

What is Cost?

(439)

# Micro Economics

9 8 21

Dr. Blawtshaw + M. 12-1330 S.S. 6.228

Office hours virtual W: 10:30 - 12:00 6.232

Calendar Thursday 10:30 - 2:30 pm

- Monday: Lecture
- Tue: post lecture by midday \*
- Wed: Lecture
- Thurs: post lecture by midday \*
- Thur/Friday: Discussion
- Sunday: complete problem set (18) total

participate (52)

## Example of exam questions \*

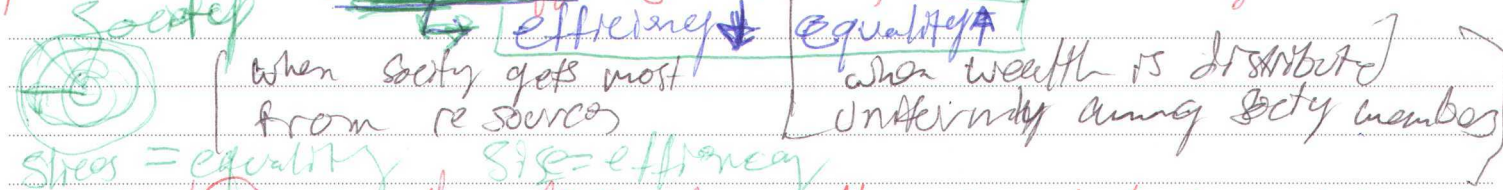
Chapter 1 - What is economics? → "decisions with scarce resources"

Scarcity: limitation of resources in society

Decisions: people, firms, society

- What to buy + how much to work + save + spend
- How much to produce, how many workers, how much to pay workers
- Govt. (national defense, education, healthcare)

How people, firms, and society make decisions: Principle (1) → Trade off (re time, fiscal) spending



Principle (2) → the cost of something is what you give up to get it

Opportunity Cost: what ever you give up to obtain something

OS: Costs and lost wages and (differences of cost of living) Principle (3) → Rational people think at the margin.

$$\begin{aligned}
 MB > MC &\rightarrow MB && \text{(marginal benefits)} \\
 MB < MC &\rightarrow MC && \text{(marginal cost)}
 \end{aligned}$$

Principle (4) people respond to incentives  
people: cost ↑ spending ↓      firms: cost ↑ production ↑

cost to consumers

How do people interact

Principle (5) Trade can make everyone better off Individuals/interacts  
How will it be.

A Sample Lecture activity

# Adam Smith - Wealth of Nations "Invisible Hand"

Principle (6) → Markets are a good way to organize economic activity.

Prices are determined by buyers / sellers  
prices reflect values / cost

Principle (7) Government can sometimes improve market outcomes

- enforce property rights (individuals control scarce resources)
- promote efficiency (externalities / market power)
- promote equality

Prin.

5.9.16

## Discussion principles

9/10/2021

1. People face trade-offs (Efficiency v. Equality)
2. Opportunity cost; what must be given up to obtain some item
3. Rational people think at the margin (compare MB & MC)
4. People face incentives
5. Trade can make ~~economy~~ everyone better off (Chapters 8-10)
6. Markets are usually a good way to organize economic activity
7. Government can sometimes improve market outcomes (Externalities)

100 seat plane flying across V. S. @ \$100,000

Standby passenger is willing to pay \$800 for ticket  
MC: \$50 MB: \$500

A got covid → A is party animal → A is not, altruistic!  
go / no go to party? MB: 10 price: 5  
social planner private

(2) w/o contract what to produce? what is the price for trade  
Third Party - Society

Externalities: occurs when the action of one party affects another party who gains no benefit

What does an economist do? ~~24/10/21~~ Economists

- ① - Microeconomies → households, firms, industry  
→ rent controls, foreign competition (single industry)
- ② - Macro economies → GDP, inflation, recession  
→ unemployment v. inflation, policies (growth standard of living)

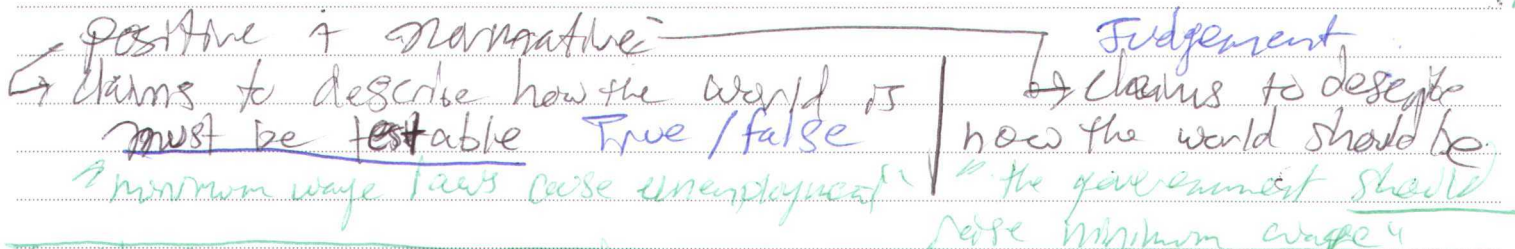
- Economists are Social Scientists! Economic models  
Theories + Data + <sup>simplifying</sup> assumptions explain how the world works

- ie. → an economy produces two goods
- ① circular flow diagram
  - ② PPF
  - ③ Demand & Supply
  - ④ pricing behavior of the market

- Policy Advisors: Using Science Credentialed

Knowledge of how the world works + goals/values = proposed policy

- ① correct externalities, prevent market power (to promote equality)

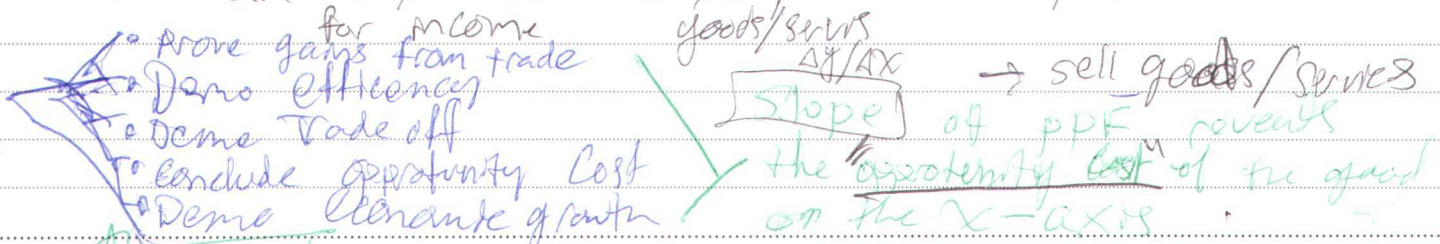
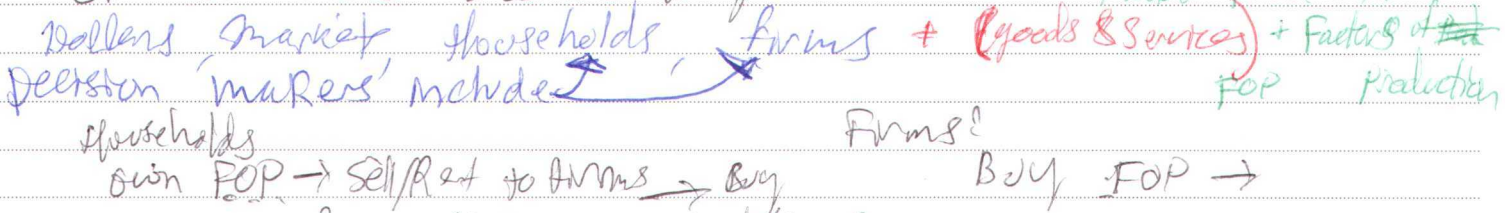


Why Economists Disagree... ① Scientific judgement ② Personal values

- ① Disagreement about validity of alternative positive theories
- ② Differing normative views about policy goals

- 93% → Rent control reduces quantity/quality of housing available
- 93% → Tariffs / import quotas usually reduce general economic welfare
- 90% →
- 85% → The US should reduce agricultural
- 79% → the minimum wage increases unemployment among young/less skilled workers

Circular Flow Model Diagram



PPF → Production Possibilities Frontier

Dem → measuring move in direction of move.

(Continued)

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Increase in workers shifts - Rightward in PPF

Technological advance in 1 company produces

Bowed PPF → (slope is increasing) → Opp. Cos. increase  
 Resources are specialized

Straight PPF → slope is constant → Opp. Cost  
 Resources are not specialized

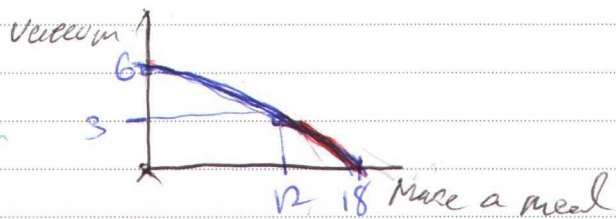
Ch. 3 Interdependence and Gains from Trade 9/15/21

who should cook dinner tonight

Helen - 4hr vacuum the house  
 - 2 hours to make a meal

Jamie: 4 hrs vacuum  
 1 hr cook meal

only cook



	cooking	vacuum
H	1	4
J	2	4

Absolute advantage

The ability to produce a good using fewer inputs

Jamie has absolute advantage to cooking a meal

Comparative advantage

the ability to produce a good at a lower opp. cost

→ Jamie opp. cost of cooking 1/4 vacuum  
 → vacuum 4 meals

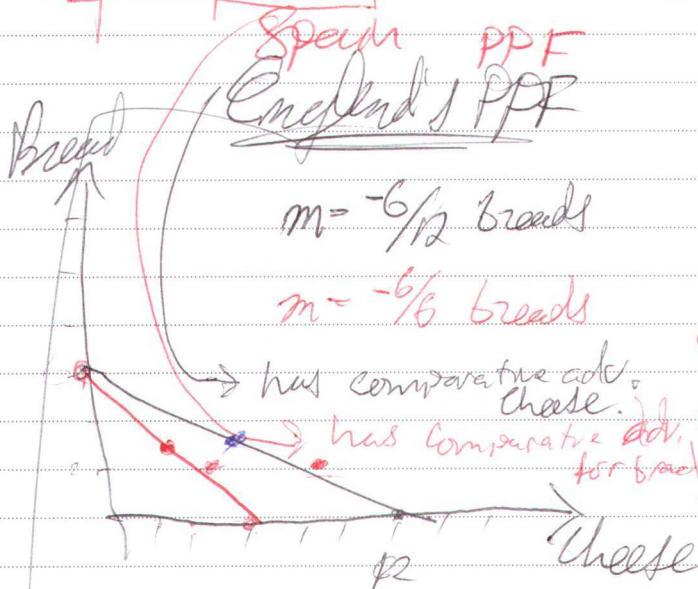
Helen opp. cost of cooking 1/2 vacuum  
 → vacuum 2 meals

A distinct ideas! not related

Productivity Table

	cook	clean
5		
4		

	cheese	bread	cheese/bread
England	2	4	1/2
Spain	4	8	1/2



fabor hours needed for unit      # of units produced in 24hr

Ⓐ → 12

Ⓑ → 4

no trade

England specialize in cheese & Spain specialize in bread  
 exports: goods produced domestically and sold abroad.  
 imports: goods produced abroad and sold domestically

consumption (w/o trade) — production  
 consumption (w/ trade) — production + import - export

gains from trade?

England: Cheese:  $12 - 4 = 8$       Spain: Cheese:  $0 + 4 = 4$   
 Bread:  $0 + 3 = 3$       Spain: Bread:  $6 - 3 = 3$

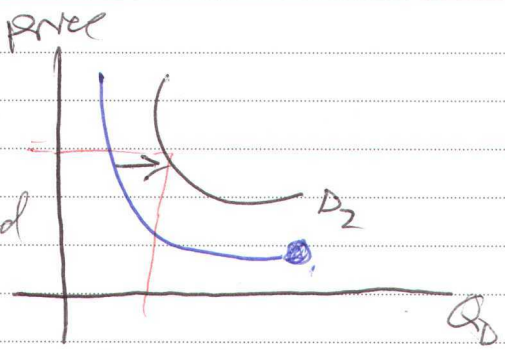
- 1) What is a demand schedule
- 2) What is a demand curve
- 3) Why do demand curves slope downward?
- 4) What makes a demand curve shift?
- 5) Why doesn't a price change shift the demand curve

7/20/21

# Demand is determined by buyers

(continued)

Rules:  $\uparrow P \uparrow P$ ,  $\uparrow D \downarrow P$



1) Life Event  
- change in need change demand

2) Societal changes  
- shifting societal view causes change in demand

3) New information  
- new information changes demand

higher quality  
also please slip  
↓

4) change in income

↳ Normal Good ↳  
- a good which rises income causes an increase in demand  
Rightward

Inferior good  
- a good which higher income causes a decrease in demand  
Leftward shift

5) Change in price of related good  
Substitutes:  $\uparrow P$   $\uparrow D$   $\downarrow P$   $\downarrow D$

demand for good  $\uparrow$  if price of a substitute good rises

Complements: demand for a good will decrease if the price of a complement good rises

6) Expected an increase of income  
- Demand for good will increase if a price increase or income increase is expected

or  
- Demand for a good will decrease if a price decrease or income decrease is expected

7) Change in number of buyers  
more buyers Rightward  
less buyers Leftward

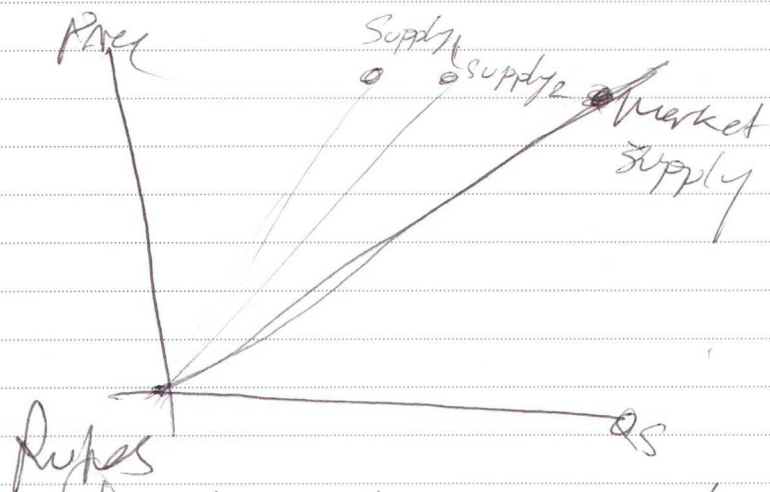
Price change changes the demand  
any thing else changes Demand

# Change in price causes change in Q<sub>s</sub>

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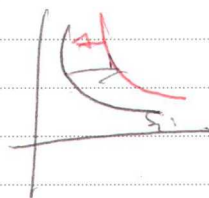
- 1) What is a supply schedule?
- 2) What is a supply curve?
- 3) Why do supply curves slope upward?
- 4) What makes the supply curve shift?
- 5) Why doesn't the price change shift supply curve?



Right & Left  
down/up

1) Increase in supply → shifts Right

2) Change in input price  
i.e. wages - raw materials  
or "expenses"



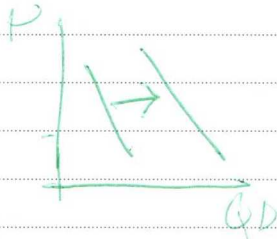
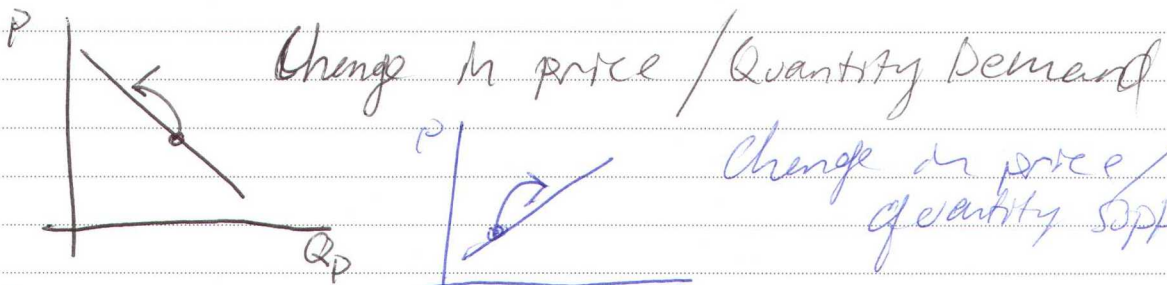
2) change in price of raw material "input price"  
 $\downarrow$  IP  $\uparrow$  Supply      $\uparrow$  IP  $\downarrow$  Supply

3)  $\uparrow$  Technology (productivity)  $\uparrow$  Supply  
 $\downarrow$  Technology (productivity)  $\downarrow$  Supply

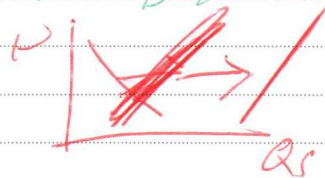
4) Change in expectations  
 $\uparrow$  Price  $\downarrow$  Supply      $\downarrow$  Price  $\uparrow$  Supply

5)  $\uparrow$  Sellers  $\uparrow$  Supply      $\downarrow$  seller  $\downarrow$  Supply

anything else changes market and the supply curve



Change in Demand



Change in Supply

What is a market

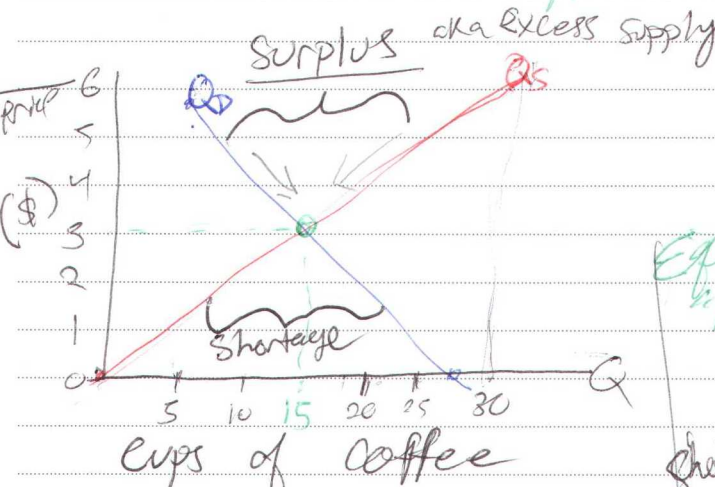
market  
a group of buyers and sellers of a particular product

competitive market  
many buyers/sellers

each has negligible effect on price

perfectly competitive market  
all goods being sold are the same

buyers & sellers are price takers  
consumers



A perfect competitive market

Equilibrium:  $Q^S = Q^D$   
"no tendency for change"

	$Q = 0$	$Q = 15$	$Q = 30$
Shortage	0	0	0
Surplus	0	0	0

If price is too high:  
 $\uparrow Q_s \downarrow Q_d$   
downward pressure on price  
= Surplus = falling price  
 $Q_s - Q_d$

If price is too low:  
 $\downarrow Q_s \uparrow Q_d$   
excess demand  
Shortage = rising prices  
 $Q_d - Q_s$



# Methods for predicting Market Shifts

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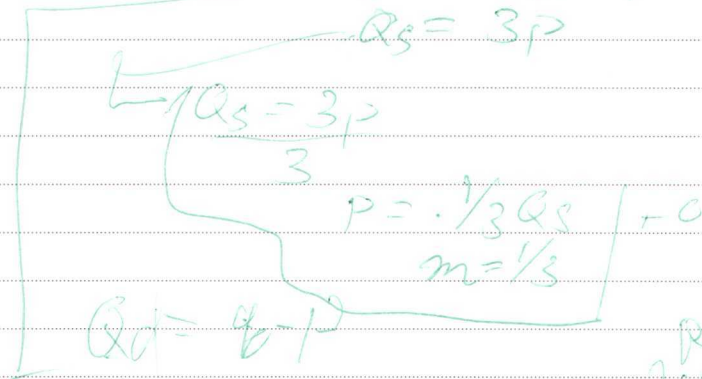
- ① which curve shifts
- ② which direction
- ③ How the equilibrium changed

$$Q_D = f(P) \quad \& \quad Q_S = g(P)$$

Example

$$Q_D = 40 - P$$

$$Q_S = 3P$$



$$Q_D = 40 - P$$

$$+P = +P$$

$$Q_D + P = 40$$

$$-Q_D = -Q_D$$

$$P = 40 - Q_D$$

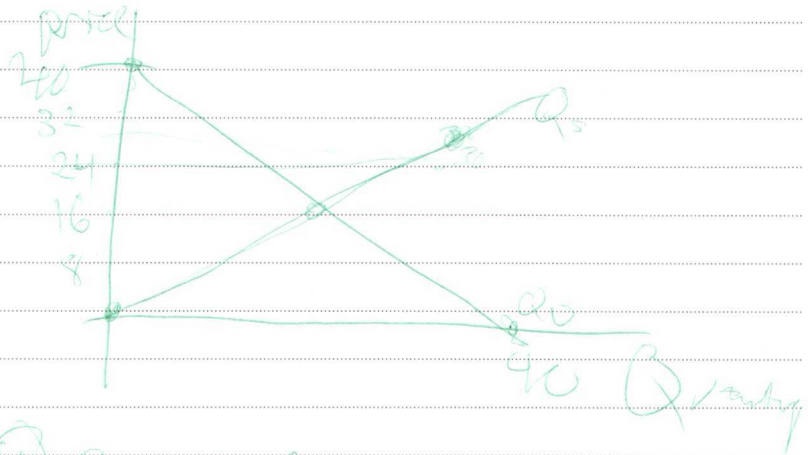
$$m = -1$$

③ equilibrium price

① determine the inverse demand curve

② determine the inverse supply curve

③ - Sketch



④ Solve for price

$$Q_S = Q_D$$

$$3P = 40 - P$$

$$+P = +P$$

$$4P = 40$$

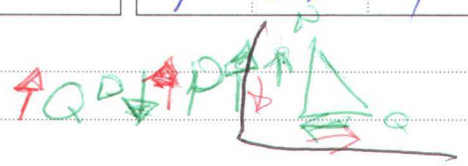
$$P = 10$$

# Chapter 5

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## Law of demand

The claim that  $\rightarrow$  *Ceteris Paribus*



## Price of elasticity of demand

a measure of how much  $Q_D$  of a good responds to a change in the price of that good

### Elastic

Demand for a good is said to be elastic if the  $Q_D$  responds substantially to changes in price

### Inelastic

Demand for a good is said to be inelastic if the quantity demanded responds only slightly to changes in the price

### (4) Determinants

## Availability of substitutes

Roman Lettuce

Elastic

Eggs inelastic

## Necessities vs. Luxuries

Spas

Elastic

Medicines

Inelastic

## Definition of the Market

One fruit

Elastic

All Fruits

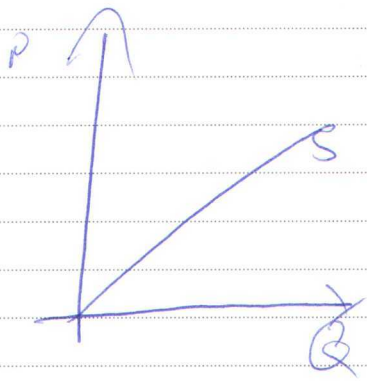
Inelastic

## Time Horizon

Long Run  
Elastic

Short Run  
Inelastic

If it's flat it's Elastic, If it's steep it's inelastic



Law of Supply ↑P↑S

as the price increases so does the quantity supplied.

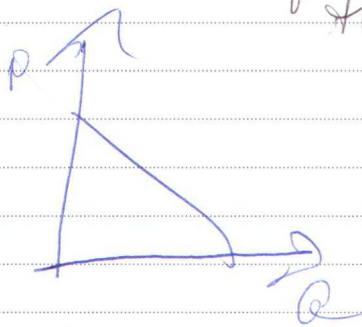
Why?  
sellers like to sell at higher prices

If  $P=9$ ,  $Q=4$   
If  $P=11$ ,  $Q=5$

$Q_s$ # products	Marginal cost	P Price
1	2	9
2	4	9
3	6	9
4	8	9
5	10	9

Law of Demand ↑P↓D

if the price decreases the level of demand increases



If  $P=1$ ,  $Q=5$

If  $P=3$ ,  $Q=4$

$Q \#$	MB	P	$P'$
1	10	1	3
2	8	1	3
3	6	1	3
4	4	1	3
5	2	1	3
6	0	1	3

↳ non-price factor

Shifts in Demand

- weather
- income
- Expectations
- substitutes
- # of consumers

Shifts in supply

- 1) technology
- 2) Number of sellers
- 3) price of inputs
- 4) Expectation of sellers

Veblen Good → buying something b/c it's expensive

The flatter the curve the more elastic the good

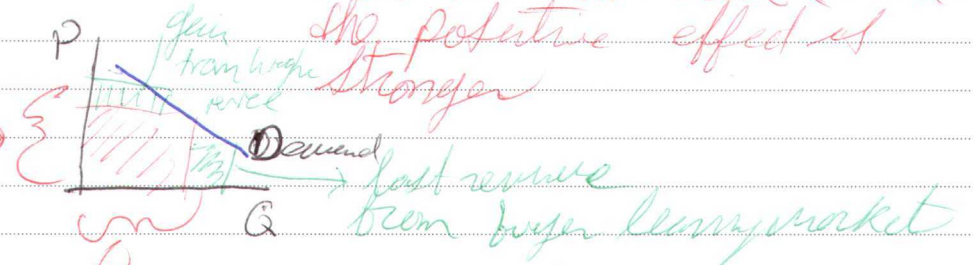
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$$\text{Revenue} = \text{Price} \times \text{Quantity}$$

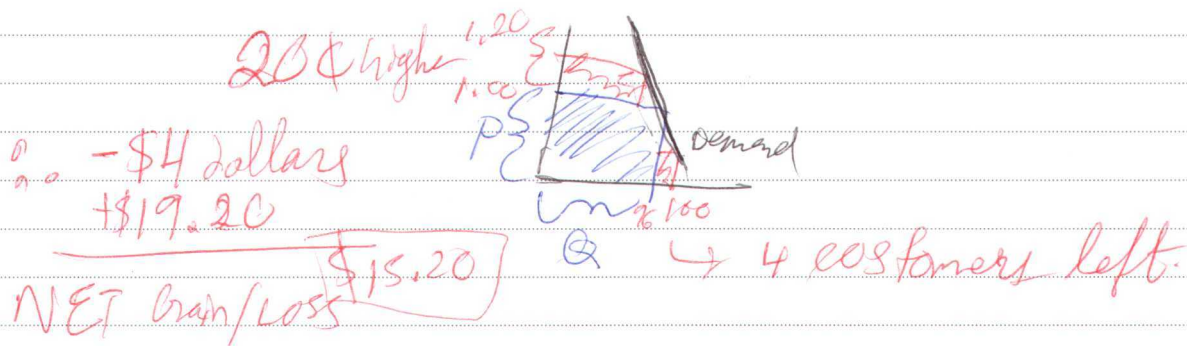
Elastic demand  
price elasticity  $> 1$   
revenue will fall  
because the neg. effect  
is stronger

Inelastic demand  
price elasticity  $< 1$   
revenue will rise because  
the positive effect is  
stronger

$$P \times Q = \text{Revenue}$$



When demand is elastic a price increase causes revenue to fall.



When Demand is inelastic a price increase causes revenue to rise

$$\text{Income elasticity} = \frac{\% \text{ (percentage change in } Q^D)}{\% \Delta \text{ income}}$$

normal goods: income elasticity  $> 0$

inferior goods: income elasticity  $< 0$

Income	Q of good x produce
\$30K	2 units
\$40K	4 units

$$\textcircled{1} \quad \% \Delta \text{ in } Q^D = \frac{4-2}{(2+4)/2} = \frac{2}{3}$$

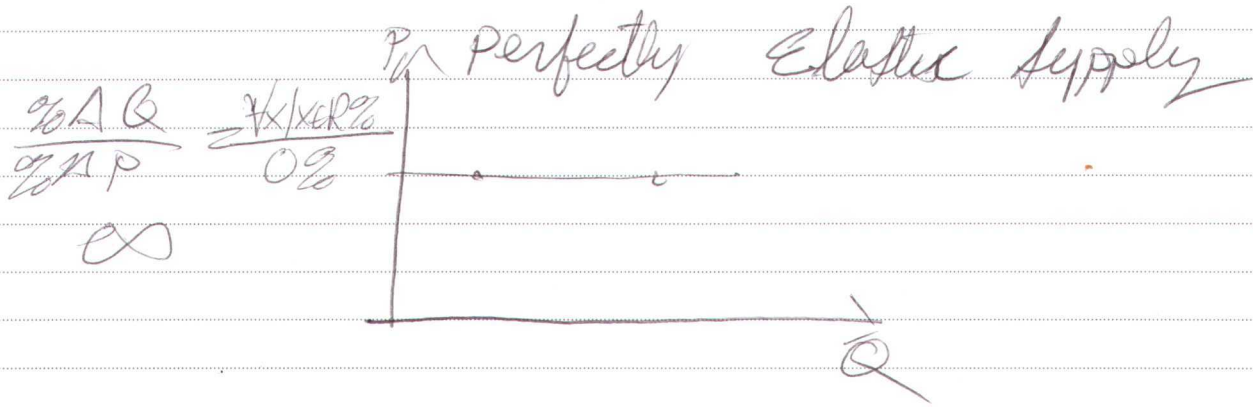
$$I.E. = \frac{(2/3)}{(1/3)} = \frac{6}{3} = 2$$

$$\textcircled{2} \quad \% \Delta \text{ in income} = \frac{40-30}{35} = \frac{10}{35} = \frac{1}{3}$$

IE  $> 1$   
normal good

Cross-price elastic of demand

$$= \frac{\% \Delta Q^D \text{ of good A}}{\% \Delta Q^D \text{ of good B}}$$



Chapter 6

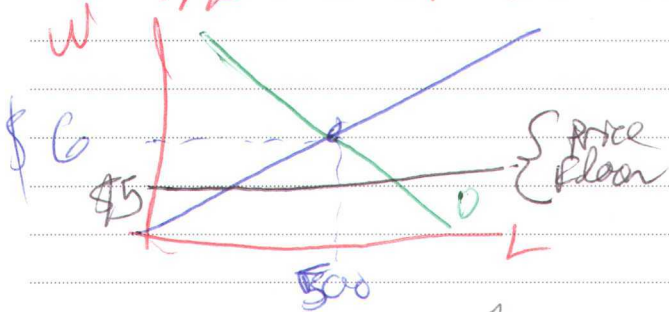
Price Ceiling

- Rent Control
- ATM fees
- Anti-price gouging law

Price Floor

- Minimum wage
- Many agricultural goods have price floors

The Market for unskilled labor 10/11/2021

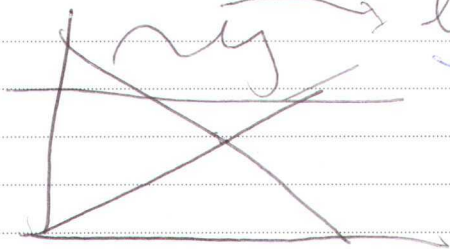


w = Wage = Price for labor

L = Quantity of labor

not binding price floor  
 → allows supply

labor surplus = un employment

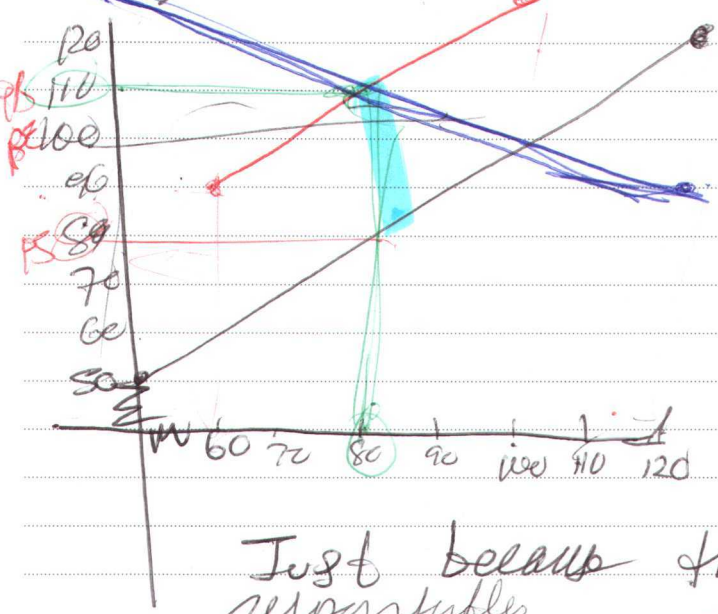


- min. wage law does not affect highly skilled labor
- affects teen workers

in 10% increase min wage raise teen unemployment by 1.7%

# Taxes

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A \$30 per unit tax on sellers.

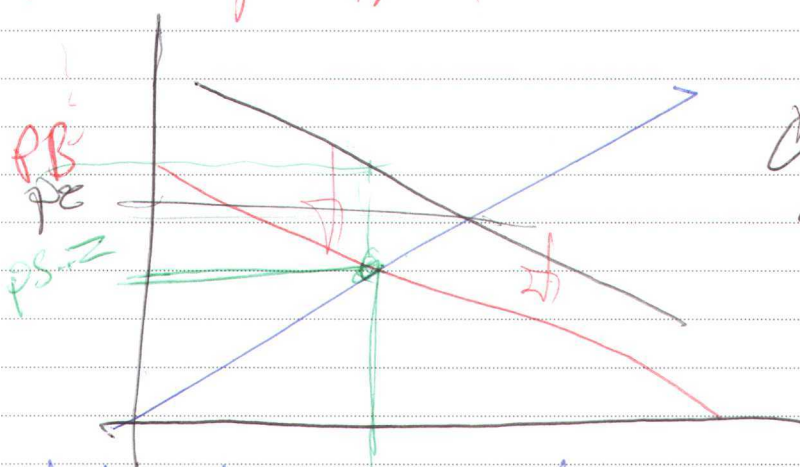
Demand curve is unaffected.

Supply curve shifts to the left (up)

Just because the buyer is administratively responsible - - - doesn't mean...

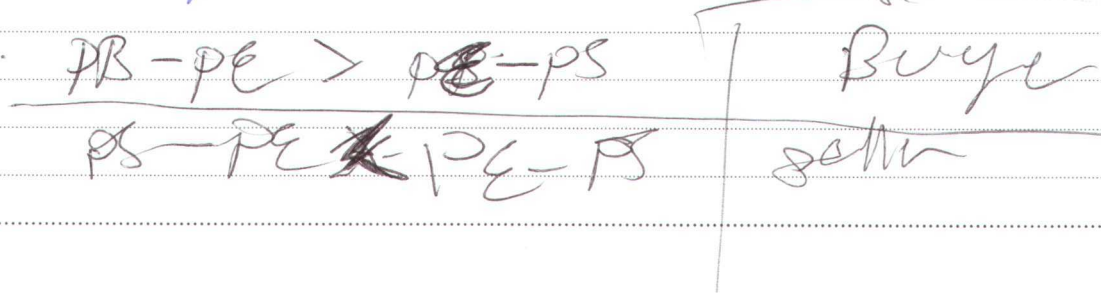
Tax  $P_B - P_S$

PE - price elasticity the incident on a tax  
 price sellers receive  $\rightarrow$  keep the burden of a tax is shared - among market participants  
 price buyers  $\leftarrow$  spend

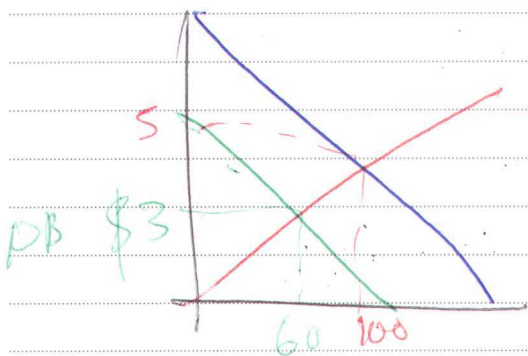


A \$ per unit tax on the buyer

Who bears the burden of tax?  
 (Elasticity)



\$ 4 tax on buyer



$Q_d = 200 - 20P$   
 $Q_s = 20P$   
 $P = 10 - \frac{Q}{20} - 4$  (tax)

ⓑ set demand for tax equal to supply

Welfare Economics  
allocation of resource

willingness to pay

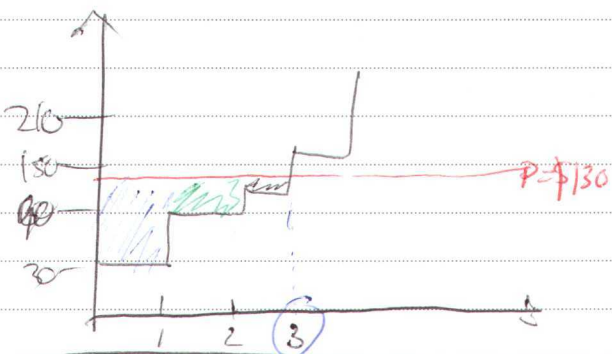
marginal Buyer: the one willing to leave the market if the price were any higher.

Consumer surplus =  $WTP - price$

Sellers prefer high cost, so they can exceed expenses

price - cost = Producer surplus

## Producer Surplus Example



How many units are supplied at a price of \$130?

3 units

- \* Consumer Surplus = WTP - price 10/18/2021
- reimagined the Demand Curve as a WTP curve
  - Height of demand at a particular  $Q$  tells us the WTP of the marginal buyer.
  - Consumer Surplus is the area below the demand curve
    - smooth demand: ~~triangle~~ Triangle
    - Step-wise demand: series of rectangles

\* Producer Surplus = price - cost

Cost table  
from \$1.00 to .70

	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>
A	2.00	1.50	.75
B	1.50	1.00	.60
C	1.75	.25	0

$$CS_1 = 2 - 1 + 1.5 - 1 = \$1.50$$

$$CS_2 = 2 - 0.7 + 1.5 - 0.7 + .75 - .70 = 2.5 + (0.05)$$



(continued)

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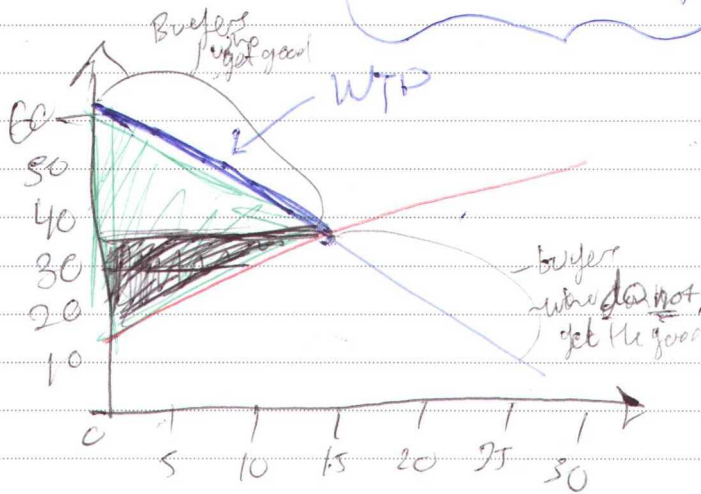
CS = buyer's gains from participating in the market

PS = seller's gains from participating in the market

Total surplus = CS + PS

= total gains from trade in a market

= value to buyers - cost to sellers



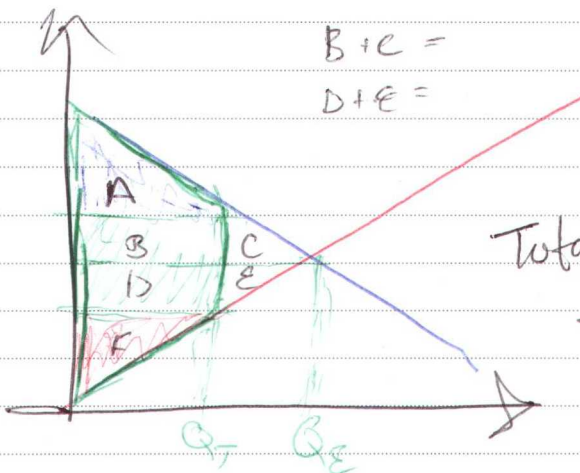
Market Equilibrium

$P = \$30$

$Q = 15$

CS = Total Surplus

Chapter 8



$B + C =$   
 $D + E =$

CS = A  
PS = F

Tax Revenue = B + D  
Tax Surplus = A + B + D + E

Total

The tax reduces surplus by C + E (DWL) Dead Weight Loss

The tax is preventing mutually beneficial trades

Deadweight loss is always from buyers leaving market.

(continued Chapter 8)

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In Algebra Example (no tax)

10/20/21

Market demand is described by the function

$$Q^D = 40 - P \quad \sim \quad 40 - P = 0$$

Market supply is described by the function

$$Q^S = 3P$$

$$\text{Producer surplus} = \frac{1}{2} (10) (30) = 150$$

$$\text{Total surplus} = 150 + 300 = 450$$

\$600

$$Q_T^S = 3(P - 20) = 3P - 60$$

$$Q_D = Q_T^S \Rightarrow 40 - P = 3P - 60$$
$$100 = 4P$$

$$P = 25$$

$$Q_T = 40 - 25 = 15$$

$$P = 25 - 20 = 5$$

Consumer surplus

$$\frac{1}{2} (40 - 25) \times 15 = \$112.5$$

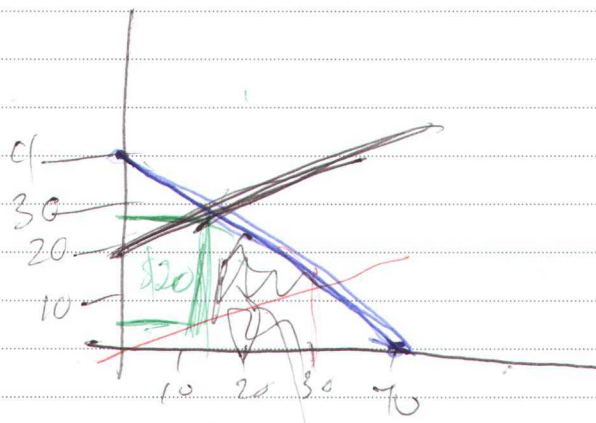
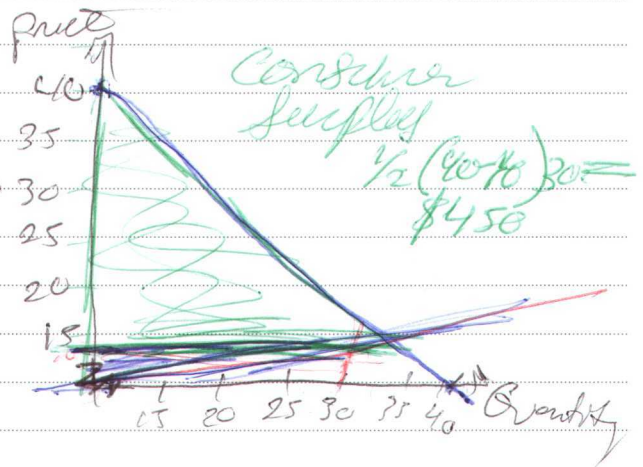
Producer surplus

$$\frac{1}{2} (5 - 0) \times 15 = 37.5$$

Tax Revenue

$$T_x \times Q_T = 20 \times 15 = 300$$

$$D.L.S = \frac{1}{2} \times 20 \times 15 = 150$$



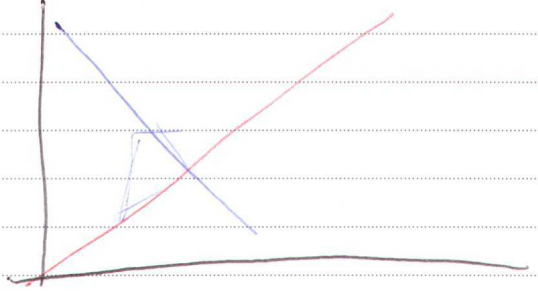
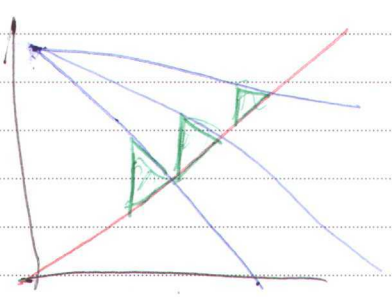
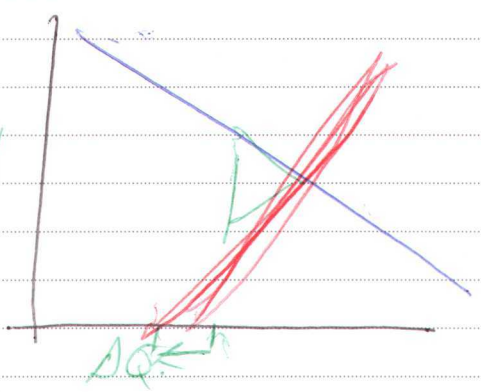
DWL = (Consumer Surplus) on the price elasticity of a good

10	20	4
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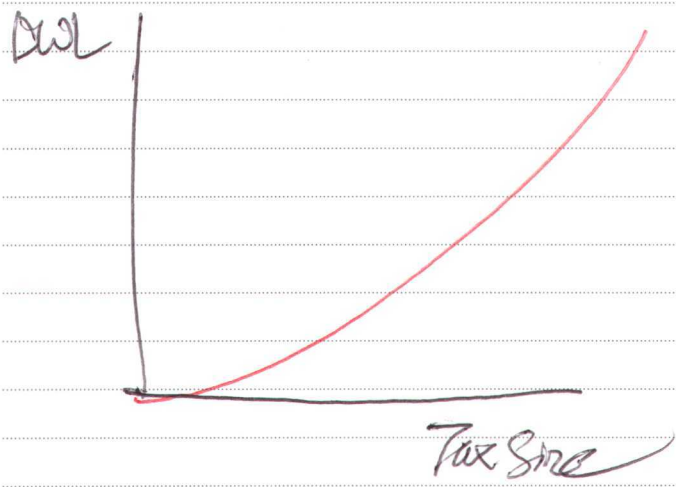
Continued (this shows we decide how to / what to tax)

Assume DWL on apply

perfectly inelastic supply  
 implies "zero" dead weight loss  
 - elastic  
 - DWL is big



Tax markets with inelastic supply/demand



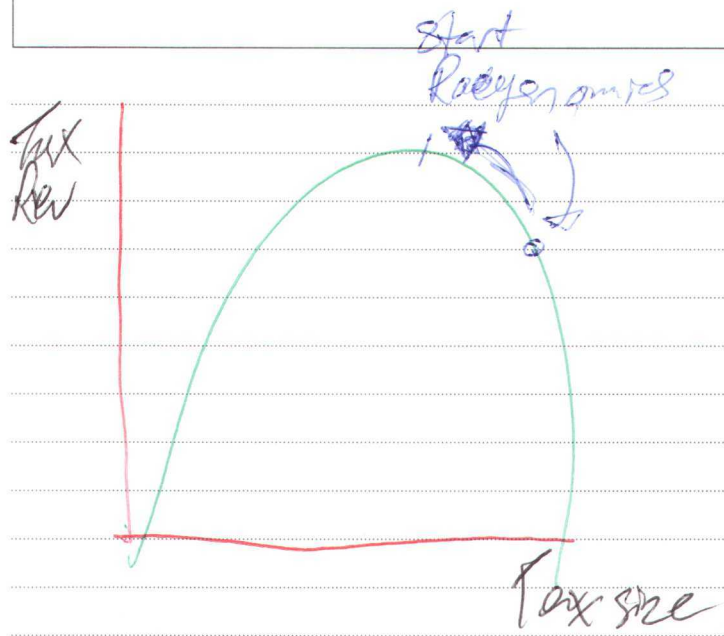
Double the tax  
 DW increases by  $2^2 = 4$  times  
 triple  $\Rightarrow 3^2 = 9$  times  
 quadruple  $\Rightarrow 4^2 = 16$  times

Groceries inelastic / - funny reason  
 Hotel Room in the short run is inelastic

When Tax rises DWL grows

Demand is more elastic on the long run  
 Hotel Room in the short run is inelastic  
 on the long run is elastic

Eggs  $\rightarrow$  inelastic  
 Ramen Noodle  $\rightarrow$  elastic (lots of substitutes)



## Laffer curve

Shows the relationship between the size of the tax and tax revenue

## Big vs. Small Government

10/25/21

### Comparative Advantage

↳ produce at lower opp cost

↳ benefit from trade

### Equilibrium w/o trade

↳ only domestic buyers/sellers

Total benefit = Consumer Surplus + Producer Surplus

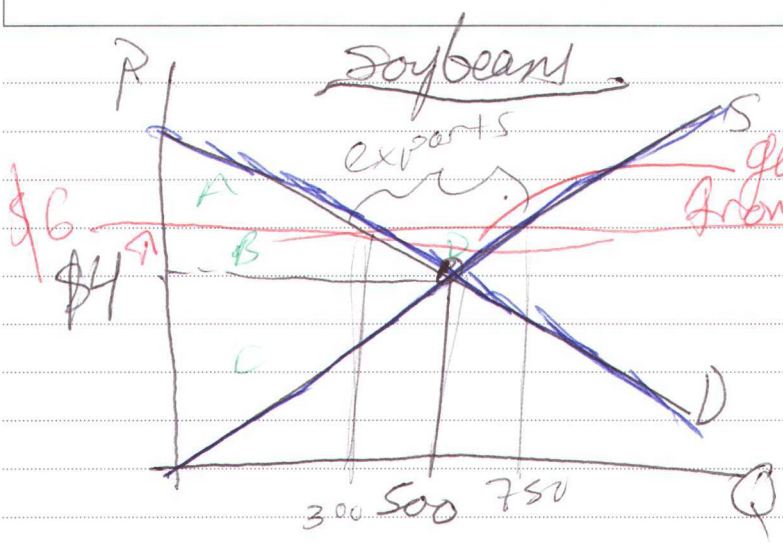
### International Trade:

$P_w$  world price of a good  
 $P_p$  domestic price w/o trade

if  $P_p < P_w$   
 ↳ domestic country has comparative advantage

Small Economy (Price) → Export the good  
 ↳ consumers have no buyer effect on  $P_w$

↳ the world price becomes the only relevant price

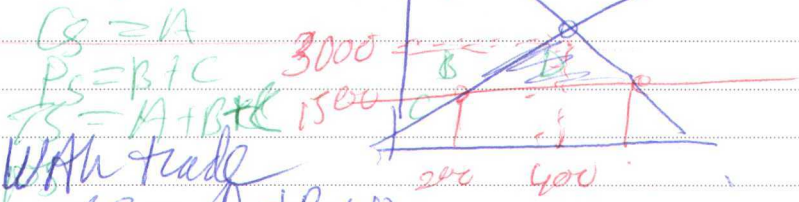


without trade  
 $P_D = \$4$   
 $Q = 500$   
 $CS = A+B$   
 $PS = C$   
 Total surplus =  $A+B+C$

Suppose that  $P_{WT} = \$6$   
 under free trade  
 • domestic consumer demand 300  
 • domestic producer supply 750

A country that imports for exports =  $750 - 300 = 450$   
 $P = \text{goes up}$

without trade  
 $P_D = \$300$   
 $P_Q = 4000$



with trade  
 $CS = A+B+D$   
 $PS = C$

Total surplus =  $A+B+C+D$

We conclude / when a good imported or exported - trade creates winners / losers

	X	M
fall	rise	
rise	fall	

Consumer Benefits

Other Bene.: increased variety of food.

Producer Benefits (lower costs)  
 Enhanced flow of ideas.

What are the opportunities  
 to be losers → feel like a loser

losers → left behind  
 winners - cost consumers

# Welfare - CS, PS, TS

## Trade Restrictions / Quota

Tariff: a tax on goods abroad sold domestically

Under Free Trade - Domestic Price becomes the world price.

Under tariff on imports

domestic price =  $P_W + (\text{tariff}) \rightarrow$  per unit

Analysis of Trade on one apple

$P_W = \$2$

under free trade

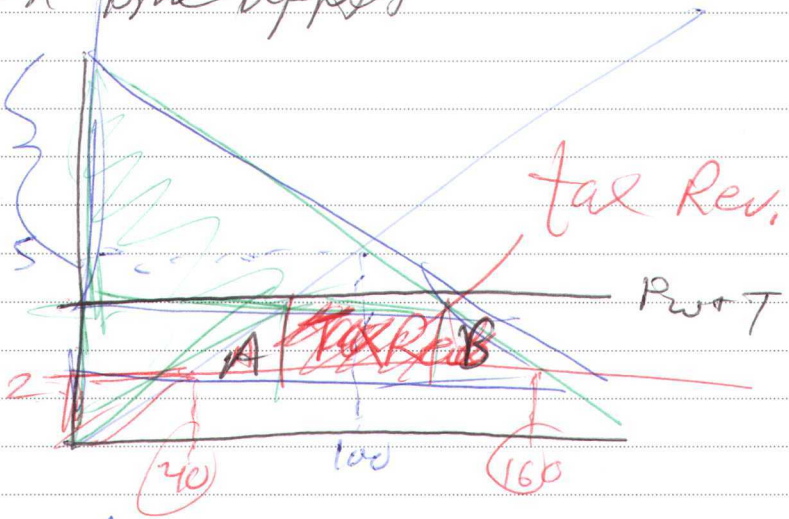
$Q_D = 40$   $Q_S = 160$

Imports = 120

Under a Tariff

$P = \$4$

$Q_D = 80$   $Q_S = 120$



Welfare under Free Trade

$CS = \frac{1}{2} (10 - 2) \times 160 = \$640$

$PS = \frac{1}{2} (2) \times 40 = \$40$

$TS = 640 + 40 = \$680$

Welfare under normal trade

$CS = \frac{1}{2} (10 - 4) \times 80 = \$360$

$PS = \frac{1}{2} (4) \times 120 = \$240$

Tariff Rev. =  $40 \times \$2 = 80 + 160 + 360 = \$600$

DWL =  $680 - 600 = \$80$

A, B

DWL

A = Domestic over production  
B = Domestic under consumption

Goal of Tariff: reduce the # of imports

# Import Quotas

- Quantitative limit on imports and goods

raises price  
reduces Q.  
on imports  
reduces welfare  
(buyers)

increases  
seller welfare

mostly has the same effects as a tariff

## Why do we Restrict trade?

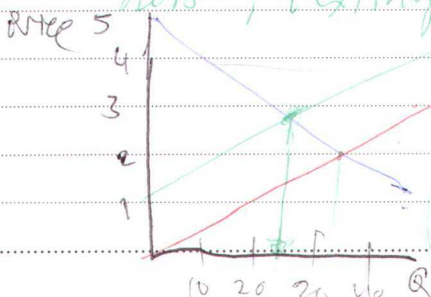
- ① - Jobs → trade destroys jobs at home  
should also create jobs ←  
+ retraining
- ② National security → wartime disruption
- ③ New industries need temporary restrictions to help them get started  
critical importance ←
- ④ It's going to work let it be!
- ⑤ In fair competition  
good for consumers ←
- ⑥ protection of the bargaining chip  
threats to not always work ←

Externality: something related to production of good or services can be impacted by an externality + or -

10/27/21

market outcome → no longer efficient  
↳ market failure

Negative Externalities (air pollution, neighbor's barking dog, late-night noise, texting while driving, smoking...)



supply curve shows private cost  
+ External cost "value of the neg. impact"  
demand curve shows private  
Social Cost Curve = private cost + external cost

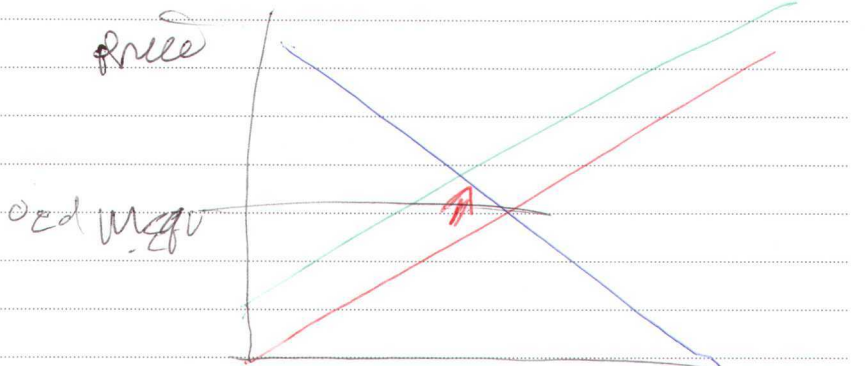
taxes all

reduces Quantity sold

# Social Value Curve / Social Cost Curve

Internalizing the Externalities! altering the incentives so that people take account of the external effects of the actions

positive externality  
re-vaccinated  
& Prof D people  
going to school.

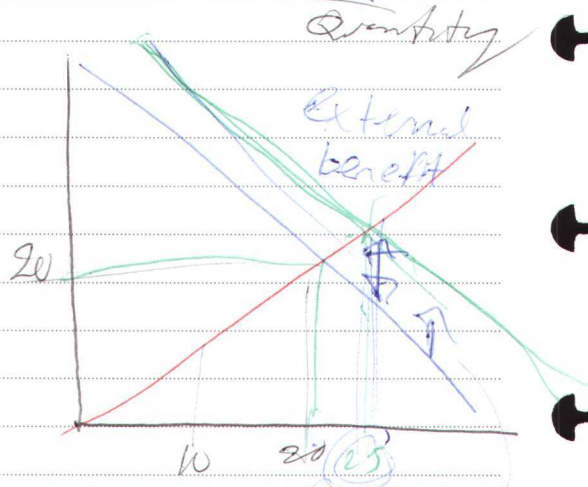


→ Social Benefit  
private value →  
external benefit →

demand curve  
supply curve  
demand =  $40 - Q_D$   
inverse supply =  $p = Q_S$

$$PSU = 50 - Q$$

① Find the social optimal output level = 25 units



\$10 PER UNIT

subsidize

## Command-and-Control

- regulation of behavior
- limit on quantity of pollution emitted.
- Requirement that firms adopt a particular technology

## Market-Based

- provide incentive so private decision maker will choose to solve the problem on their own
- corrective taxes or subsidies
- Tradable Pollution Permits

## Corrective Taxes & Subsidies

a tax (subsidy) designed to induce private decision makers to take account of the social cost (benefit) that arise from a negative (positive) externality



Each firm pays 16K per 10 tons of SO<sub>2</sub>

Example:   
 - Acme and US Electric run coal burning power plant.

• Each emits 50 tons of SO<sub>2</sub>/month

• Total emissions = 100 tons/month

Goal: Reduce SO<sub>2</sub> 20% (80 tons/month)

QTY	Acme	US E
50 + 50 tons each reduce 10T.	<10	2K ✓
total cost reduction	11-20	3K ○
\$3000	21-30	4K ○
	31-40	5K ○
	41-50	6K ○

Pr total cost of reduction  
 1K + 1.5K = 2.5K

It's efficient since the lower abatement cost firm does the reduction

P3 Issue of permits allow up to 10 tons SO<sub>2</sub> emissions each start w/ 4 permits @ \$1800 sale

US: 1800  
 Acme: 1000 + 1500 = 1800

Total reduction 1800 + 700 = 2500 - 1800 = 700

Costs thru markets enter  
 transaction cost  
 coordination problem  
 & free riders

# Public Goods And Common Resources

11 / 1 2021

What goods do we consume w/o directly paying for them?  
e.g., fire dept, public schools, military, clean water/air

Who price - price private market may fail  
→ promoting the need for governmental intervention

Four types of goods

- Excludable: individuals can be prevented from consuming
- Non-excludable: ie sunset - cannot be denied to anyone
- Rival in Consumption: one use reduces other's use (Scarcity) <sup>stock</sup>
- Non-rival in Consumption

- 4 types of goods
  - Private good
  - Common resource
  - Not excludable + (Public good)
  - Club good

Public & private Free Rides → ~~Free~~ ~~to~~ ~~behave~~  
of a good

Benefit of public good exceeds the  
(Cost benefits outweigh) → inefficient

Cost - ← inefficient

History 1909 → 16<sup>th</sup> amendment ratified (income tax)  
 1916 & 1917 → WWI → revenue act / war revenue act  
 1970 -  
 1975-1981 -  
 1982 - Great depression  
 1940 - Rev act increased  
 1944 - tax rate rose to 94%

Discretionary Spending (Defense Spending)  
Mandatory Spending (Social Security)

Taxable income - wages, interest or savings, dividends, profits  
- deducts: mortgages, charity, dependent

Welfare > for the gov collects = DWL  
 hunting / fishing licenses like a tax

TUL The private members of the social contract

\* → Deadweight is the loss of opportunity

The tax is going to generate Rev

ROTH, IRA, ETC.

→ not taxed until you withdraw

→ Post Tax income, let it grow

calculate average tax rate

① determine the total taxes paid by a person who earns \$60,000

$$= 0.2 \times (40,000) + .5 \times (60,000 - 40,000)$$

Income	Tax Rate
0-40k	20%
over 40k	30%

$$\approx 18,000$$

Next calculate average of tax payer

$$\frac{18k}{60k} = 30\%$$

Lump Sum Tax

# Revenue Profit.

11 15 21

(all in)

(all out)

$$\text{Total Revenue} - \text{Total Cost}$$

the amount of money a firm receives

price \* quantity

the market value of all the input a firm uses in production

Total Costs =

Explicit cost

+

Implicit cost

Explicit costs

↳ In part cost that require an outlay of money

Implicit costs

↳ In part cost that do not require an outlay of money  
↳ the idea of cost  
↳ foregone income

## The Opportunity Cost of Financial Capital

Example

business. → you need \$100,000 to start your business.  
- The interest rate is on loan @ 5%  
- The interest you earn in a savings account is 2%

Case 1: borrow \$100k

$$\text{explicit cost} = 0.05 \times 100,000 = 5,000 \text{ interest}$$

Case 2: use \$40k of personal savings + borrow the other \$60k

2 types of profit

Accounting Profit

total revenue minus

total explicit costs

$$\text{explicit cost} = 0.05 \times 60,000 = \$3,000$$

$$\text{Implicit cost} = 0.2 \times 40,000 = \$8,000$$

## Economic Profit

total revenue minus total costs

TOL → if positive then firm = " else "

Example!

Walter quit job from \$40k to open biz.

① - he took out 20k from savings from 3%

② - he borrowed 30k from 3%

He paid 25k for supplier  
He earned 60k

Account of Profit

$$= 60,000 - 25,000 - 0.03(30,000)$$

$$= \$34,100$$

Economic Profit

$$= 60,000 - 25,000 - 0.03 \cdot (30,000)$$

$$= 0.03(20,000) - 40,000$$

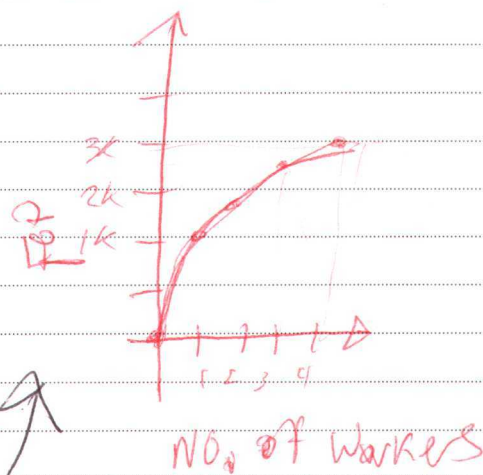
$$= 6,500$$

Production function

\* Shows the relationship between the quantity of inputs used to produce a good and the quantity of that good

~~input~~

L	Q
No. of workers	(bushes of wheat)
0	0
1	1000
2	1500
3	2000
4	2800
5	3000



The ~~MP~~ marginal price of labor  
 $\frac{\text{change in output}}{\text{change in labor}} = 1$

# Output of the best labor hired

$$= \frac{\Delta Q}{\Delta L} \text{ MPL}$$

Labor	output	MPL
0	0	
1	1000	$1000/1 = 1000$
2	1800	$(1800 - 1000)/1 = 800$
3	2400	
4	2800	
5	3000	$(3000 - 2800)/(5-4) = 200$

Farmer ~~is~~ finds

If you add more work, the grapes become  
 - average worker has less land ~~to work on~~

## Diminishing Marginal Product (Law)

Recall Rational people think at the margin  
 →

How production functions and costs related?  
 example:

1000/month - land  
 2000/worker

as farmer picks costs are related to how many

Labor	Output	Cost of land	Cost Labor	Total Cost	Marginal Cost
0	0	1000	0	1000	
1	1000	1000	2000	3000	$5000 - 1000 / 1000 = \$2$
2	1800	1000	4000	5000	$(5k - 3k) / (1.8k - 1k) = \$25$
3	2400	1000	6000	7000	$7k - 5k / 2.4k - 1.8k = \$33$
4	2800	1000	8000	9000	\$5
5	3000	1000	10000	11000	\$10

## Marginal Cost

$$MC = \frac{\Delta \text{TC cost}}{\Delta \text{Quantity}}$$

← Marginal Product

Fixed cost (FC) do not vary w/ the quantity of output produced

- Farmer Jack: FC = 81000 land etc
- Other example

Variable costs (VC) vary with the quantity produced

- Farmer Jack: VC = wage paid to workers
- Other example: cost material

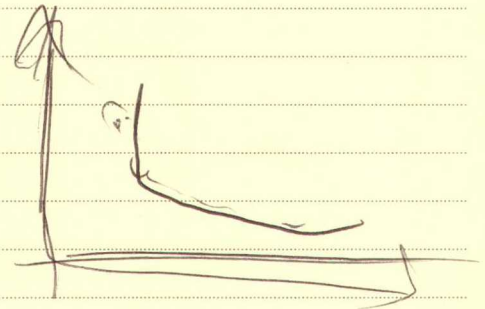
$$\text{Total Cost} = FC + VC$$

Quantity	FC	VC	MC
0	800		
1	800		
2	800		
3	800		
4	800		
5	800		
6	800		
7	800		

800
700
600
500
400
300
200
100

Average fixed cost (AFC)  
 $\frac{\text{Total fixed cost}}{\text{output}}$



Average variable cost (AVC)

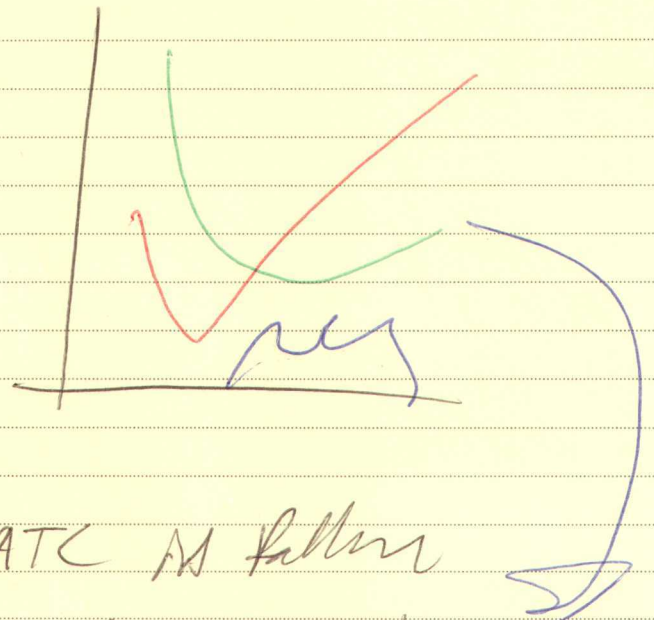
$$\frac{\text{variable cost}}{\text{output}} \text{ or } ATC - AFC$$

Average total cost =  $\frac{TC}{Q}$  (ATC)  
 or =  $AFC + AVC$

U-shaped



U-shaped ATC  
at  $Q$ -uses  
- Minimum



When  $MC < ATC$  . ATC is falling  
when  $MC > ATC$  . ATC is rising



# Exit / Entry in the Long Run

11 22 21

\* Exiting the market  
 cost of exiting revenue loss = TR

Benefit of exiting the market  
 cost savings = TC

Profit = TR - TC  
 exit if  $TR < TC$

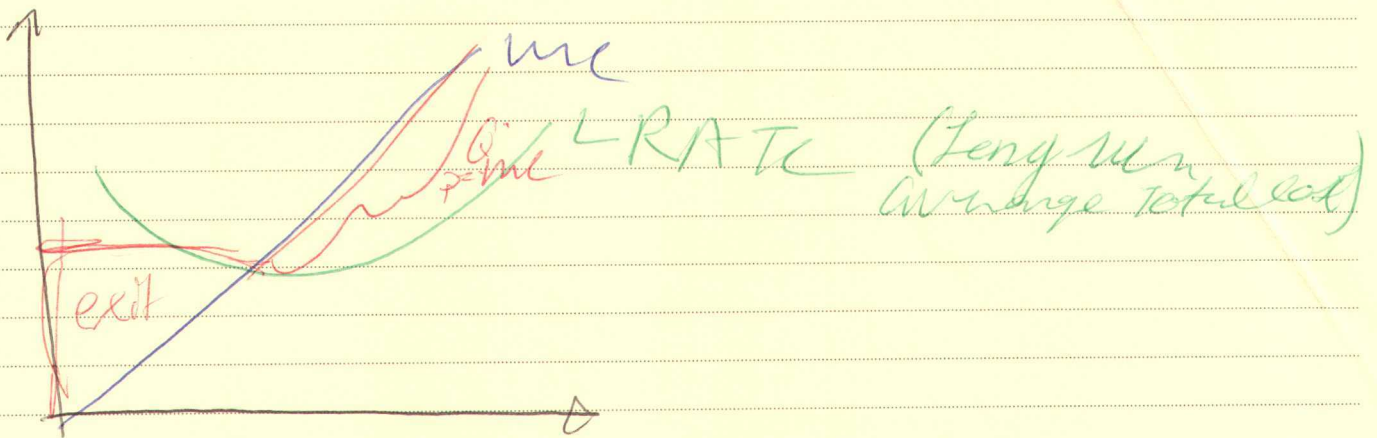
$\frac{P \times Q}{Q} < \frac{TC}{Q} \Rightarrow P < \frac{TC}{Q}$

$\frac{TC}{Q} = ATC$

Enter the market if profit =  $TR - TC > 0$

$P > ATC$

$TR > TC$

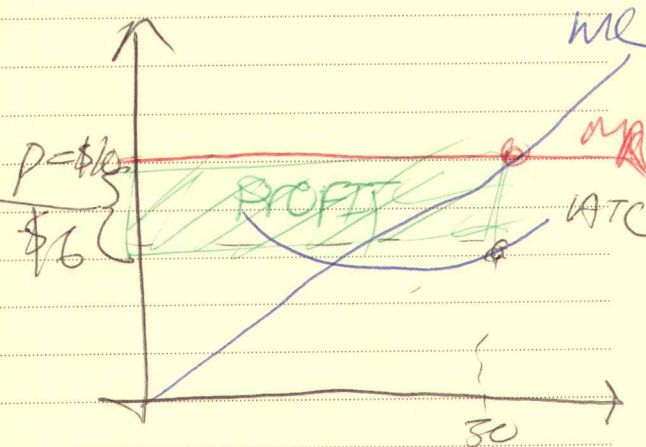


profit = TR - TC  
 $= P \times Q - ATC \times Q$   
 $= Q (P - ATC)$

profit per unit

$\frac{ATC}{1} = \frac{TC}{Q} \Rightarrow TC = ATC \times Q$

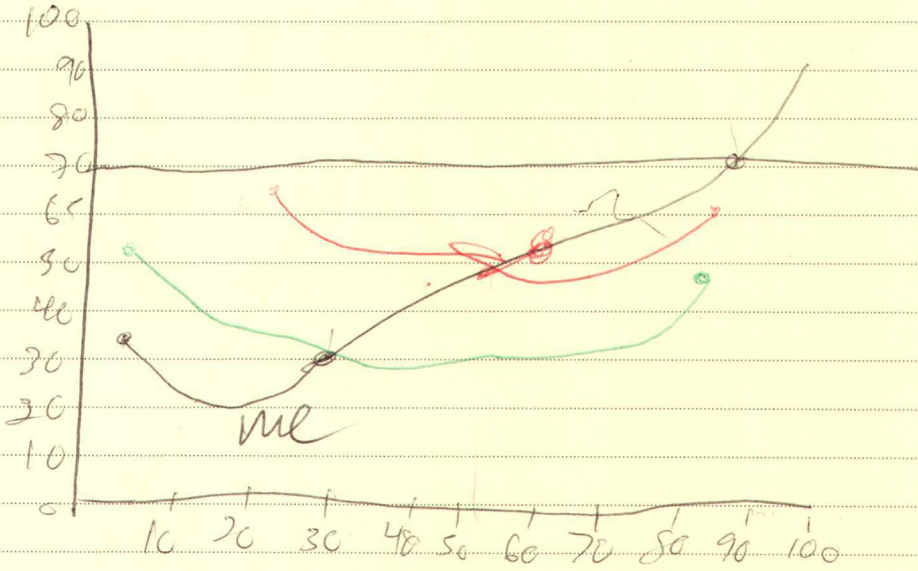
per-unit profit  
 $\$4 = P - ATC$   
 Total profit  
 $= (P - ATC) \times Q$   
 $= 4 \times 50$   
 $= 200$



$$\text{Profit} = Q(P - ATC)$$

$\left\{ \begin{array}{l} MC = MR \text{ produce} \\ MC < MR \text{ increase} \\ MC > MR \text{ decrease} \end{array} \right.$

price = MR (marginal revenue)



Monopoly - Price setter; Barriers to entry

- ① Single firm owns key resources
- ② Government regulation - permitting exclusive
- ③ production process

power homes need cost electricity.

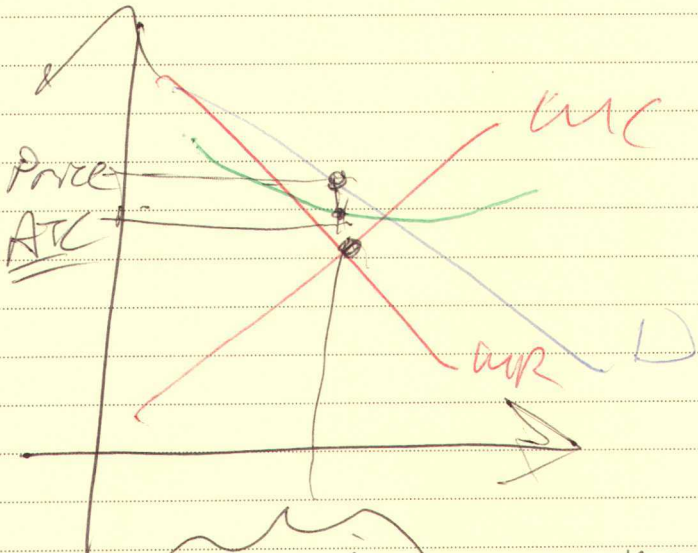
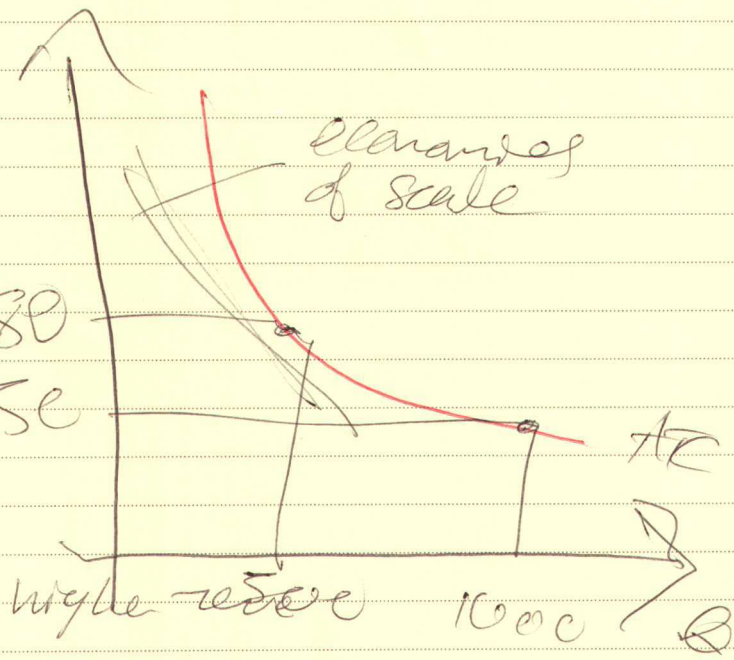
Price effect (neg)

→ to increase revenue = reduce price

Output effect (pos)

→ increase Q means higher revenue

\$80  
\$50



profit  
profit maximizing  
Behavior  
of a monopoly

profits

$$MR = MC$$

max. important part  
monopolist's profit =  $(P - ATC) \times Q$

competitive

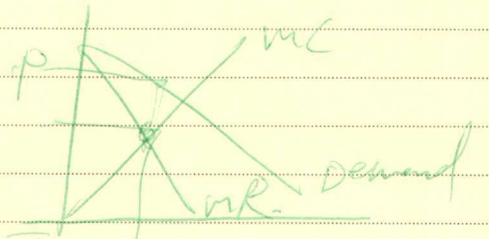
$$P = MC$$

monopoly

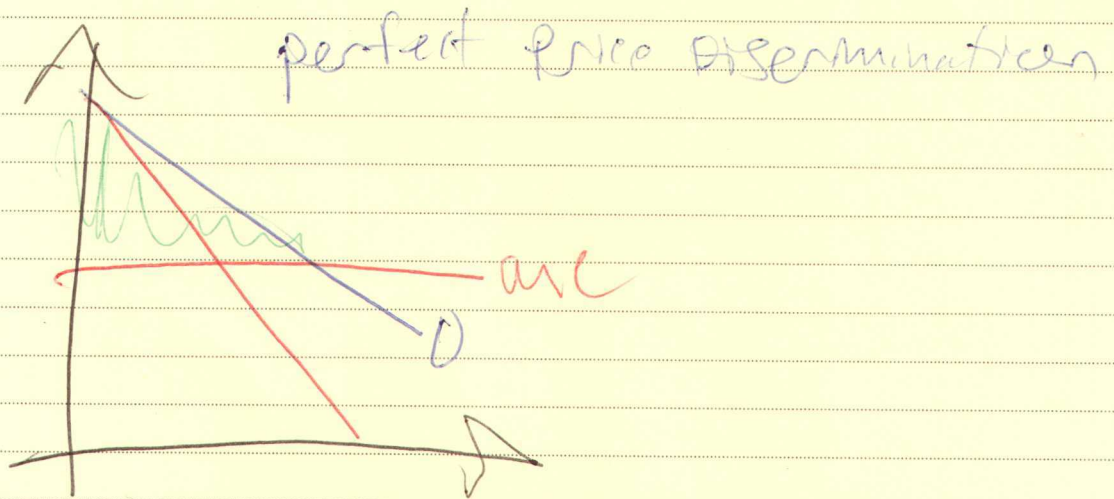
$$P > MC$$

$$\begin{aligned}
 TR &= Q^2 - 4Q \\
 MC &= 2Q \\
 S &= 8 - Q \\
 MR &= 8 - 2Q
 \end{aligned}$$

Profit max. price  $MC = MR$



$$\begin{aligned}
 \text{profit} &= TR - TC \\
 (8Q - 4Q^2) - [2^2 + 4] &= 4
 \end{aligned}$$



- ① break up monopolies → prevent merger
- ② regulate → setting price
- ③ make into public enterprise
- ④ do nothing

# Oligopoly

12 6 21

Strategic behavior in oligopoly

a firm's decisions about P or Q can affect firms and cause them to react

## Game theory

The study of how people behave in strategic situations

P	Q
0	140
5	130
10	120
15	110
20	100
25	90
30	80
35	70
40	60
45	50

Cell phone monopoly in small town

- Small town had 140 residents

two firms: AT&T Verizon

Oligopoly: You are competing w two firms

mobile phone service with unlimited data and free iPhone

Each firm's costs:  $FC = \$0$ ,  $MC = \$10$

example -  $TC = 2Q^2$

Q	TC	MC	ATC
0	0	-	-
1	2	2	2
2	8	4	4
3	18	6	6

P	Q	Rev.	Cost	Profit
0	140	0	1400	-1400
5	130	650	1300	-650
10	120	1200	1200	0
15	110	1650	1100	550
20	100	2000	1000	1000
25	90	2250	900	1350
30	80	2400	800	1600
35	70	2450	700	1750
40	60	2400	600	1800
45	50	2250	500	1750

Collusion: An agreement among firms in the market about quantities to produce or prices to charge

Cartel: a group of firms acting in unison

ie - OPEC oil

compute outcome if monopoly

$P = MC = \$10$

$Q = 60$

profit = \$1800

Suppose each firm agreed to produce  $Q = 30$  & earn profit = \$900

If AT&T reneges on the agreement and produces  $Q = 40$ , what happens to the market price

market  $Q = 40 + 30 = 70$  price = \$35

AT&T =  $40(35 - 10) = 1000$  ∴ AT&T reneges

(continued)

If both firms remain and produce  $Q = 40$

market  $Q = 40 + 40 = 80$

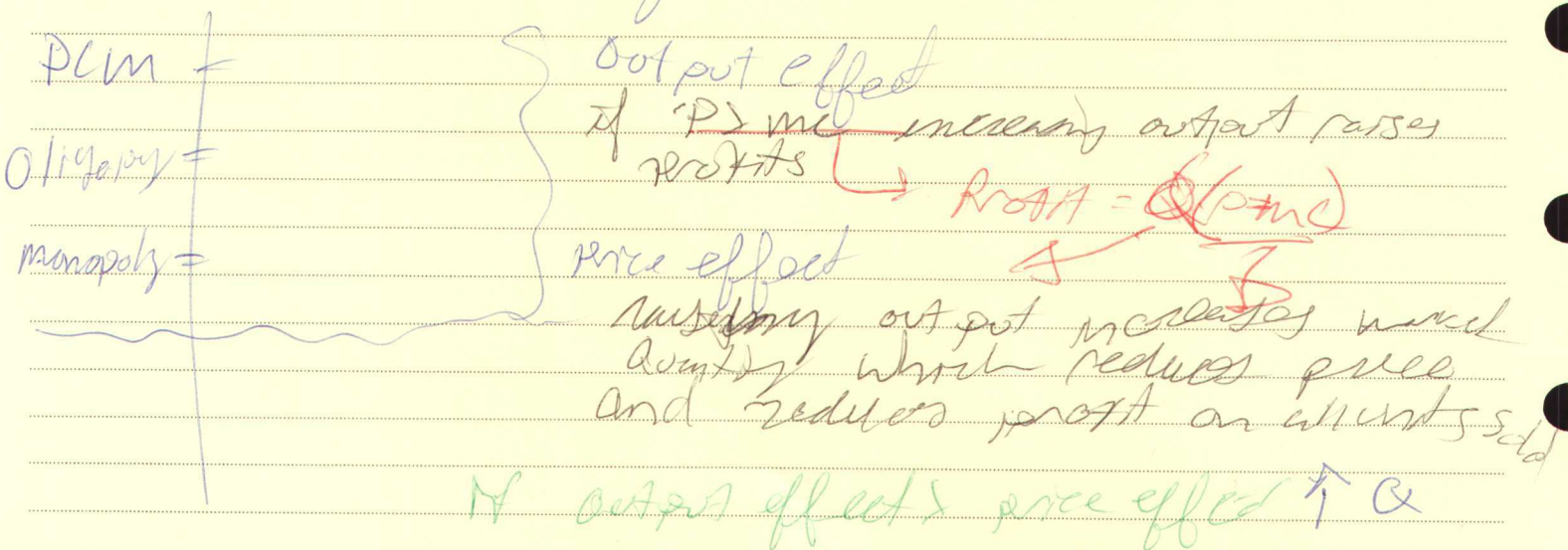
price = \$30, each firm's profit =

collusion doesn't work and is illegal. When it is done explicitly it is not an ongoing agreement.

Suppose AT&T instead its output  $Q = 50$

Equilibrium for an oligopoly = Nash Equilib

- relevant participants each choose the best strategy



produce where price effect > output effect  $\uparrow Q$

\* The limit of the oligopoly

↳ as the # of firms increases price eff. to  
b/c demand.

∴  $p$  approaches  $MC$

The market quantity approaches the social efficiency quantity.

Game theory → helps understand oligopoly / other situations where "players" interact

Dominant Strategy  
a strategy that is best for

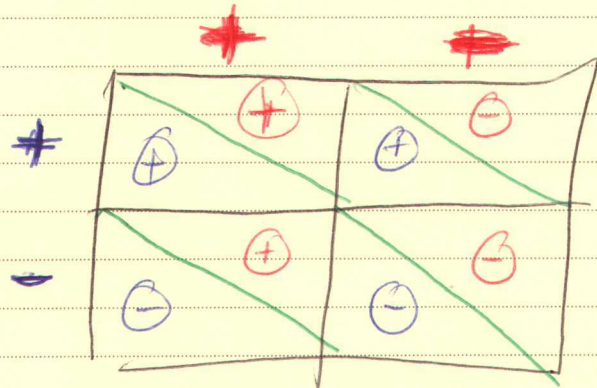
Prisoners' Dilemma

a "game" between two captured criminals that illustrates why cooperation is difficult even when it is mutually beneficial

Both  $EB_1 = + +$

	Left	Right
Up	100, 30	30, 8
Down	150, 6	0, 4

Both → down left



Handwritten notes on the left margin.

- 1) The characteristics of a competitive market in the short/long run
- 2) How competitive firms decide how much output to produce  
 $MR = MC \rightarrow P = MC$
- 3) How competitive firms decide whether to enter or exit a market.  
 ~~$P < AVC$  [or  $P < ATC$ ]~~
- 4) How competitive firms decide when to shut down production temporarily!