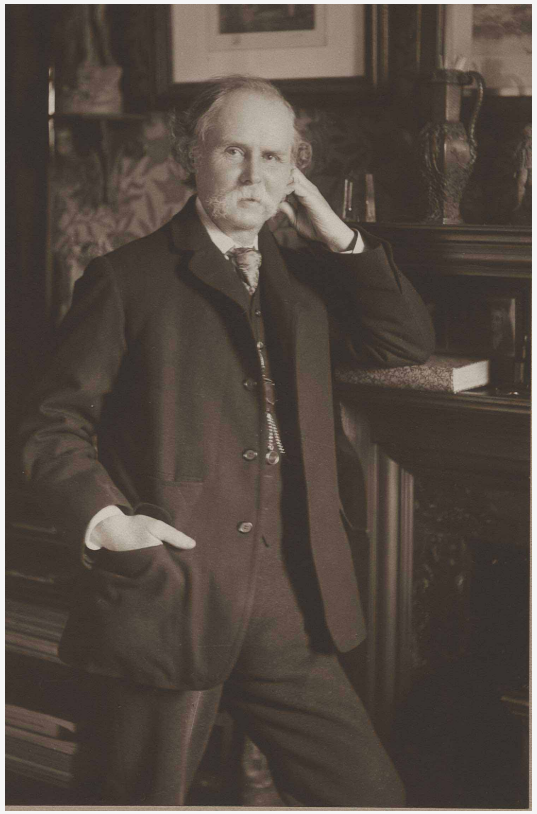


Alfred Marshall

1842-1924

- **From the perspective of *society*:**
- **Rents *may* be price-determined (by demand-side)**
  - if the supply of the factor is indeed fixed in long run (e.g. scarce talent, *prime* real estate, intellectual property, etc.)
  - a perfectly inelastic supply, demand sets the market price
- Rents *may* be price-determining (part of costs)
  - if the supply is not fixed
  - e.g. early United States with free unclaimed land (vs. country where land is all settled)
  - upward-sloping supply, higher (expected) land values cause people to explore & cultivate more land

Quasi-Rents

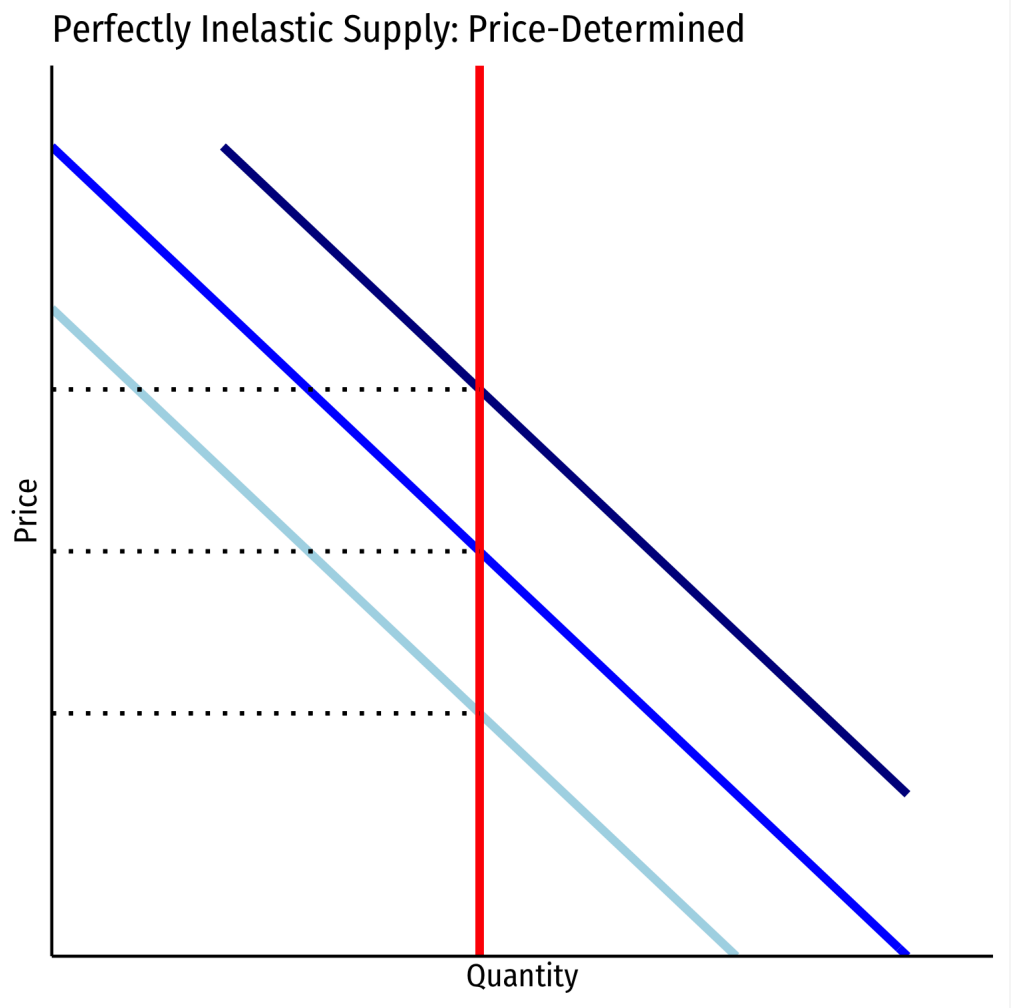


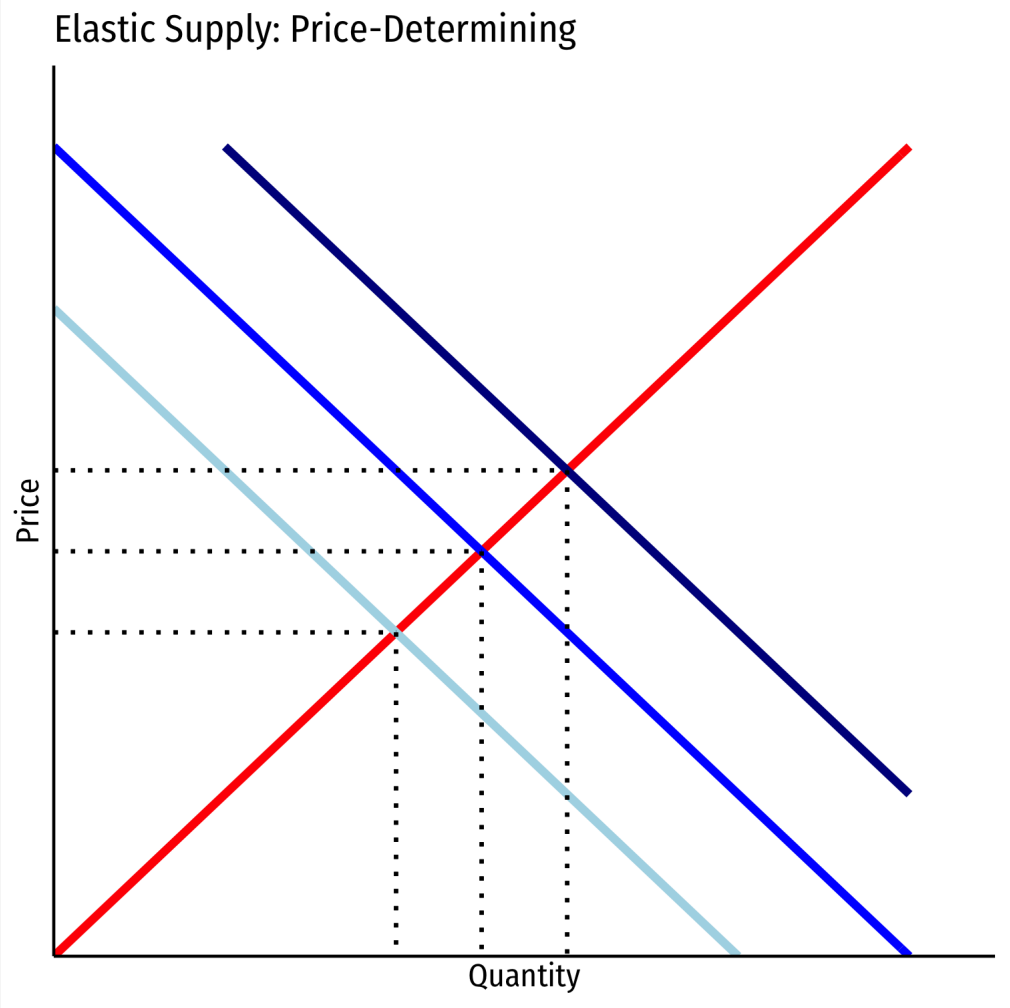
Alfred Marshall

1842-1924

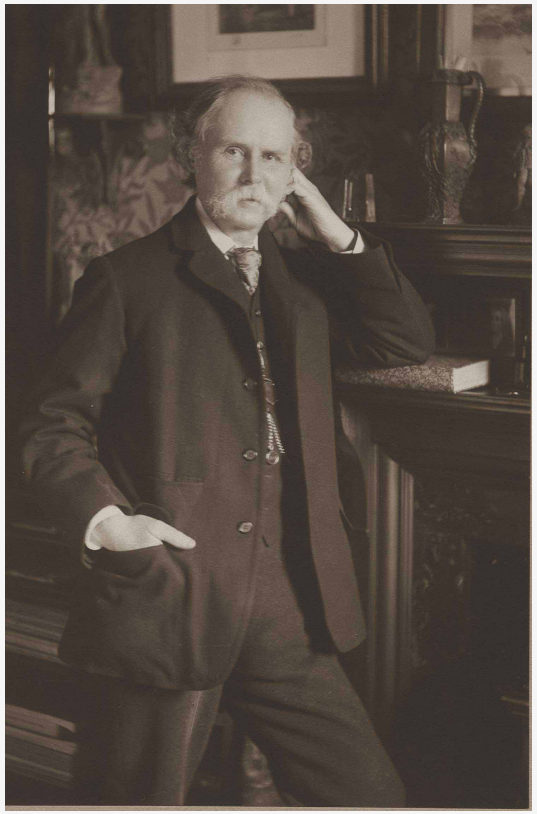
> "[I]t is *wisest* not to say that 'Rent does not enter into cost of production': for that will confuse many people. But it is *wicked* to say 'Rent *does* enter into cost of production,' because that is *sure* to be applied in such a way as to lead to the denial of subtle truths." — Letter to Francis Edgeworth

Key Difference: Price Elasticity of Supply





Quasi-Rents



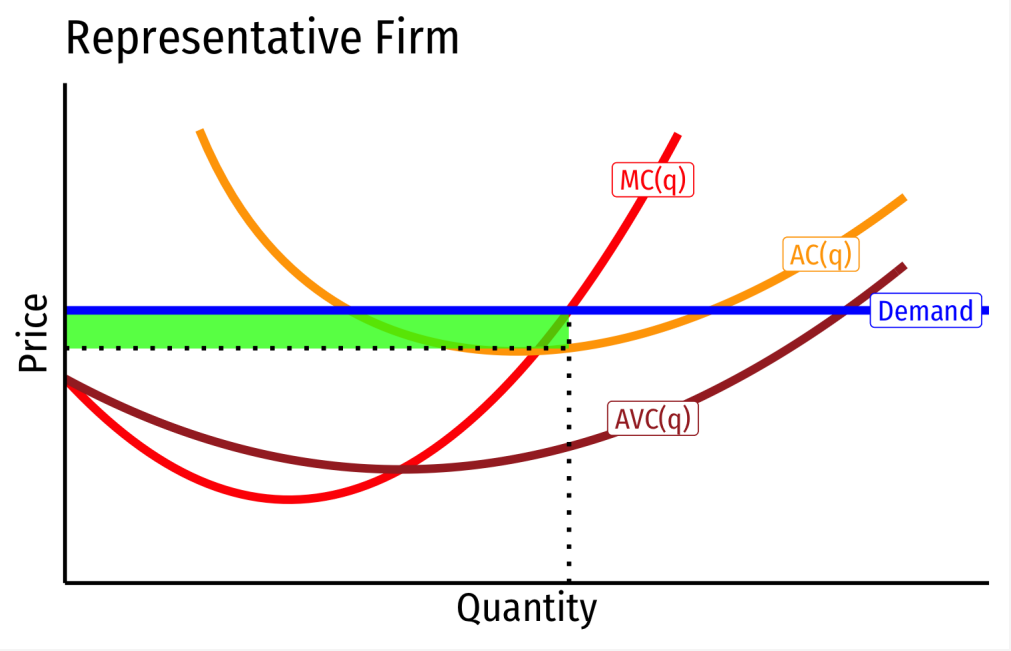
Alfred Marshall

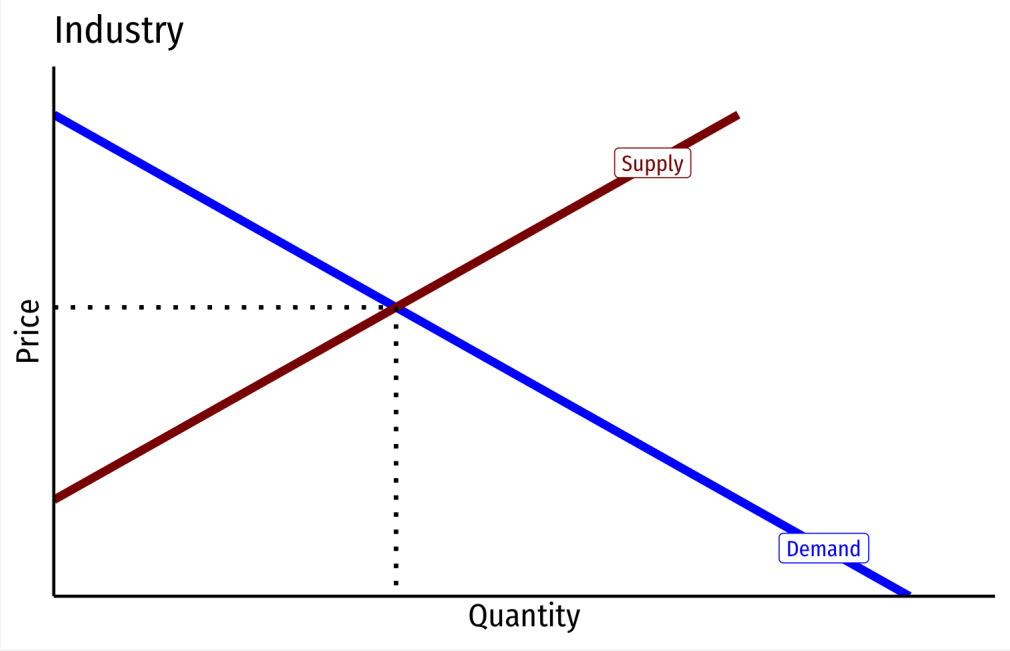
1842-1924

- In the short run (or market period), when supply of *any* particular factor is inelastic, changes in demand may cause above-normal returns
- **"Quasi-rents"** paid to fixed factor in short run

> "And thus even the rent of land is seen, not as a thing by itself, but as the leading species of a large genus."

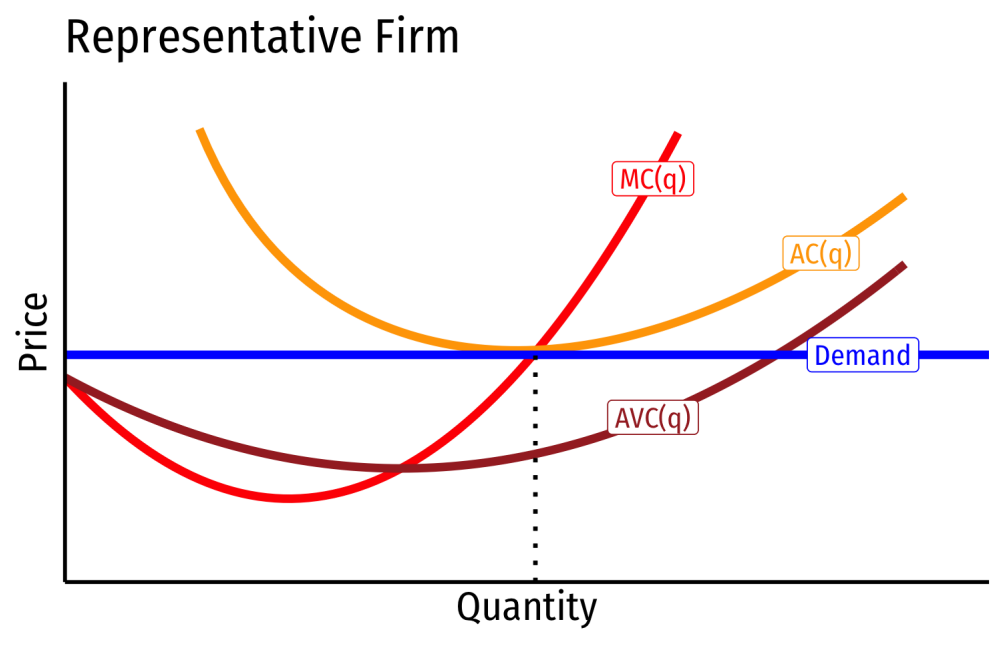
Quasi-Rents

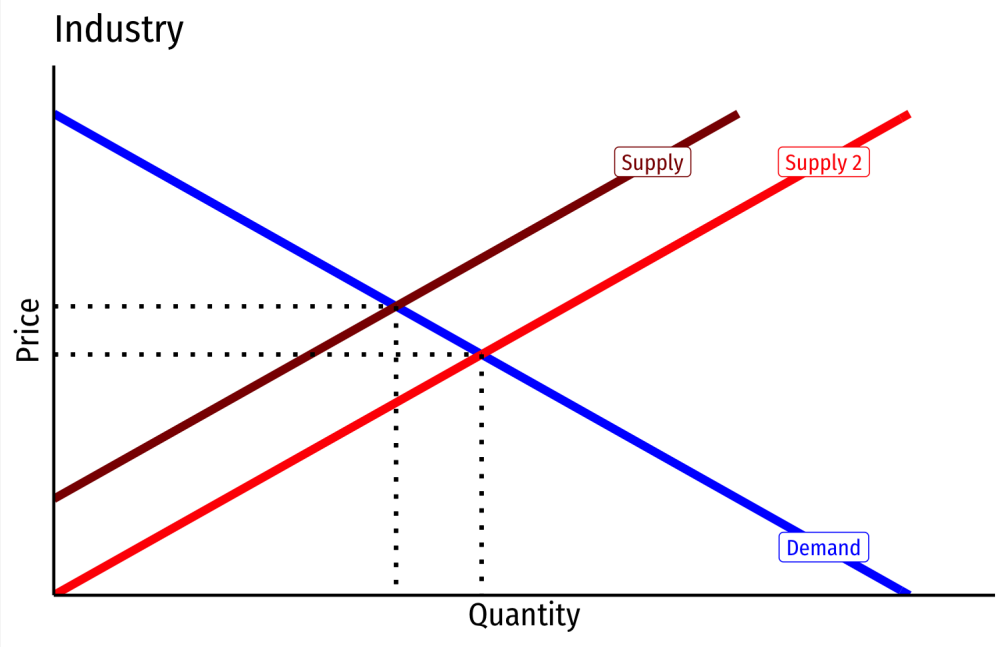




- If firms earn profit in short-run...

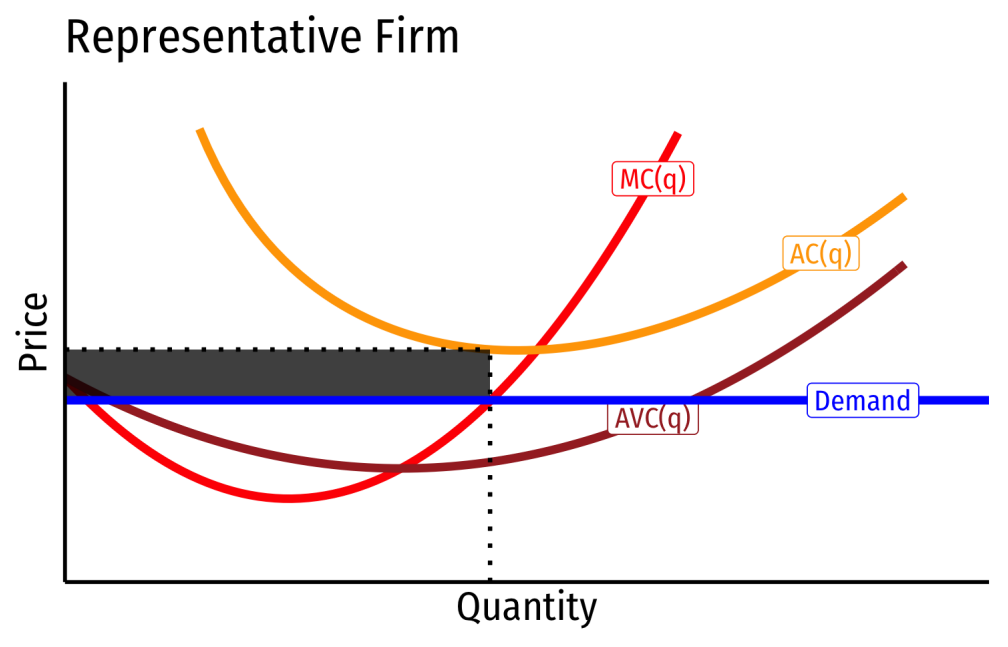
Quasi-Rents

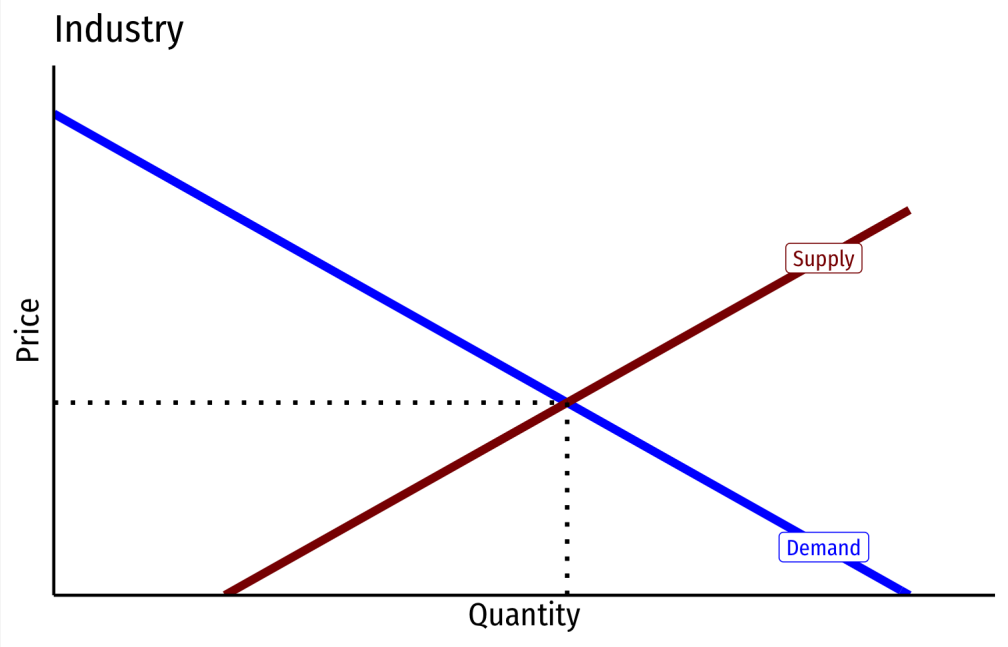




- If firms earn profit in short-run...
- More capital will flow into firm over long run, pushing profits to 0
    - Also, more firms enter, pushing market price down

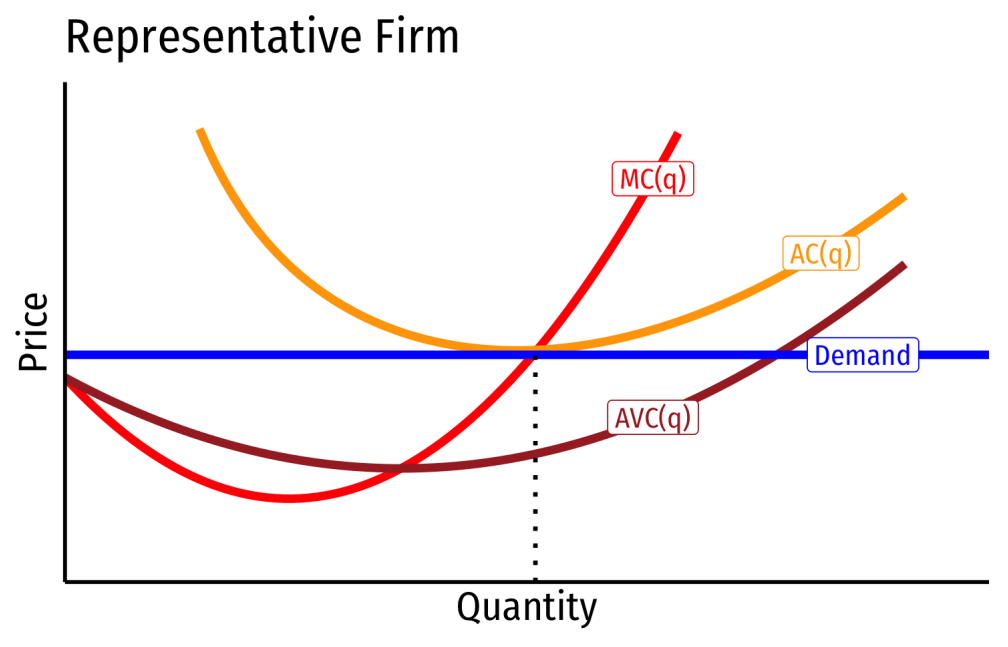
Quasi-Rents

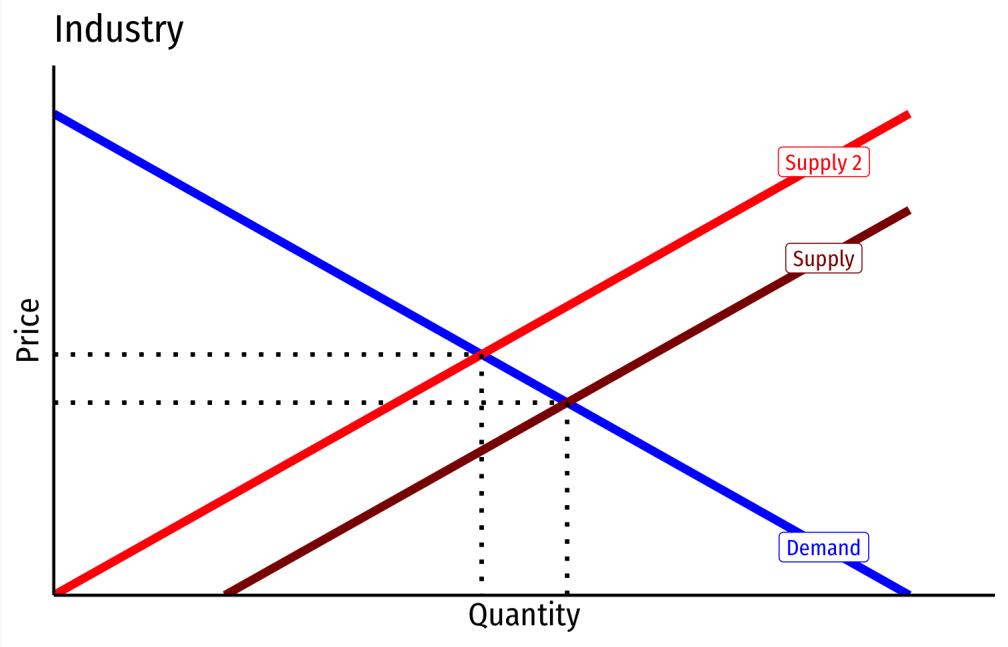




- If firms earn losses in short-run...

Quasi-Rents

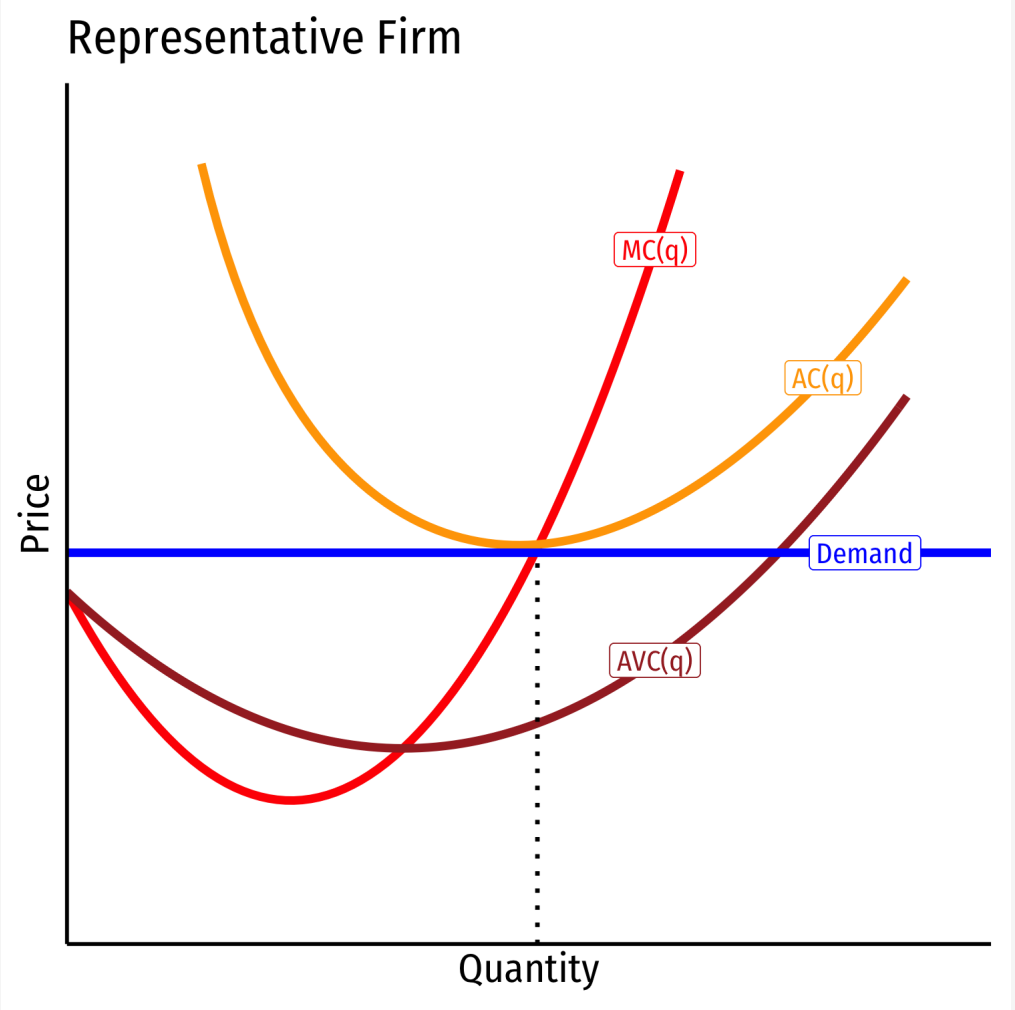




- If firms earn losses in short-run...
- Capital will flow out of firm over long run in pursuit of normal profits, pushing losses to 0
    - Also, firms will exit, pushing market price up

Quasi-Rents

- Competitive industry in the long run: firms earn "normal profit"
  - economic profit of zero: all factors of production paid their opportunity cost
  - full product exhaustion $R(q) = C(q)$
- Firms earn normal profits, the opportunity cost of holding capital in firm (versus other investment opportunities)
  - Profits are price-determining (adjust to 0)

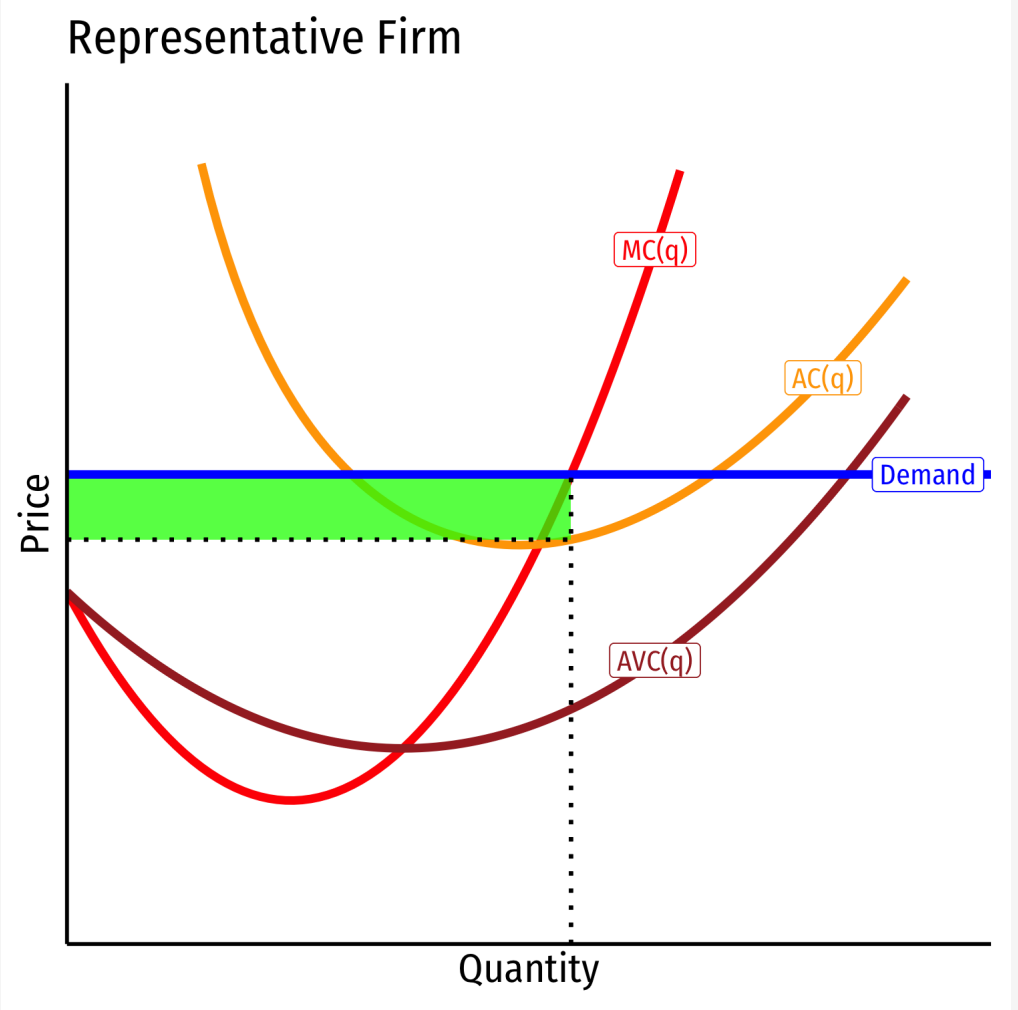


Quasi-Rents

- But in short run, when some factors are fixed (i.e. capital), if price $>$ average cost:
- Firm must pay its variable factors (variable costs) or else they will leave the firm
- Revenues leftover go to fixed factors (fixed costs) i.e. capital
    - In SR, these are fixed (perfectly inelastic supply)
    - Capital earns **"quasi-rents"** *because* it is fixed
    - Returns higher than its long-run equilibrium price (opportunity cost)
    - price-determined

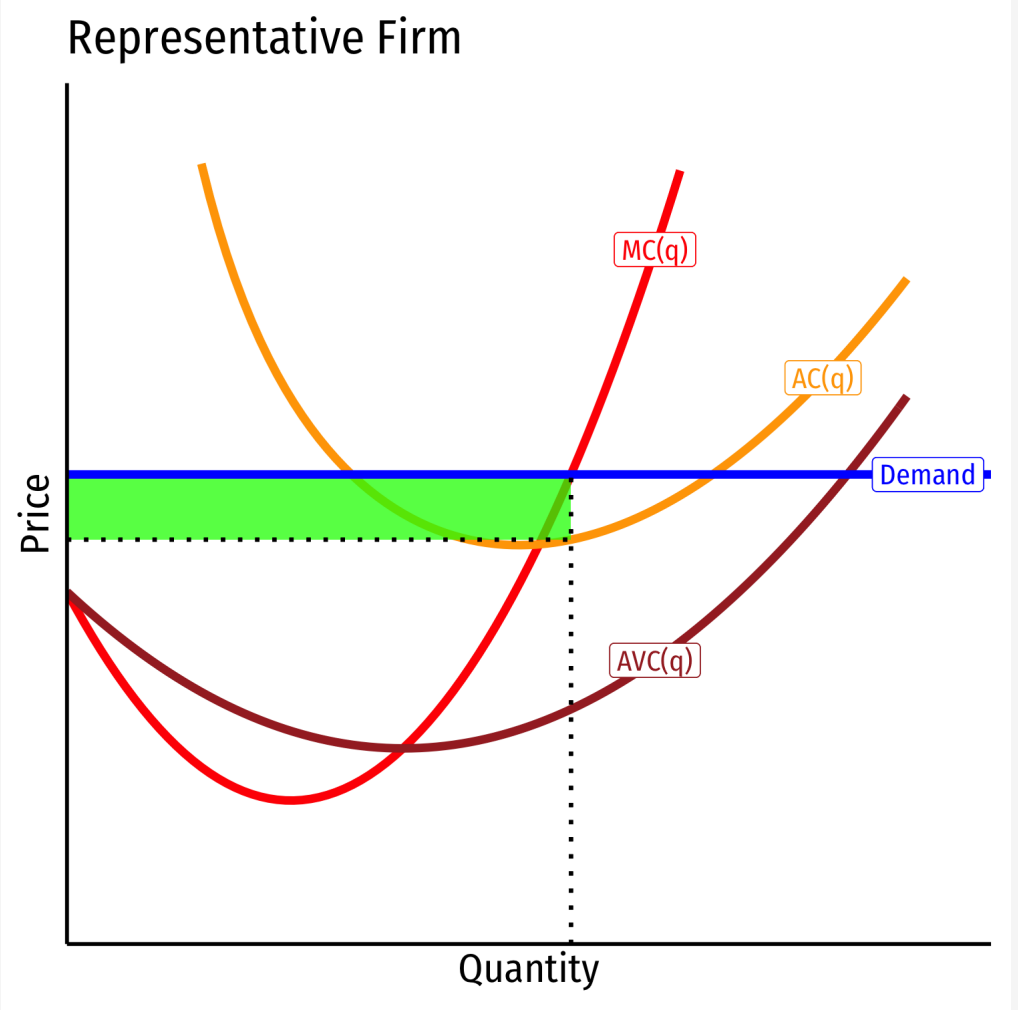
> "[I]n a sense all rents are scarcity rents, and all rents are differential rent."

- But these quasi-rents will be eroded away in the long run



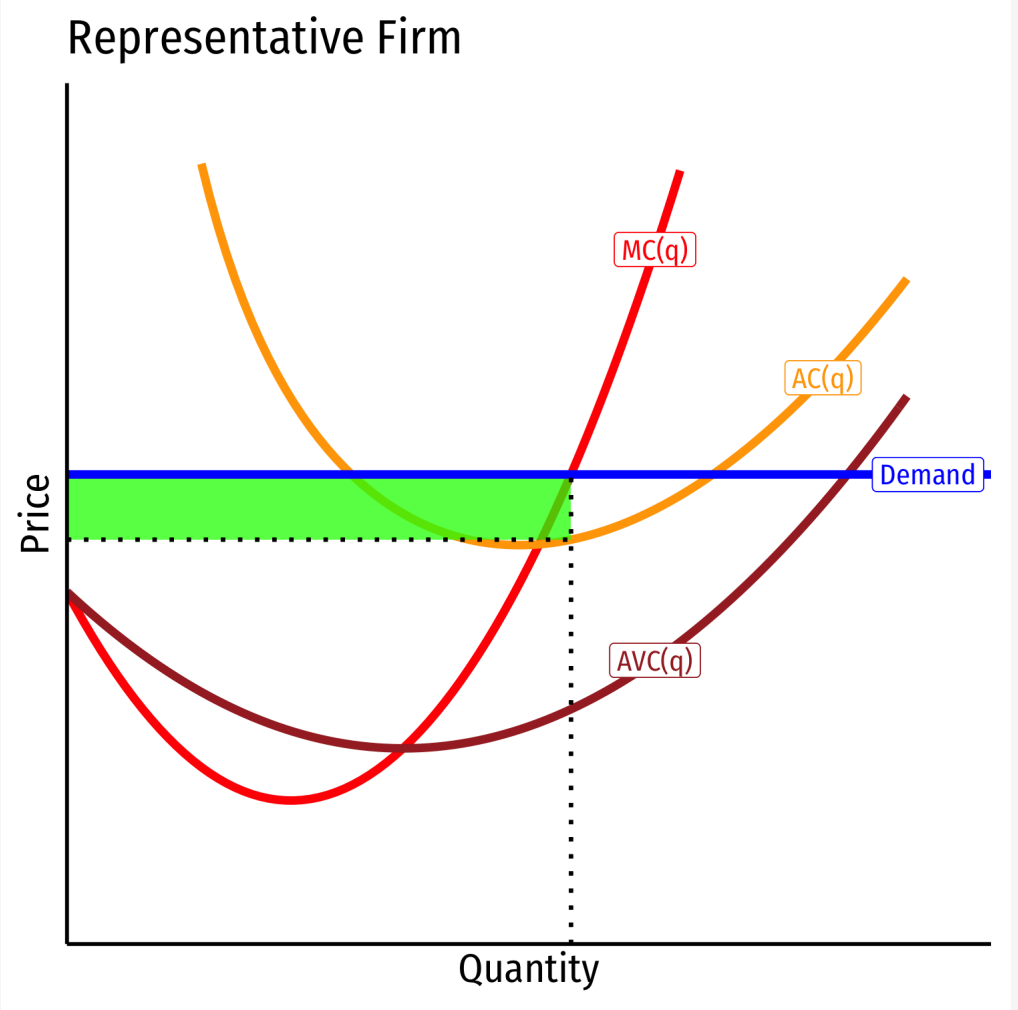
Quasi-Rents

- We often assume in neoclassical economics that capital is fixed in the short run
- But Marshall's quasi-rents can apply to *any* factor that is fixed in the short run!
    - In short run, inelastic supply of factor, price-determined (by demand), can earn quasi-rents *because* it's fixed
    - In long run, elastic supply of factor, price-determining, will be paid its opportunity cost (as firms compete for the factor over the long run)



Quasi-Rents

- Marshall thought these returns look more like economic rent in the short run, but more like interest in the long run, hence “quasi-rents”
  - Rate of return on capital approximates the interest rate in long run



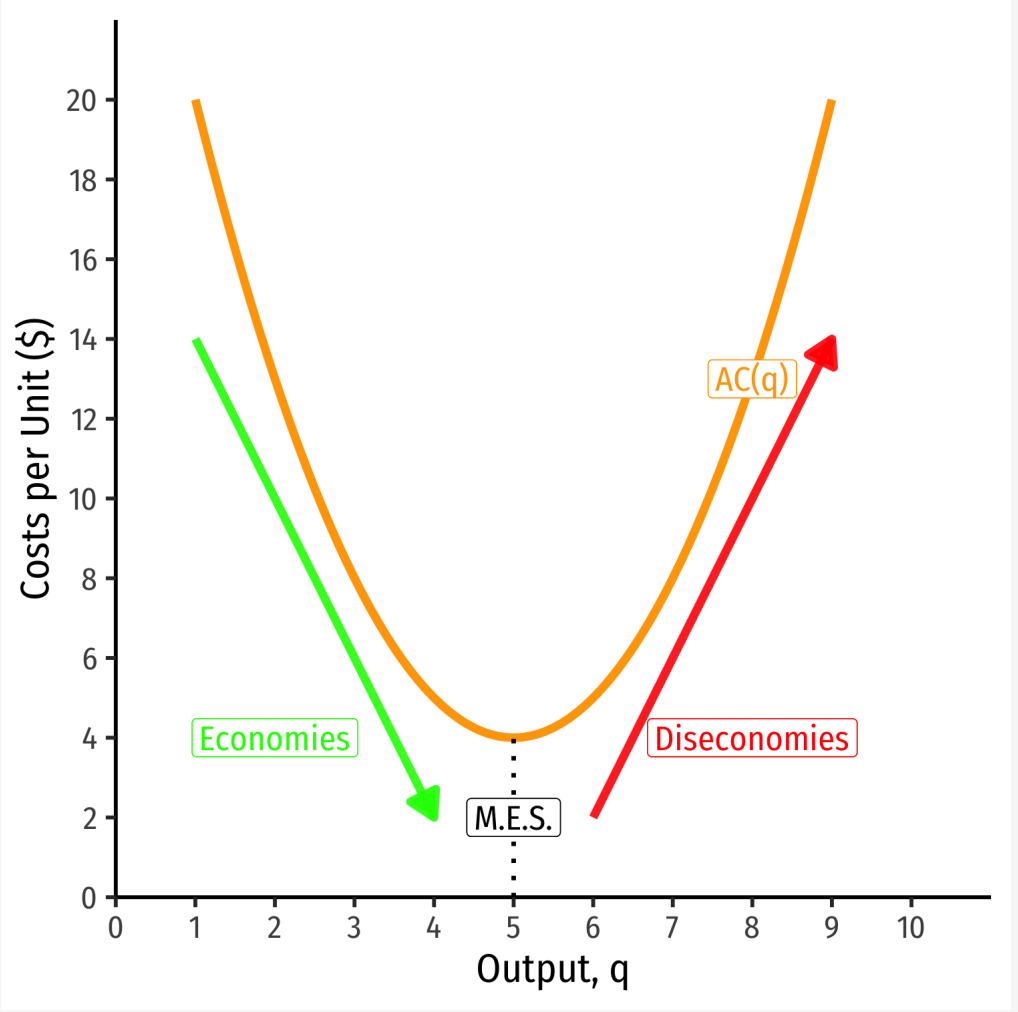
Types of Industries & External Economies

Economies of Scale

- Economies of scale come in two flavors:
- ***Internal* economies**: firm-level features that improve a **firm's** productivity, often leading to market power for that firm
    - e.g. firm produces more and lowers its *average* costs
- ***External* economies**: industry-wide features that spill over to the productivity **all** firms in the industry
    - e.g. more firms producing more lowers **all firms'** *total* costs

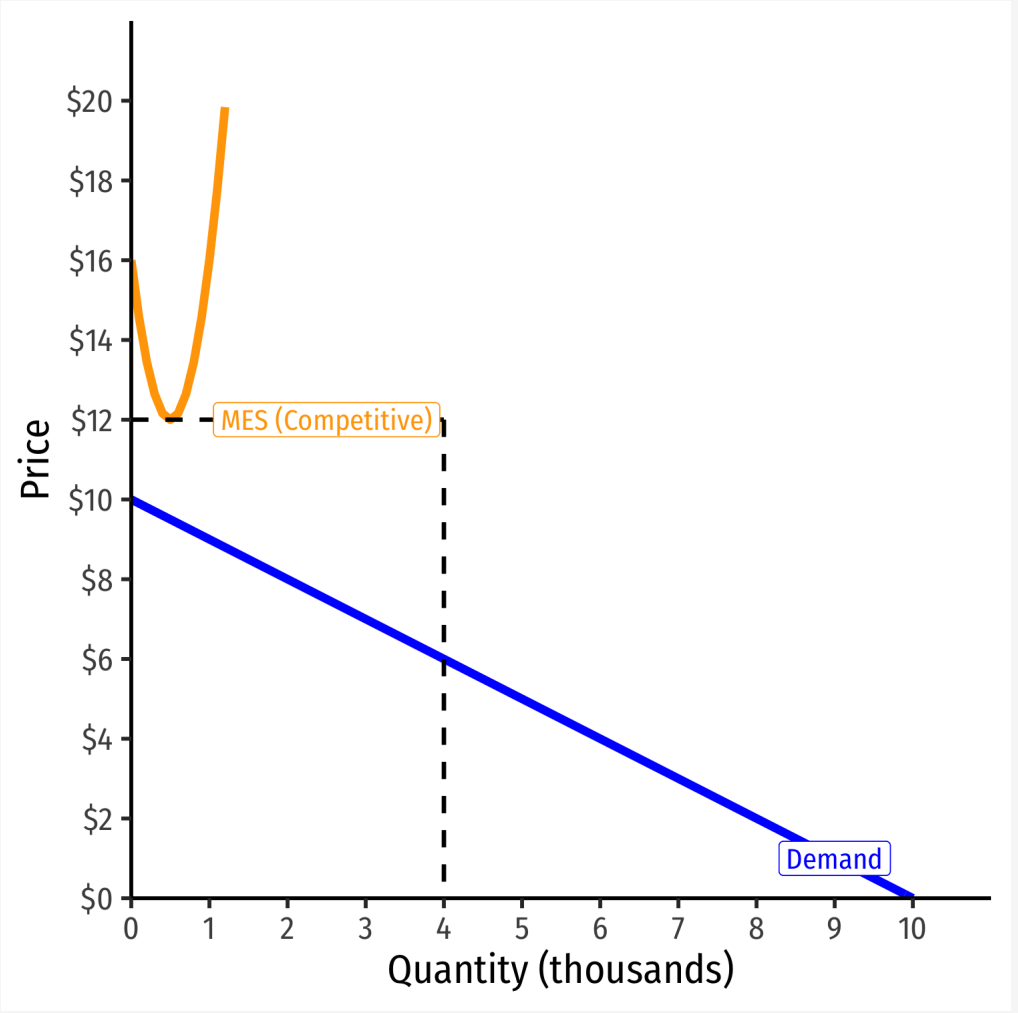
Recall: (Internal) Economies of Scale I

- **Minimum Efficient Scale**: q with the lowest $AC(q)$
- **Economies of Scale**: $\uparrow q, \downarrow AC(q)$
- **Diseconomies of Scale**: $\uparrow q, \uparrow AC(q)$



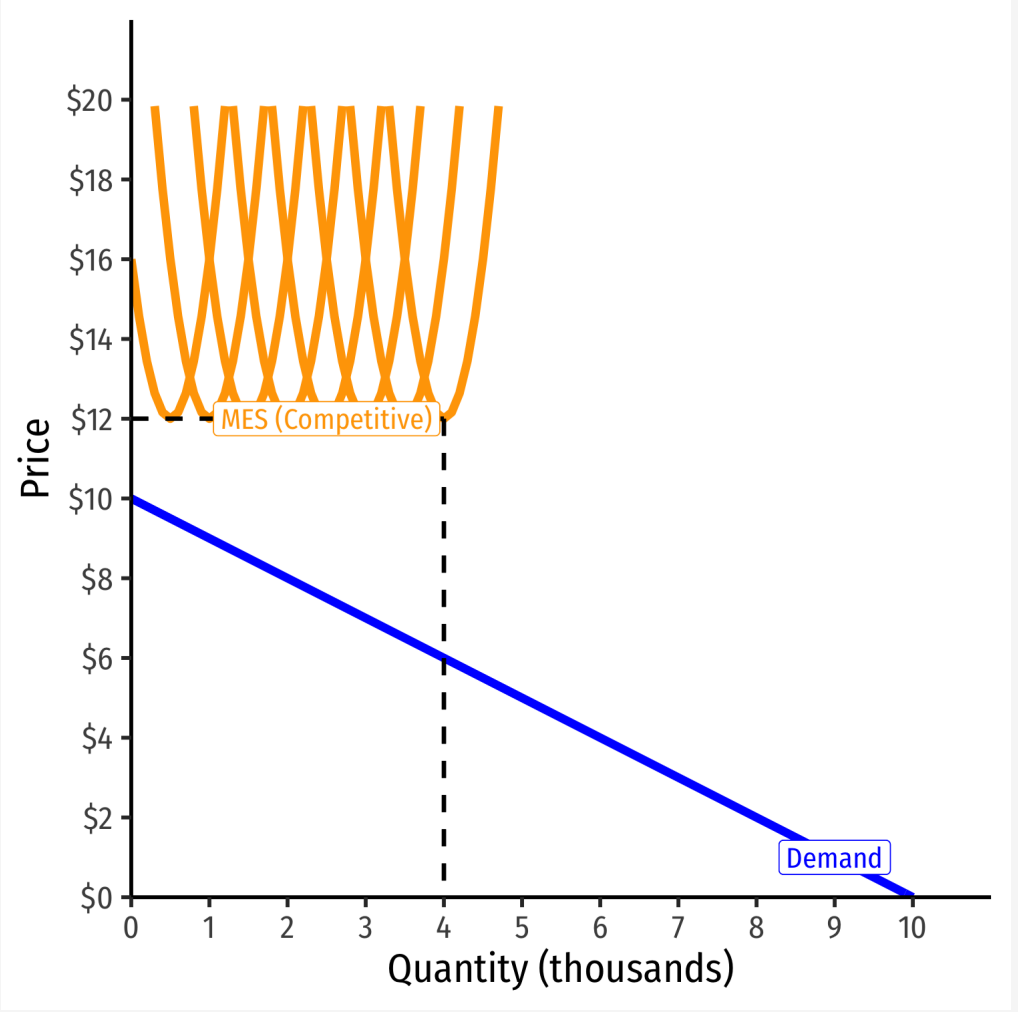
Recall: (Internal) Economies of Scale II

- Recall: **economies of scale**: as $\uparrow q$, $\downarrow AC(q)$
- **Minimum Efficient Scale (MES)**: q with the lowest $AC(q)$
- If MES is small relative to market demand...
    - AC hits Market demand during **diseconomies of scale**...



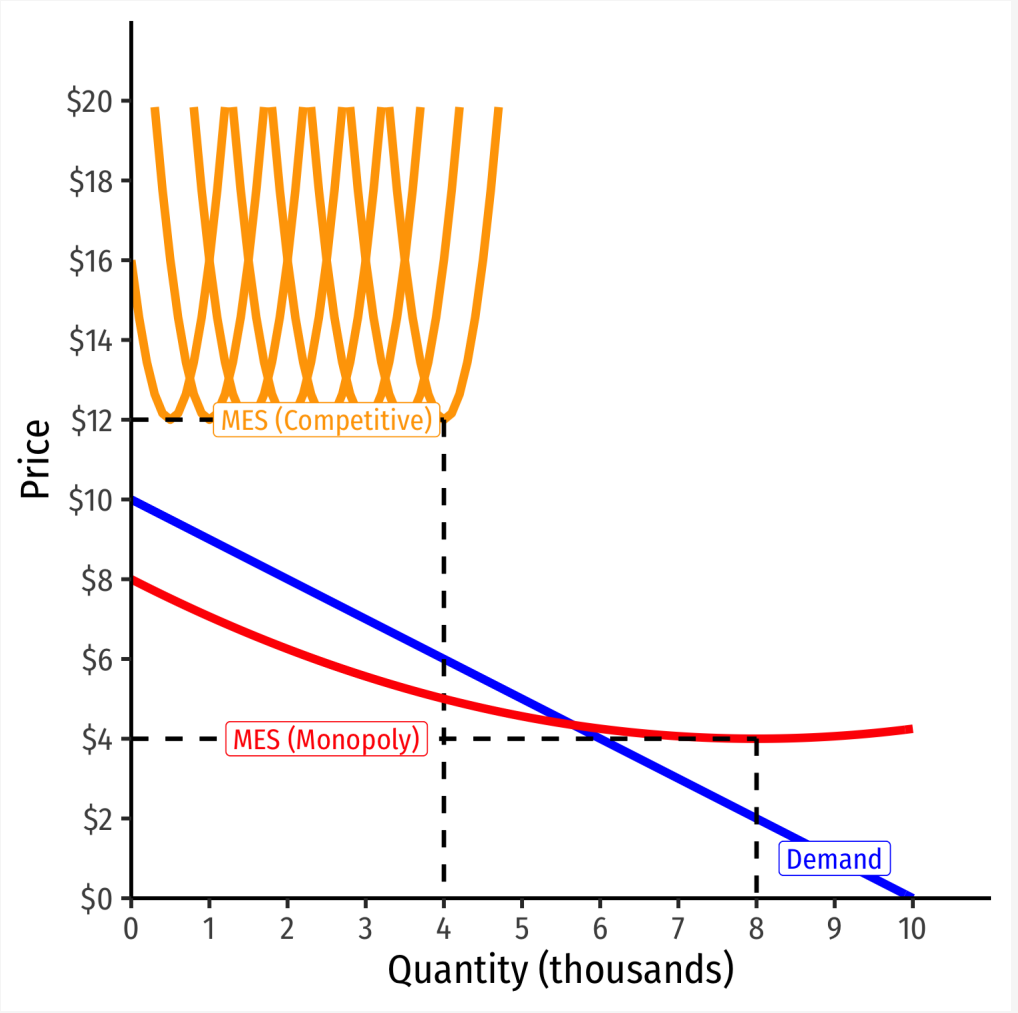
Recall: (Internal) Economies of Scale II

- If MES is small relative to market demand...
  - AC hits Market demand during **diseconomies of scale**...
  - **...can fit more identical firms into the industry!**



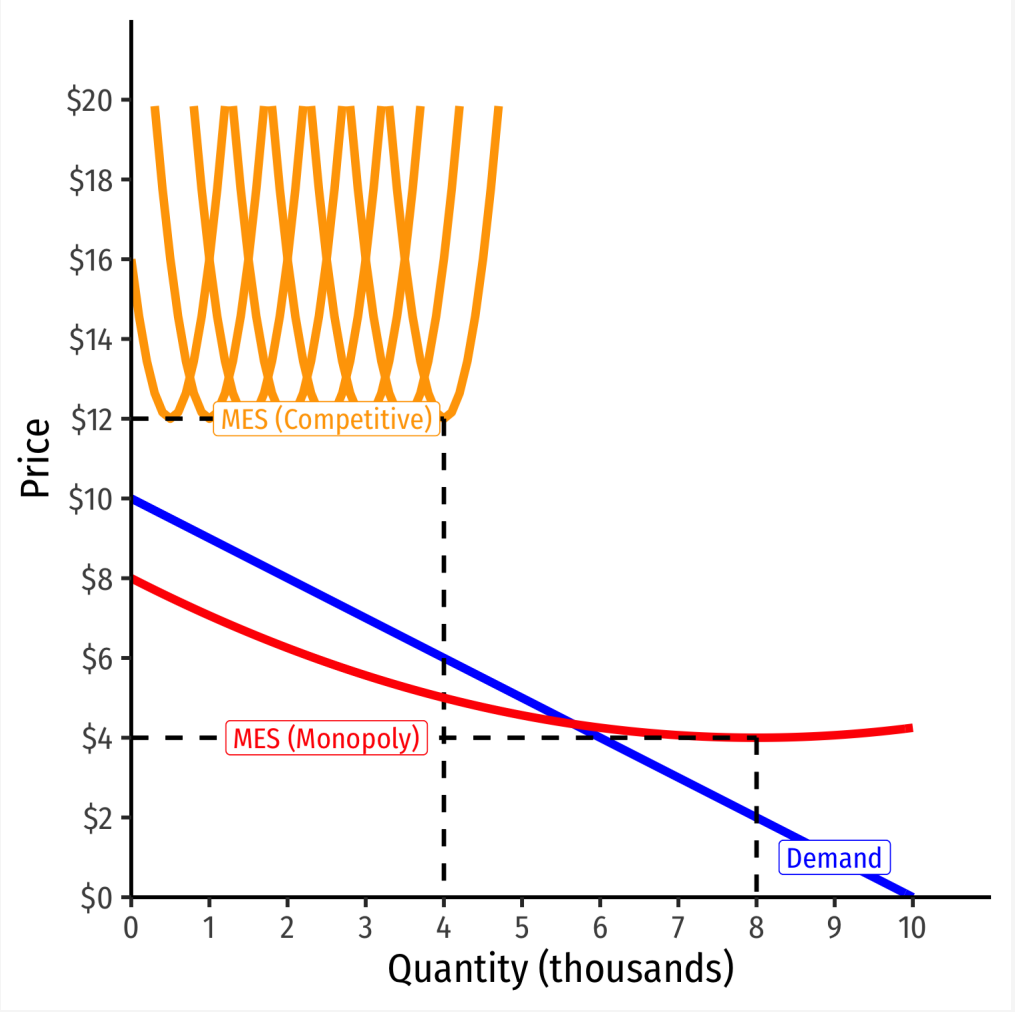
Recall: (Internal) Economies of Scale III

- If MES is **large** relative to market demand…
  - AC hits Market demand during ***economies* of scale**…
  - **likely to be a single firm in the industry!**



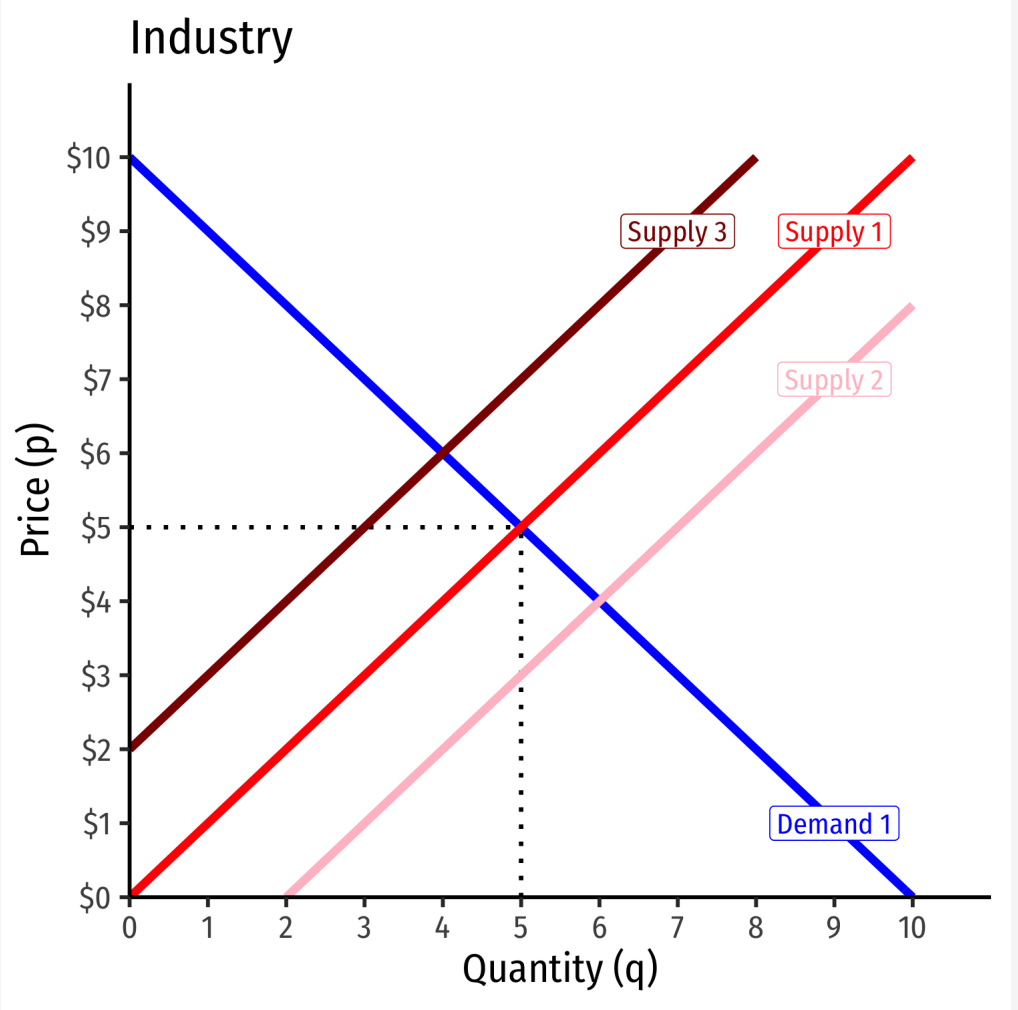
Recall: (Internal) Economies of Scale III

- If MES is **large** relative to market demand...
  - AC hits Market demand during ***economies* of scale**...
  - **likely to be a single firm in the industry!**
- A **natural monopoly** that can produce higher q^* and lower p^* than a competitive industry!



Entry/Exit Effects on Market Price

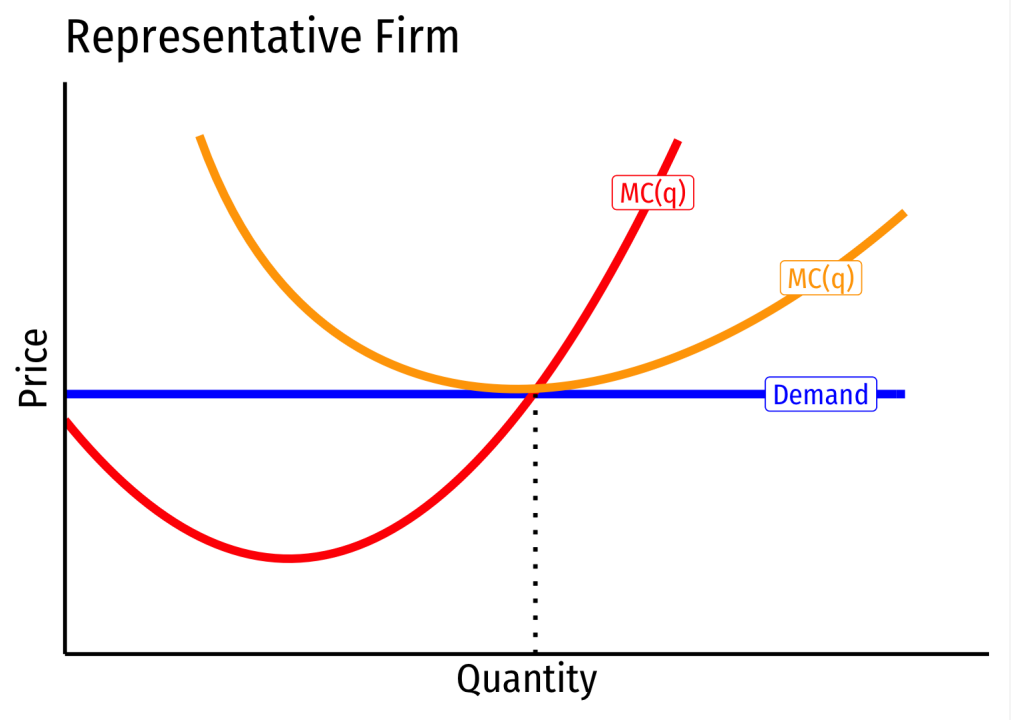
- When **all firms produce more/less**; or **firms enter or exit** an industry, this **affects the equilibrium market price**
- Think about basic supply & demand graphs:
  - **Entry**: ↑ industry supply $\implies \uparrow q, \downarrow p$
  - **Exit**: ↓ industry supply $\implies \downarrow q, \uparrow p$
- If the size of the entire industry affects all individual firm's costs, then there are ***external economies*** effects
  - Cost externalities that spill over across all firms in an industry

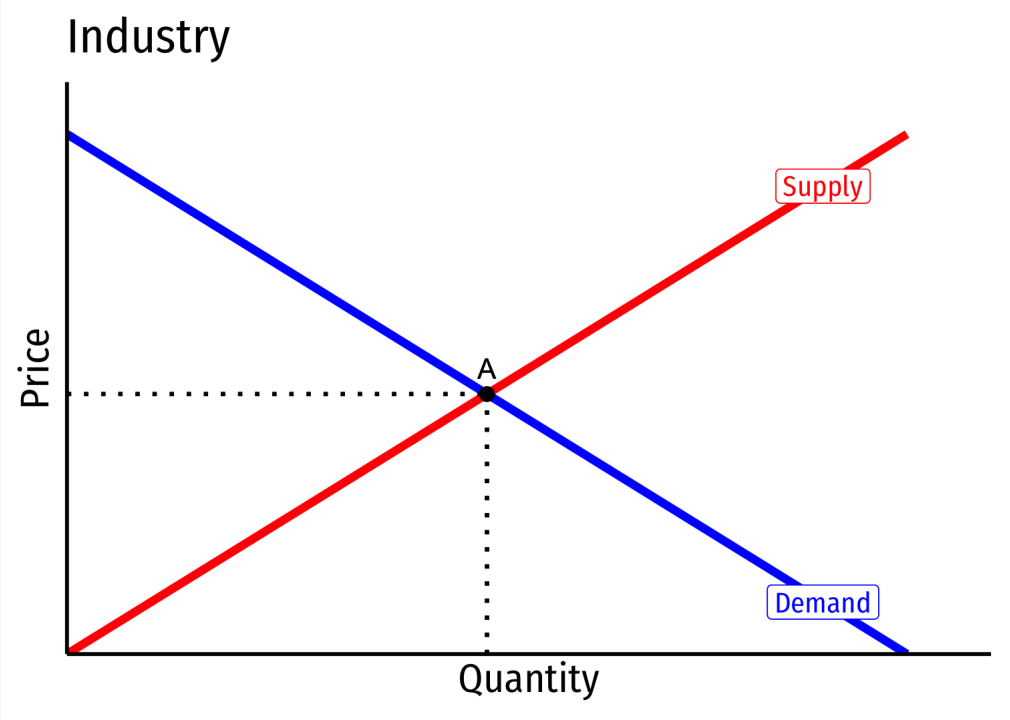


Constant Cost Industry (No External Economies) I

- **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
- Examples: toothpicks, domain name registration, waitstaff

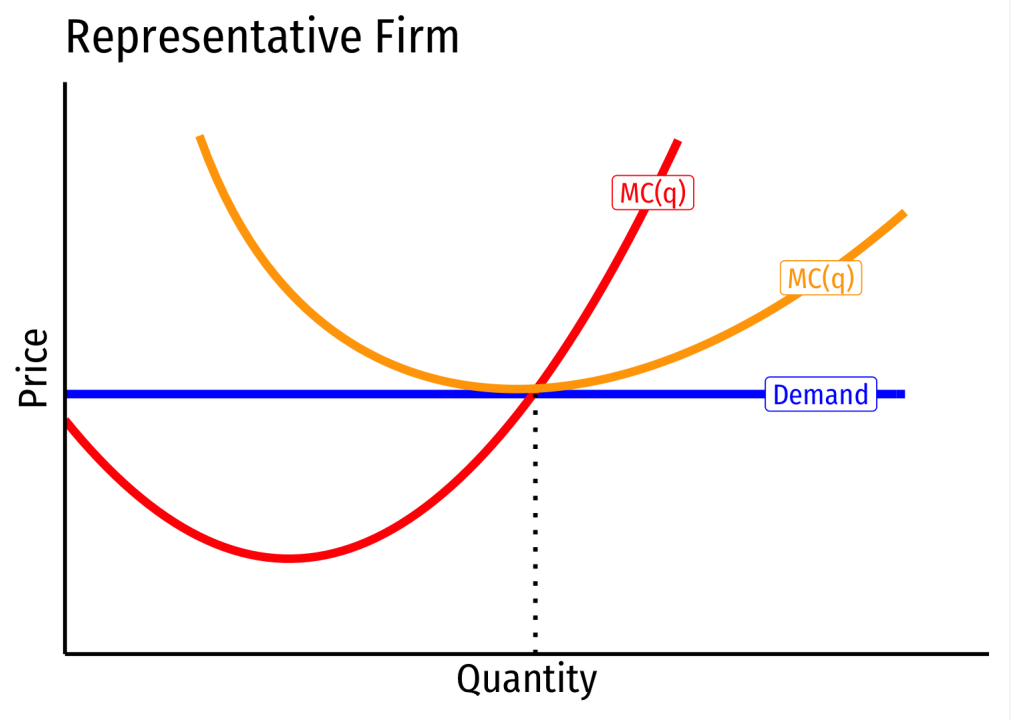
Constant Cost Industry (No External Economies) II

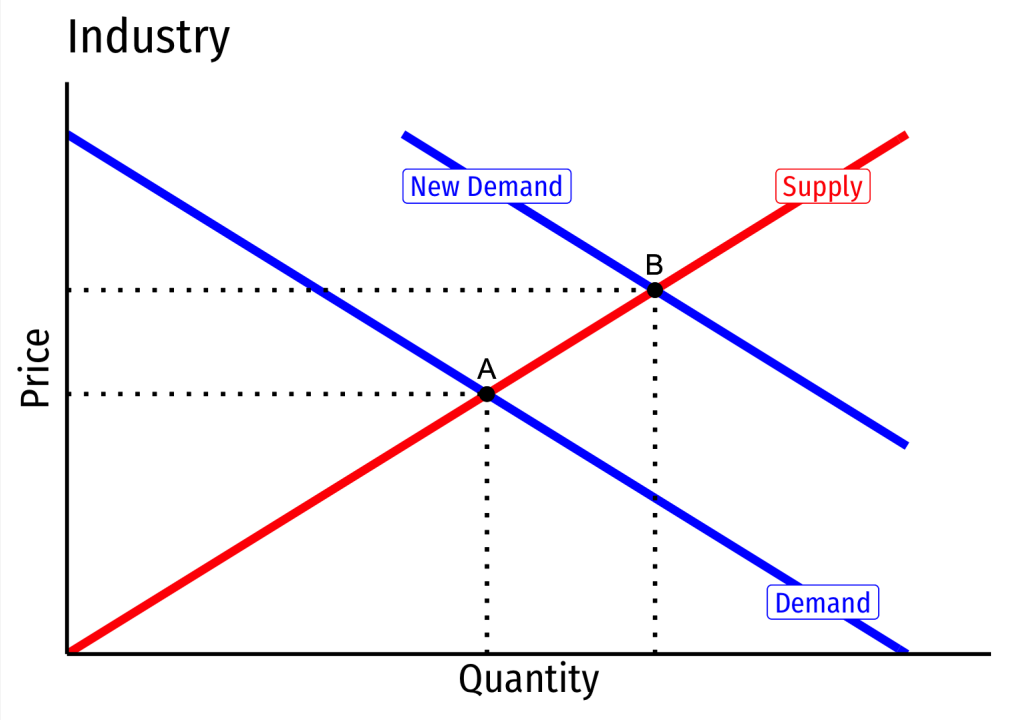




- Industry equilibrium: firms earning normal $\pi = 0, p = MC(q) = AC(q)$

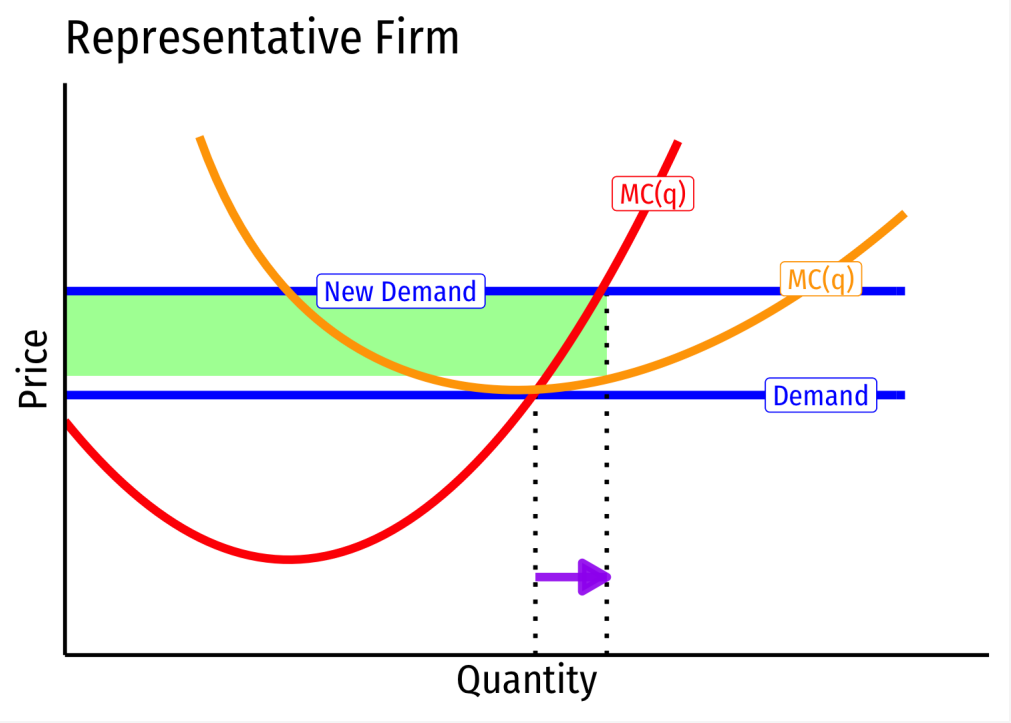
Constant Cost Industry (No External Economies) III

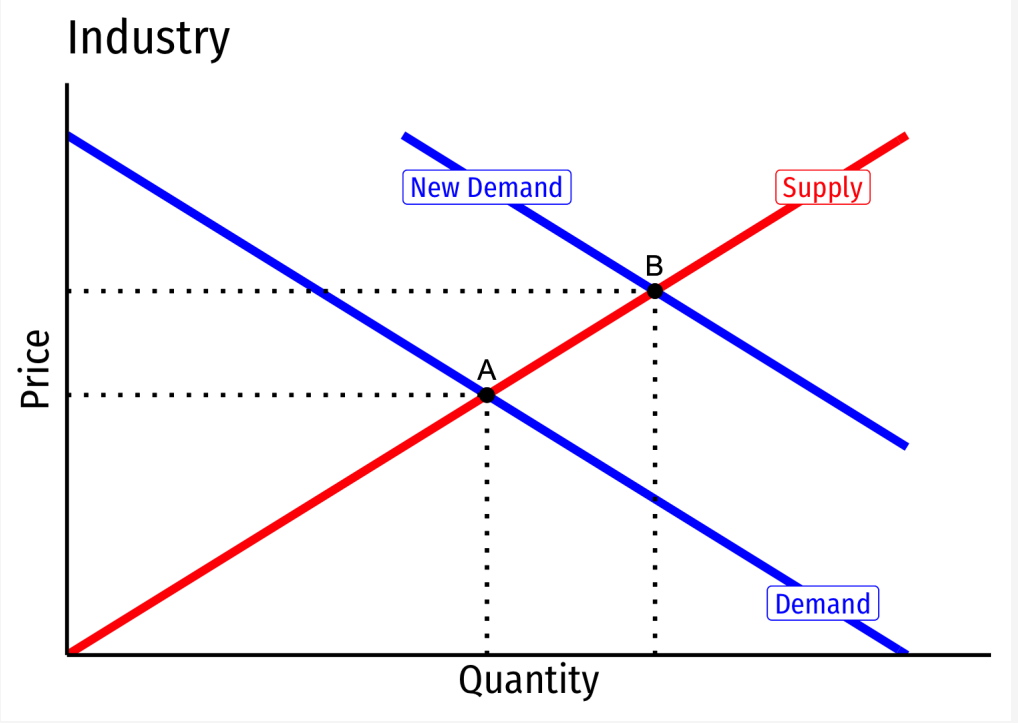




- Industry equilibrium: firms earning normal $\pi = 0, p = MC(q) = AC(q)$
- Exogenous increase in market demand

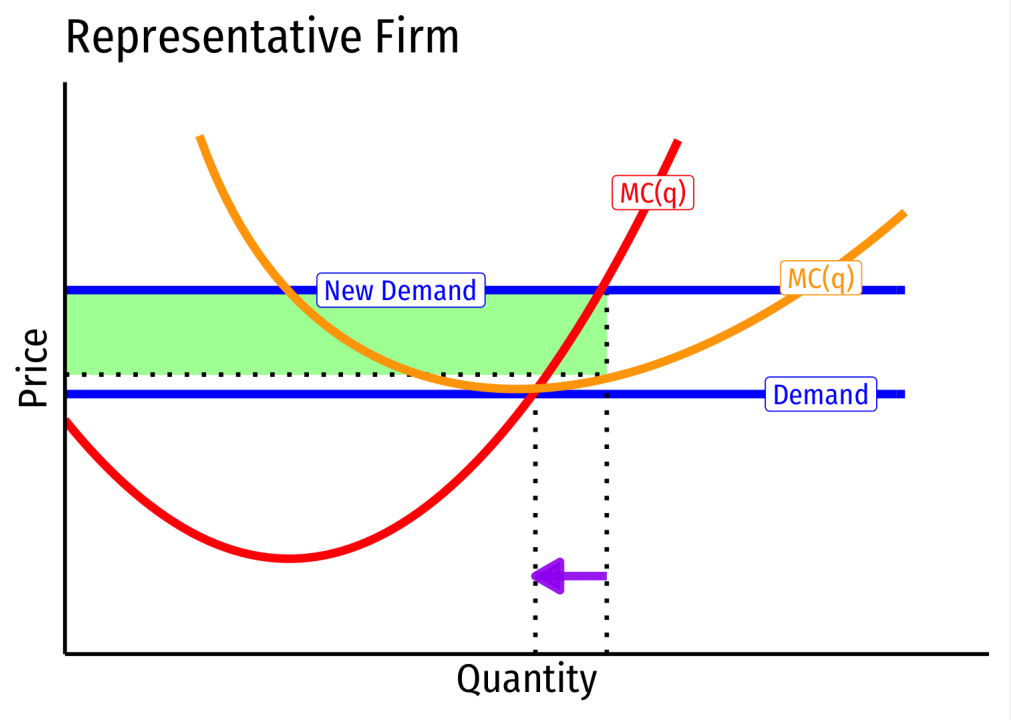
Constant Cost Industry (No External Economies) IV

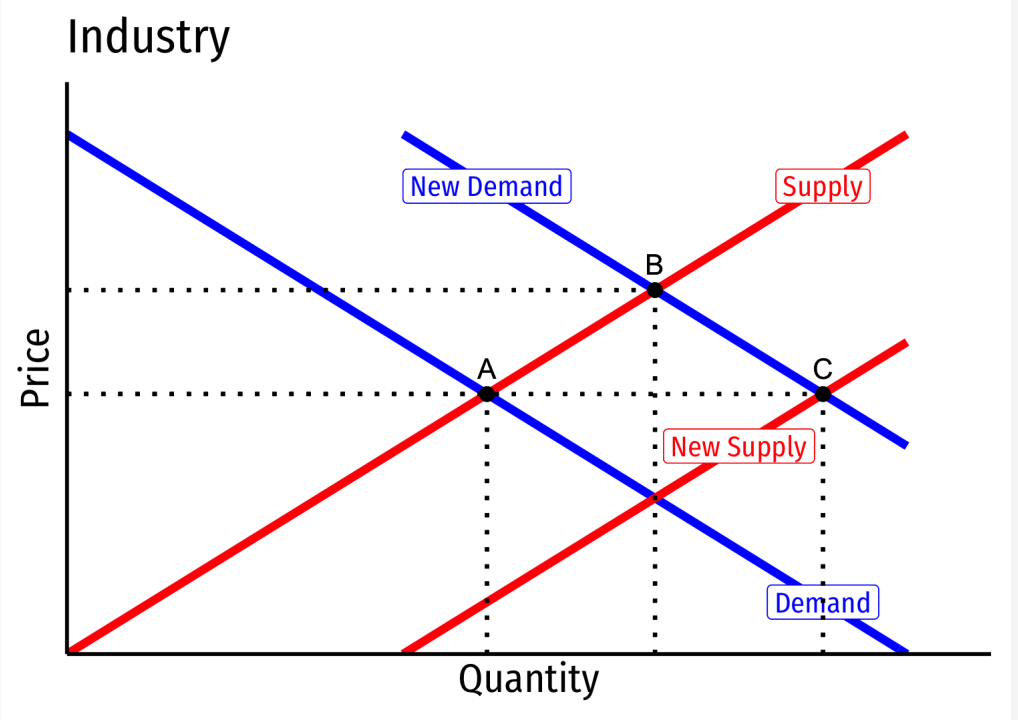




- **Short run** $(A \rightarrow B)$: industry reaches new equilibrium
- Firms charge higher p^*, produce more q^*, earn π

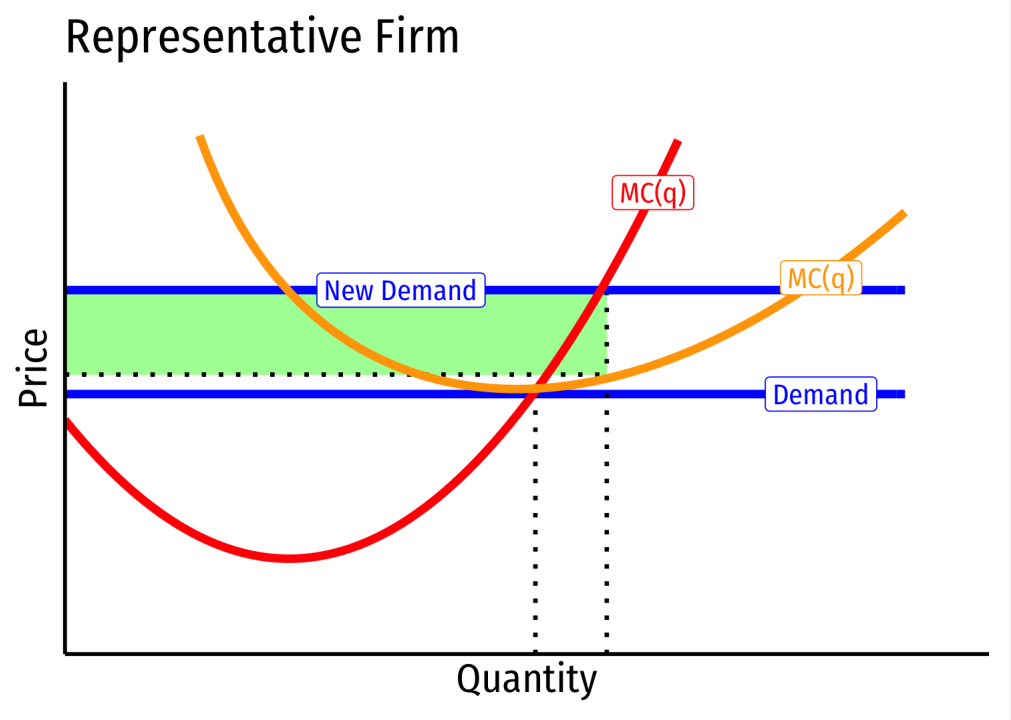
Constant Cost Industry (No External Economies) V

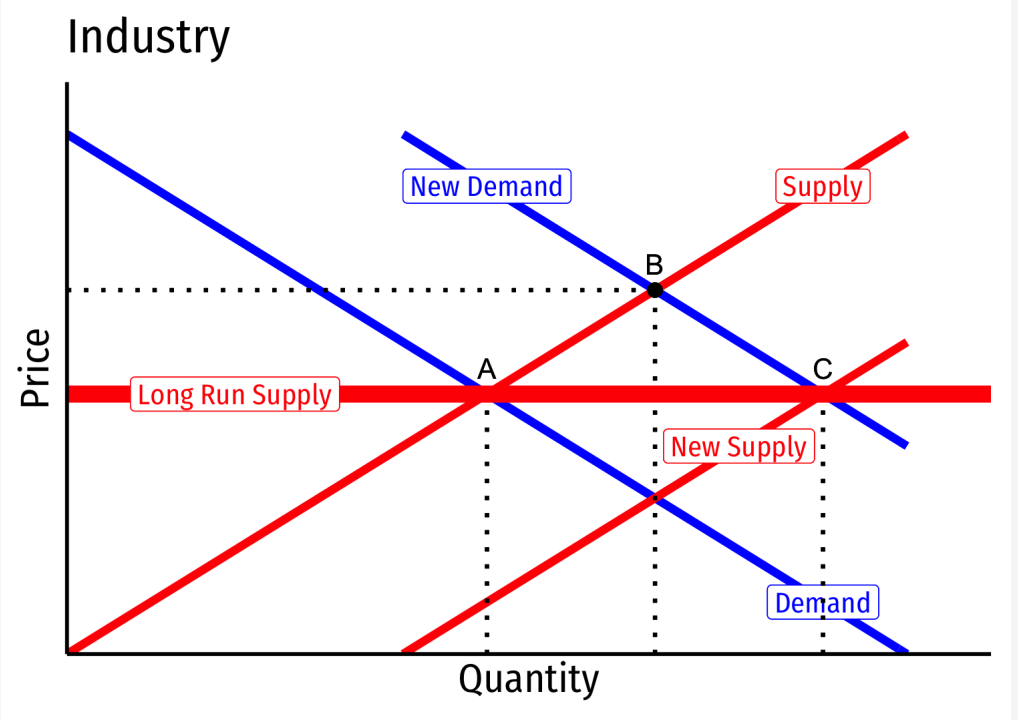




- **Long run** $(B \rightarrow C)$: profit attracts entry $\Longrightarrow$ industry supply increases
- No change in costs to firms in industry, firms enter until $\pi = 0$ at $p = AC(q)$

Constant Cost Industry (No External Economies) VI



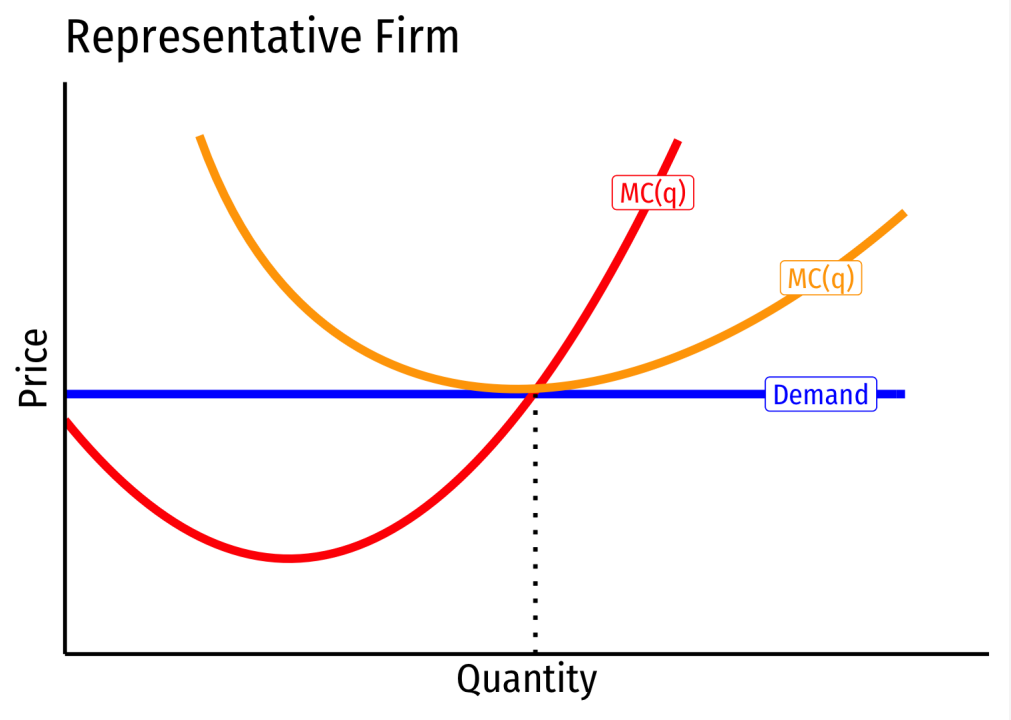


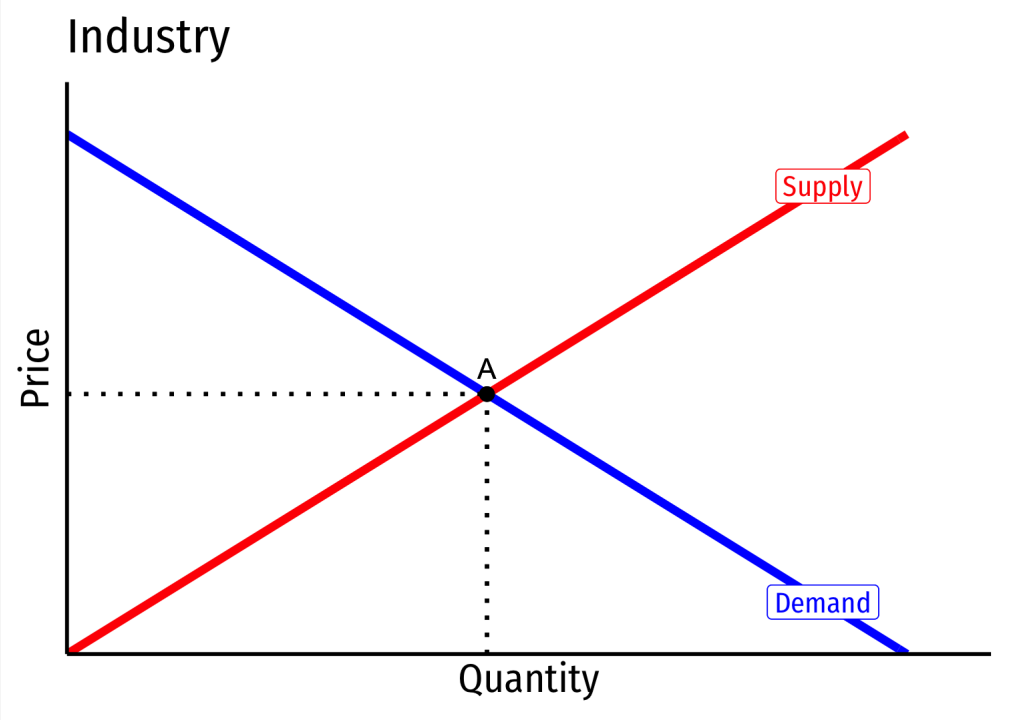
- Long Run Industry Supply is perfectly elastic

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
- Examples: oil, mining, particle physics

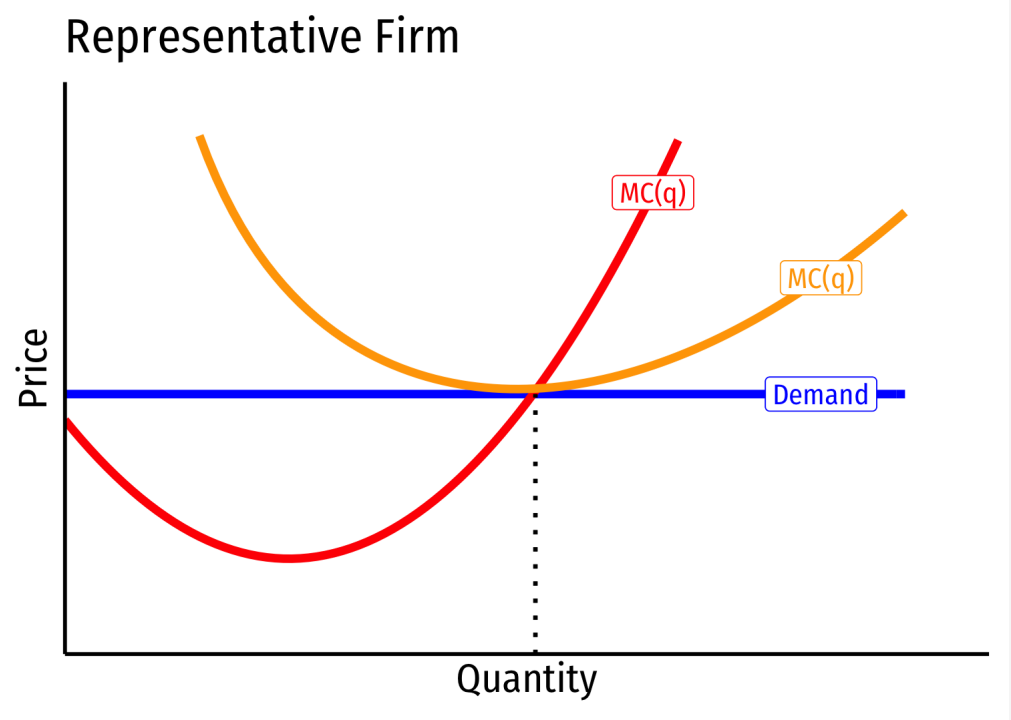
Increasing Cost Industry (External Diseconomies) II

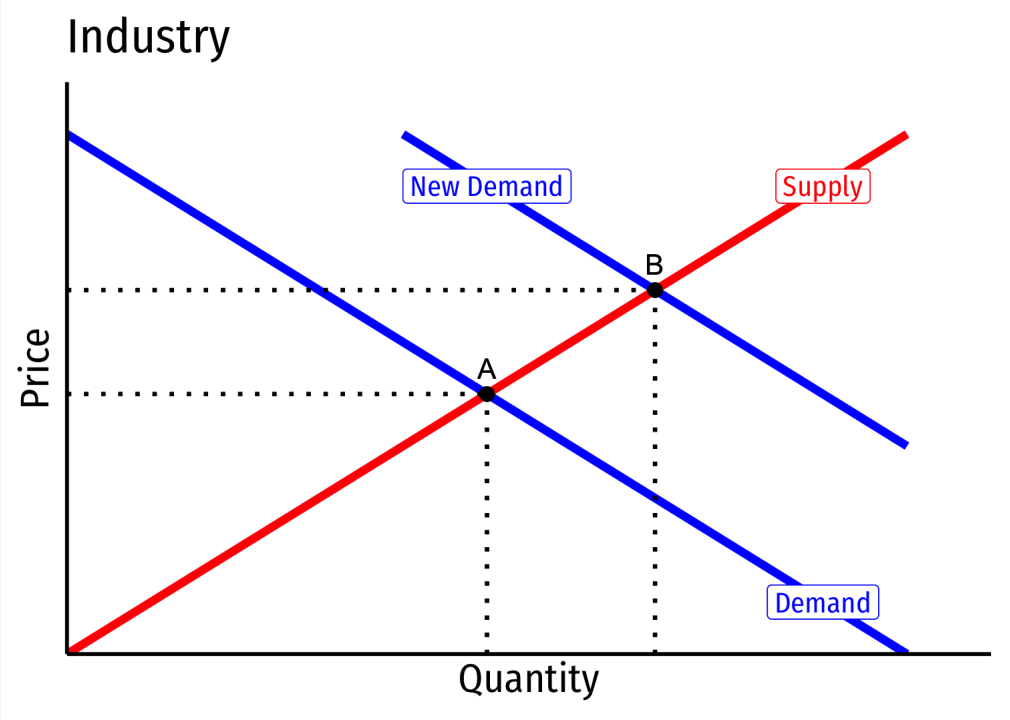




- Industry equilibrium: firms earning normal $\pi = 0, p = MC(q) = AC(q)$

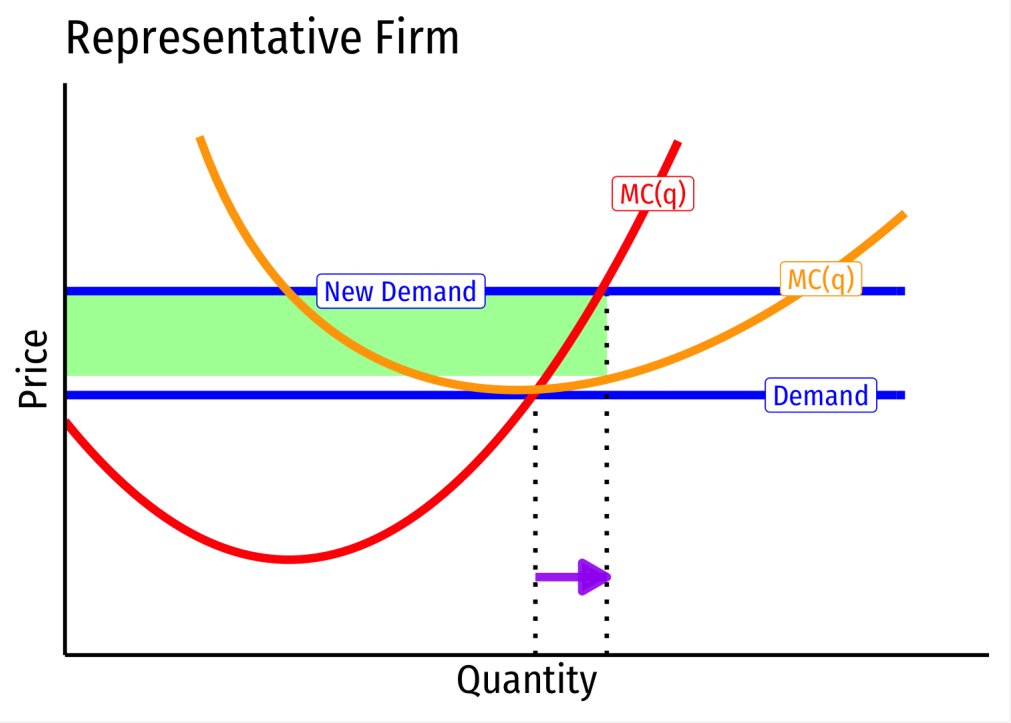
Increasing Cost Industry (External Diseconomies) III

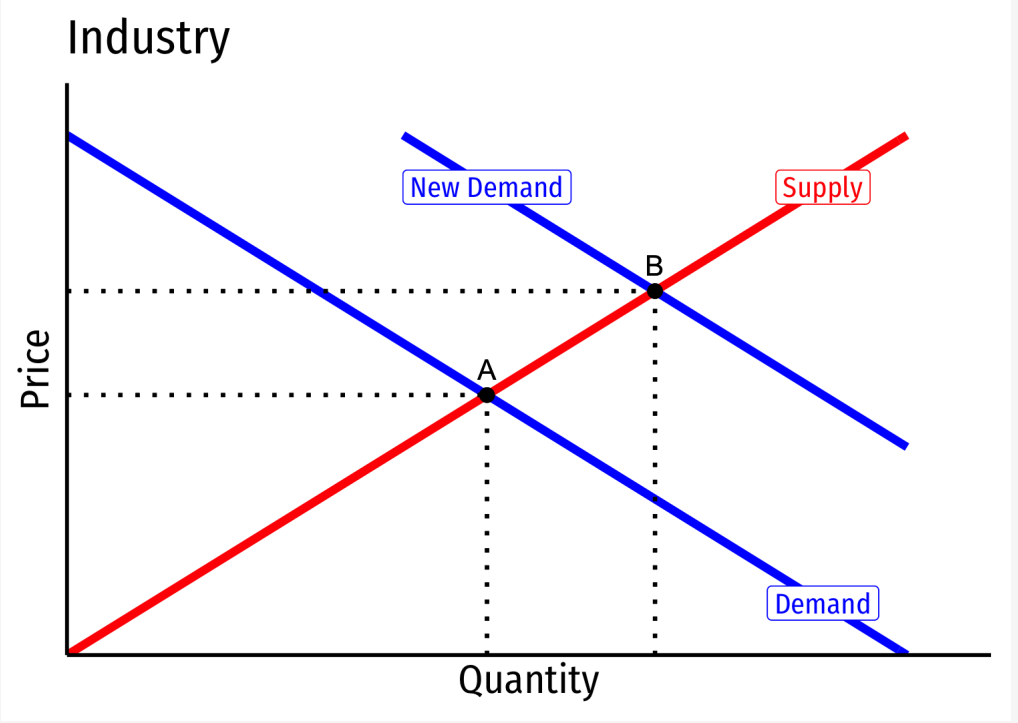




- Industry equilibrium: firms earning normal $\pi = 0, p = MC(q) = AC(q)$
- Exogenous increase in market demand

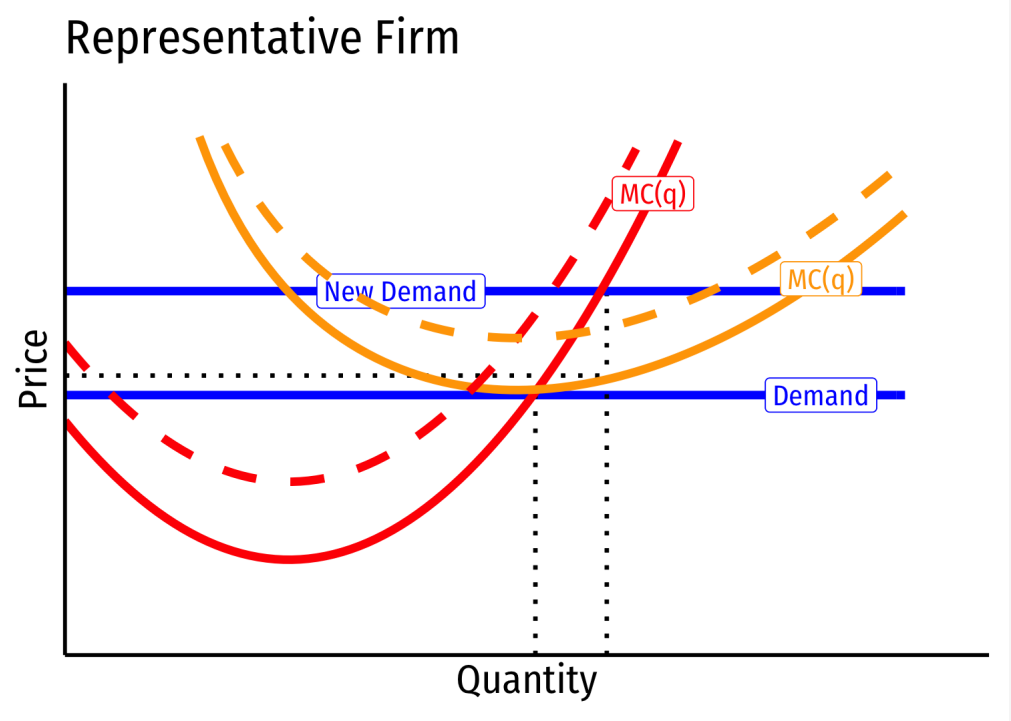
Increasing Cost Industry (External Diseconomies) IV

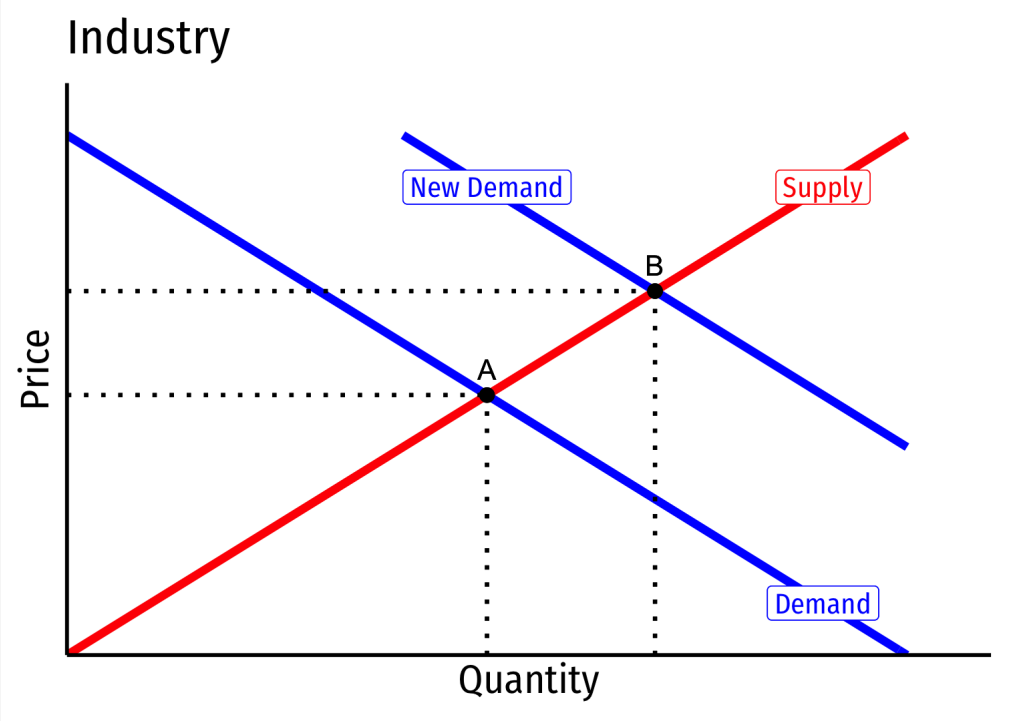




- **Short run** $(A \rightarrow B)$: industry reaches new equilibrium
- Firms charge higher p^*, produce more q^*, earn π

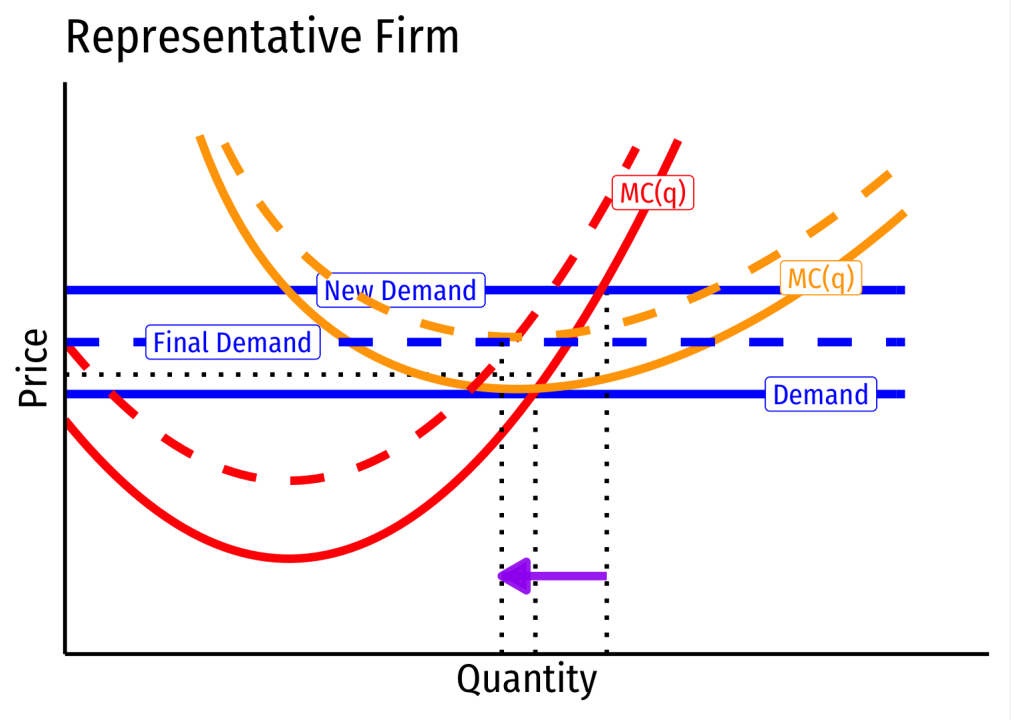
Increasing Cost Industry (External Diseconomies) V

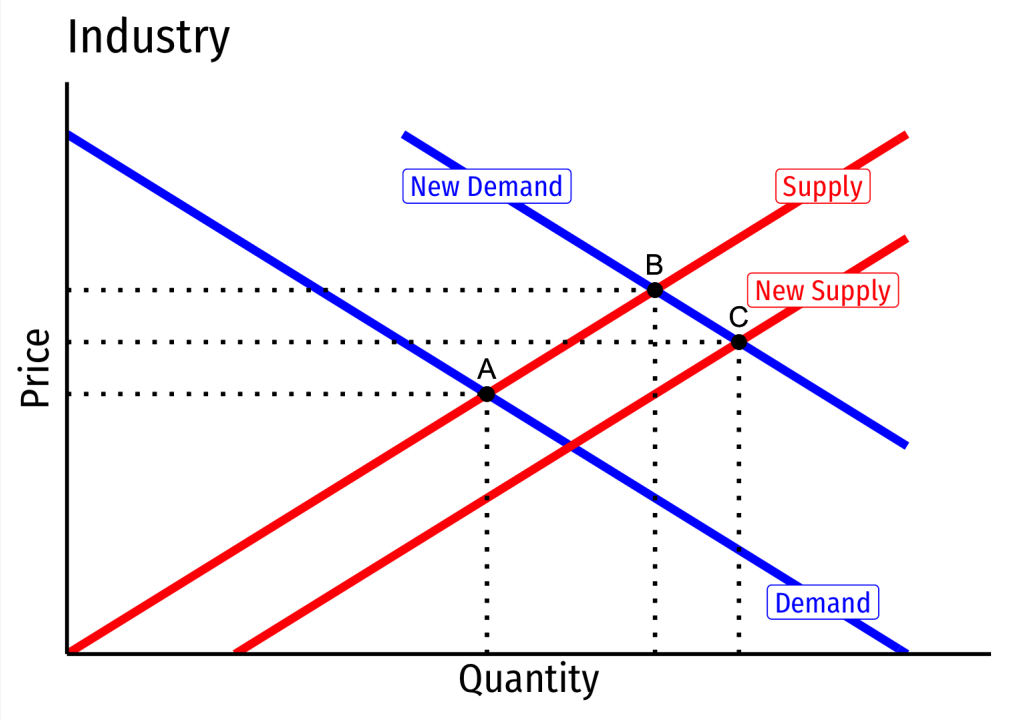




- **Long run**: profit attracts entry $\Longrightarrow$ industry supply will increase
- **But more production increases costs** (MC, AC) **for all firms in industry**

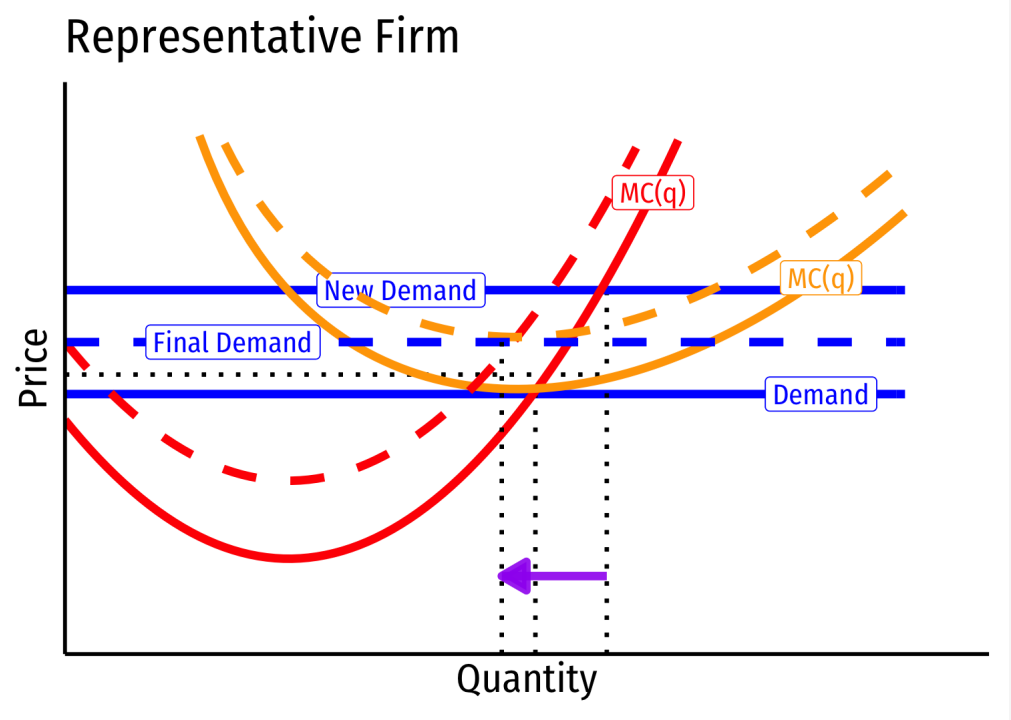
Increasing Cost Industry (External Diseconomies) VI

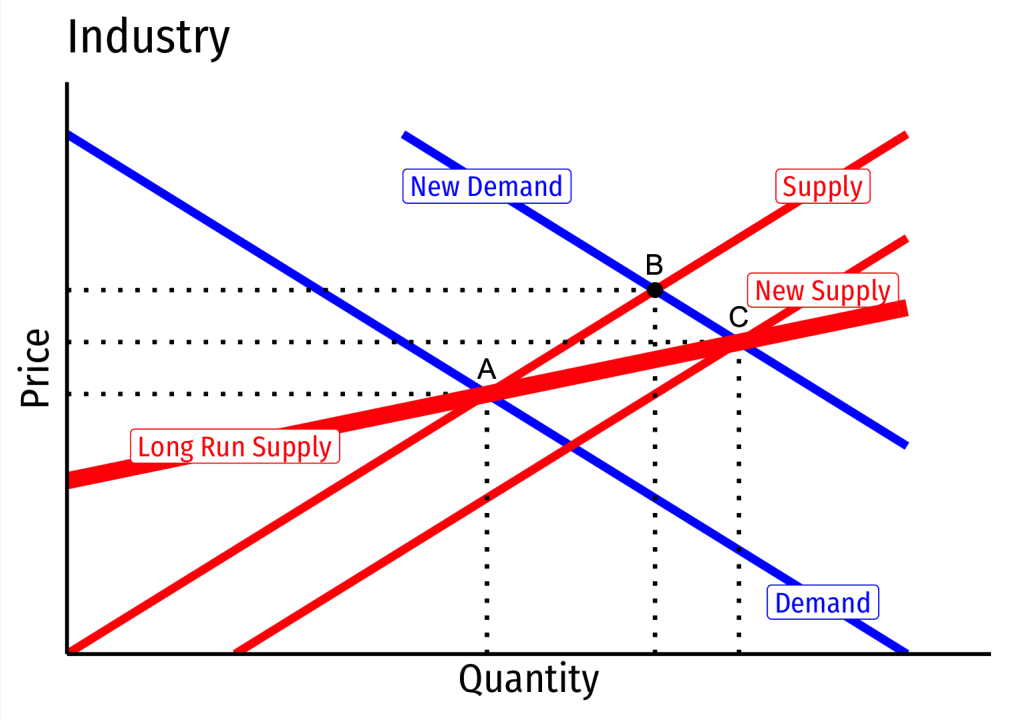




- **Long run** $(B \rightarrow C)$: firms enter until $\pi = 0$ at $p = AC(q)$
- Firms charge higher p^*, producer lower q^*, earn $\pi = 0$

Increasing Cost Industry (External Diseconomies) VII



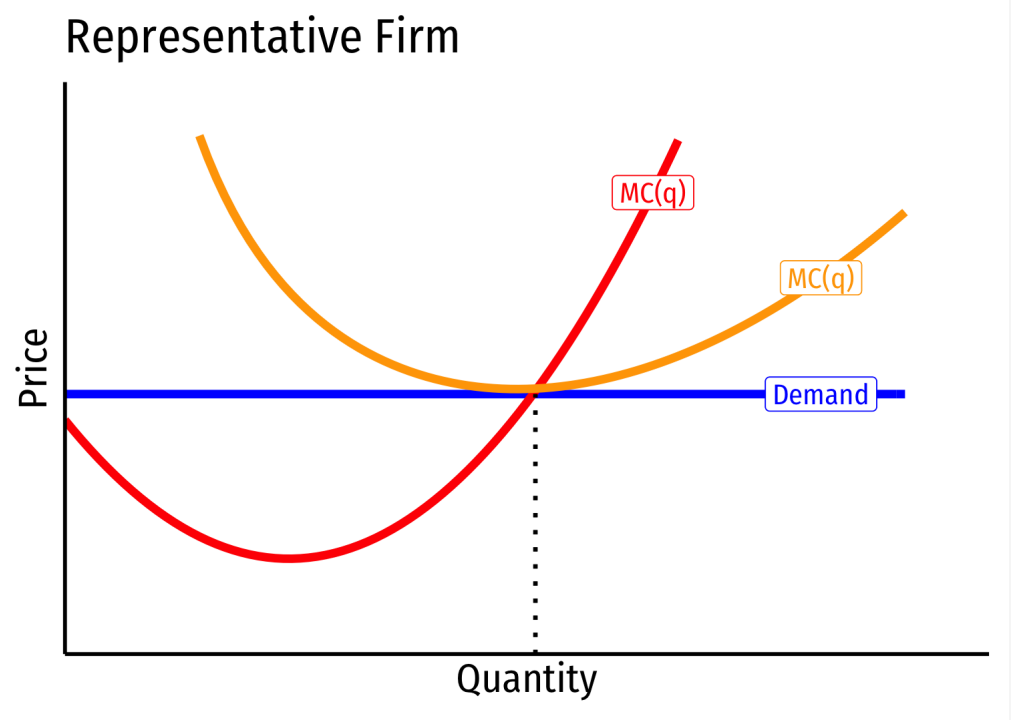


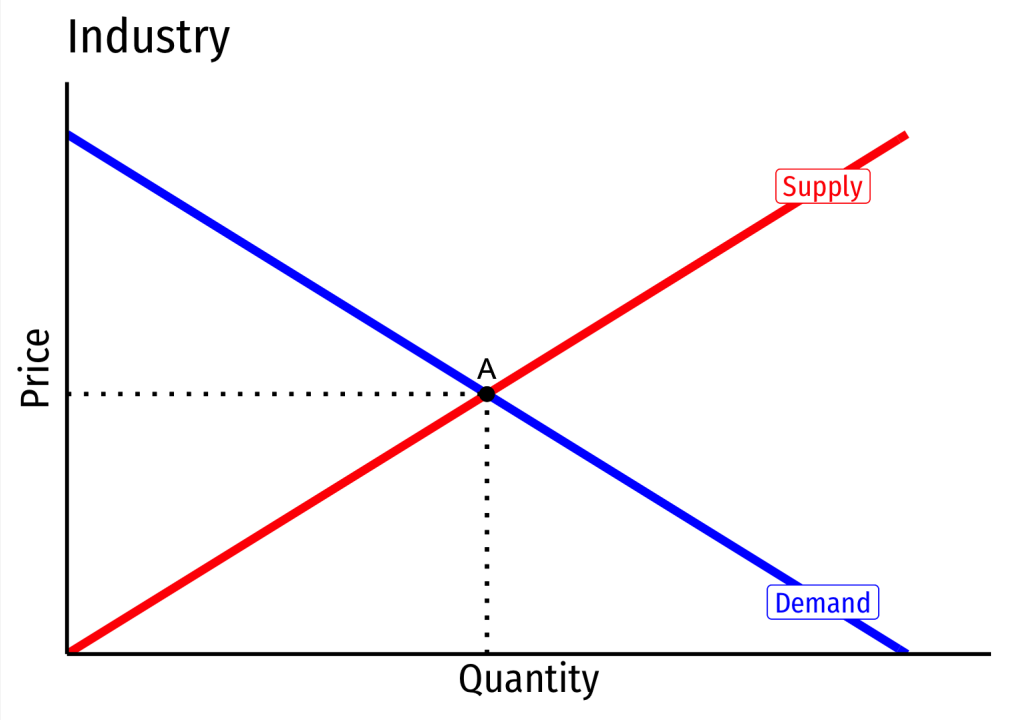
- Long run industry supply curve is upward sloping

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**

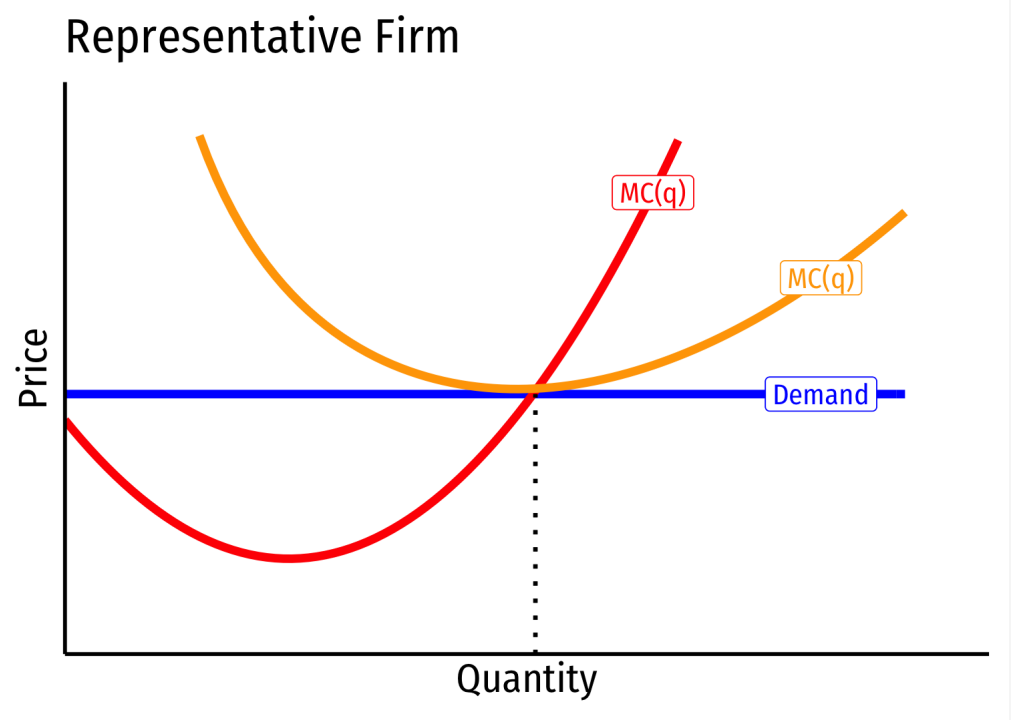
Decreasing Cost Industry (External Economies) II

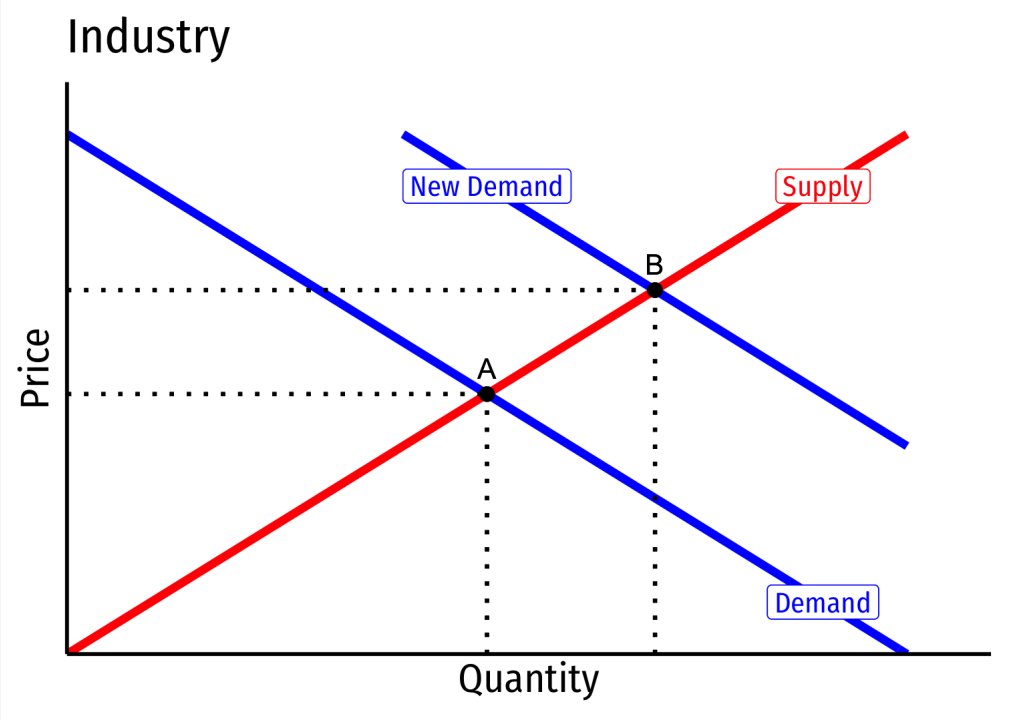




- Industry equilibrium: firms earning normal $\pi = 0, p = MC(q) = AC(q)$

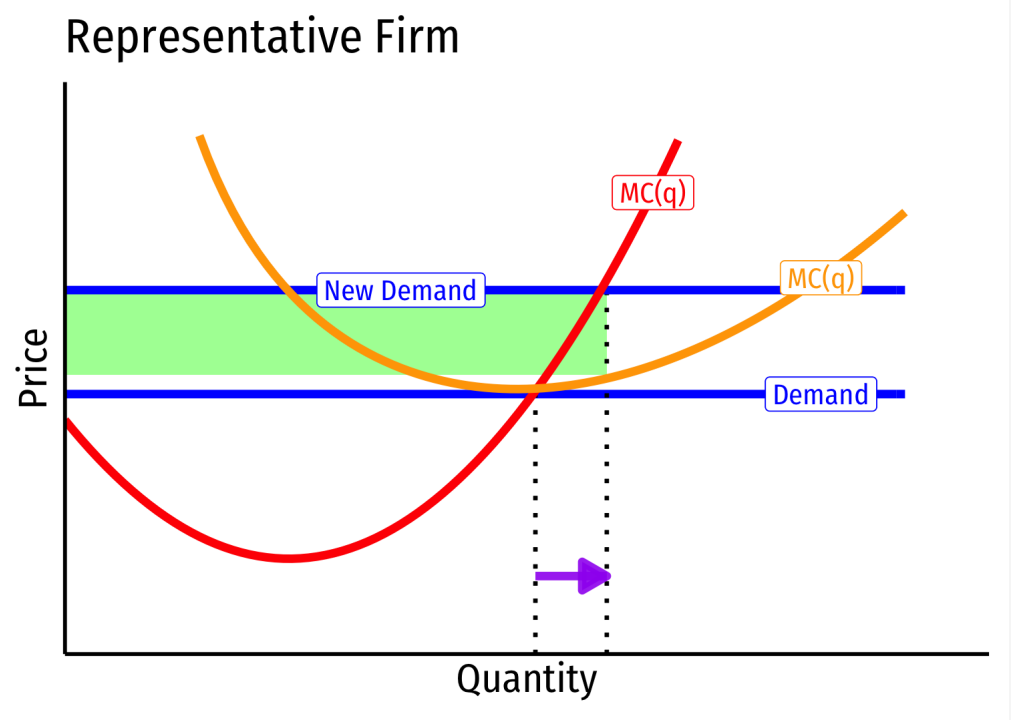
Decreasing Cost Industry (External Economies) III

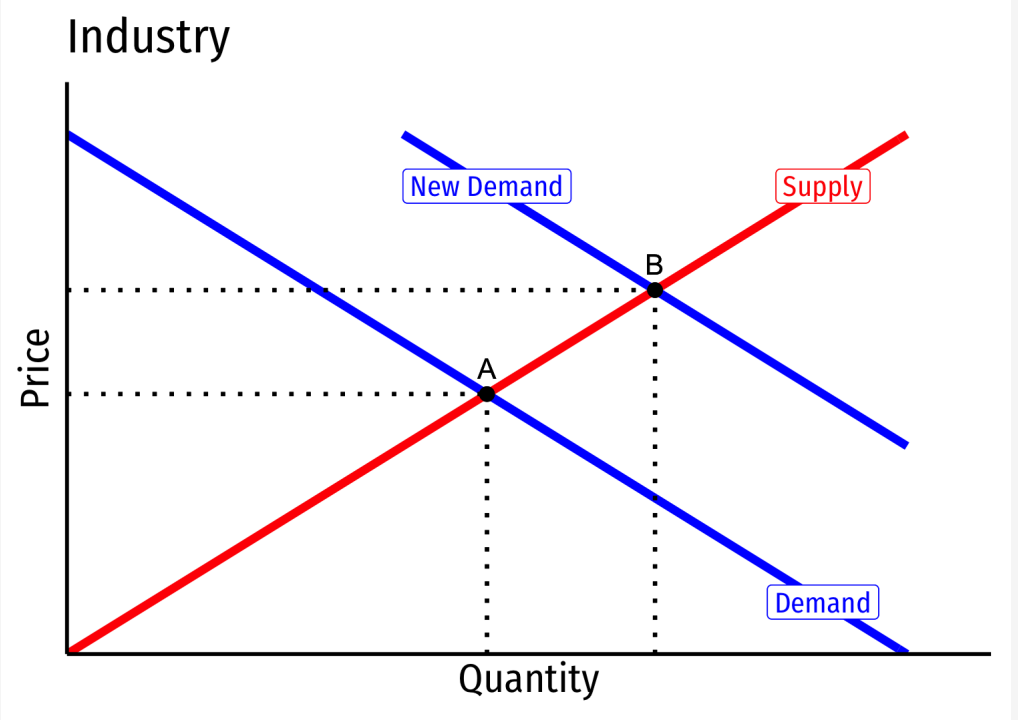




- Industry equilibrium: firms earning normal $\pi = 0, p = MC(q) = AC(q)$
- Exogenous increase in market demand

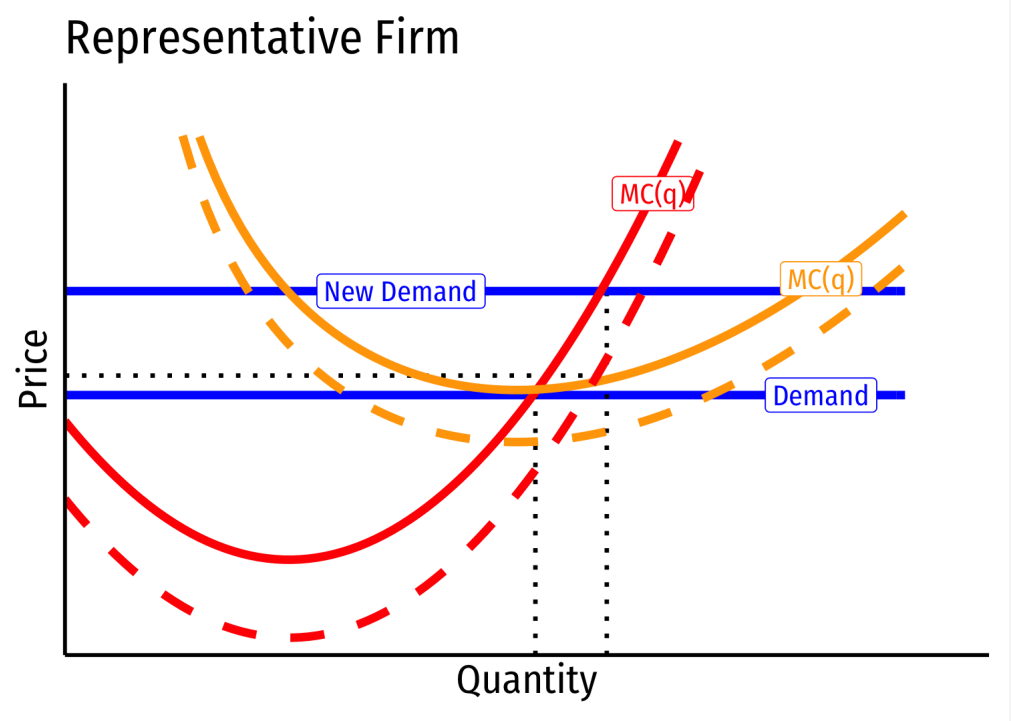
Decreasing Cost Industry (External Economies) IV

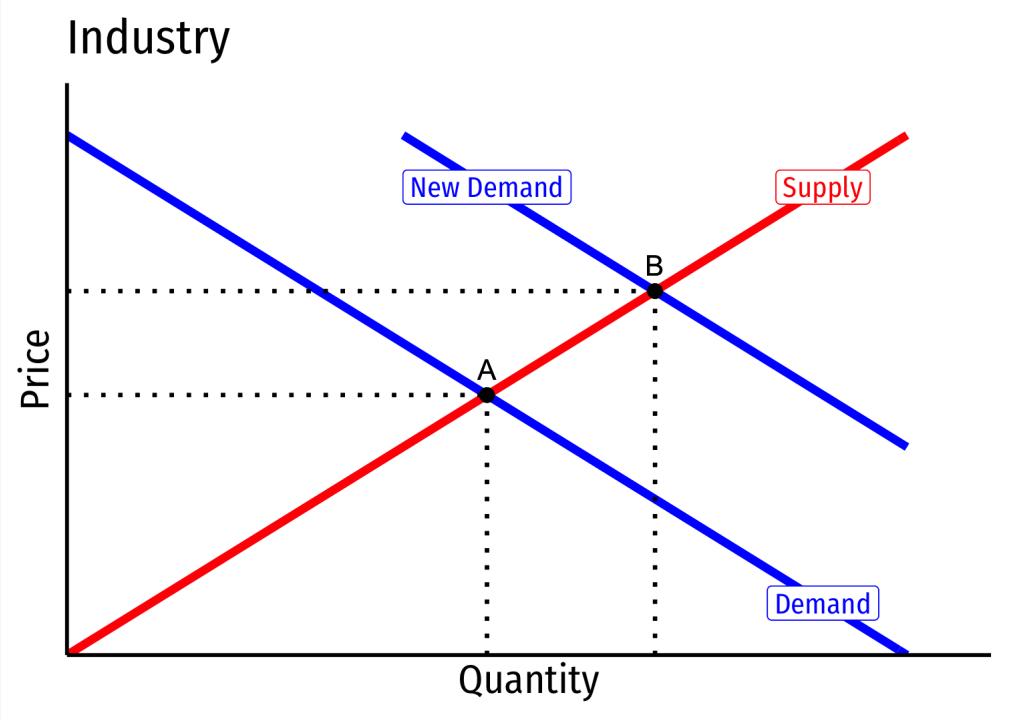




- **Short run** $(A \rightarrow B)$: industry reaches new equilibrium
- Firms charge higher p^*, produce more q^*, earn π

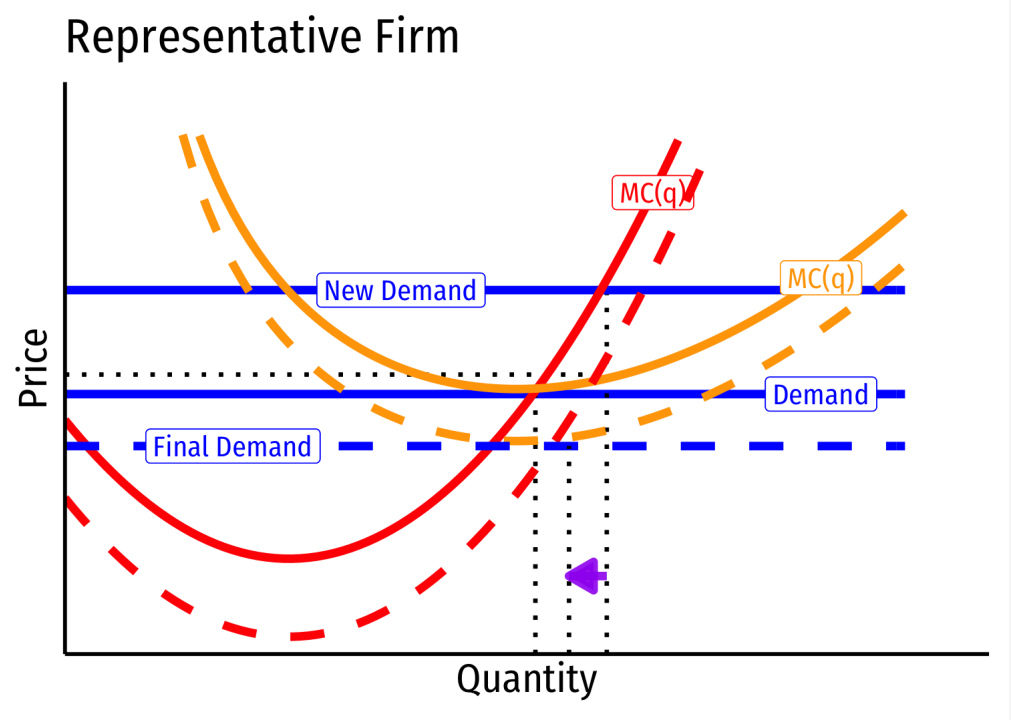
Decreasing Cost Industry (External Economies) V

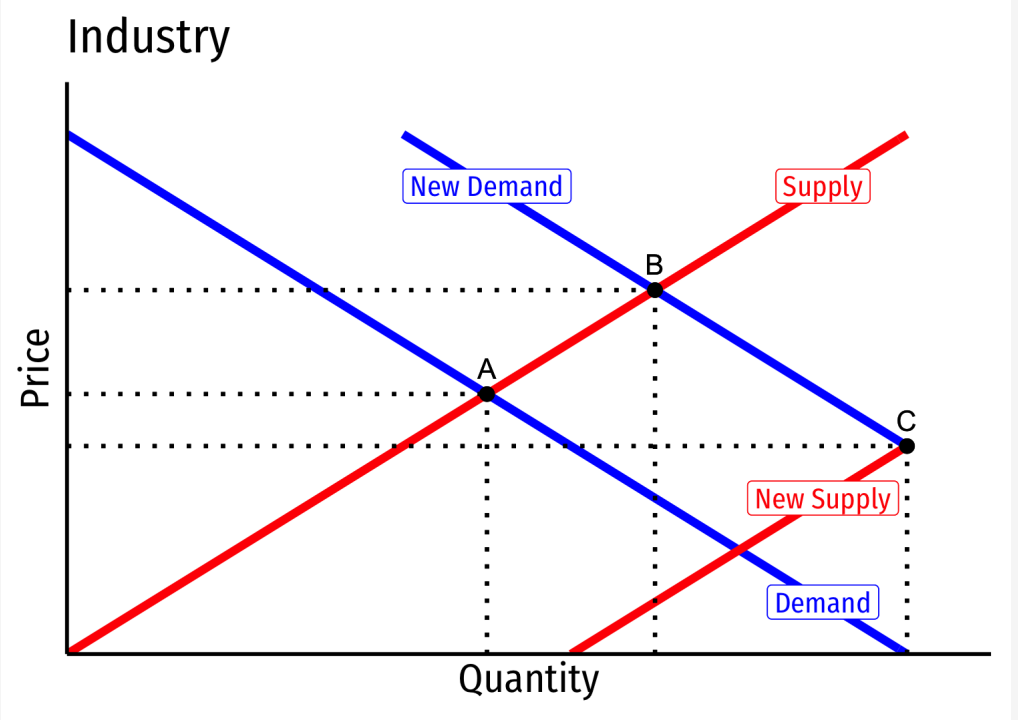




- **Long run**: profit attracts entry $\Longrightarrow$ industry supply will increase
- **But more production lowers costs** (MC, AC) **for all firms in industry**

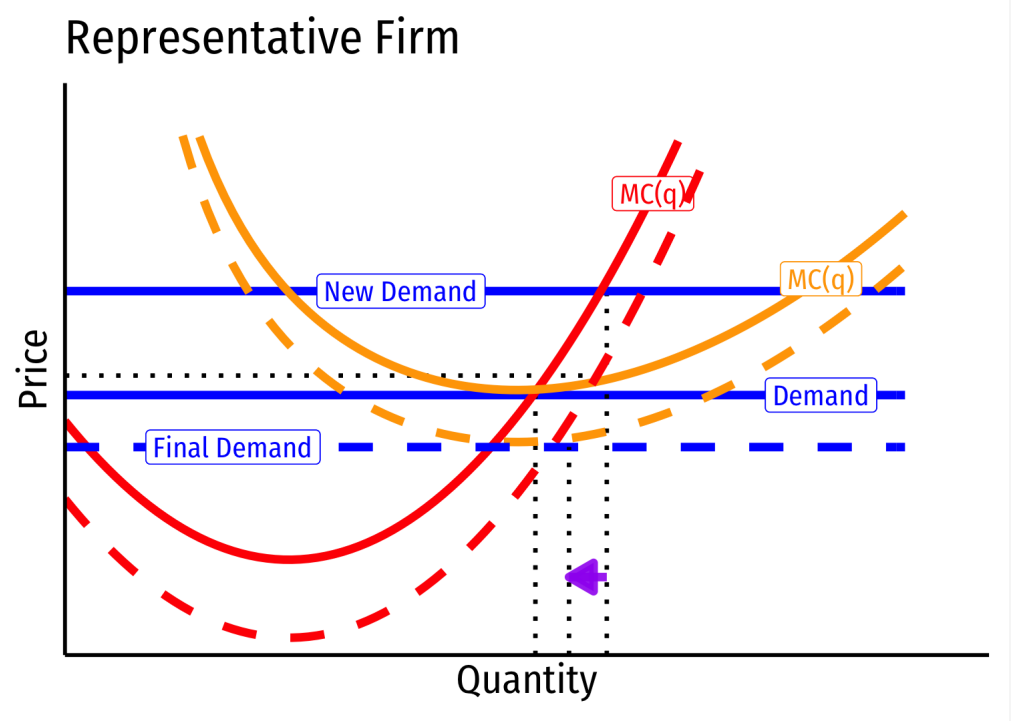
Decreasing Cost Industry (External Economies) VI

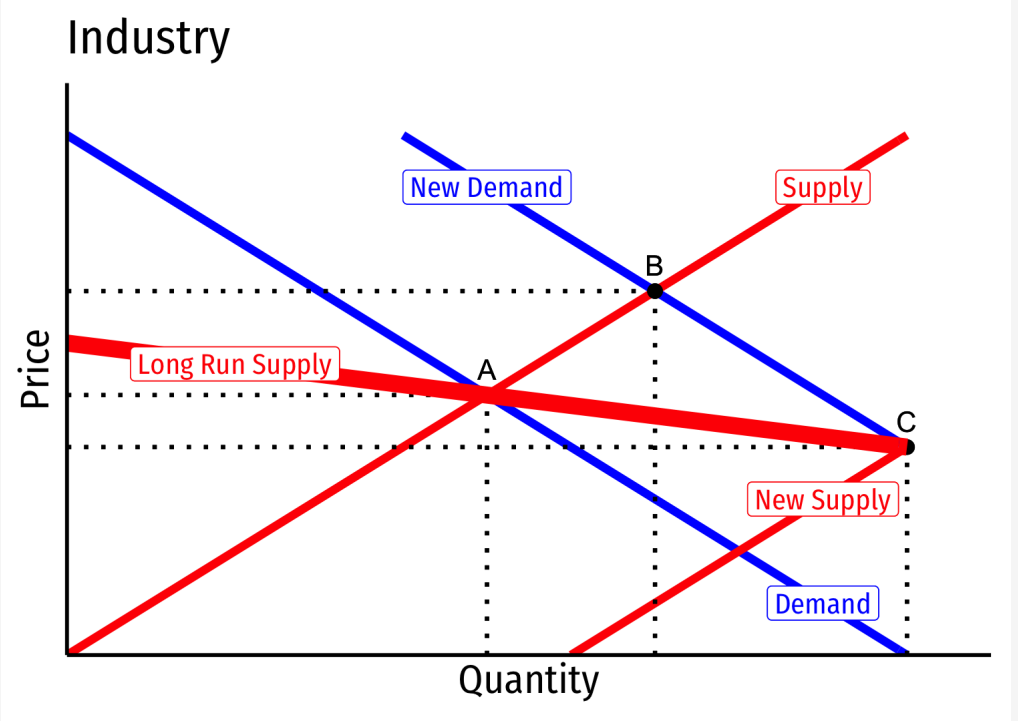




- **Long run** $(B \rightarrow C)$: firms enter until $\pi = 0$ at $p = AC(q)$
- Firms charge higher p^*, producer lower q^*, earn $\pi = 0$

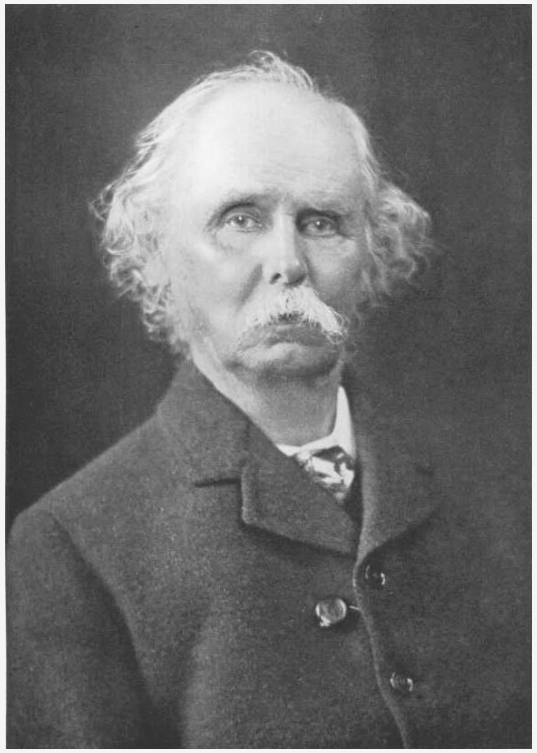
Decreasing Cost Industry (External Economies) VII





- Long run industry supply curve is downward sloping!

External Economies

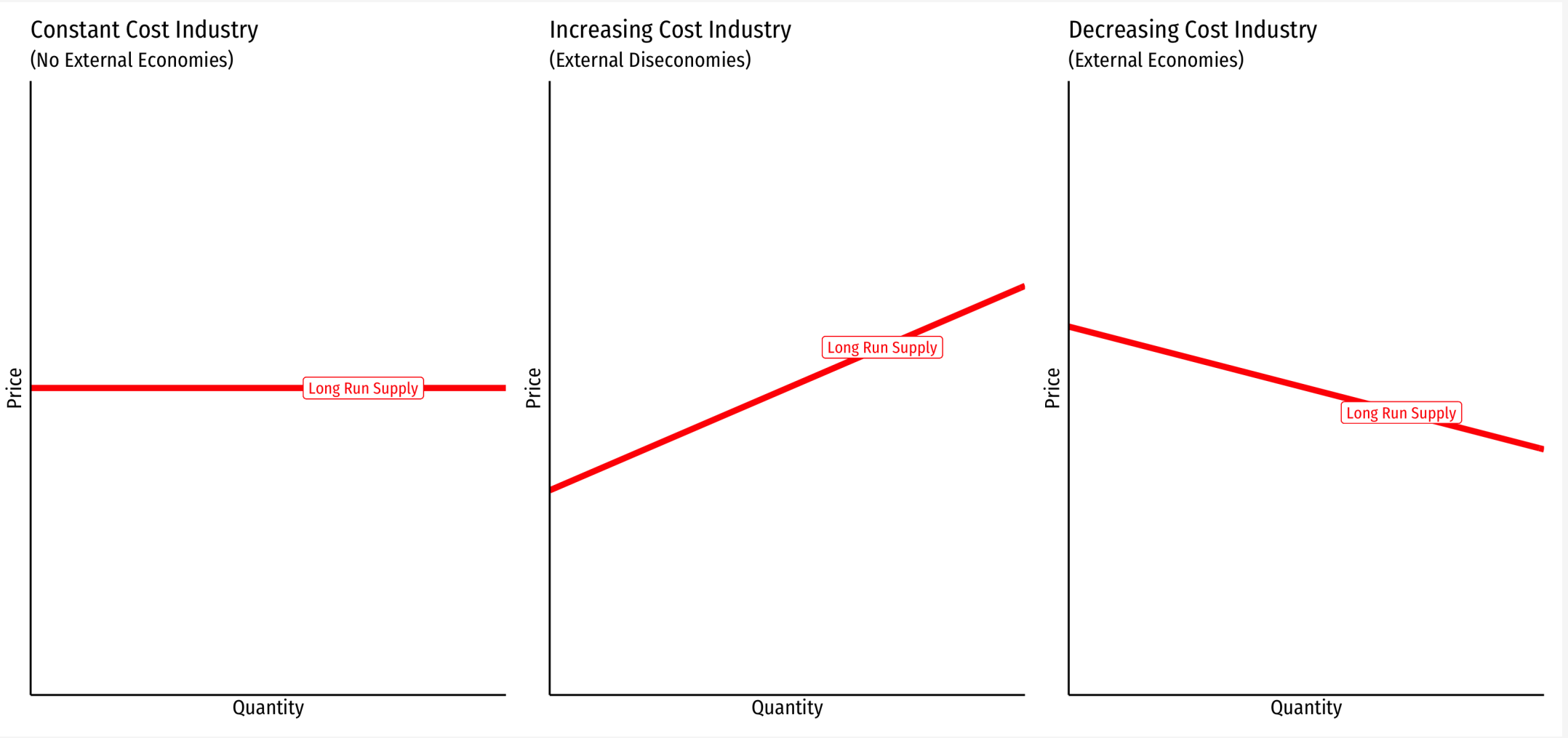


Alfred Marshall

1842-1924

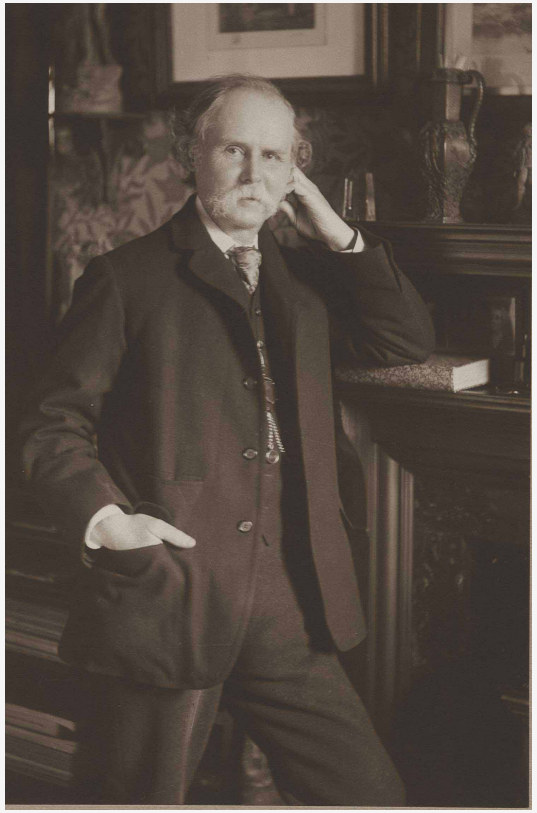
"[G]reat are the advantages which people following the same trade get from near neighborhood...The mysteries of the trade become no mysteries; but are as it were in the air, and children learn many of them unconsciously. Good work is rightly appreciated, inventions and improvement in machinery, in process and the general organization of the business have their merits promptly discussed: if one man starts a new idea, it is taken up by others and combined with suggestions of their own; and thus it becomes the source of further new ideas."

Summary: Types of Industries



Money and Economic Fluctuations

Marshall on Monetary Theory



Alfred Marshall

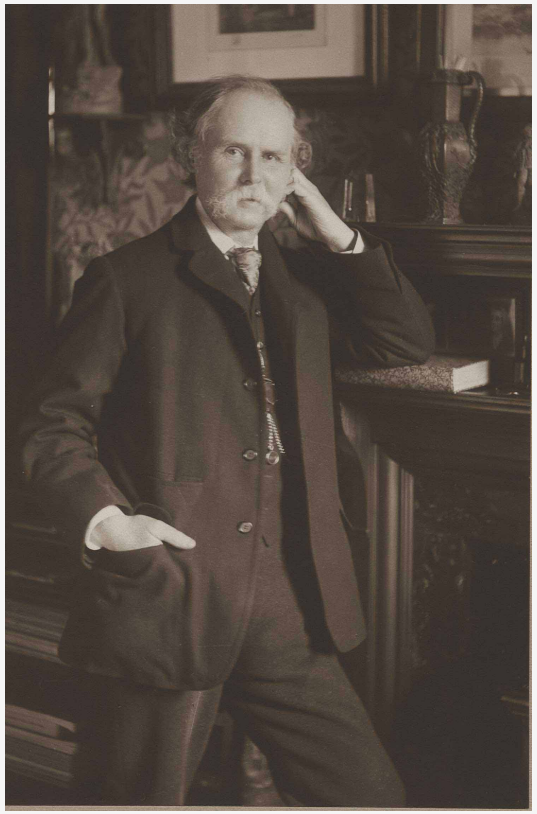
1842-1924

- The **"Cambridge cash-balance"** approach to **quantity theory of money**, vs. Fisherian approach:
  - nominal money supply meets real money demand to determine price level
- Nominal demand for money balances: $M^D = kPy$
  - *Real* demand for money balances: $\frac{M^D}{P} = m^D = ky$
- Nominal supply of money: $M^S = M$
- Equilibrium: $M^D = M$, so $P = \frac{M}{ky}$

Marshall, Alfred, 1871, "Money"

Marshall, Alfred, 1879, *Economics of Industry*

Marshall on Monetary Theory

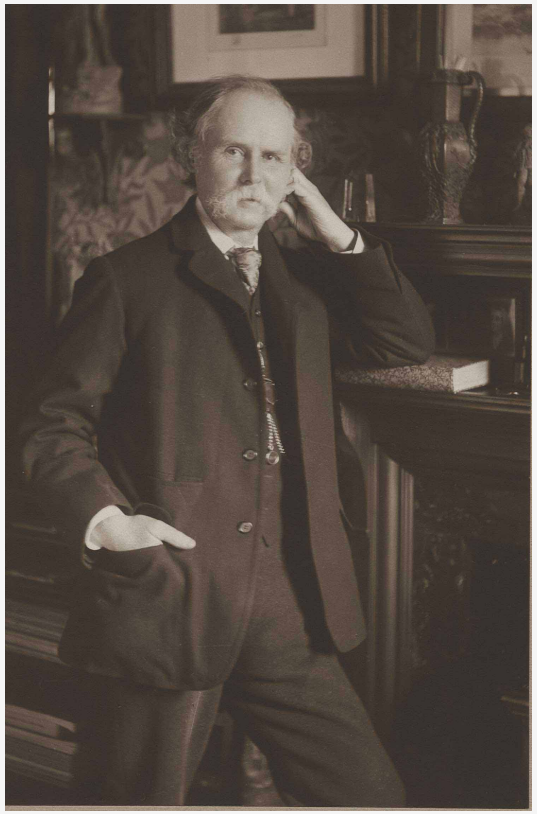


Alfred Marshall

1842-1924

- k is "desired" average level of nominal money balances $\frac{M}{Py}$ in long run
  - i.e. I hold "k%" of my (nominal) income as cash each period
- Depends on:
  - convenience of holding money
  - opportunity cost (other interest-earning investments)
  - money substitutes (checks, credit, etc)
  - inflation expectations
  - degree of business confidence
- This is what Marshall really meant by his "marginal utility of money" MU_m

Marshallian vs. Fisherian Quantity Theory of Monetary



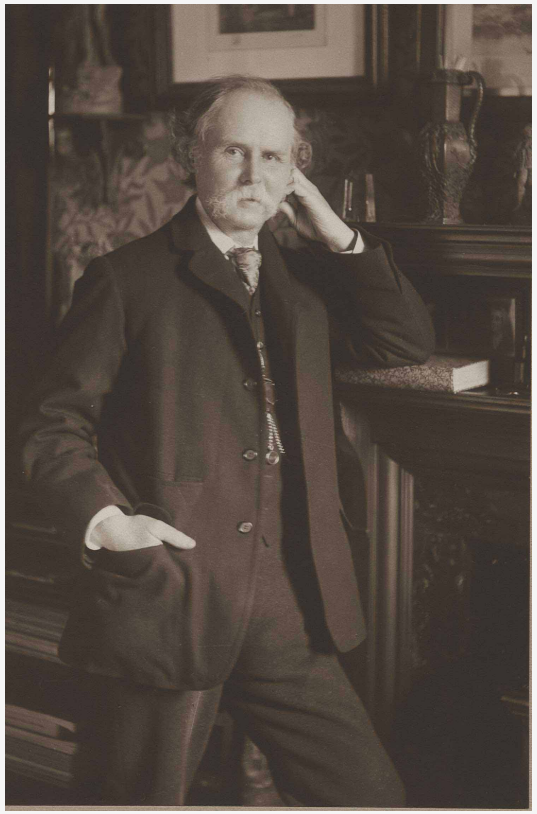
Alfred Marshall

1842-1924

- Recall Fisher's equation of exchange: $MV = Py$[†]
  - V defined tautologically as $V = \frac{Py}{M}$
  - Velocity, "number of times a dollar changes hands"
  - $V = \textit{actual}\ \frac{Py}{M}$
- Marshall (and Cambridge approach) alternatively uses k
  - "Desired ratio of money balances to income"determined by *real* factors
  - Determined by *real* factors (independent of M)
  - $k = \textit{desired}\ \frac{Py}{M}$
  - V adjusts to "desired V" implied by desired k

[†] Updated to modern notation!

Marshall on Monetary Theory



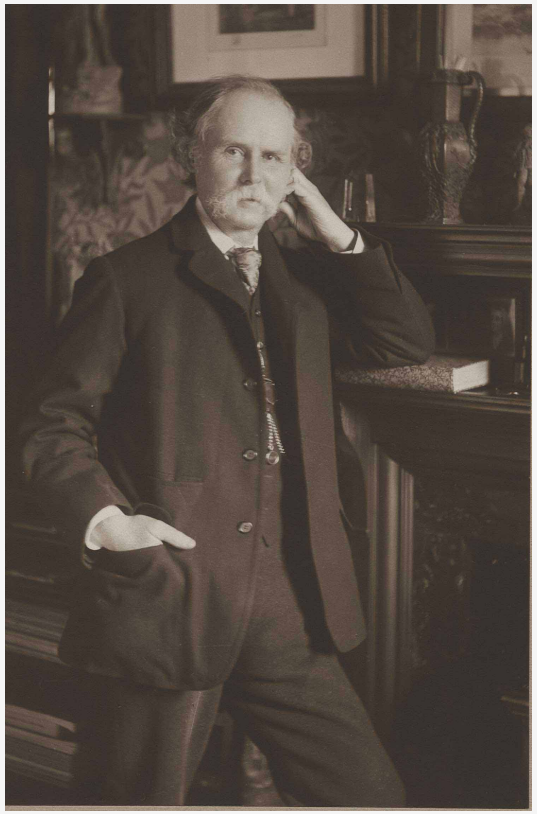
Alfred Marshall

1842-1924

> "The fact is that in every state of society there is some fraction of their income which people find it worth while to keep in the form of currency, it may be a fifth, or a tenth, or a twentieth. A large command of resources in the form of currency renders their business easy and smooth, and puts them at an advantage in bargaining; but, on the other hand, it locks up in a barren form resources that might yield an income of gratification if invested, say, in extra furniture; or a money income, if invested in extra machinery or cattle."
>
> "[I]f everything else remains the same, then there is this direct relationship between the volume of currency and the level of prices...Of course, the less the proportion of their resources which peopel care to keep in the form of currency, the lower will be the aggregate value of the currency, that is, the higher will prices be with a given volume of the currency."

Marshall, Alfred, 1899, "Evidence before the Indian Currency Committee"

Marshall on Monetary Theory



Alfred Marshall

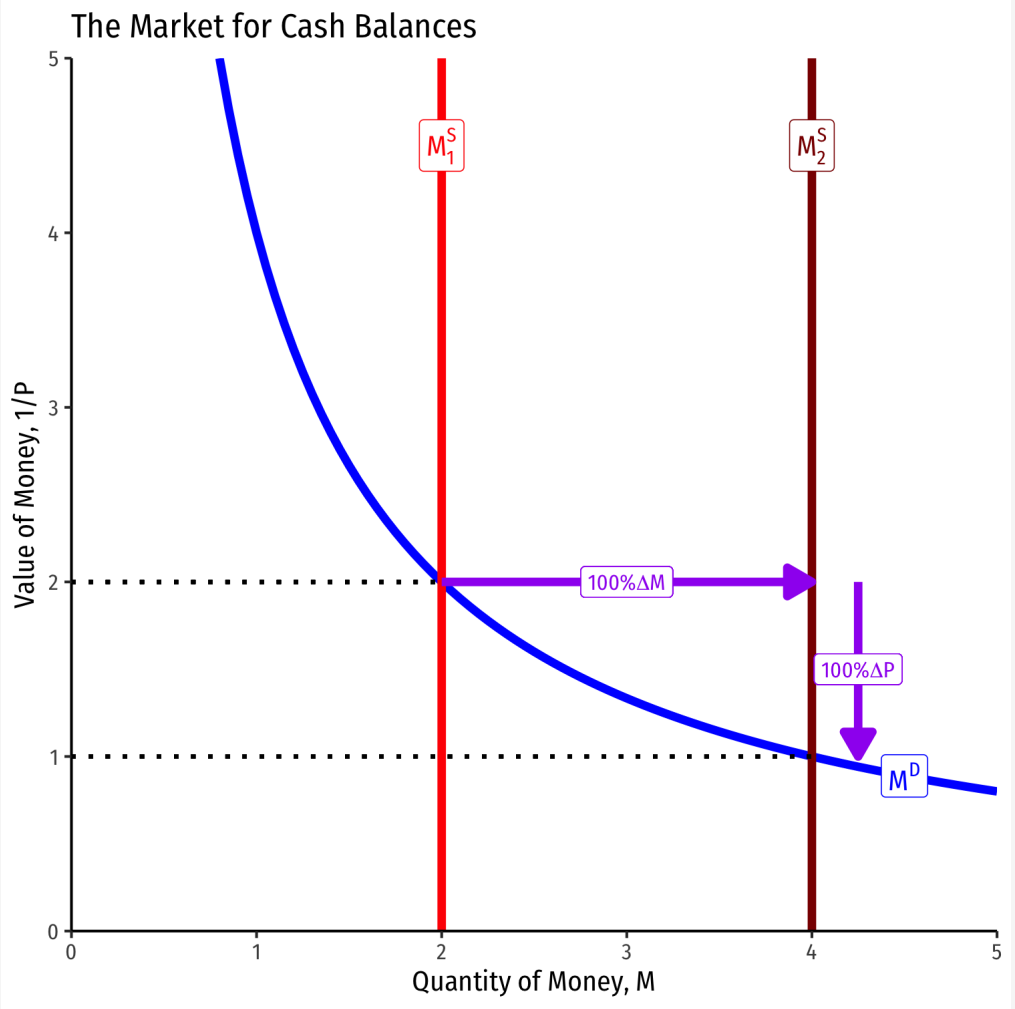
1842-1924

- Same implications as Fisherian QTM
- *Ceteris paribus* (for constant k and y):

> "If [currency] is increased ten per cent, [prices] also will be increased by ten per cent."

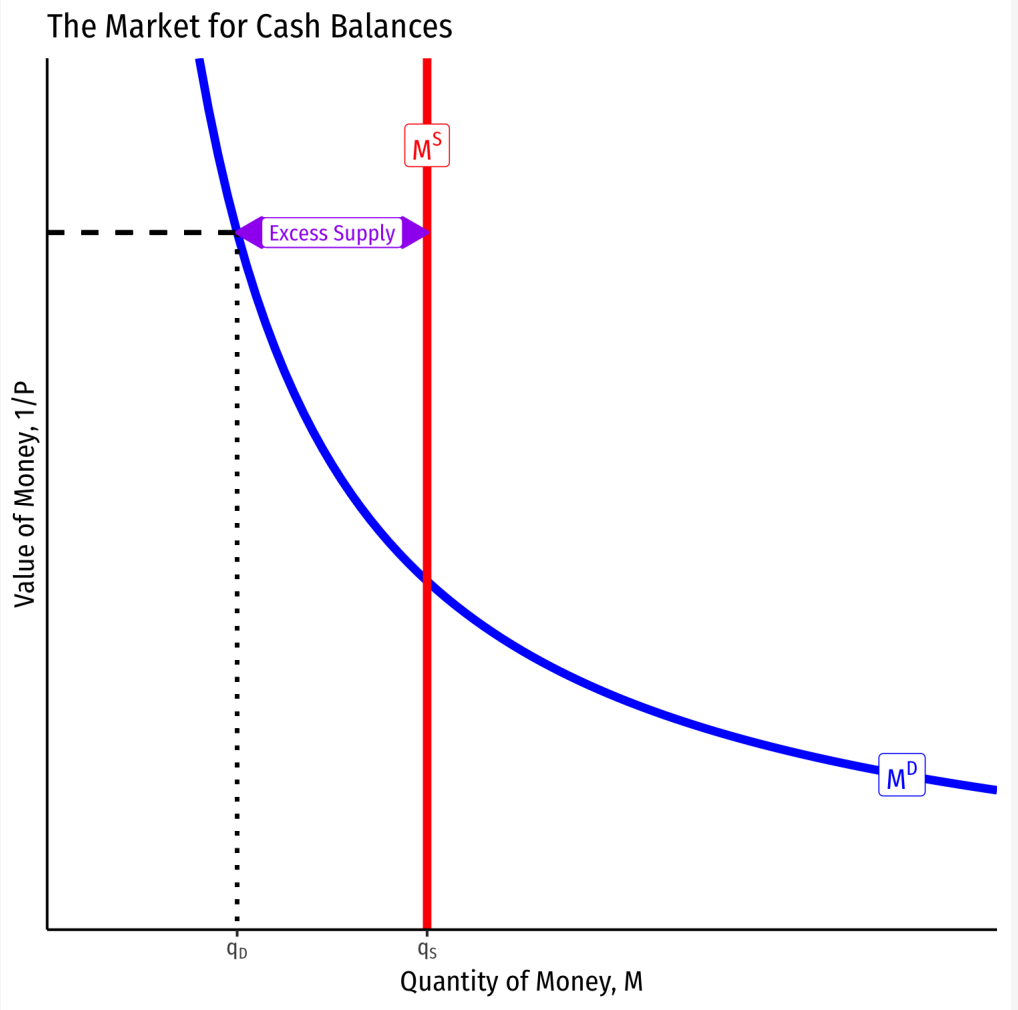
Marshallian Quantity Theory of Money

- Vertical axis is purchasing power of money (classicals: 'value of money'), inversely related to price level P
    - How many goods can be bought with \$1
- Nominal demand for money, $M^D = kPy$, so *real* demand $\left(\frac{M^D}{P}\right)$ is constant for given y
  $\Longrightarrow$ demand curve is a rectangular hyperbola
- A doubling of M yields exactly double prices P and exactly cuts purchasing power of money, $\frac{1}{P}$ in $\frac{1}{2}$



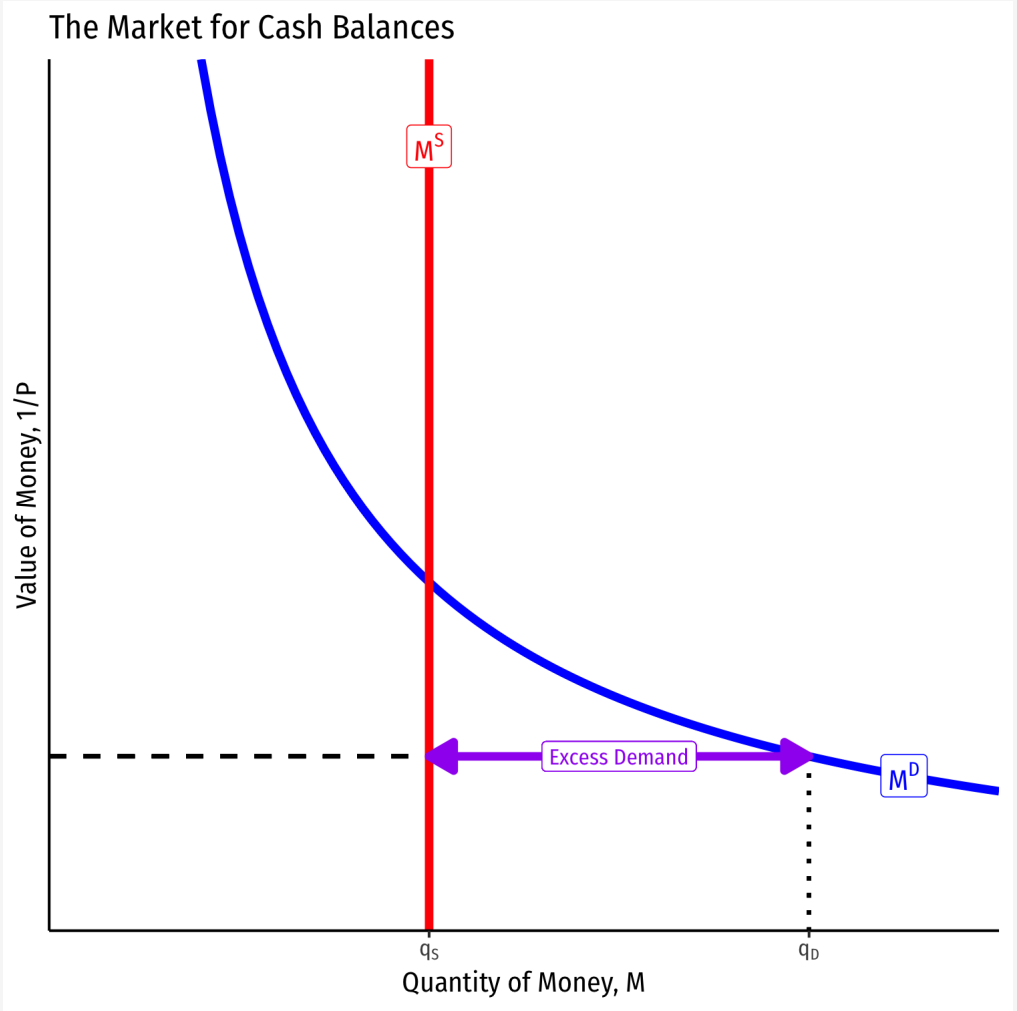
Monetary Disequilibrium

- If excess supply of money $q_D < q_S$
- $MU_{goods} > MU_{money}$
- P is too low ($\frac{1}{P}$ too high) to clear market
- People spend off excess money balances, buy real goods and services
- Pushes up prices P, pushes down purchasing power $\frac{1}{P}$
  - "inflation"



Monetary Disequilibrium

- If excess demand for money $q_D > q_S$
- $MU_{goods} < MU_{money}$
- P is too high ($\frac{1}{P}$ too low) to clear market
- People spend less/sell more to build up money balances to desired level
- Pushes down prices P, pushes up purchasing power $\frac{1}{P}$
  - “deflation”



Monetary Equilibrium

- Equilibrium value of P (and $\frac{1}{P}$) where $M^D = M^S$