

2.1 — Theory of the Firm

ECON 306 · Microeconomic Analysis · Fall 2020

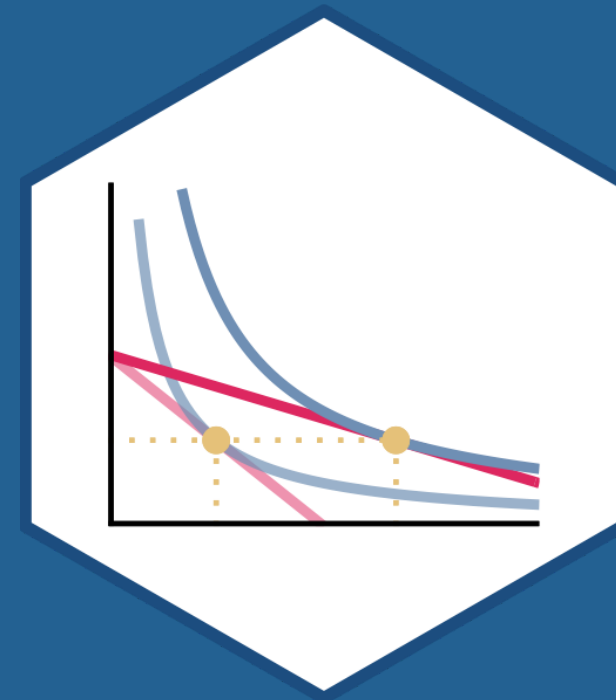
Ryan Safner

Assistant Professor of Economics

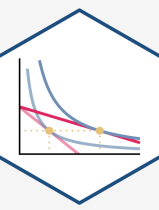
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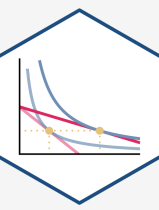
Producer Behavior



- How do **producers** decide:
 - which products to produce
 - in what quantity
 - using which resources
 - and for what price?
- Answers to these questions are building blocks for **supply curves**



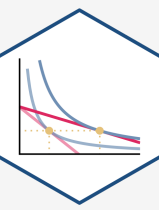
The Basics of Production



- Nearly all goods must be **produced** before we can exchange & consume them
- **Consumption** is the **destruction** of value to gain utility
 - Consumption is the ultimate goal of all economic activity



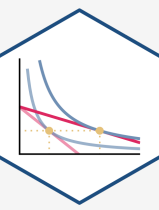
The Basics of Production



- **Production** is the **creation** of value, by transforming *lower-valued* goods (resources, inputs, etc) into *higher-valued* goods (outputs, consumer products, etc)



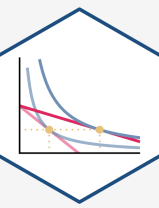
The Firm



- In modern market economies, most production takes place in a legal organization known as **the firm**
- It does not *have* to be this way, and for most of history it was not this way!
 - Craft guilds
 - Independent artisans
 - Independent contractors

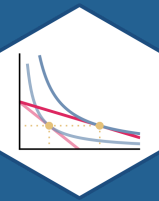


The Firm



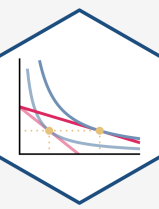
- Firms exist in the forms they do because they are an efficient response to particular problems of economic organization
- Lots of interesting, Nobel-prize winning, analysis on “theory of”
- For now, we'll sidestep these and just *assume* firms exist. Learn more in my **Industrial Organization** course:
 - [Why Are There Firms?](#)
 - [The Firm as Nexus of Contracts](#)
 - [Asset Specificity and Vertical Integration](#)





What Do Firms Do?

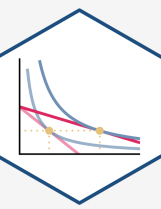
What Do Firms Do? I



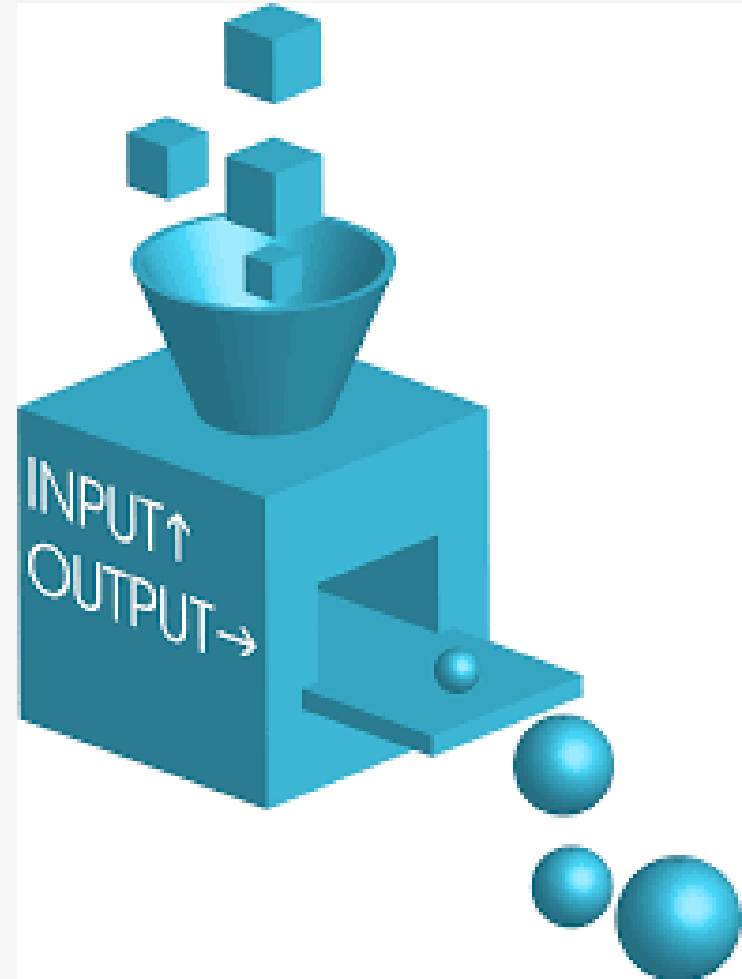
- We'll assume "the firm" is the agent to model:
- So what do firms do?
- How would we set up an optimization model:
 1. **Choose:** < some alternative >
 2. **In order to maximize:** < some objective >
 3. **Subject to:** < some constraints >



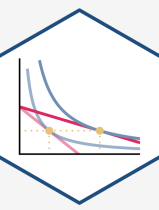
What Do Firms Do? II



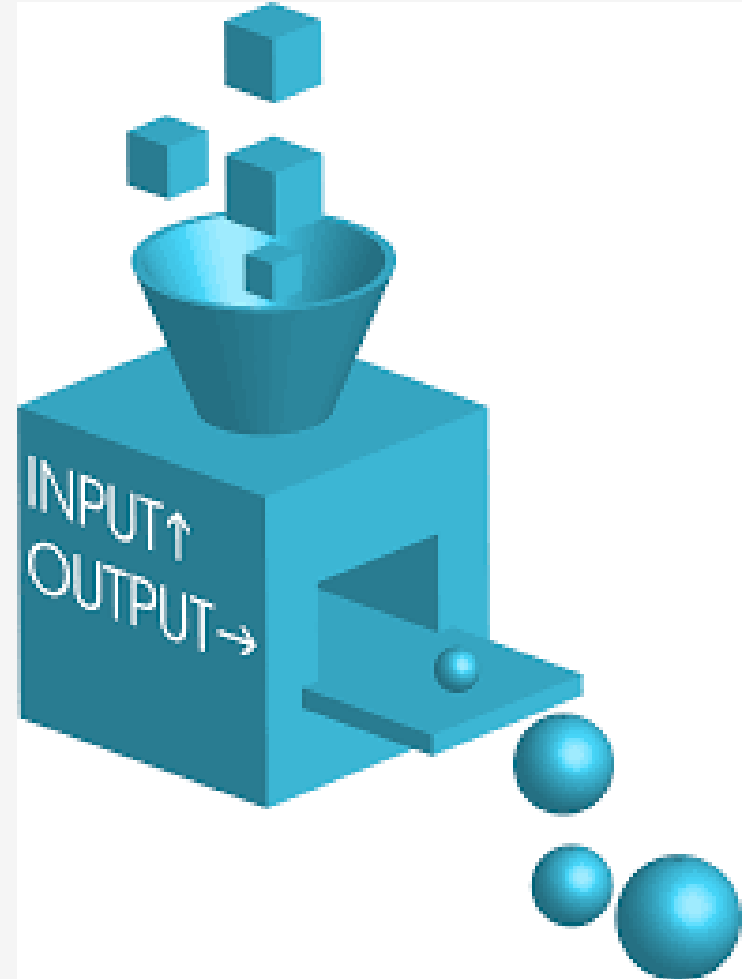
- Firms convert some goods to other goods:



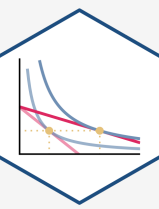
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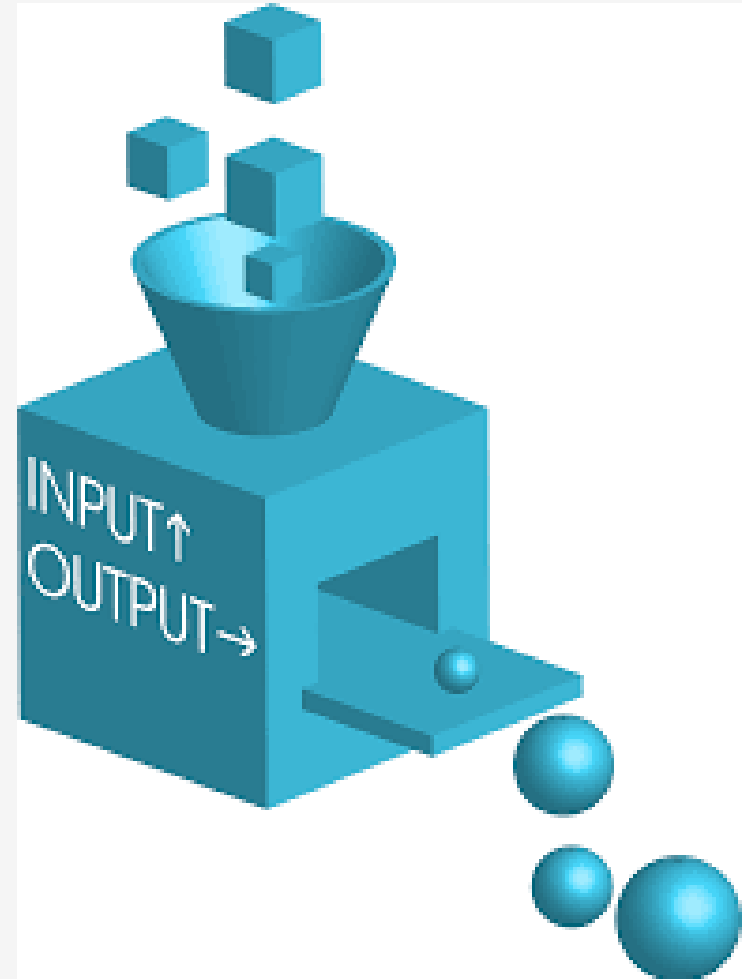
- Firms convert some goods to other goods:
- **Inputs:** x_1, x_2, \dots, x_n
 - **Examples:** worker efforts, warehouse space, electricity, loans, oil, cardboard, fertilizer, computers, software programs, etc



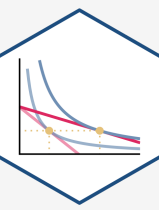
What Do Firms Do? II



- Firms convert some goods to other goods:
- **Inputs:** x_1, x_2, \dots, x_n
 - **Examples:** worker efforts, warehouse space, electricity, loans, oil, cardboard, fertilizer, computers, software programs, etc
- **Output:** q
 - **Examples:** gas, cars, legal services, mobile apps, vegetables, consulting advice, financial reports, etc

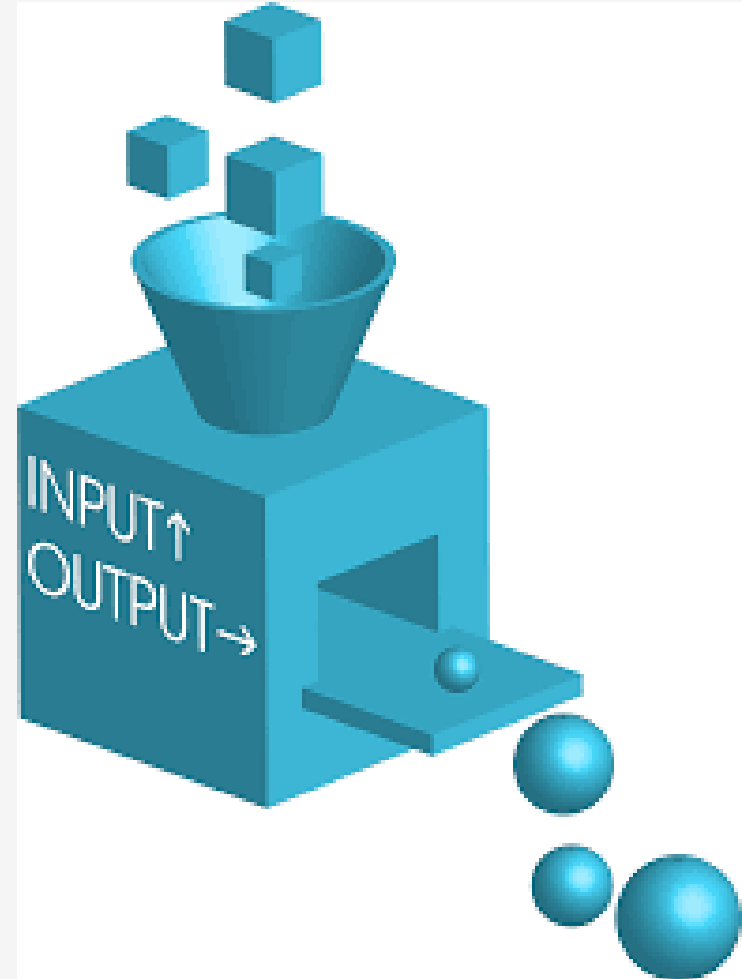


What Do Firms Do? III

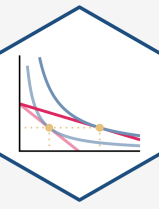


- **Technology** or a **production function**:
rate at which firm can convert specified
inputs (x_1, x_2, \dots, x_n) into output (q)

$$q = f(x_1, x_2, \dots, x_n)$$



Production Function as Recipe



The production function

READY IN: 1hr 20mins

YIELD: 2 loaves

UNITS: US

INGREDIENTS Nutrition

- | | |
|-----|------------------------------------|
| 5 | cups all-purpose white flour |
| 2 | tablespoons yeast (or 2 x 7g pkts) |
| 2 | teaspoons sugar |
| 1 | teaspoon salt |
| 2 | cups warm-hot water |
| 1/4 | cup cooking oil |

The production algorithm

DIRECTIONS

Put 4 cups of the flour, yeast, sugar and salt into large bowl.

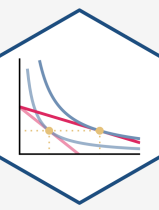
Pour in hot water and oil and mix until combined- it will be sticky.

Add the remaining flour in increments until dough is no longer sticky.

Knead for about 5 minutes until dough is elastic and smooth.

Place dough back into bowl and cover with a damp teatowel and let it rise until double its size- about 1/2 hour.

Factors of Production I

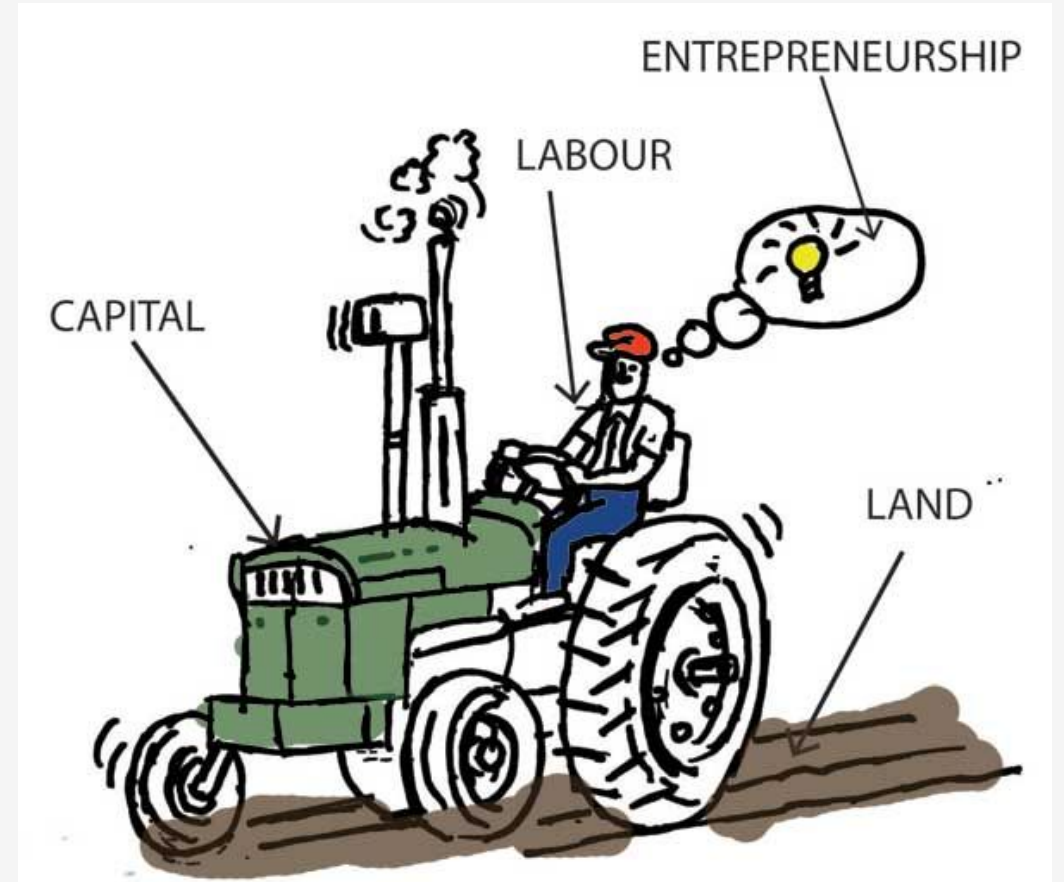


$$q = Af(t, l, k)$$

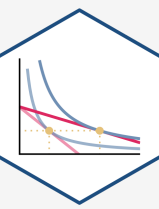
- Economists typically classify inputs, called the **“factors of production” (FOP)**:

Factor	Owned By	Earns
Land (t)	Landowners	Rent
Labor (l)	Laborers	Wages
Capital (k)	Capitalists	Interest

- A : **“total factor productivity”**
(ideas/knowledge/institutions)
- and Entrepreneurs/Owners who earn **Profit**



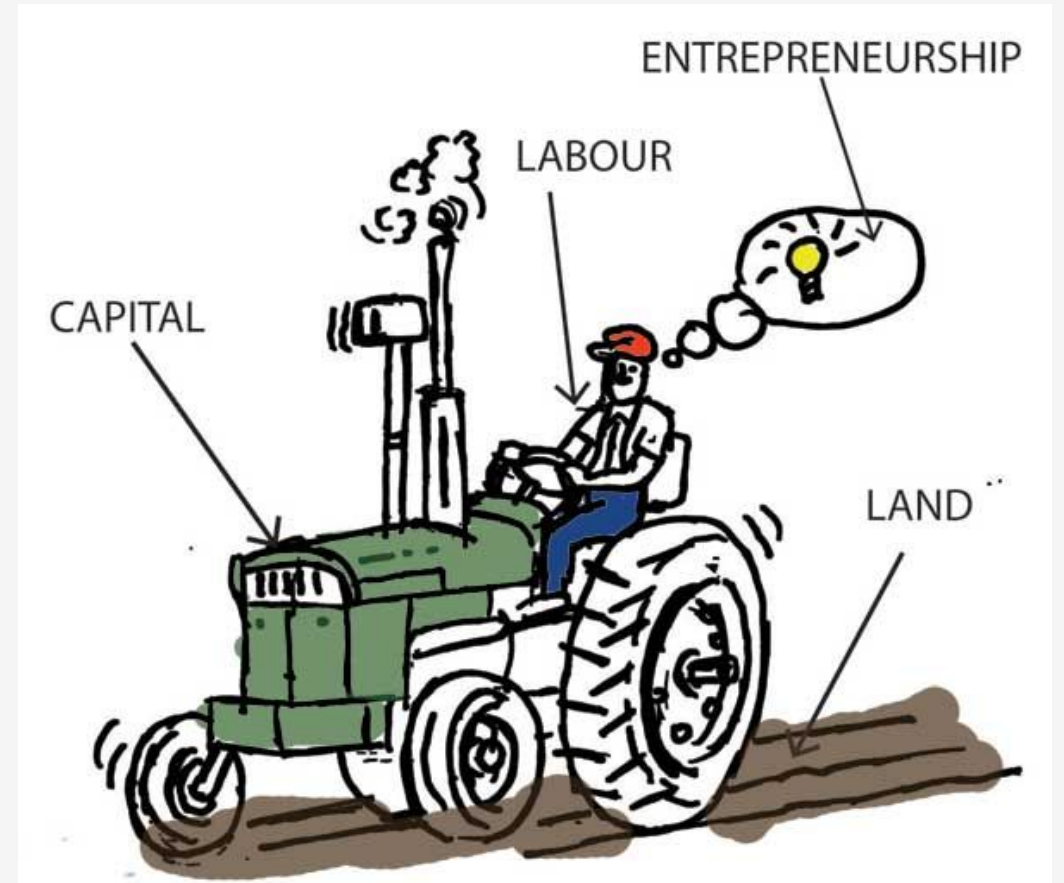
Factors of Production II



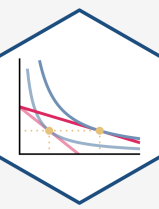
$$q = f(l, k)$$

- We will assume just two inputs: labor l and capital k

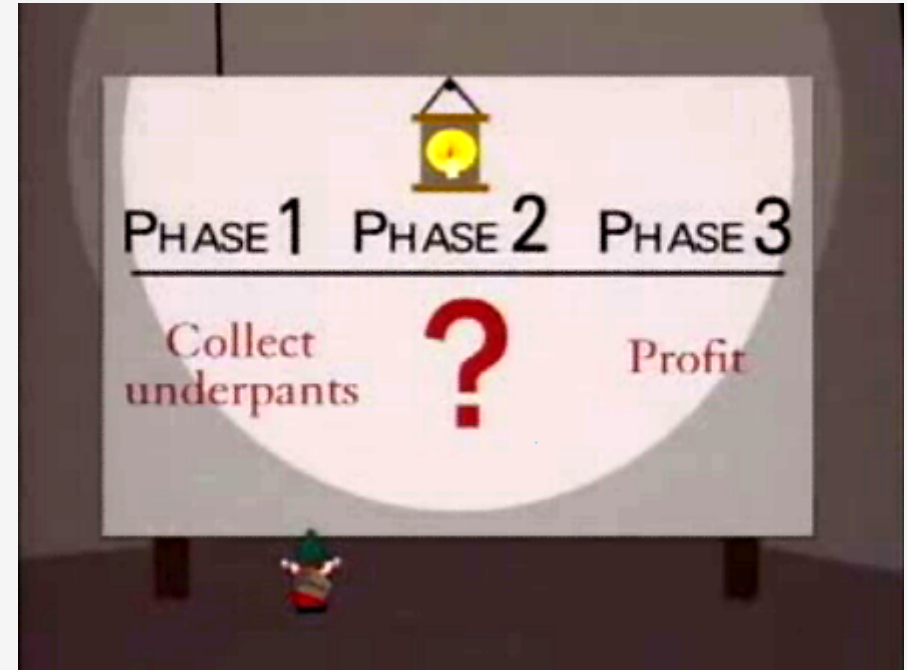
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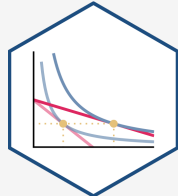
What Does a Firm Maximize?



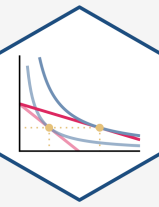
- We will assume firms **maximize profit** (π)
- Not true for all firms
 - **Examples:** non-profits, charities, civic associations, government agencies, criminal organizations, etc
- Even profit-seeking firms may also want to maximize additional things
 - **Examples:** goodwill, sustainability, social responsibility, etc



Profits Have a Bad Rap These Days



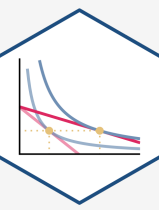
What is Profit?



- In economics, profit is simply **benefits minus (opportunity) costs**



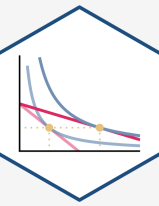
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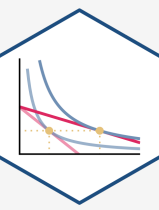
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- It can buy each **input** x_i at an associated price p_i
 - labor l at wage rate w
 - capital k at rental rate r



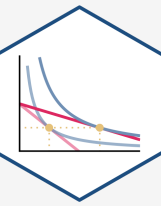
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- Suppose firm sells **output** q at price p
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 - labor l at wage rate w
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- The profit of selling q units and using inputs l, k is:



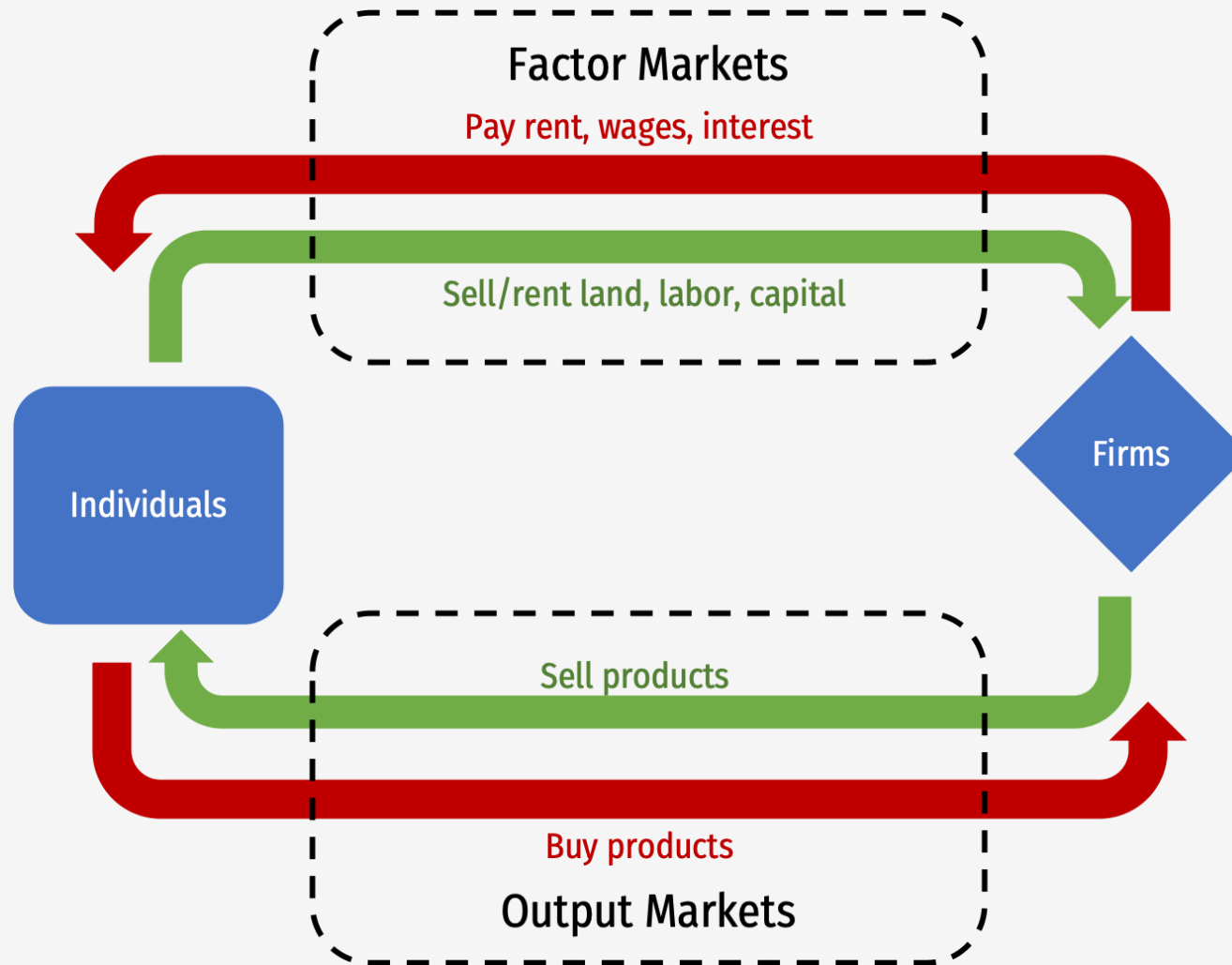
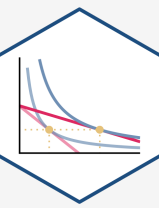
Who Gets the Profits? I



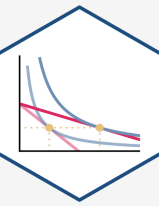
$$\pi = \underbrace{pq}_{\text{revenues}} - \underbrace{(wl + rk)}_{\text{costs}}$$



Reminder from Macroeconomics: "The Circular Flow"



Who Gets the Profits? I

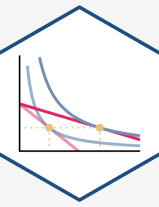


$$\pi = \underbrace{pq}_{\text{revenues}} - \underbrace{(wl + rk)}_{\text{costs}}$$

- **The firm's costs are all of the factor-owner's incomes!**
 - Landowners, laborers, creditors are all paid rent, wages, and interest, respectively



Who Gets the Profits? I

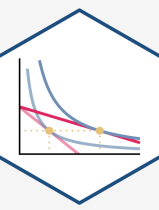


$$\pi = \underbrace{pq}_{\text{revenues}} - \underbrace{(wl + rk)}_{\text{costs}}$$

- Profits are the **residual value** leftover after paying all factors
- Profits are income for the **residual claimant(s)** of the production process (i.e. **owner(s)** of a firm):
 - Entrepreneurs
 - Shareholders



Who Gets the Profits? II

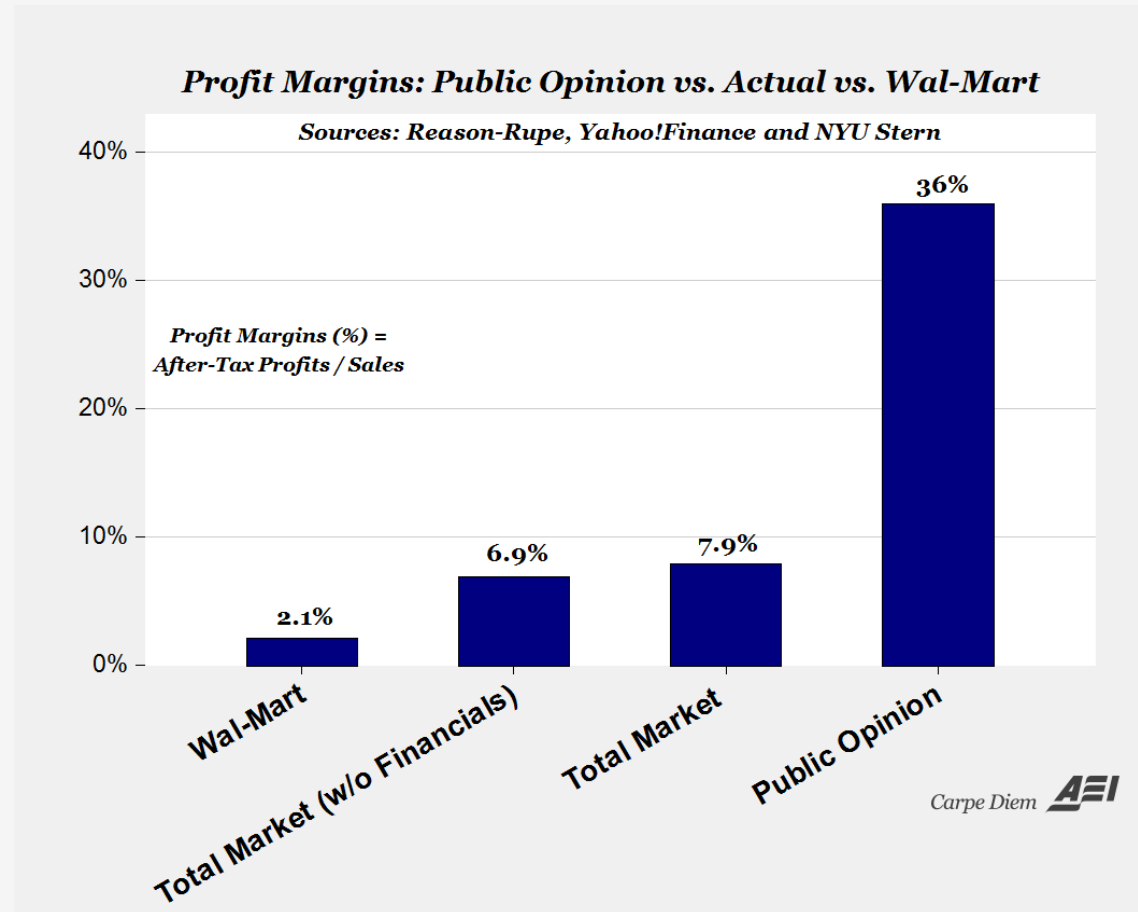
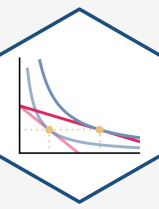


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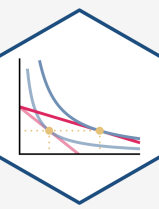
- Residual claimants have incentives to maximize firm's profits, as this *maximizes their own income*
- Entrepreneurs and shareholders are the only participants in production that are *not* guaranteed an income!
 - Starting and owning a firm is inherently **risky!**



People Overestimate Profits



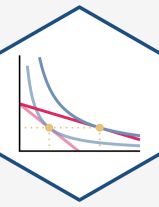
Corporations



- **Corporations** are firms that have many owners (**shareholders**)
 - Each owns at least one **share of stock** or **equity** in the firm
- **Shareholders** are (partial) **owners** of the firm
 - **Residual claimants** on profits
 - Have decision-making rights
 - **Limited liability** of firm's debts
- Learn more in a business course!



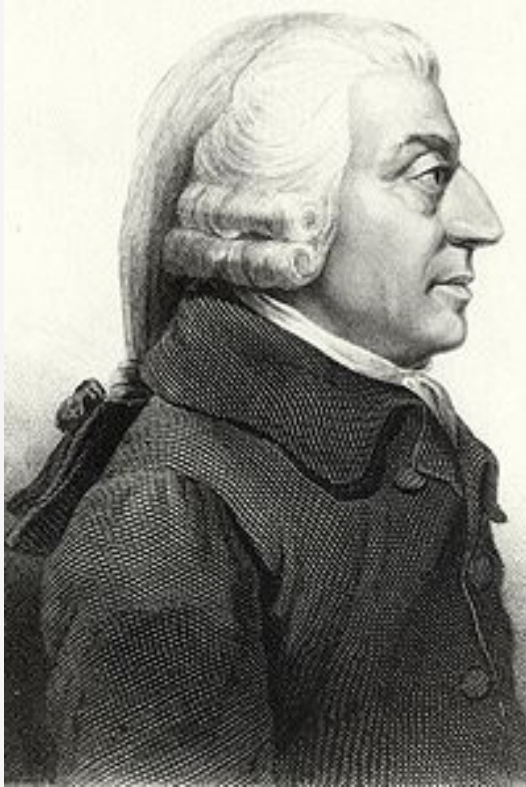
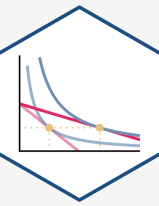
Corporations



- Many owners cannot possibly coordinate production: choose **managers** to run day-to-day production in exchange for a salary
- One of the key differences in modern large firms is the **separation of ownership and control**



Agency Theory



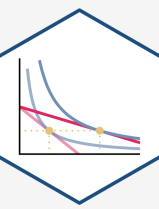
Adam Smith

1723-1790

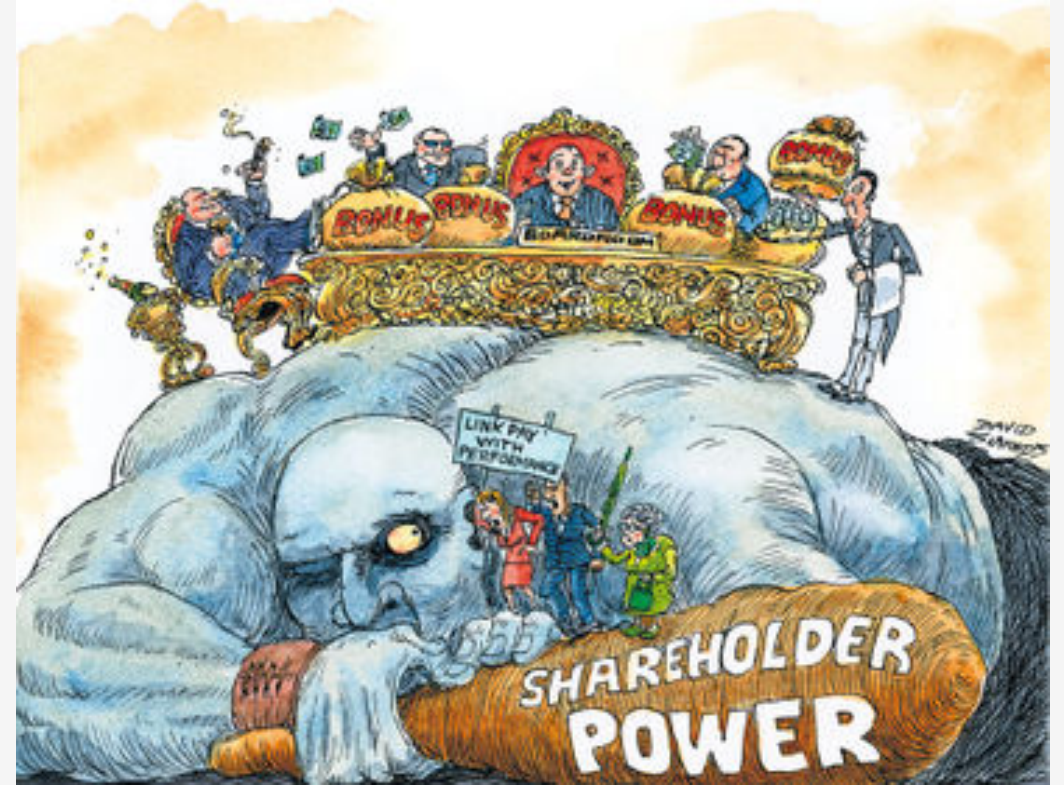
"The trade of a joint stock company is always managed by a court of directors...The directors of such companies, however, **being the managers rather of other people's money than of their own, it cannot well be expected that they should watch over it with the same anxious vigilance with which the partners in a private copartnery frequently watch over their own.** Like the stewards of a rich man, **they are apt to consider attention to small matters as not for their master's honour,** and very easily give themselves a dispensation from having it. Negligence and profusion, therefore, must always prevail, more or less, in the management of the affairs of such a company;" (Book V, Chapter 1).

Smith, Adam, 1776, *An Enquiry into the Nature and Causes of the Wealth of Nations*

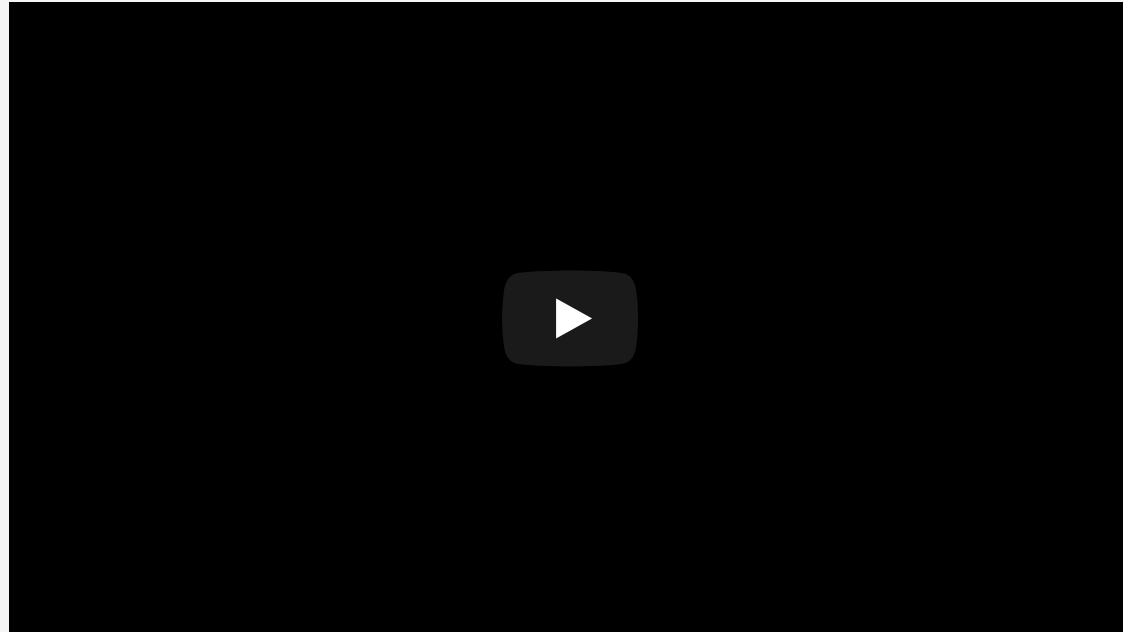
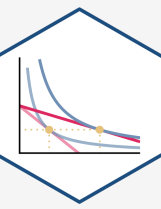
A Peek Inside the Corporate Veil II



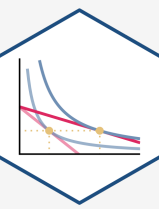
- **Principal-Agent problem:** owners and agents may have different incentives
- Maximizing different things!
 - Shareholders: maximize profit
 - Management: maximize own salary
- Again, learn more about corporate governance in [IO](#) & business courses



The Separation of Ownership and Control



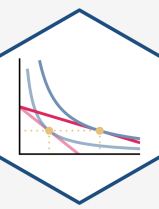
Profits and Entrepreneurship: A Preview



- In markets, production must face the **profit test**:
 - **Is consumer's willingness to pay $>$ opportunity cost of inputs?**
- Profits are an indication that **value is being created for society**
- Losses are an indication that **value is being destroyed for society**
- Survival in markets *requires* firms continually create value & earn profits



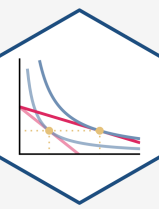
The Firm's Optimization Problem I



- So what do firms do?
 1. **Choose:** < some alternative >
 2. **In order to maximize:** < profits >
 3. **Subject to:** < technology >
- We've so far assumed they maximize profits and they are limited by their technology



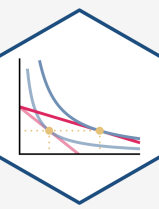
The Firm's Optimization Problem II



- What do firms **choose**? (Not an easy answer)
- Prices?
 - Depends on the market the firm is operating in!
 - Study of **industrial organization**
- Essential question: how competitive is a market? This will influence what firms (can) do



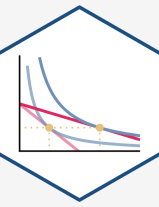
Industrial Organization: A Roadmap I



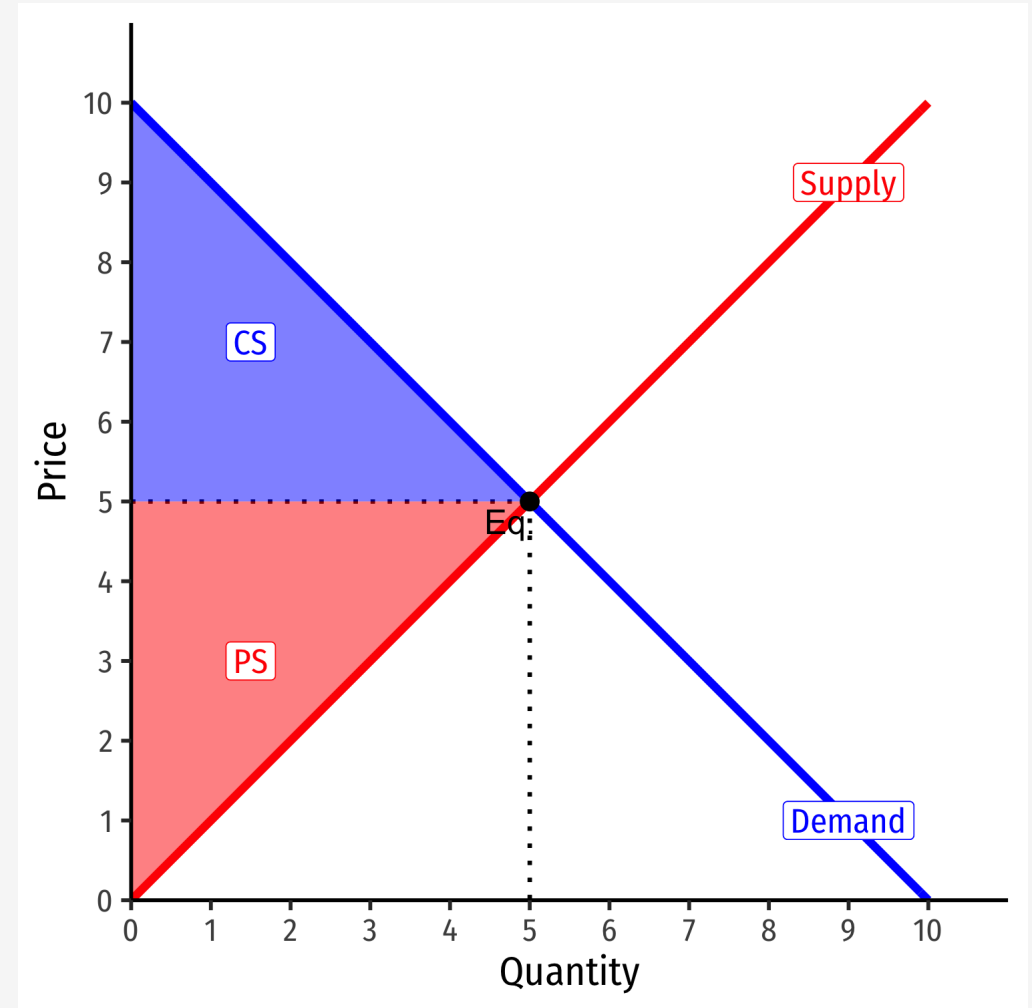
- Begin with one extreme case: "**perfect competition**"
 - Firms can choose to sell as much q^* as they want
 - Firms are constrained to sell at the (exogenous) market price \bar{p}
- Appropriate for settings with *many* firms, each small relative to market



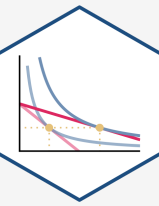
Interlude



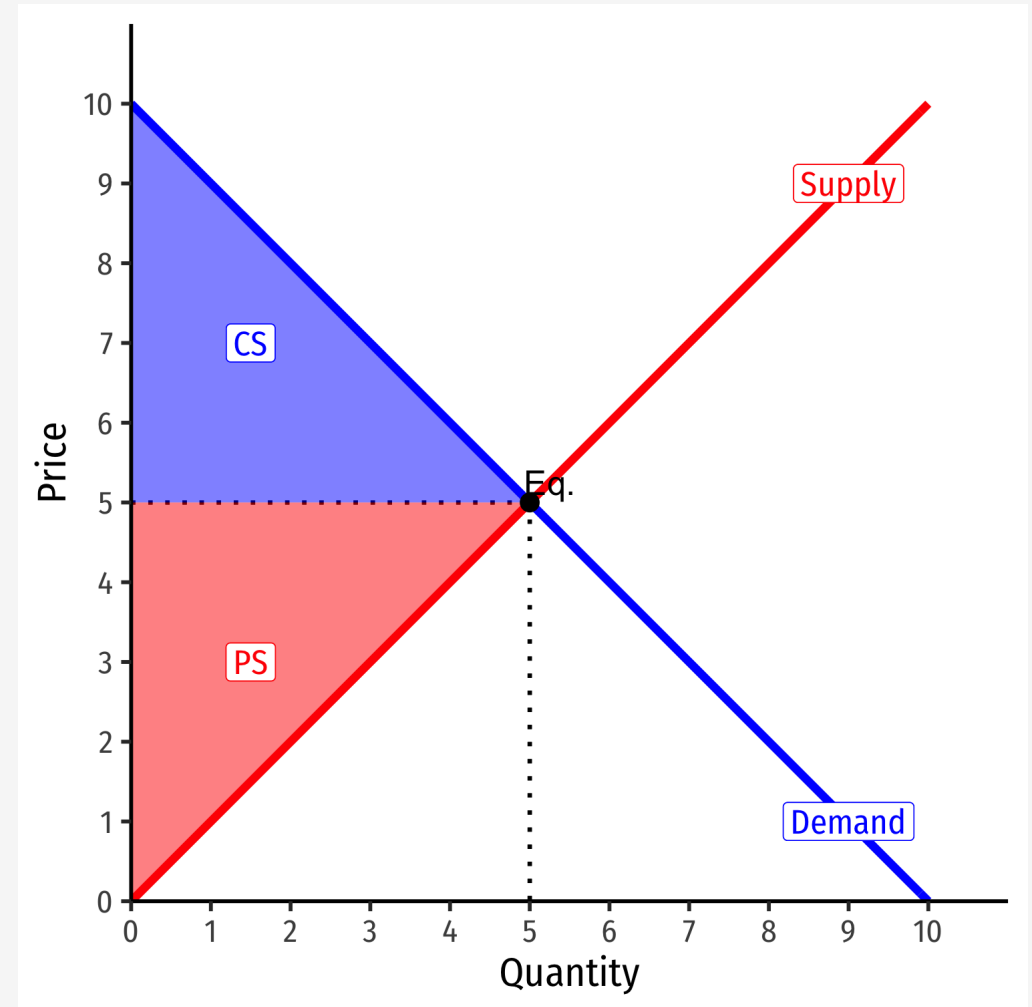
- After we find firm's **optimal decisions** in this market (and have Exam 2), we will then finally look at **market equilibrium**
- Put Supply and Demand together



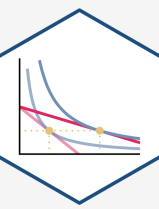
Interlude



- We've seen how **consumers** cause and respond to market changes
 - e.g. $(\Delta p_x, \Delta p_y, \Delta m)$
- We're about to explore how **producers** cause and respond to market changes
- Finally we can explain all of these market changes with Supply and Demand **equilibrium models**
- Discuss how markets work, why they are good & efficient, and when they fail



Industrial Organization: A Roadmap II



- Examine another extreme case:
monopoly of a single seller
 - Appropriate for some markets
- "**Imperfect competition**": models of
monopolistic competition & **oligopoly**
 - In latter case, firms act **strategically**,
so we will need **game theory**
- Firms can choose *both* q^* & p^* to
maximize π

