

# Introduction to (Macro) economics

→ for many of you, this is your first class in economics! So let's define some things

Economics: the study of human decisions in the face of scarcity

→ we want things

→ there aren't unlimited things

→ so we have to make choices  
  & accept trade offs.

Example: I want to teach a class in my area of research (Computational Methods in Econ) in Spring 2020. But the department needs someone to teach Money & Banking.

→ this is a pretty broad concept.

↳ broken down into 2 major fields:

- Microeconomics
- Macroeconomics

Microeconomics studies the decisions of individual units

- people
- firms
- schools
- families, ...

Macroeconomics studies the decisions of groups, usually countries.

→ this includes the interactions between & among the people, firms, schools, families, & so on.

### Micro Choices:

- come to class or sleep
- Which classes to take
- What job to take
- What car to drive

### Macro Choices:

- levy more taxes
- unemployment insurance vs. healthcare subsidies
- international aid vs. domestic aid

This class: Learning the building blocks we use to analyze these questions.

(2)

## (\*) How To Do Well:

→ your primary source for information (& for studying) is your notes from class.

- come to class
- take good notes
- ask questions
- recopy your notes

Show

Planner

↳ sounds like a pain in the ass but it will likely raise your grade by an entire letter

- write things down

→ what the book is helpful for

- filling in gaps you missed or were confused by
- cementing your understanding
- practice questions
- VOCAB WORDS

↳ macro is a very wordy subject  
make flashcards the words mean very specific things (demand vs. quantity demanded)

↳ a large portion of each test will be defining words

## \* Five Foundations of Economic Reasoning

1. Opportunity Cost: the highest-valued alternative forgone

→ Accounting Cost: the dollars you exchange for something

→ Opportunity Cost: by doing something, you didn't do something else. That thing had a value; what was it?

Ex: If you choose to go to a concert one night, likely the highest valued alt. would be working. The opportunity cost of the concert is the money you would have made.



2. Trade Offs: By choosing to do something, you must necessarily not do something else.

↳ you can't do everything

→ by choosing to take this class, there was another class that didn't end up on your schedule.

→ by coming to class, you did not sleep in

3. Incentives: factors that motivate a person (or group of people) to act  
(Rotunda Principles)

### \* Incentives Affect Behavior \*

Examples:

- the classic: free food brings college students to events
- posting notes on Canvas disincentivizes you from attending
- taxing cigarettes
- subsidizing green technology

4. Trade: the voluntary exchange of goods and/or services between two or more parties.

### \* Trade Creates Value \*

→ If two (or more) parties engage in voluntary trade, it must be the case that they are both made better off.

→ Why? (Single sentence proof)

## 5. Marginal Thinking

→ a much better description: "Cost-Benefit Analysis"

→ "Is the cost of this thing (item, activity, tax plan, etc.) larger than the benefit?"

- if yes, don't do it
- if no, do it!

→ Makes use of the other ones

- compute the (opportunity) cost
- understand the incentives at work, etc.

# Production (Question)

→ this & next week we're going to talk about how stuff is made, bought & sold

↳ the goal: to talk about everything made in the country

→ today: produce stuff

(\*) First step: describing what we can produce

→ Production Possibilities

Frontier (PPF)

→ AKA PPC

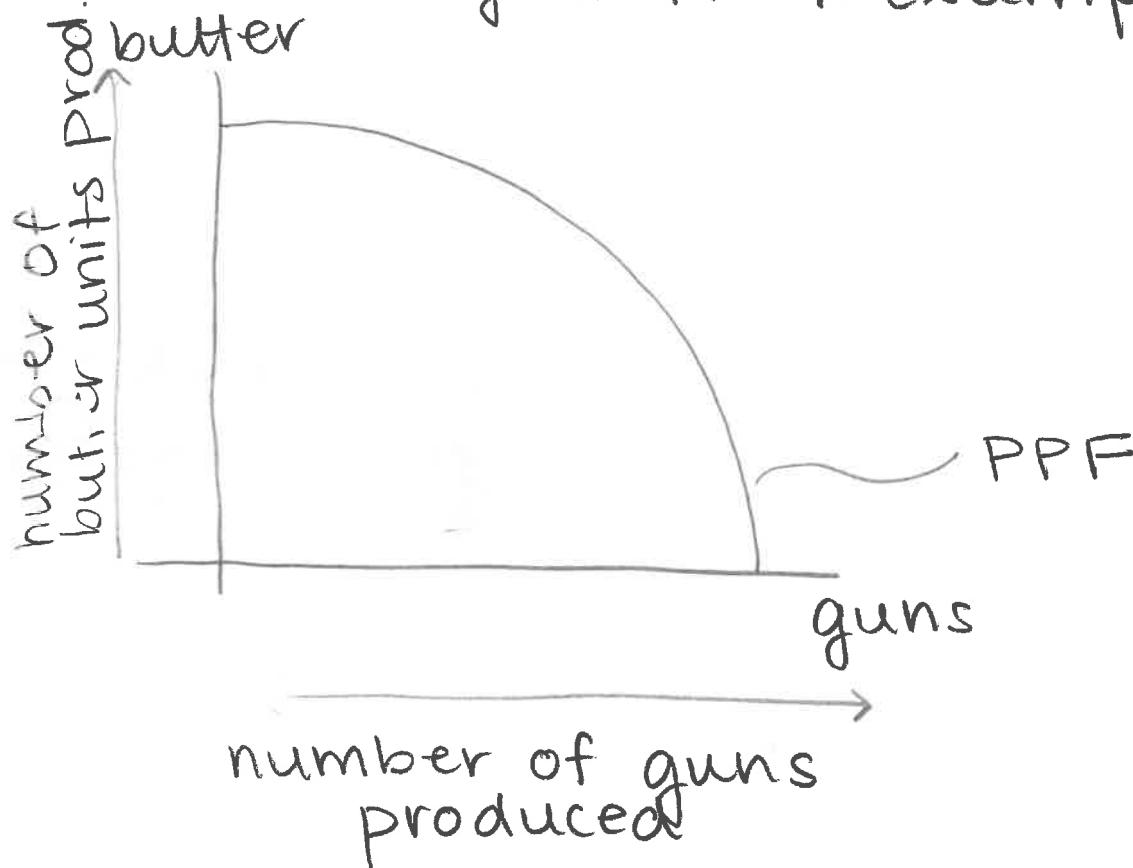
(\*) Assume we only produce 2 goods: guns & butter

→ Why are we comfortable assuming such a blatantly false thing?

"All models are wrong, some models are useful."

→ in Economics we use mathematical models to write down how we think the world works in useful ways

→ here's your first example:



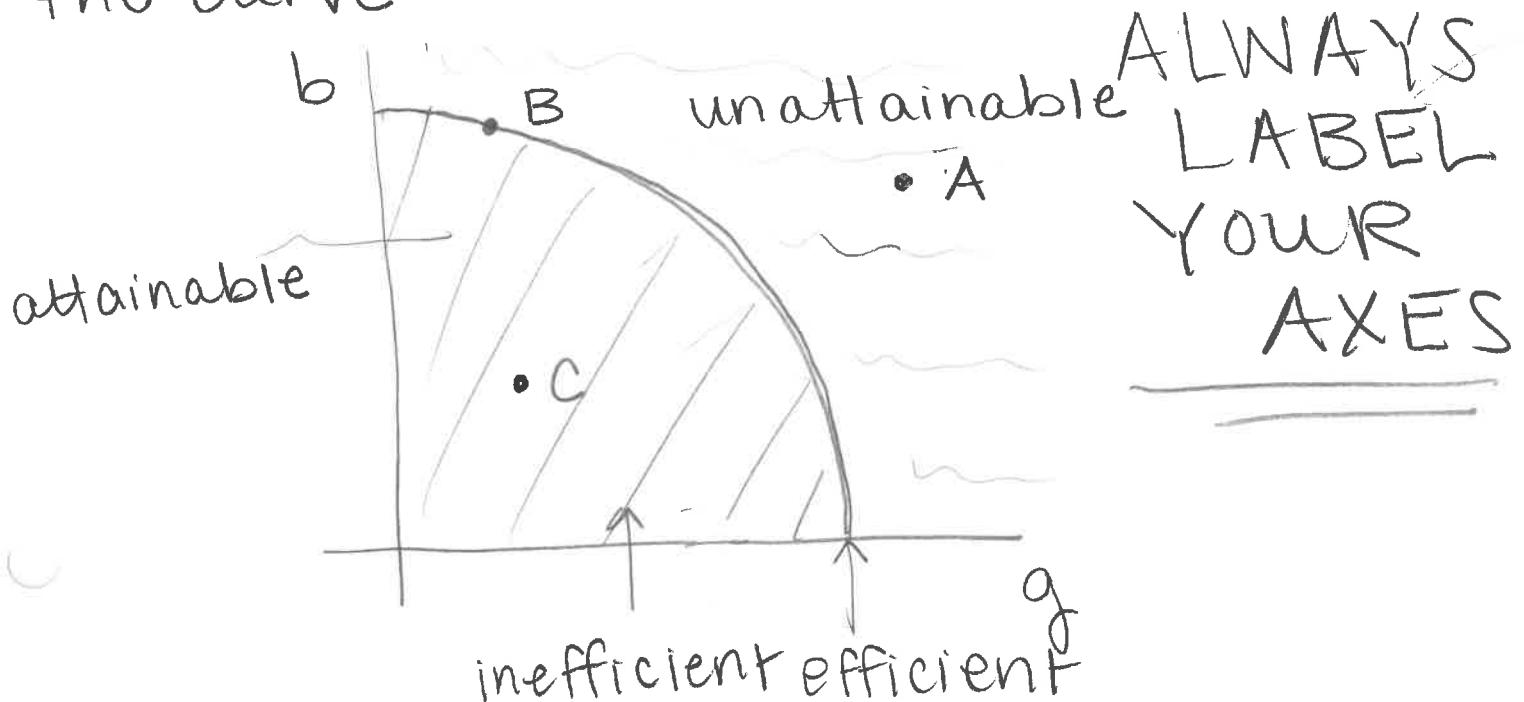
- ① The PPF describes the possible combinations of guns & butter that we can produce.

→ we know the US produces more than 2 goods, but

- graphs are easiest to understand in 2 dimensions
- we can think of
  - guns as defense & manuf. goods
  - butter as domestic goods
- so we can still say useful things from this graph

(All models are wrong, some models are useful!)

\* Let's talk about (1) the regions of the graph & (2) the points along the curve



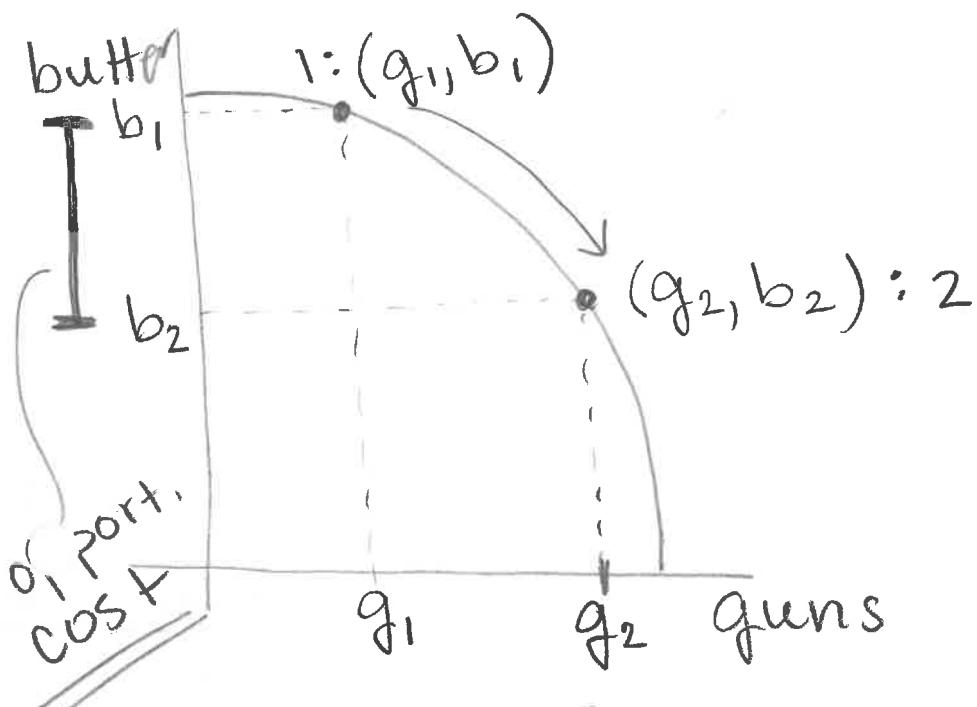
Unattainable: A

Attainable: B, C

Efficient: B

Inefficient: C

\* Points  
on the PP



→ to go from point 1 to point 2 we give up butter to get guns.

↳ how much butter?  $b_1 - b_2$

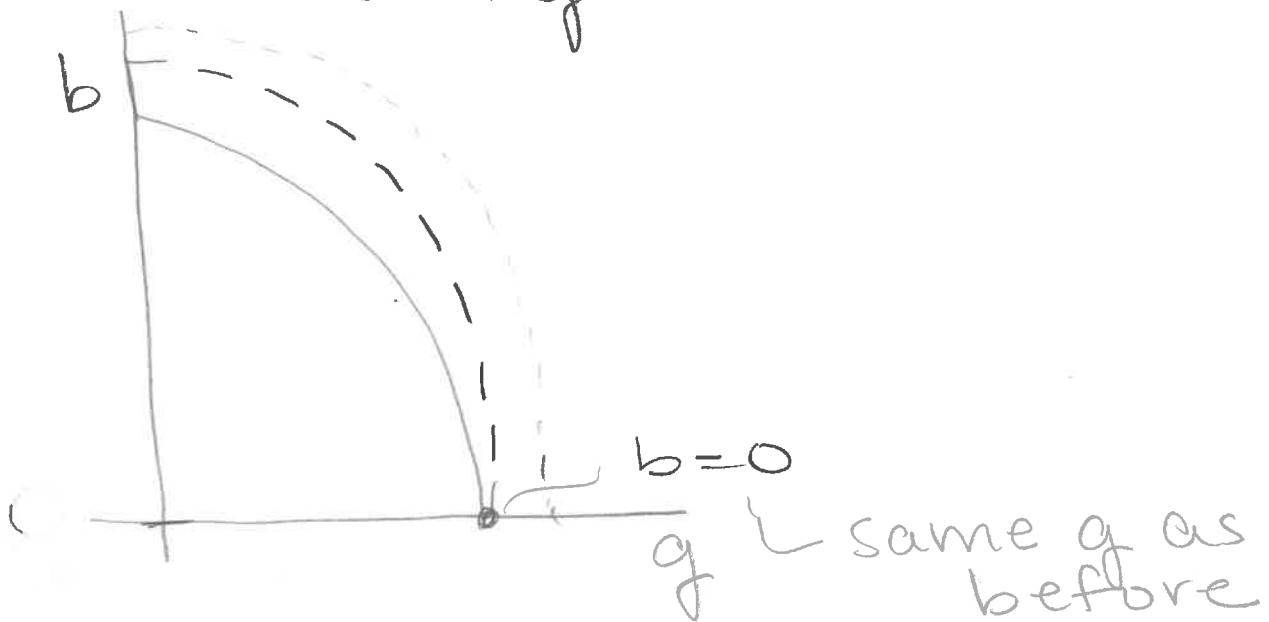
→ What do we call the cost of giving up one thing to get another?

opportunity cost!

→ the opportunity cost of going from point 1 to point 2 is  $b_1 - b_2$

## \* PPF Movements

- PPFs describe a country's ability to produce things
  - ↳ if that ability changes, the PPF changes



- new butter-making technology discovered
  - ↳ we can make more butter for every gun. — — —
- large influx of workers
  - ↳ we can make more of both -----

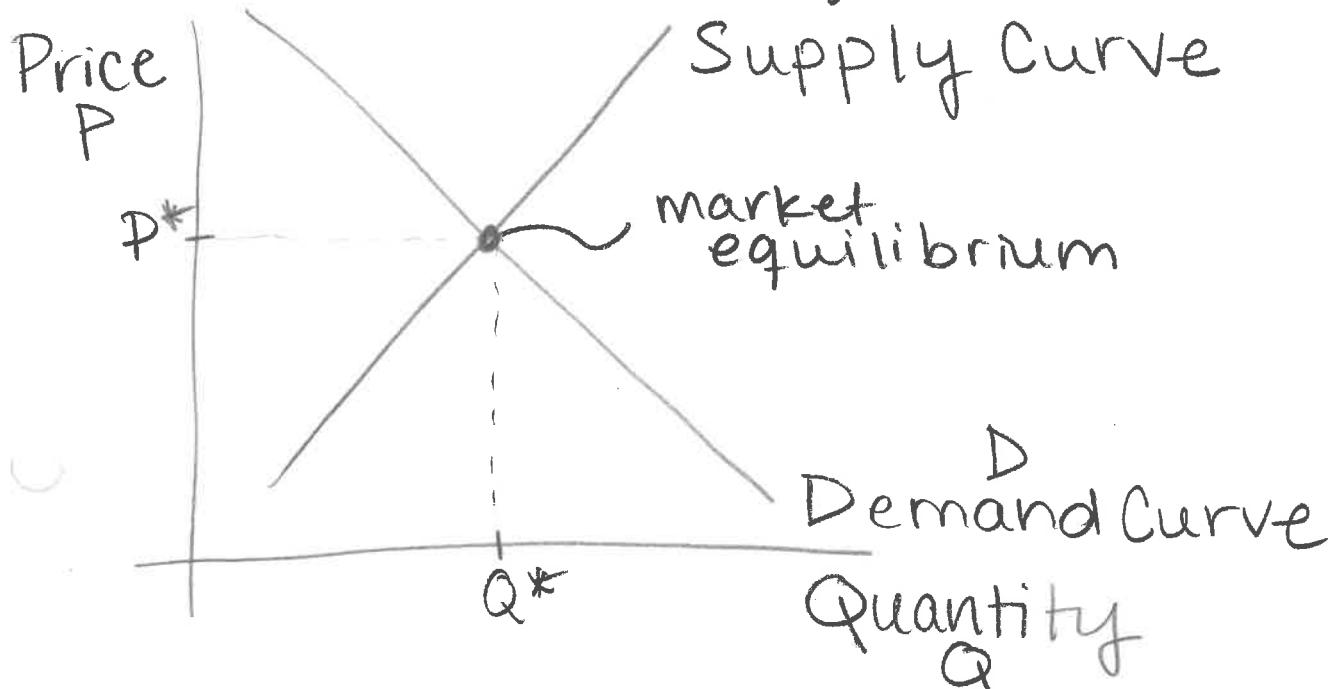
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# Supply & Demand: Demand

- Last Class: What we're able to produce (PPFs)
- This Week: how we think of things being bought & sold
  - the Supply & Demand Model

\* The Supply & Demand Model features:

- a curve describing the demand for a product (the Demand Curve) (Today)
- a curve describing the supply of a product (the Supply Curve) (Fri.)



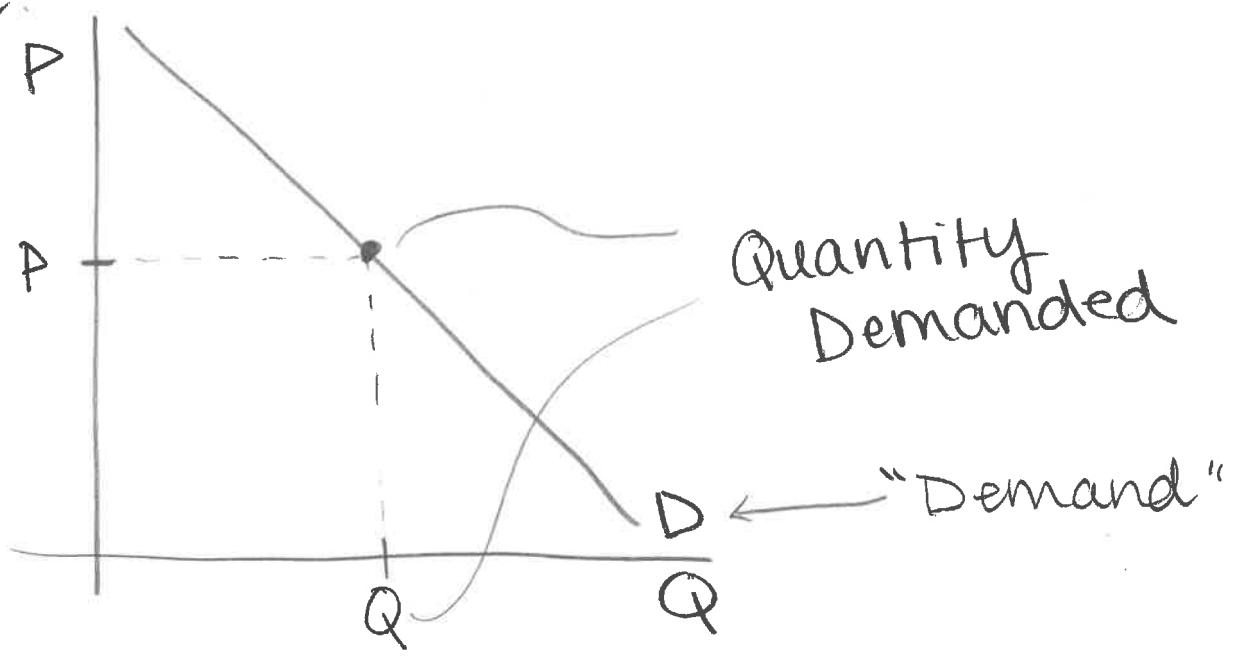
- a market equilibrium point that describes the amount bought & sold & at what price (Mon.)

### \* The Demand Curve:

→ the Demand Curve is a function that describes the relationship between the quantity of a good and the price that consumers are willing to pay

\* The term "Demand" refers to the whole Demand Curve.

\* The term "Quantity Demanded" refers to points on the Demand Curve.



→ the Demand Curve is downward sloping (ceteris paribus)

\* The Law of Demand: All else equal, quantity demanded falls when prices rise and quantity demanded rises when prices fall.

↳ (it's a negative relationship)

→ there are several things that shift Demand (we'll talk about them momentarily)

↳ but only one thing shifts Quantity Demanded: Price

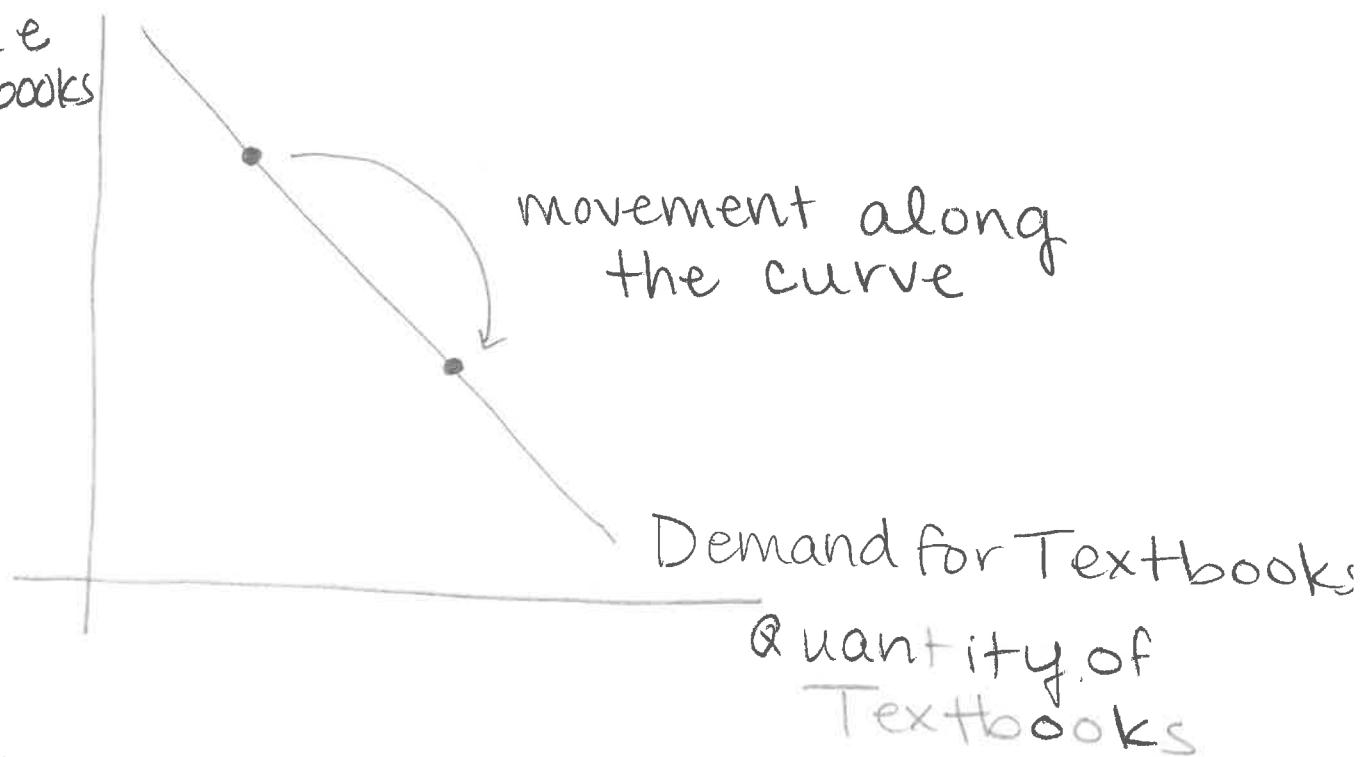
\* If you know price went up, then you know that quantity demanded went down (& vice versa).

→ we can talk about the Demand Curve for a single good

Ex: The demand for Macroeconomics

Textbooks

Price  
of Textbooks



→ Or we can talk about the Demand for all goods in the economy  
↳ we'll talk about this <sup>(Aggregate Demand)</sup> later in the semester

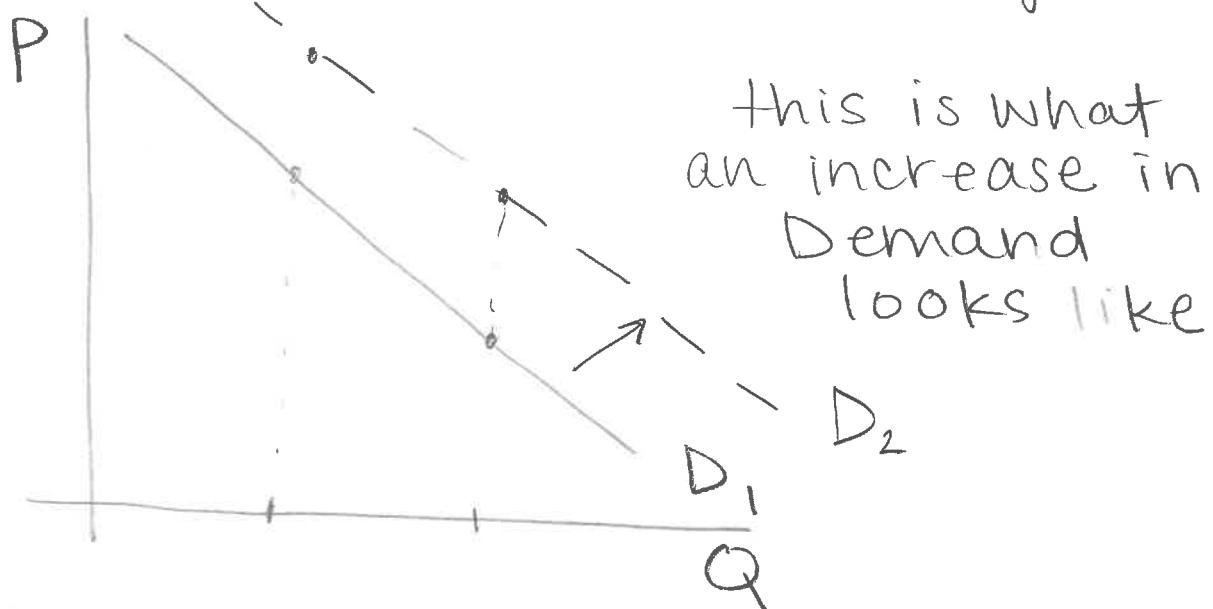
④ What can move the entire Demand Curve

1. Consumer Income
2. Price Expectations
3. Tastes & Preferences
4. Taxes

## 1. Consumer Income

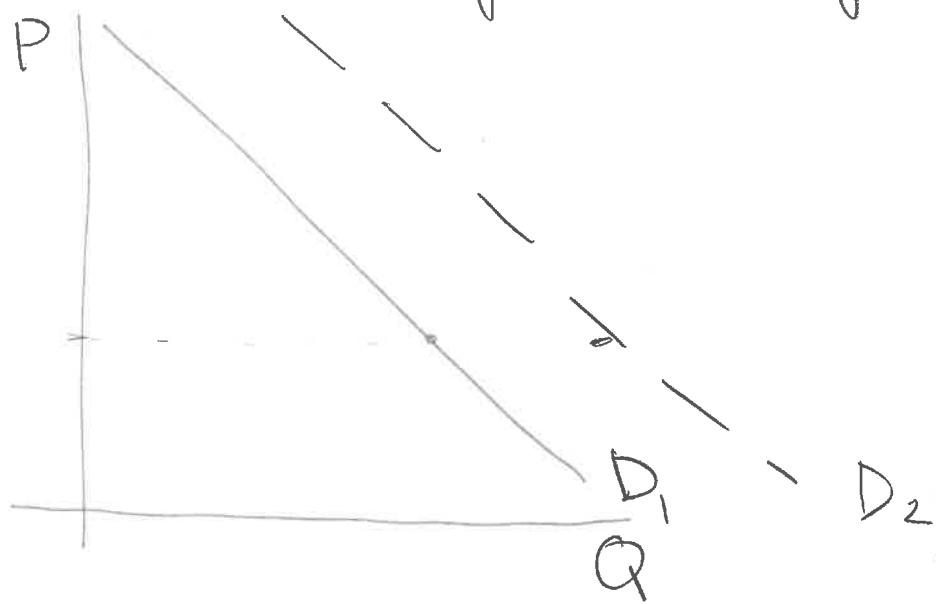
→ Suppose we all get \$100 more in our paychecks every month

↳ we'd be willing to spend more for each unit of most things



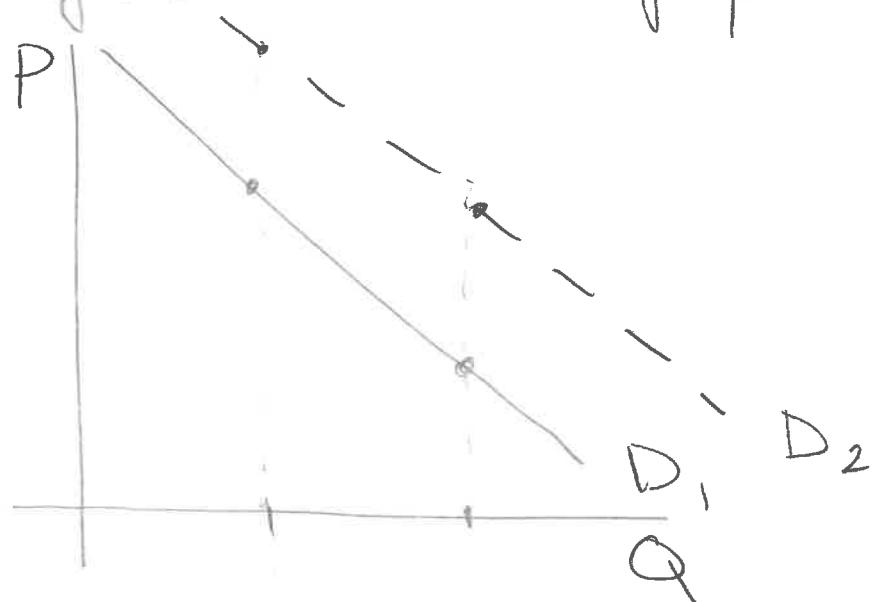
## 2. Price Expectations

→ if prices are expected to rise in the future, you'll buy more today



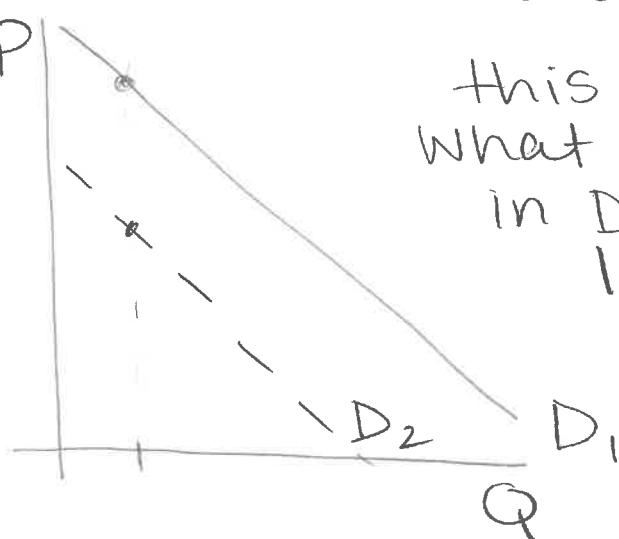
### 3. Tastes & Preferences

→ Before the Show Fixer Upper, Shiplap was not a very desirable feature. After Joanna Gaines popularized it, people were willing to pay more for every quantity



### 4. Taxes

→ When the cigarette tax was levied, it made the price smokers were willing to pay smaller for every quantity.



this is  
what a decrease  
in Demand  
looks like

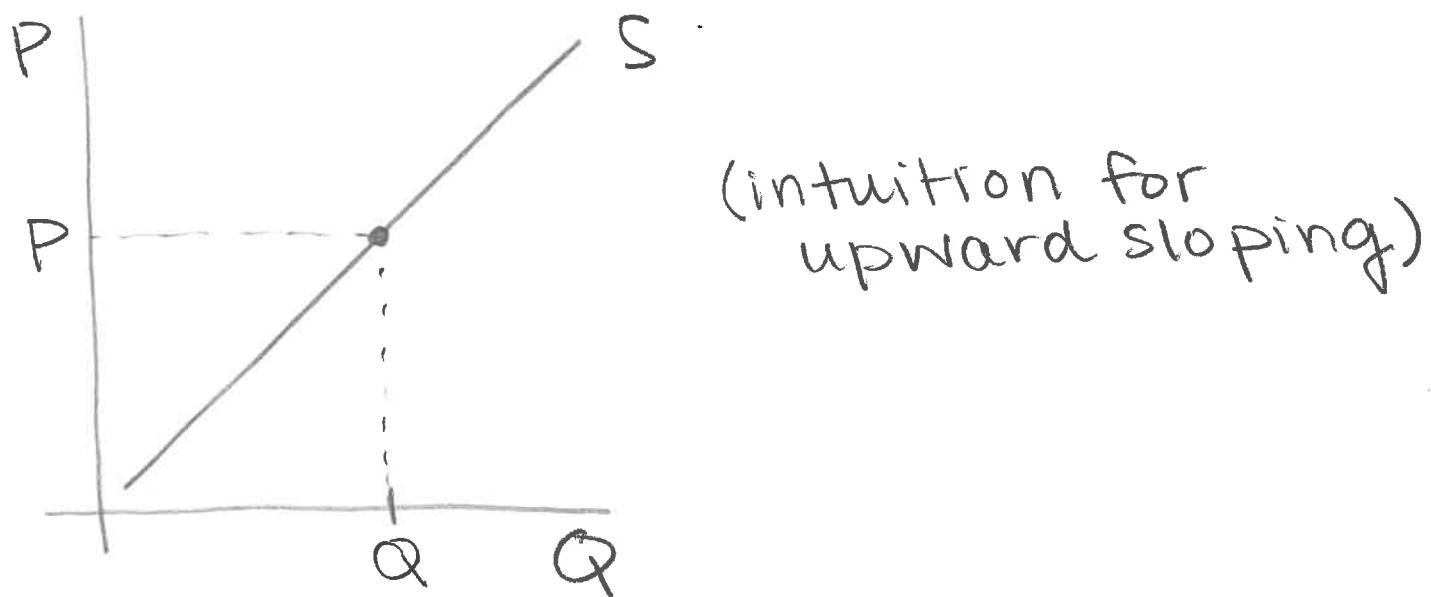
## Supply & Demand: Supply

- Last time: the demand curve
- Today: the other key ingredient in the Supply & Demand model: the Supply Curve

\* The Supply Curve: a function describing the relationship between the price of a product and the quantity supplied.

\* "Supply": the curve

\* "Quantity Supplied": a point on the line.



→ it's upward sloping

\* The Law of Supply: All else equal, when the price of a good rises, so does the quantity supplied.

→ just like with Demand, this can be the supply of a single good ("the supply of pens") or all goods ("Aggregate Supply").

○ There are several (4) things that shift the supply around

↳ But only one thing moves the quantity supplied: the price.

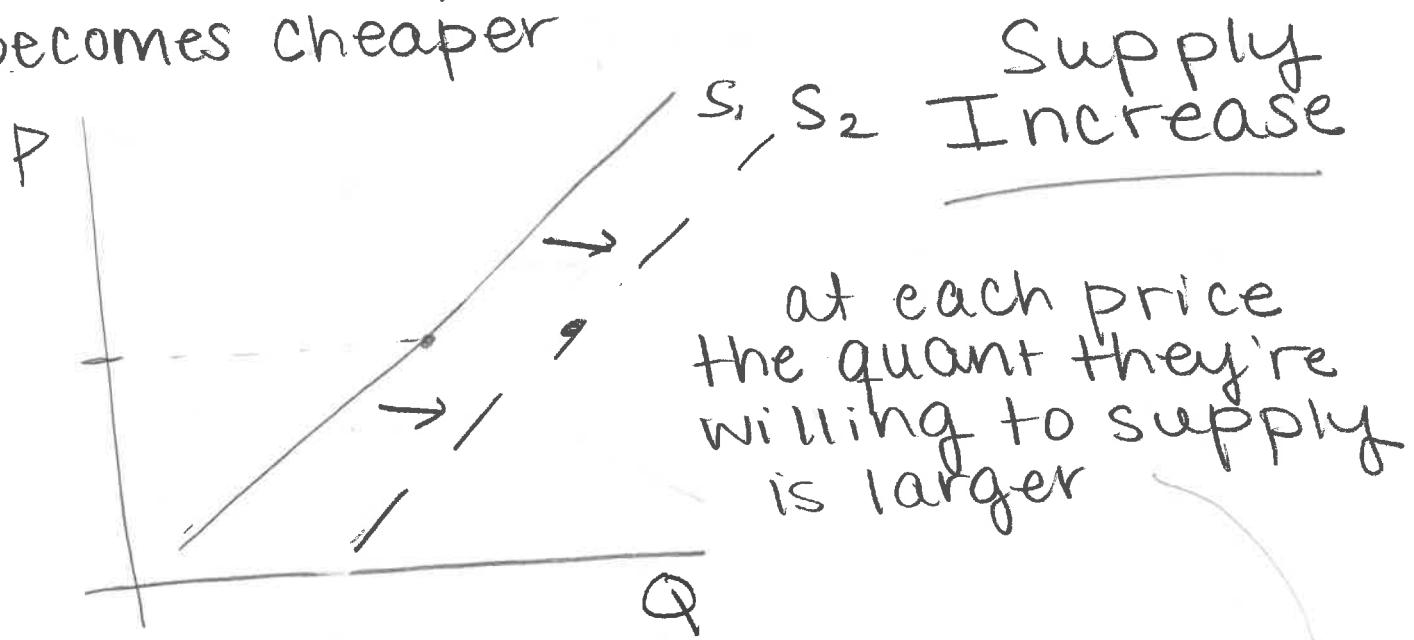
\* Shift Factors of Supply:

1. Cost of Inputs
2. Technology
3. Price Expectations
4. Taxes

(example  
of each)

## 1. Cost of Inputs.

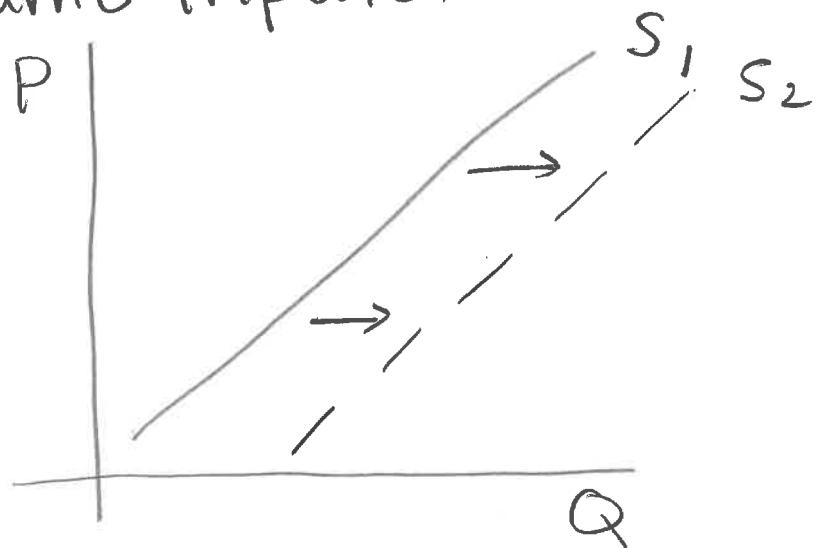
Ex: Consider the market for Hot Chocolate. Suppose chocolate becomes cheaper



## 2. Technology

Ex: Someone invents a machine that makes hot chocolate more efficiently

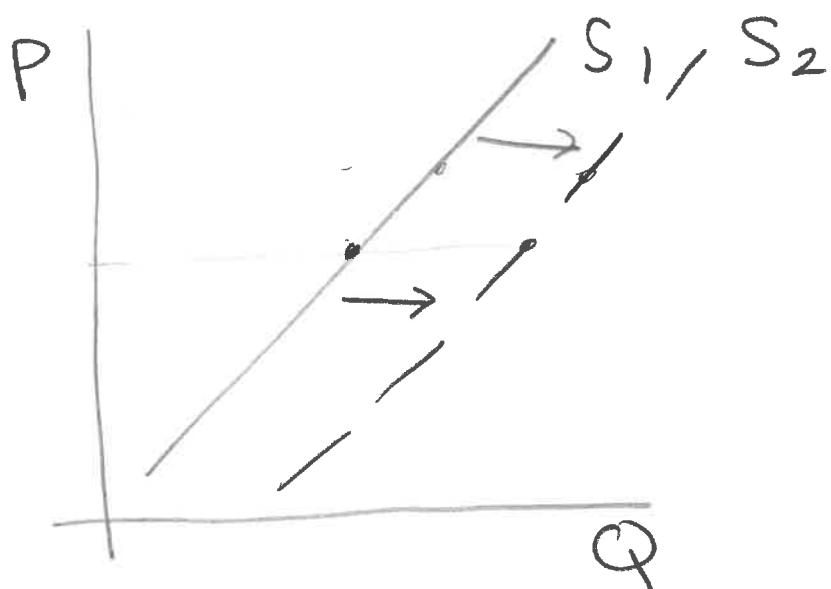
↳ they can produce more w/ the same inputs.



### 3. Price Expectations

→ If the producers expect the price of hot chocolate to increase, they will work to increase their supply curve to make the most of that.

Ex: Another huge snowstorm is coming. The people of Swiss Miss expect prices for their hot chocolate to go up.

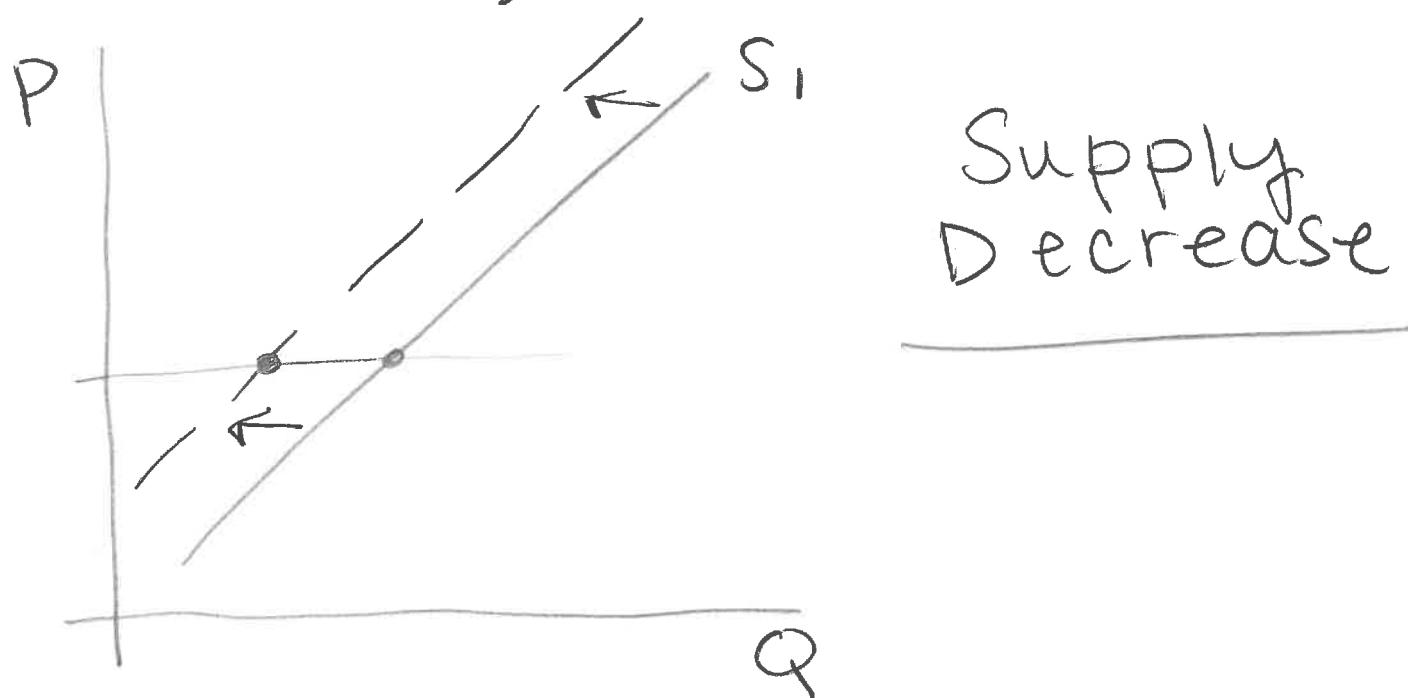


### 4. Taxes

→ there are taxes that consumers pay (e.g. cigarette tax) and taxes that producers pay (e.g. pollution)

→ tariffs are taxes on foreign inputs

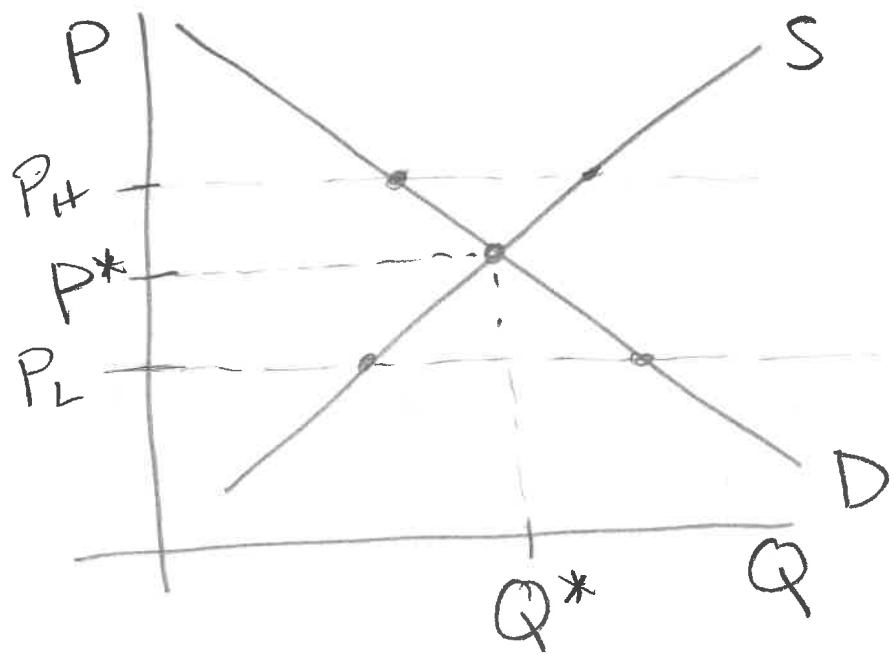
Ex: Suppose a tariff is placed on Swiss chocolate (an input in hot chocolate).  $S_2$



the quantity they are willing to supply at each price is LOWER at every price

\* Putting Supply & Demand  
Together

→ market for hot chocolate



\* Why not  $P_L$ ?

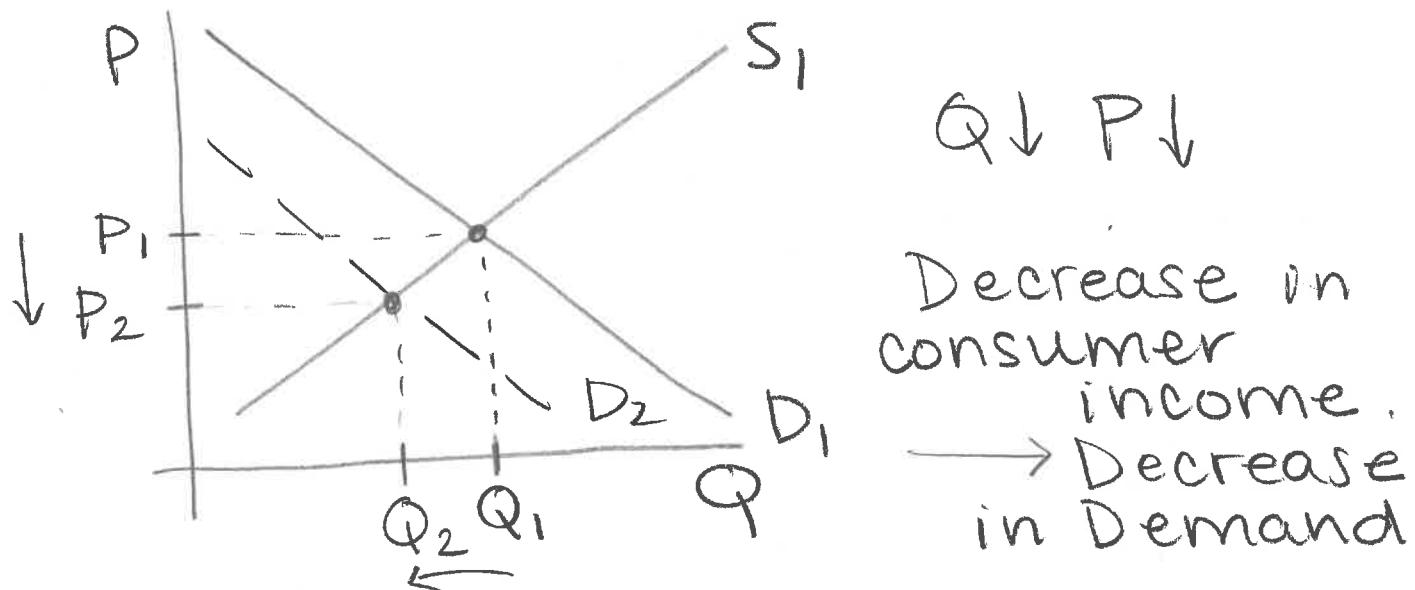
\* Why not  $P_H$ ?

# Market Equilibrium

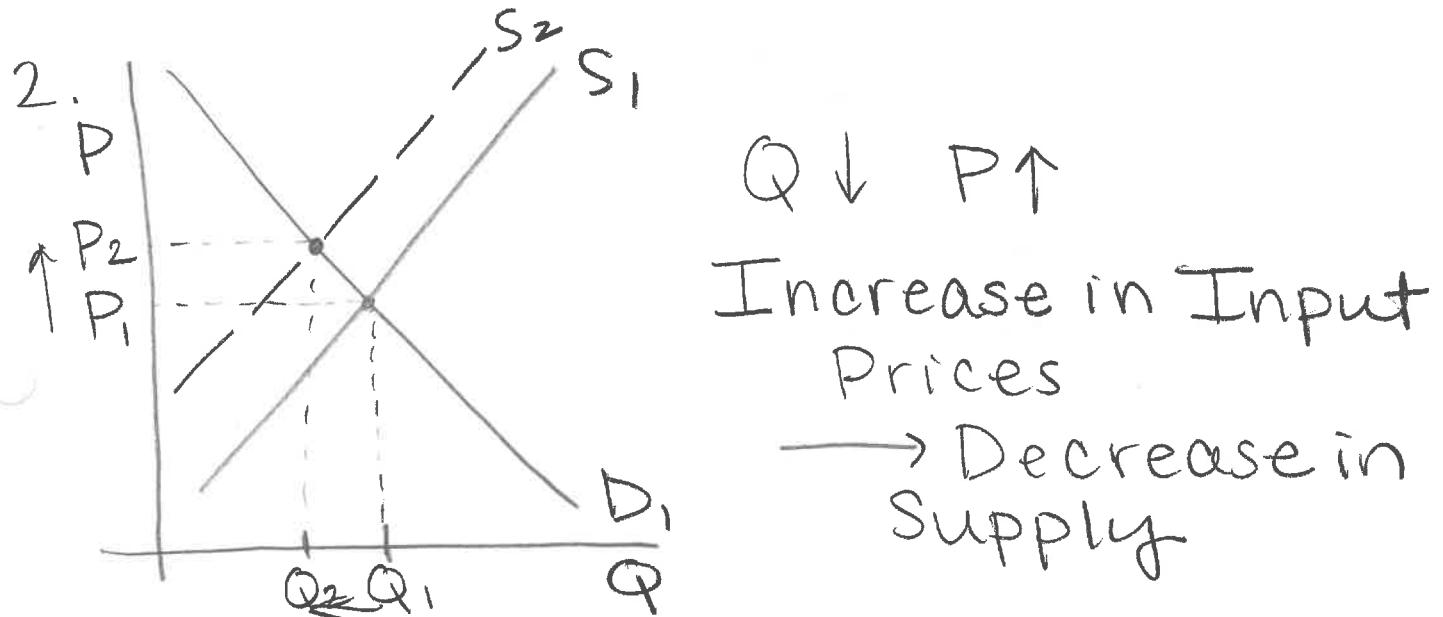
\* The equilibrium price & quantity are defined by the point where the Demand curve & the Supply curve meet.

[Algorithm]

1. The Market for Gasoline



Decrease in consumer income.  
→ Decrease in Demand



Increase in Input Prices  
→ Decrease in Supply

①

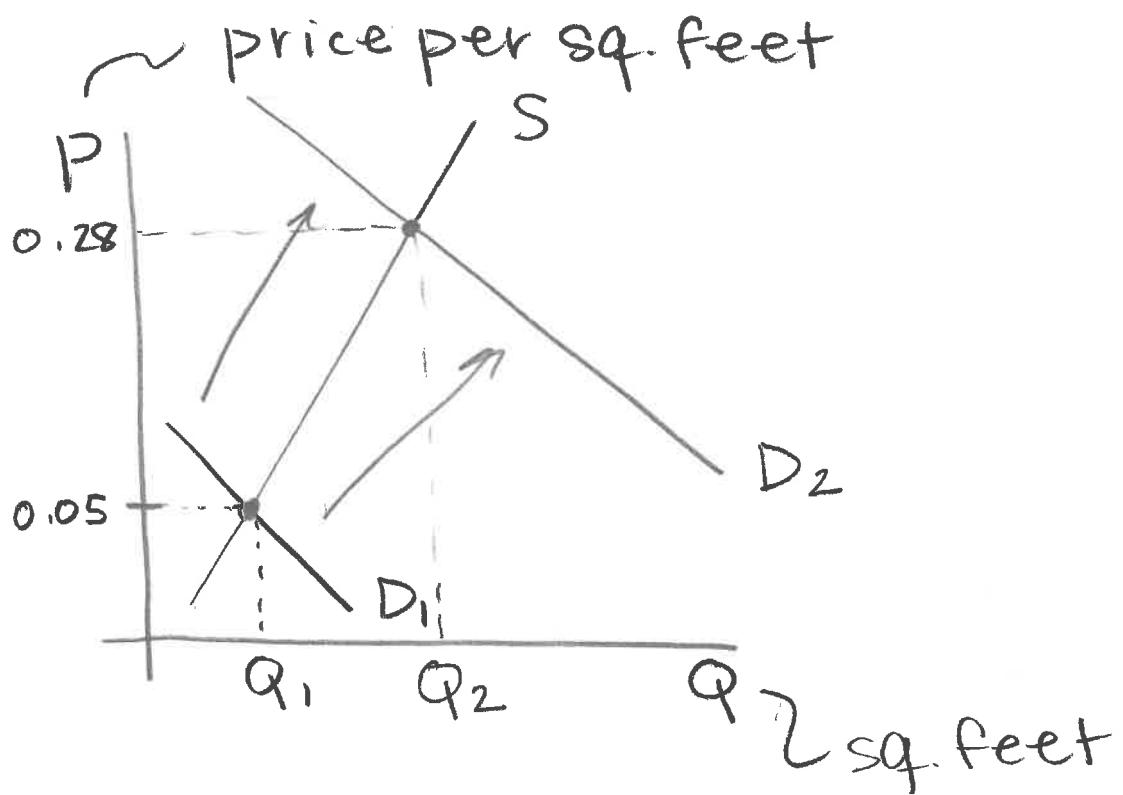
## (\*) Algorithm for Supply & Demand Shifts

1. Draw the initial equilibrium
2. Identify the change
3. Determine which curve it shifts: Supply or Demand?
4. Determine which direction: Increase or Decrease?
5. Draw the new curve
6. Find the new market equilibrium

## \* The market for shiplap

- mentioned last week
- What is Shiplap? (Picture)
- Clip from Fixer Upper
- Statistics
  - ↳ used in 39% of episodes
- google trends: shiplap
  - ↳ talk about google trends as a resource
  - ↳ ex. search
  - ↳ top states, map
- current price

Question: What happened to the eq. quantity of shiplap?  
↳ by more or less than price?



# Introduction to GDP

Ch. 6

- last section: What's bought & sold (supply & demand, eq. price & quantity)
- today: how much do we, as a country make (produce)?
  - ↳ We use the Gross Domestic Product to answer this question

\* Gross Domestic Product (GDP):  
the <sup>①</sup> market value of <sup>②</sup> final <sup>③</sup> goods & service produced in a country <sup>④</sup> in a <sup>⑤</sup> year

## I. Market Value

[ always keep in mind what we're trying to measure ]

→ it's not enough to count how many apples, & iPhones, & snow shovels we make

↳ 1 million apples & 2 iPhones is very different from 1 million iPhones & 2 apples

↳ both: 1 million & two things

→ so we take all the things made & multiply each by their price

$$\begin{array}{r} 1 \text{ million iPhones} \cdot \$1000 \text{ each} \\ + 2 \text{ apples} \cdot \$0.99 \text{ each} \\ \hline \text{GDP} = \$1,000,000,001.98 \end{array}$$

$$\begin{array}{r} 1 \text{ million apples} \cdot \$0.99 \text{ each} \quad 990,000 \\ + 2 \text{ iPhones} \cdot \$1000 \text{ each} \quad 2000 \\ \hline \text{GDP} = \$992,000 \end{array}$$

## 2. final goods & services

→ final goods are the goods sold to consumers

↳ they are different from intermediate goods (the goods that producers buy to make things) (ingredients)

Ex: The lattes you buy: final good  
The milk that Einstein's uses: intermediate good  
(because the value is already in the latte)

### 3. goods & services

- not just apples & iPhones but apple picking & iPhone repair
- Why? Because we value those things
- How do I know? Because we pay money for them.

### 4. Produced in a country

- this is specifically stuff produced within the physical borders of a country ("Domestic")
- so American Company
  - an iPhone made in China is not counted in the US GDP
  - a BMW (German Company) produced in Alabama is counted in the US GDP.

National  
GNP: stuff produced by American

### 5. in a year

- produced in that year companies (anywhere)
  - ↳ don't want iPhone made in November but sold this weekend to be missed in the 2018 GDP.

④ How can this very specific number be used?

→ First Note: the <sup>total</sup> value of goods & services in a country will be the same as the total income in that country.

$$\text{GDP} = \text{Output} = \text{Income}$$

GDP can measure

1. Living Standards: the quality of life for people in that country
2. Economic Growth: how has GDP grown over time? (thus the economy)
3. Business Cycles: we can tell if the economy is in a recession or expansion by how the GDP is doing.

→ We'll have to do some adjusting to the raw GDP value for each of these.

# I. Living Standards

latin words  
of the day

Measure Used: GDP per capita

→ if we're after the living standards (how people are living), it's not enough to know the big lump GDP number

(in mill.)

GDP

GDP per ca

US GDP in 2014: \$17,419,100

<sup>1</sup>\$ 54,630

Japan GDP 2014<sup>2</sup>: \$4,601,461

<sup>3</sup>\$ 36,194

Canada GDP 2014<sup>3</sup>: \$1,785,386

<sup>2</sup>\$ 50,235

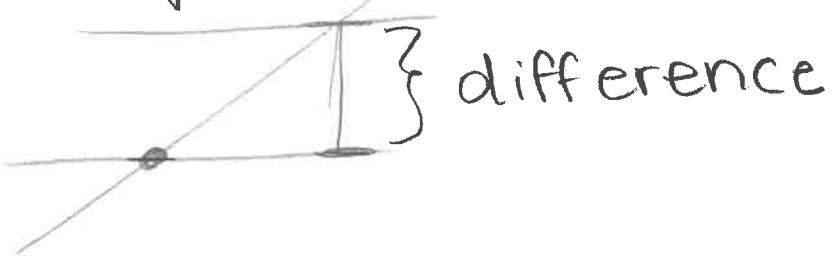
But what if you divide each by their population

## 2. Economic Growth

next week

Measure Used: percent change in real per-capital GDP

→  $\% \Delta$ : not just the difference between this year & last year, but how big is that diff. relative to the current GDP?



3 Business Cycles, <sup>real</sup>  
Measure used: GDP per capita  
→ A country experiencing a recession  
encompasses a lot of things

↳ But GDP is one of the best ways  
to see it.

↳ if it goes down, it's bad.

# The Components of GDP

- last time: the definition
- today: how to actually accurately measure that very specific number.
- the definition tells us what should be included
  - ↳ the stuff we'll do today: how to achieve that.

① Should it be included in this year's U.S. GDP?

- ~~the money I spent on these Expo markers~~ X
- the snow tires that I bought & put on my car ✓
- the snow tires that Subaru buys to put on their cars before they sell them X
- Swiss Miss (made in Switzerland) consumed here X
- the 1<sup>st</sup> edition of your textbook (published in 2010) X

## \* The Components of GDP

$$GDP = Y = C + I + G + NX$$

$C$  = Consumption

→ private spending on all

↑ goods & services

not govt. not intended for

↑ use in future production

by folks  
n. the US

makes up most (~70%)  
of GDP

→ this is the main goal.

↳ the other components are  
basically there to tidy things  
up.

→ consumption includes both  
durable & non-durable goods.

durable goods: goods that continue  
to be used after the year in which  
they're purchased

→ washing machines

→ cars

I = Investment

- NOT stocks & bonds
- private spending on tools, factories, & equipment to produce future output
  - ↳ ALSO includes inventories (stuff that is produced but not sold yet)
- Examples:
  - a hammer used by a contractor
  - my Expo markers
  - any 2018 model year cars not sold yet

G = Government Spending

- Spending at all levels of the government (federal, state, local) on final goods & services.

- airplanes
- computers
- soldiers' income

NX = Net Exports

○ = Exports - Imports

Want to  
include stuff  
we made that  
people in other  
countries bought

DON'T want to  
include stuff  
that other countries  
made that we  
bought.

- BMW made in Alabama but bought in England: +
- Toyota made in Japan bought here: -

→ sometimes our net exports are negative ("trade deficit") and that's fine.

④ Examples:

→ First, figure out what should be counted (from defn / Wed.)

→ Then, figure out how (today)

1. Suppose Subaru produces 100  
(in hundreds of thousands say) cars  
in 2018, but only sells 75.

How should those cars be counted?

How much should  
GDP increase?  
100

•  $C = +75$  cars value

•  $I = +25$  cars value

$GDP = +100$  cars value ✓  
(2018)

2. Suppose the other 25 sell this  
year. How should that be counted  
in the 2018 GDP?

How much should GDP increase?

0

•  $C = +25$  cars value

•  $I = -25$  cars value

$GDP = +0$

3. Apple makes 200 computers in 2018.  
The government buys 100, Adobe  
buys 25 to use to develop the next  
PhotoShop, & private citizens buy  
50 for home use. How should this  
enter the 2018 GDP?

→ By how much should the 2018 GDP increase from these computers?

200

→ How?

$$C: +50$$

$$I: +25, +25$$

$$G: +100$$

---

$$\text{GDP: } +200$$

## Real GDP

ch 6? still

→ in Economics the term "real" refers to numbers that aren't subject to the vagaries of price levels

↳ Real Estate is physical property

→ the ~~opposite~~ alternative is "Nominal" (including current prices)

→ last week we talked about Nominal GDP

↳ we use today's prices in the market value part.

→ BUT we want to compare GDP's across time periods

- Economic Growth
- Business Cycles

↳ the prices for things change drastically over time

\* Why is that a problem?

- Always remember the goal
- want to measure what we produce

\* In 1950, a cup of coffee cost about 15¢. My coffee from Cafe Cheray was \$1.85.

- Coffee GDP in 1950: \$15
- Coffee GDP in 2018: \$925

→ doesn't tell me what I want to know

↳ it went up, but that includes the huge increase in coffee price

→ Coffee GDP in 1950 in 2018 prices: \$75

→ coffee GDP in 2018 in 2018 prices: \$925

→ coffee production increased

\*) We compute Real GDP using a measure called the Price Level (P).

→ Price Level: A number that describes the level of prices in the economy for a given year

↳ measured relative to a base year → we put everything in that year's dollars

→ E.g. if 2009 is the base year then the price level is measured for all other years in 2009 dollars

→ the Price Level for the base year is always 100

↳ all other years easy to compare

2008: 99.2

2009: 100

2010: 101.2

2016: 111.4

2017: 113.4

Price Level:  $P$       }  
 Real GDP:  $Y$       }  
 Nominal GDP:  $\underline{PY}$

- Real GDP in constant dollars
- Nominal GDP in current dollars

(\*) How to compute real GDP?

→ need to filter out the current prices.

current  
1. Divide out old Prices

2. Multiply in new Prices

$$\text{Real GDP}_{\text{year}} = \frac{\text{Nom. GDP}_{\text{year}}}{\text{Price Level}_{\text{year}}} \cdot \text{Price Level}_{\text{Base Year}}$$

$$\text{Real GDP}_{2017} = \frac{\text{Nom. GDP}_{2017}}{P_{2017}} \cdot P_{2009}^{\downarrow 100}$$

$$= \frac{19,387}{113,4} \cdot 100 = 17,096,12$$

(in billions)

\* We can also use this to put current prices (of anything not just GDP) in the price of other years (not just the base year)

Ex. I made \$35,000 annually as a grad student at UVA.

\$35,000 in 2017 dollars

What would that have been in 2007?

$$\frac{35,000}{113.4} \cdot 97.3 = 30,030.86$$

\* OK, now we have a number that actually means something when we compare it over time!

↳ so let's do that.

→ growth rate:

$$\% \Delta X = \frac{x_2 - x_1}{x_1} \cdot 100$$

earlier  
time  
period

later  
time period

(\*) Always report your percent changes to me w/ a % sign.

↳ If the formula gives you  $0.012 \cdot 100$ , the answer you give me is 1.2%

(\*) Let's calculate the growth rate of real GDP from 2016 to 2017.

→ First: find real GDP 2016

$$rGDP_{2016} = \frac{\text{nom GDP}_{2016}}{P_{2016}} \cdot P_{2009}$$

$$= \frac{18,425}{111.4} \cdot 100 = 16,719.03$$

$$\% \text{ real GDP}_{2016-2017} = \frac{rGDP_{2017} - rGDP_{2016}}{rGDP_{2016}} \cdot 100$$

$$= \frac{17,096.12 - 16,719.03}{16,719.03} \cdot 100$$

$$= (0.021) \cdot 100$$

2.1%

④ The historical growth rate  
of real GDP is 3%.

↳ I want you to memorize  
this.

## GDP: Business Cycles

(\*) GDP: the market value of all final goods & services produced in a country in a year.

(\*) Real GDP: GDP in constant dollars  
↳ in the base year's dollars

$$\text{real GDP}_t = \frac{\text{nominal GDP}_t}{P_t} \cdot P_{\text{Base Year}}$$

$$\% \Delta \text{real GDP} = \frac{\text{real GDP}_{\text{later}} - \text{real GDP}_{\text{earlier}}}{\text{real GDP}_{\text{earlier}}} \cdot 100\%$$

Note that  $r_{\text{GDP BY}} = n_{\text{GDP BY}}$  → P's cancel  
(\*) Calculate the growth rate of real GDP for each of the following years.

Year	P	nomGDP	real GDP	%ΔrGDP
2000	96.4	13,111	13,600.62	-
2001	98.9	15,025	15192.11	11.7%
BY 2002	100	14,626	14,626	-3.7%

$$rGDP_{2001} = \frac{\text{nomGDP}_{2001}}{P_{2001}} \cdot 100$$

$P_{BY} = 2002$

$$= \frac{15025}{98.9} \cdot 100 = 15192.11$$

$$rGDP_{2000} = \frac{\text{nomGDP}_{2000}}{P_{2000}} \cdot 100$$

$P_{2002}$

$$= \frac{13111}{96.4} \cdot 100 = 13600.62$$

$$\% \Delta rGDP_{2000-2001} = \frac{rGDP_{2001} - rGDP_{2000}}{rGDP_{2000}} \cdot 100$$

$$= \frac{15192.11 - 13600.62}{13600.62} \cdot 100$$

$$= 0.117 \cdot 100 = 11.7\%$$

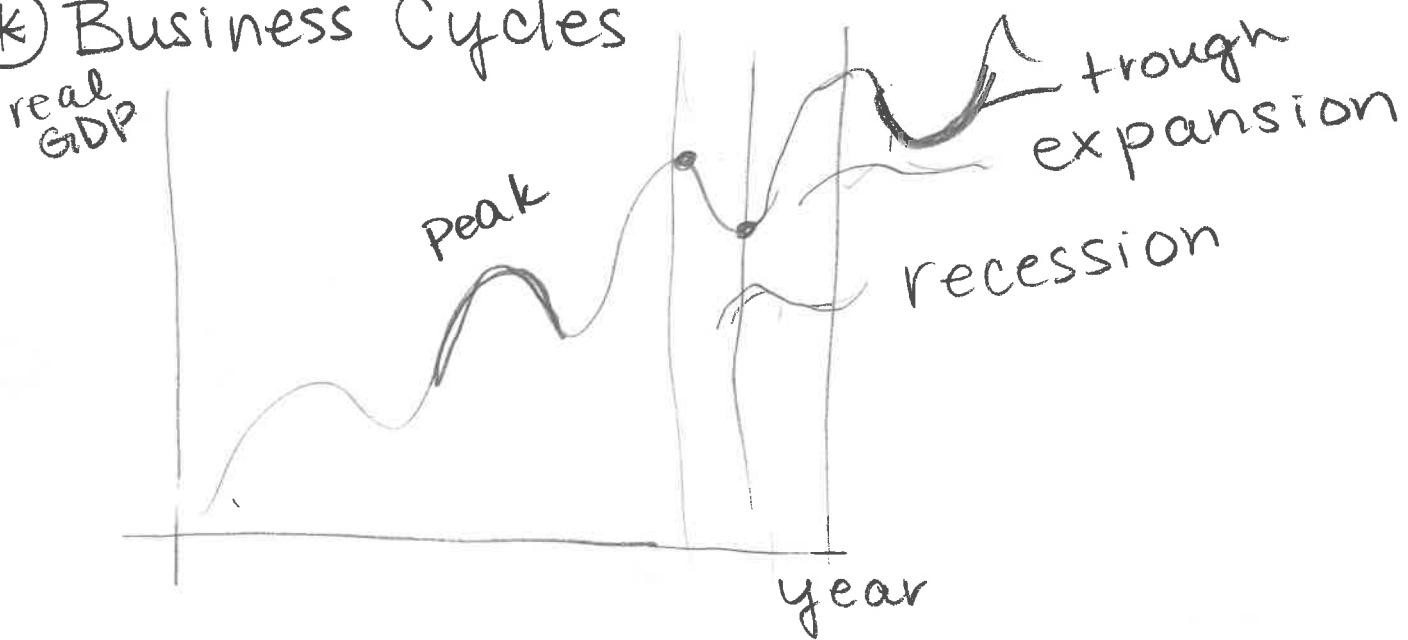
(2)

$$\% \Delta rGDP_{2001-2002} = \frac{rGDP_{2002} - rGDP_{2001}}{rGDP_{2001}} \cdot 100$$

$$= \frac{14626 - 15192.11}{15192.11} \cdot 100$$

$$= -0.037 \rightarrow -3.7\%$$

### \* Business Cycles



→ the study of expansions & recessions

→ shorter term than economic growth

\* recession: a short-term economic downturn.

\* expansion: a short-term economic upturn

(3)

④ Recessions are declared by the National Bureau of Economic Research (NBER)

NBER Standard for a Recession:

"A recession is a significant decline in economic activity spread across the economy, lasting more than a few months, normally visible in real GDP, real income, employment, industrial production, wholesale-retail sales."

- Vermont GDP
- US GDP
- NBER Website

## \* Shortcomings/Limitations of GDP:

### 1. Non-market production

- housework
- Stay at home parents
- Volunteer work

### 2. Underground Markets

- illegal activity (drugs, etc.)
- tutoring, etc.

### 3. Leisure Time

→ We certainly value it

### 4. Environmental Impact



things that mean GDP doesn't perfectly measure what we want it to

↳ But also: is that what we should be measuring.

# Unemployment

Ch. 7

→ GDP (of all sorts) is one measure we use to talk about the macroeconomy

↳ the next: the unemployment rate

✳ To define the unemployment rate, we need to define some groups:

Relevant Population: non-institutionalized civilians older than 16

- no soldiers
- no children
- etc.

Labor Force: People in the relevant population who are employed or actively seeking work

- not students
- not homemakers
- not retirees

unemployed: those in the labor force who are not employed

↳ must be actively seeking work

\* the unemployment rate ( $u$ ) is the percent of the labor force that is unemployed.

$$u = \frac{\# \text{ Unemployed}}{\# \text{ Labor Force}} \cdot 100$$

↑  
to make it a percent

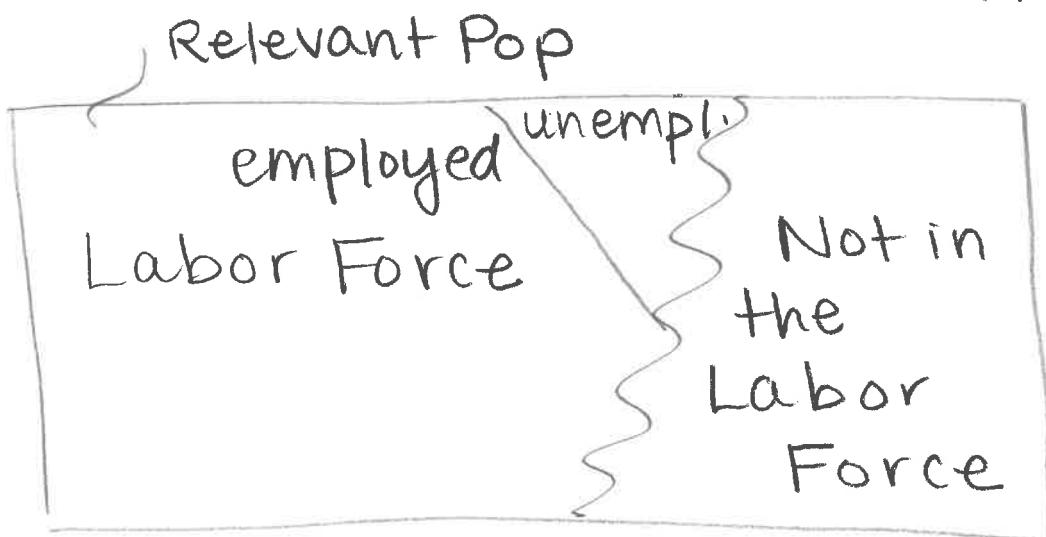
→ does not include people who have stopped looking for work.

↳ there is a number that can help you with that

\* the labor force participation rate is the percentage of the relevant population that is working or actively looking for work.

$$LFPR = \frac{\# \text{ Labor Force}}{\# \text{ Relevant Pop}} \cdot 100$$

↑  
to make  
it a perc.



$u =$

$$\frac{\text{[wavy line diagram]}}{\text{[square diagram]}} \cdot 100$$

$$LFPR = \frac{\text{[wavy line diagram]}}{\text{[square diagram]}} \cdot 100$$

- ① You'll need to be able to not just calculate  $u$  & LFPR but use algebra to get the other values

Example: that's enough to find the rest

Rel. Pop	LF	Not LF	un.	em	u	LFPR
100	60	40	6	54	10%	60%
150	60	90	3	57	5%	40%
100	75	25	15	60	20%	75%

$$0.05 = \frac{\# un}{\# LFP} = \frac{3}{LFP} \quad LFP = \frac{3}{0.05} = 60$$

$$LFPR = \frac{\# LFP}{\# Rel Pop} \quad 0.40 = \frac{60}{Rel Pop}$$

$$Rel Pop = \frac{60}{0.40} = 150$$

$$LFPR = \frac{\# LFP}{\# Rel Pop} = 0.75 = \frac{75}{Rel Pop}$$

$$Rel Pop = \frac{75}{0.75} = 100$$

$$100 - 75 = 25$$

$$u = \frac{\# unem}{\# LF} = 0.2 = \frac{\# un}{75}$$

$$0.2(75) = 15$$

\* the long run avg  $u = 6\%$

(4)

\*) The unemployment rate is made up of 3 kinds of unemployment:

1. Structural unemployment: unempl. caused by changes in the industrial make up, or structure

→ jobs lost because we don't travel by horse & buggy.

2. Frictional Unemployment: caused by time delays in matching jobs with workers.

→ We call these "search frictions"

These are natural forms of unemployment (part of a healthy, normal economy)

3. Cyclical unemployment: caused by economic downturns (recessions)

↳ unnatural

↳ would optimally be 0%

\* The natural rate of unemployment ( $u^*$ ): the typical rate of unemployment when the economy is growing normally.

$$u^* = \text{structural} + \text{frictional}$$

→ We don't know what the number is (maybe about 5%)

→ if I ask "what's  $u^*$ ?" give a def<sup>n</sup> not a number.

When  $u=u^*$ , we say we're at "full employment."

↳ the GDP that is produced when we're at full employment is called Full Employment Output ( $Y^*$ ).

$$u=u^* \Rightarrow Y=Y^*$$

## Price Level & Inflation

\*) Unemployment questions

\*) Inflation: the growth rate of the price level.

    → Better figure out what the price level is.

    → in general, the price level ( $P$ )  
    Weighted average of a large &  
    representative bundle of goods

    → two different ways to measure  
    the price level

    1. Consumer Price Index

    2. GDP Deflator

\*) Consumer Price Index (CPI)

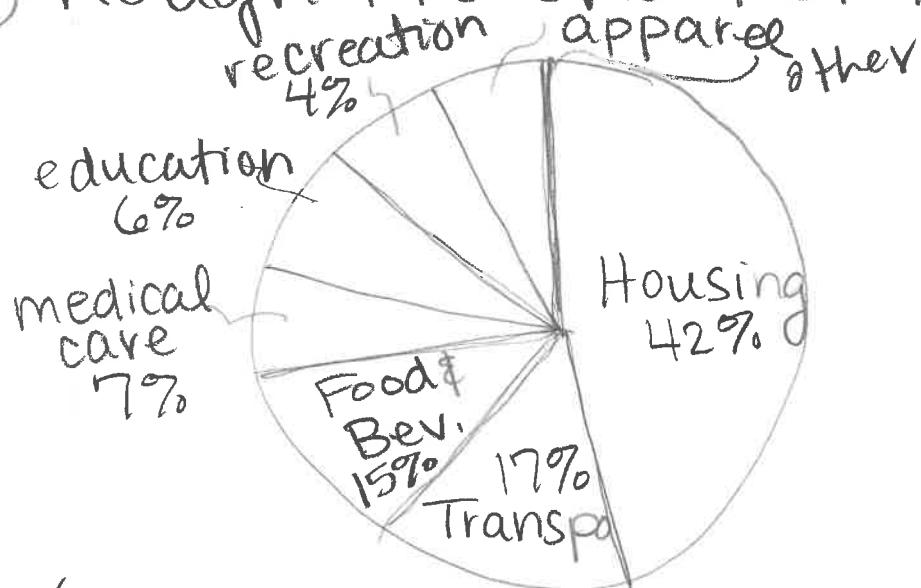
    the measure of the price level  
    based on the consumption  
    patterns of a typical consumer.

→ the BLS calls people up, asks them what they spend their money on.

↳ create category weights

↳ use these to find a weighted average price level.

\* Rough Pie Chart of the Categories



(the BLS)

→ their current base year is 1983 so  $P_{1983} = 100$ .

$$P_{2018} = 234$$

↳ prices (for consumers) have more than doubled.

(inflation)

→ We'll usually use the CPI as our measure for the price level.

↳ it's the most normal person based option.

(\*) GDP Deflator: the price level measure that includes all final goods & services.

→ We'll use this for calculating real GDP

→ both use baskets of goods.

↳ GDP deflator just has a much bigger basket.

(\*) Inflation: the growth rate of the price level of one year to the next.

$$i = \frac{P_2 - P_1}{P_1} \cdot 100$$

(\*) Today's CPI release & overtime

Example: Find the inflation rate

Year	Price Level	i
1983	100	-
1984	104	6%
1985	111	4.7%

$$i_{1984} = \frac{P_{1984} - P_{1983}}{P_{1983}} \cdot 100$$
$$= \frac{104 - 100}{100} \cdot 100 = 6\%$$

$$i_{1985} = \frac{P_{1985} - P_{1984}}{P_{1984}} \cdot 100$$
$$= \frac{111 - 104}{104} \cdot 100$$
$$= \frac{5}{104} \cdot 100 = (0.047) 100$$
$$= 4.7\%$$

④ What is & is not a problem with inflation:

→ First, what is not a problem:

Stuff getting more expensive

→ Yes, eggs, gasoline, coffee, etc have become more expensive

↳ BUT wages have gone up with the price level

↳ We can spend more money on eggs, gasoline, & coffee

→ So what is a problem?

(most stems from the uncertainty & confusion it causes)

## Ch.8 Problems with & Causes of Inflation

\* We know what isn't a problem with inflation: prices going up  
→ because wages rise too

\* But inflation does lead to some problems (mostly due to the uncertainty it causes)

### 1. Shoe-Leather Costs

→ inflation is basically a tax on holding money

↳ every minute you hold onto cash, its value is dropping!

→ so you don't, so you need to go to the bank to make withdrawals

→ "Shoe-Leather Costs" referred to the opportunity cost of this extra time.

↳ but also the wear & tear on your shoes from walking to the bank!

## 2. Money Illusion

→ people (irrationally) interpret nominal changes as real changes.

↳ they behave as though the thing that isn't a problem is a problem

↳ wage example

## 3. Menu Costs

→ it costs businesses money to physically change prices

↳ these costs are called menu costs

→ it costs money to print new menus  
↳ but also update websites

→ Trader Duke's

## 4. Future Price Level Uncertainty

→ you don't know what the value of a dollar will be in the future & you need to sign contracts now.

→ businesses: wages, inputs, etc.

→ individuals: loans, mortgages

## 5. Wealth Redistribution

→ inflation levels that are different than we expect can redistribute wealth between borrowers & lenders

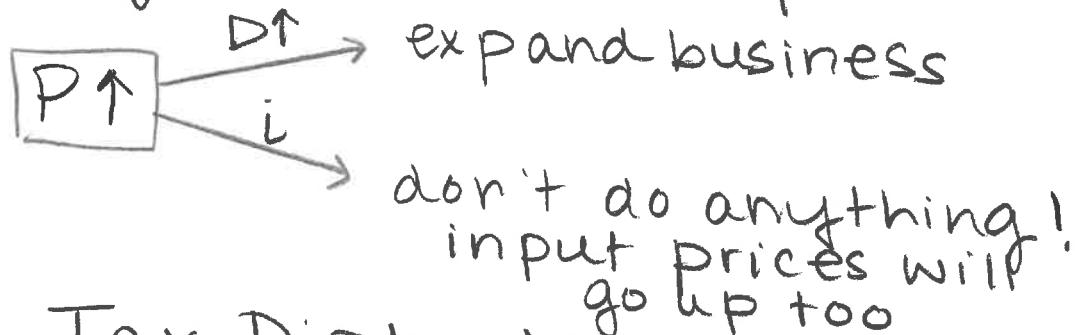
→ surprise inflation: redistributes from lenders to borrowers

→ surprise deflation: redistributes from borrowers to lenders.

## 6. Price Confusion

→ are changes in prices real or nominal?

(signal extraction problem)



## 7. Tax Distortions

→ taxes are the output of a political process

↳ don't necessarily keep pace with inflation

→ capital gains tax

→ even if price just went up by inflation, the "gain" is still taxed → lost money in real terms. (3)

## (\*) What causes Inflation?

Milton Friedman, 1976 Nobel Prize in Econ recipient: "Inflation is always & everywhere a monetary phenomenon."

Answer: money.

- the amount of money ( $M$ )
- how often the money is used ( $V$ )
- how much money the stuff we produce is worth ( $Y$ )

## (\*) There's an equation that describes all this: The Equation of Exchange.

$$MV = PY$$

inflation!

$$\% \Delta M + \% \Delta V = \% \Delta P + \% \Delta Y$$

→ get inflation by itself

$$\% \Delta M + \% \Delta V - \% \Delta Y = \% \Delta P$$

(inflation)

Ways for inflation  
to change

- \*) Suppose we know those other things

$$\frac{\% \Delta M}{2}$$

$$\frac{\% \Delta V}{0}$$

inflation

$$\frac{\% \Delta P}{2}$$

$$\frac{\% \Delta Y}{0}$$

(print more money)

$$(2 + 0 - 0 = 2)$$

2

0

0

2

(print more money but also  
grew the economy)

$$(2 + 0 - 2 = 0)$$

9

-5

2

2

(print lots of money but move it around  
less grow the economy)  $9 - 5 - 2 = 2$  (5)

→ and of course we can use the equation to find other things.

$$\boxed{4} \quad 0 \quad 2 \quad 2$$

(inflation & the economy grew)

$$\% \Delta M + \% \Delta V = \% \Delta P + \% \Delta Y$$

$$\begin{aligned}\% \Delta M &= \% \Delta P + \% \Delta Y - \% \Delta V \\ &= 2 + 2 - 0 \\ &= 4\end{aligned}$$

\* Be careful with the +'s & -'s  
it's very easy to get them mixed up & end up with 0 instead of 4.

# The Loanable Funds Market

\* The Loanable Funds Market is, stunningly, the market for funds that are loanable.

→ people borrowing money

→ people saving money

\* A Broad Overview of How Loans Work

→ Borrowers (individuals, small businesses, the government, etc.) borrow money from banks.

↳ they agree to pay back whatever they borrow plus interest

For Example:

You borrow 50,000 today & agree to pay it back with 6% interest in 10 years.

\*) What do borrowers do with their borrowed money?

↳ they buy capital goods

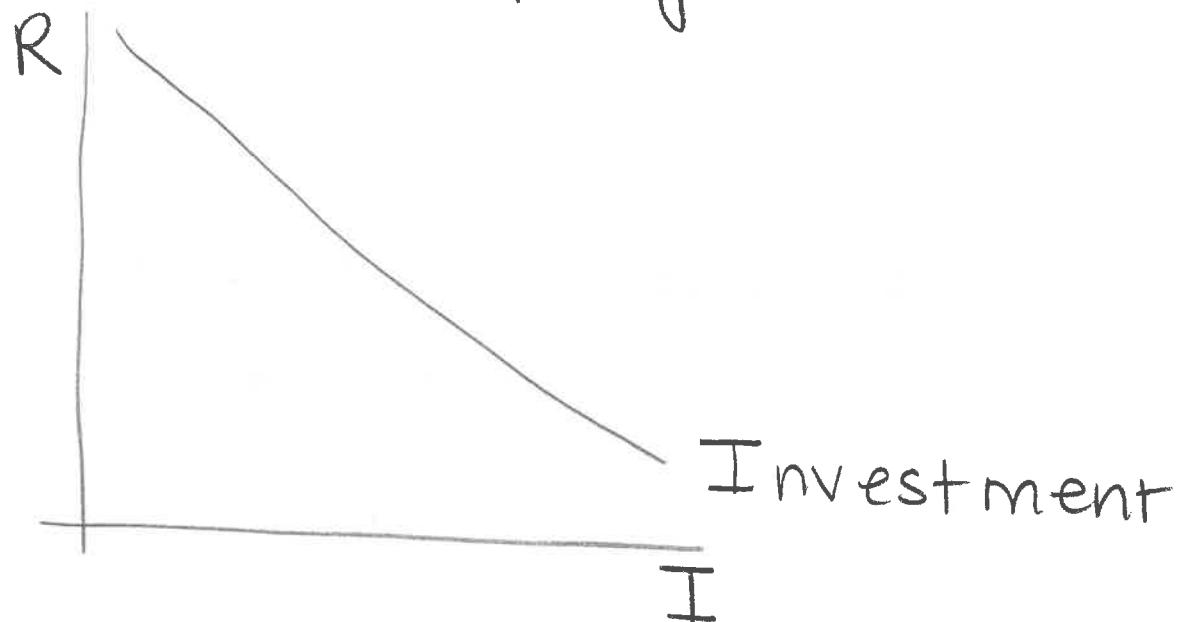
capital goods: goods that are used to make other goods

- machines
- inputs
- etc.

\*) Money spent on capital goods is investment

↳ all of the money spent on capital in the economy is the Investment in  $C + \underline{\underline{I}} + G + NX$

✳ Why is the Investment Curve downward sloping?



→ As the interest rate (cost of borrowing) increases, <sup>quantity of</sup> investment (the quantity of borrowing) decreases.

→ As interest rates increase, the amount of money you need to pay per dollar borrowed increases.

↳ So people will be able to afford less.

↳ So they'll borrow less

## ④ Equation of Exchange Practice

The Equation of Exchange :  $MV = PY$

An Approximation We use:

$$\% \Delta M + \% \Delta V = \% \Delta P + \% \Delta Y$$

Example: If inflation was 4%, real GDP grew by 3%, and the money supply didn't change, did the velocity of money grow or shrink?  
By how much?

$$\begin{aligned} \% \Delta M + \% \Delta V &= \% \Delta P + \% \Delta Y \\ - \% \Delta M &\quad - \% \Delta M \end{aligned}$$

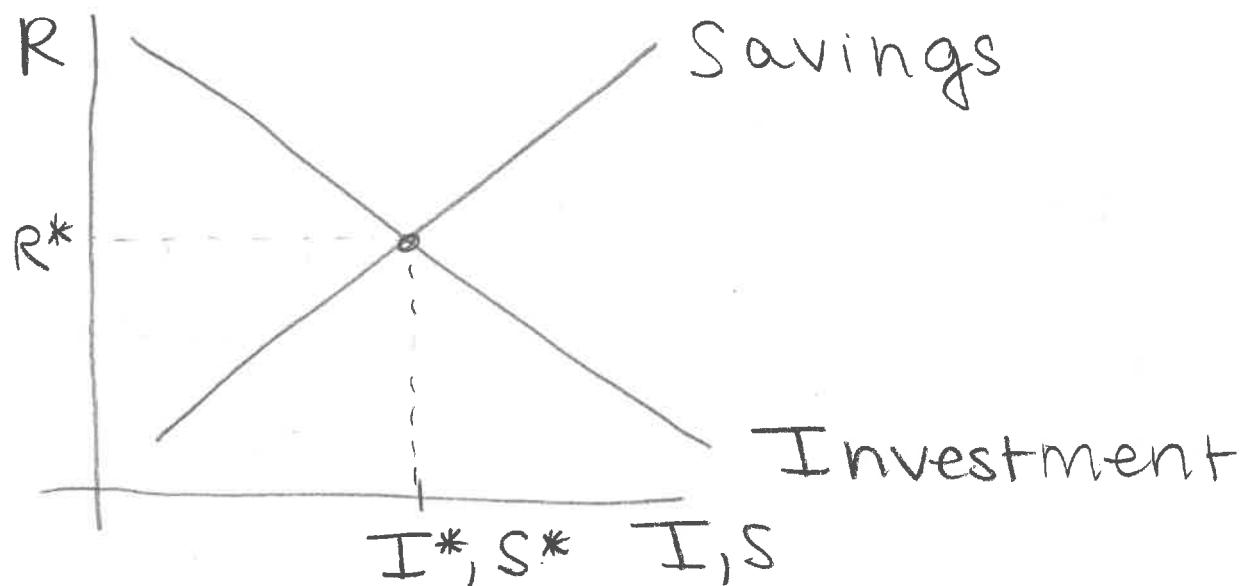
$$\begin{aligned} \% \Delta V &= \% \Delta P + \% \Delta Y - \% \Delta M \\ &= 4 + 3 - 0 = 7 \end{aligned}$$

→ The velocity of money grew by 7%.

## Shift Factors in the LFM

\* The LFM is just a market like any other

↳ it's just important enough that we spend extra time talking about it.



$$I^* = S^*$$

↳ every dollar borrowed requires a dollar saved

(just like the quantity demanded needs an equivalent quantity supplied.)

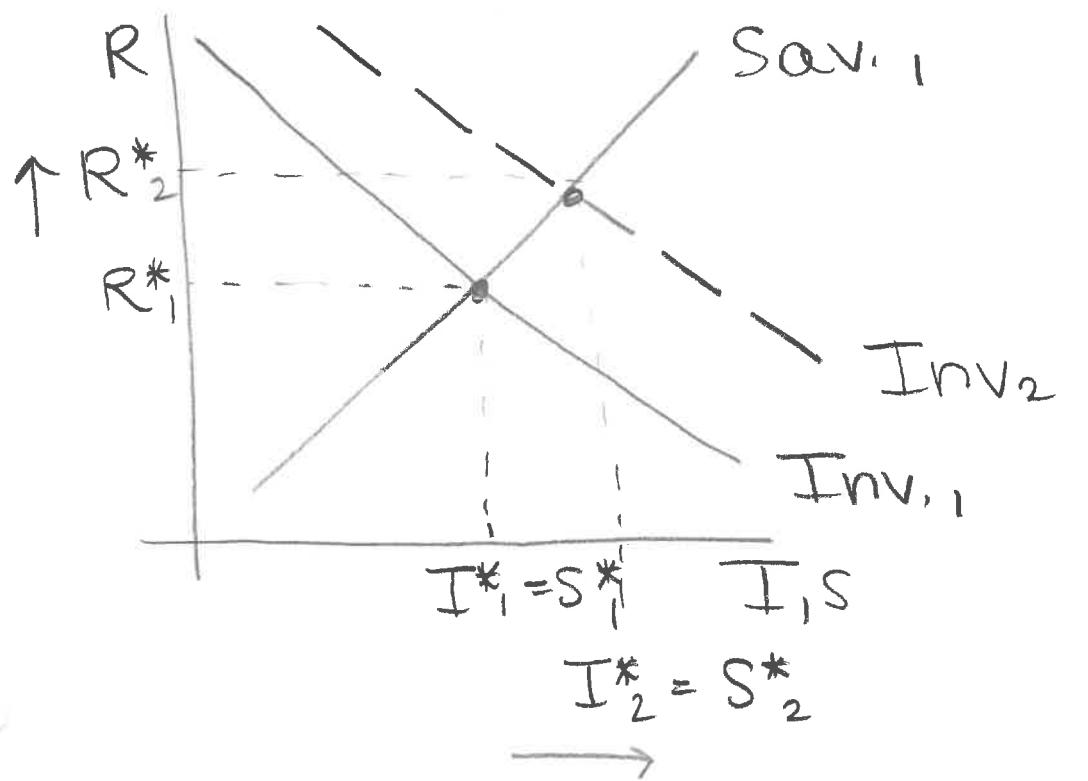
→ these supply & demand curves have shift factors just like the regular supply & demand curves do

### \* Shift Factors of the Investment Curve:

#### 1. Capital Productivity

→ if capital becomes more productive, firms will want more  
↳ so they'll borrow more

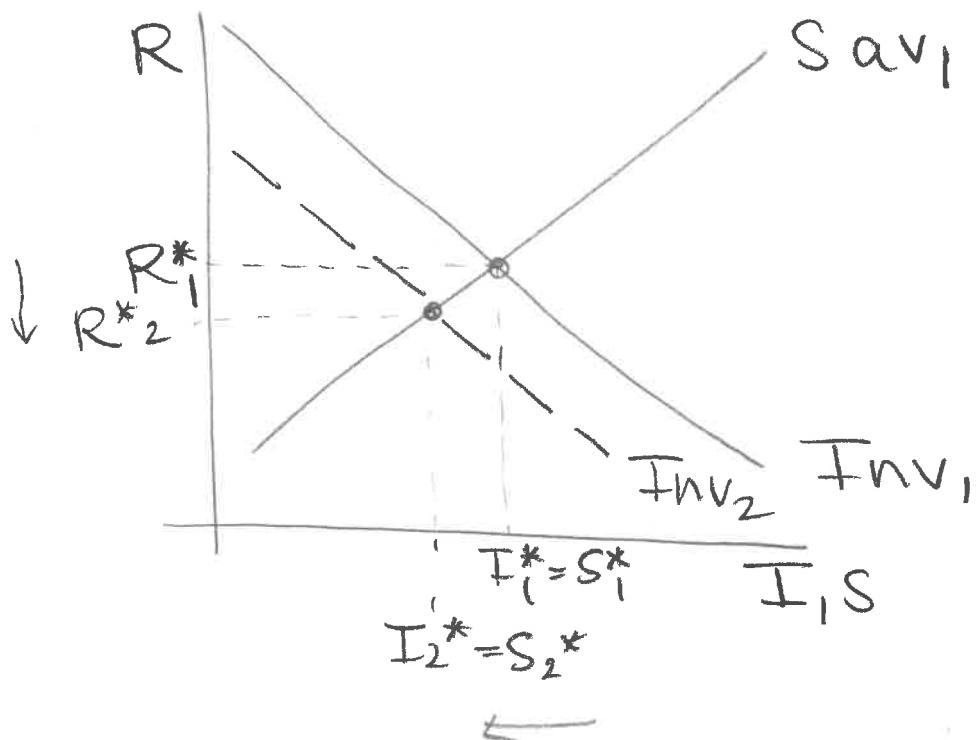
↳ demand for loans (Investment) increases



The amount of investing & saving increases, as does the interest rate. (2)

## 2. Investor Confidence

- investing in capital is risky
  - ↳ sometimes you can spend lots of money & get nothing back
- if investors are more confident that their investments will yield a good return, they'll be more willing to take the risk
  - ↳ borrow more
- if they're less confident, they'll borrow less



The amount of savings & inv. falls, as does the interest rate.

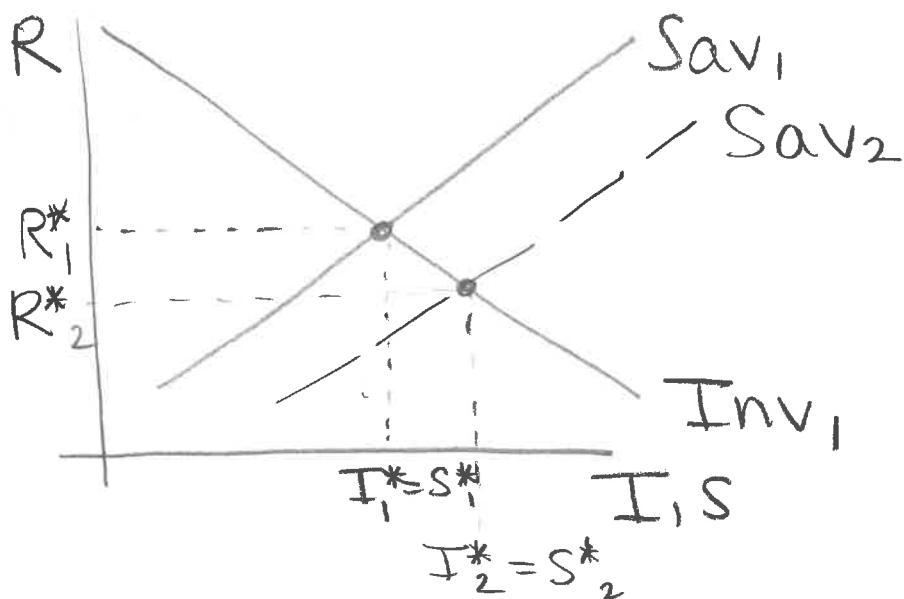
\*) Interest Rates are the only thing that moves the quantity invested.

\*) The Shift Factors of the Savings Curve

I. Income & Wealth

→ When people have more money they save more

↳ increases the supply of loanable funds



The amount of savings & investment increases, while the interest rate falls.

## 2. Time Preferences (Patience)

→ people can spend their money or save it.

↳ if they spend it, they can have stuff now

↳ if they save it they can have more stuff later (b/c it earns interest)

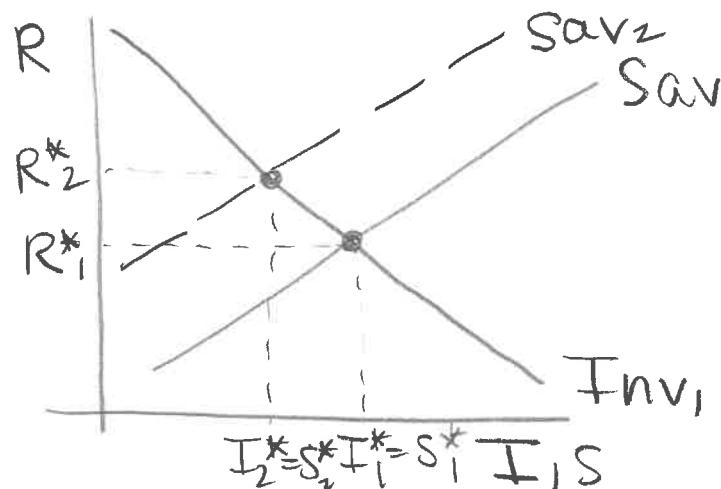
→ But stuff now is better than stuff later

↳ Time Preferences describe by how much

→ if people really prefer stuff now versus later

↳ spend more, save less

↳ decrease in supply

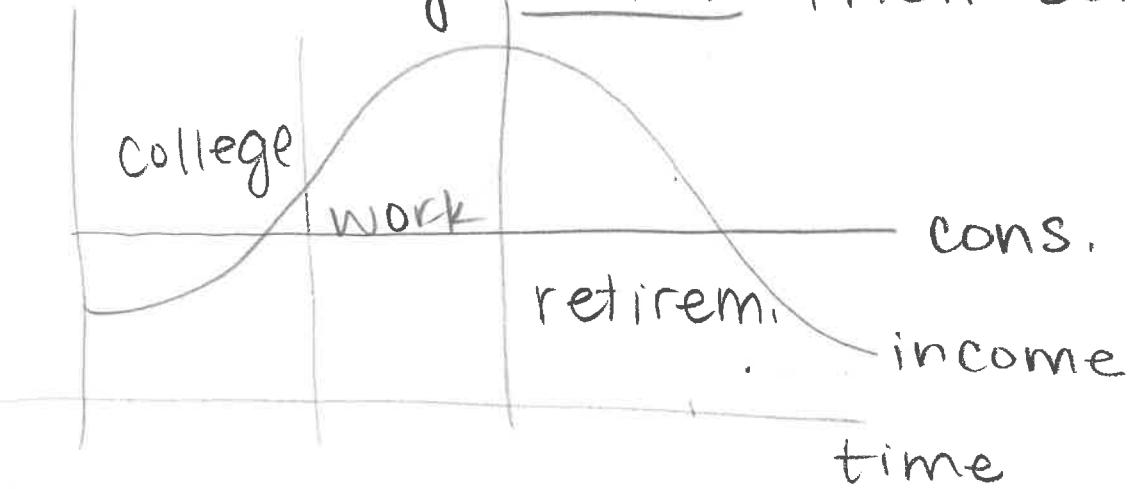


The amount of  $S, I$  decreases, while the interest rate increases

### 3. Consumption Smoothing

→ just like people don't like waiting, they don't like wild fluctuations in consumption level

↳ they smooth their cons.



→ so if there are a lot of people hitting retirement (& there are)

↳ less saving

↳ supply decrease

④ Only the interest rate can shift the quantity saved

## Financial Markets: Direct Lending

\* The Loanable Funds Market describes how banks act as a middle man for savers & borrowers.

↳ some borrowing/saving occurs without the banks

↳ the borrowers borrow directly from savers through stocks & bonds.

\* For both stocks & bonds, I (the saver) hand the business some money & they hand me a piece of paper that promises me money in the future.

↳ what that promise looks like is what determines whether it's a stock or a bond.

## \* Bonds

→ a fancy piece of paper that says the borrower promises to pay a certain amount on a certain date.

→ 3 Key Pieces

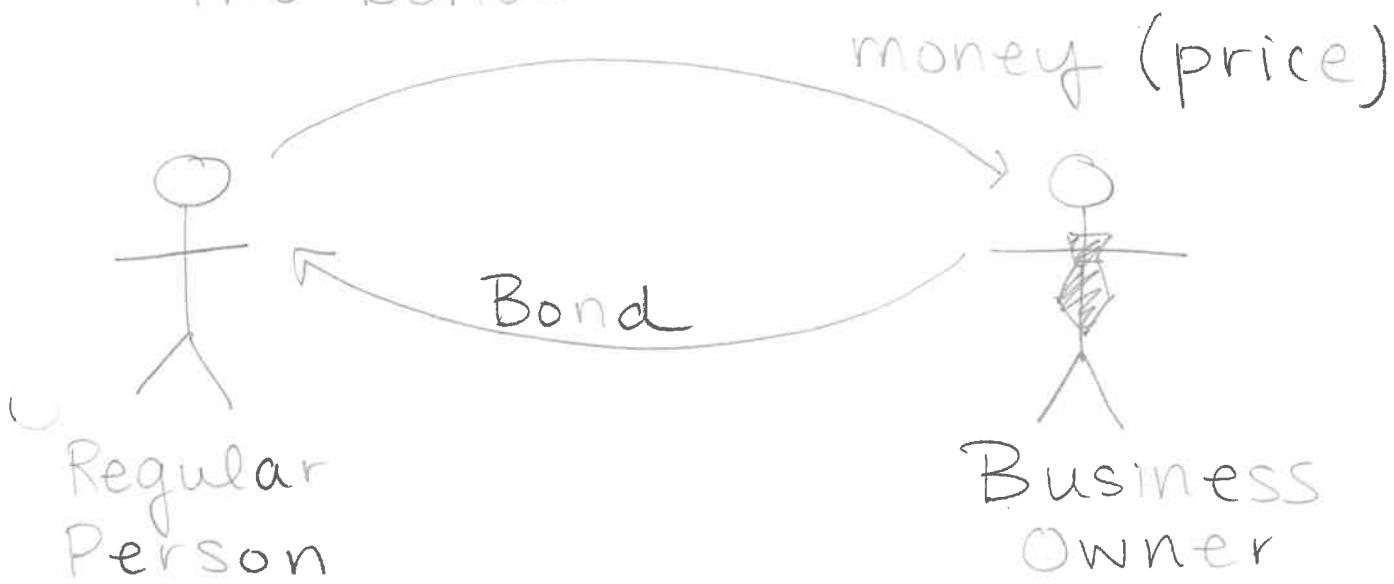
1. Borrower

2. Date of Maturity: the date it's paid

3. Value at Maturity (Face Value): the amount paid

↳ this is not the "price"

→ the price is the amount of money handed over in exchange for the bond



→ the price and the face value  
define the interest <sup>rate</sup> earned on a given bond

$$R = \frac{FV - P}{P} \cdot 100$$

Names the bond  
Face Value

Ex: I buy a  $\underbrace{10,000}$  bond for  $\underbrace{8,000}$ . What interest do I earn on it?

Price  $R = \frac{FV - P}{P} \cdot 100 = \frac{10,000 - 8000}{8000} \cdot 100$

$$= (0.25)(100) = \underline{\underline{25\%}}$$

④ Based on this formula, do interest rates & prices move in the same direction or <sup>the</sup> opposite direction?

→ How can we answer this?

① Try some numbers.

$\frac{P}{}$   
 8,000  
 9,000  
 9,500

$\frac{R}{}$   
 25%  
 11.1%  
 5.3%

$$\frac{10,000 - 9000}{9000} = 0.11$$

$$\frac{10,000 - 9500}{9500} = 0.053$$

- ① Price & interest rate move in opposite directions. (for a fixed FV)
- ② Graph it

$$R = \frac{FV - P}{P} \rightarrow Y = \frac{10,000 - X}{X}$$

(Wolfram Alpha)



- ③ Price & interest rate move in opposite directions.

4

④ What leads to a lower price for a higher interest rate?

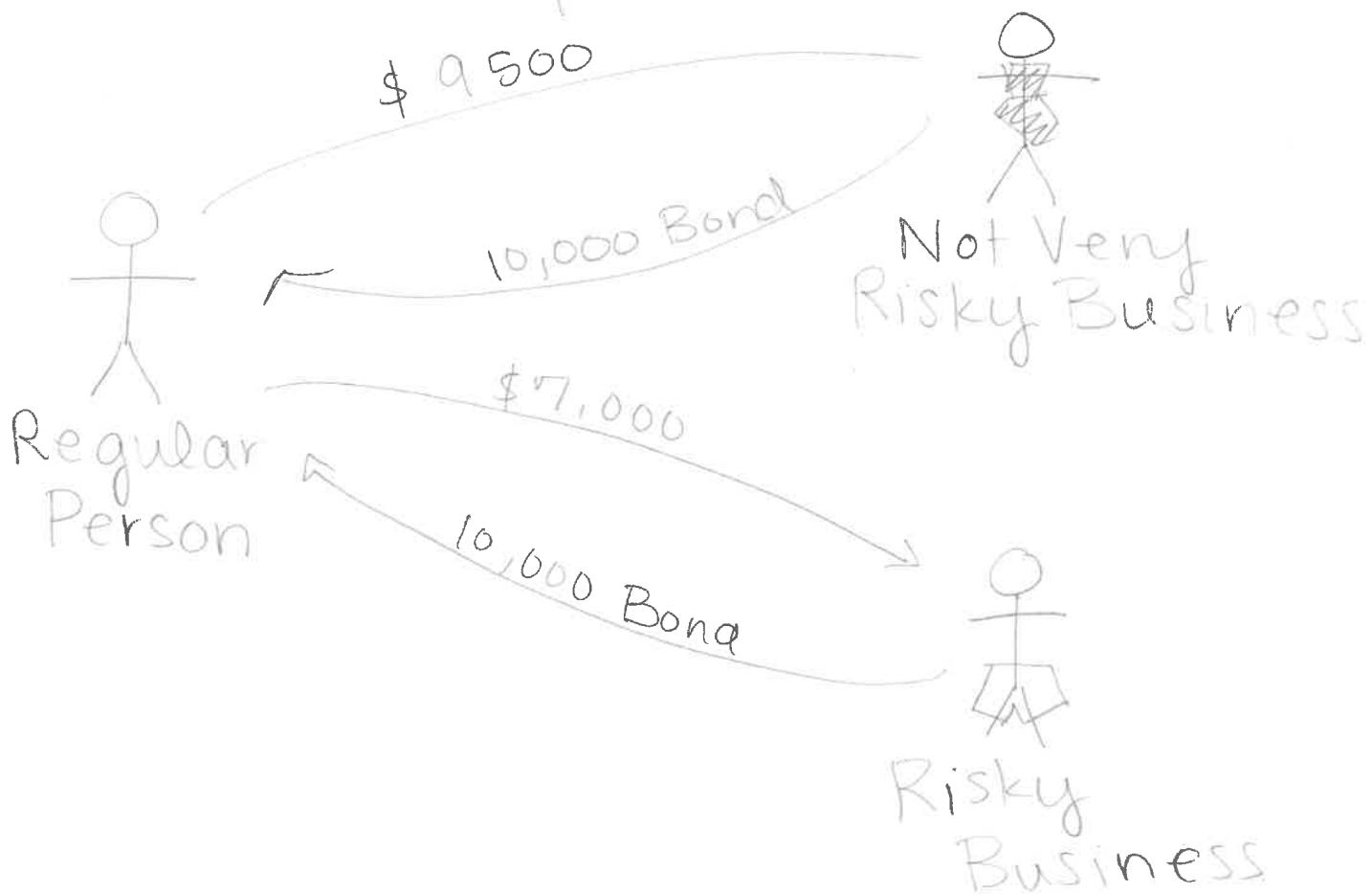
→ default risk

↳ How risky is the business

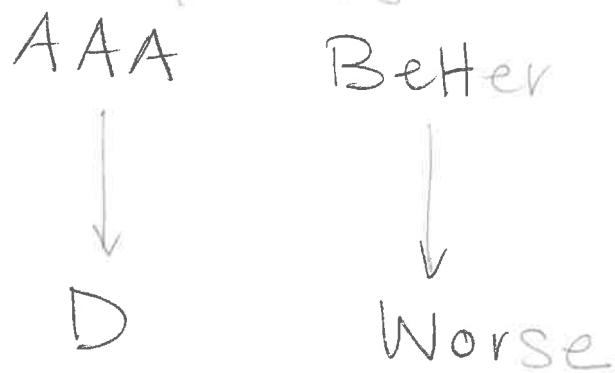
→ it's possible that the business will not be able to pay the bond

↳ they "default" on it.

→ the more likely this is, the lower the price



\* There are companies who evaluate the riskiness of bonds: Moody's & Standard & Poors



### \* Stocks

→ you pay for a portion of the company

→ you own  $\frac{1}{100}$ th or  $\frac{1}{1000}$ th or  $\frac{1}{2}$ b nth of a company & as a result you're entitled to dividends

↳ a portion of the profits

→ the price of a stock is also related to the riskiness of the business, but through the stock market.

\* Treasury Securities: bonds sold by the US Treasury

## Economic Growth: Why is it Important?

(\*) One of the things GDP can be used for: economic growth

→ how has the economy grown over time?

\* • What is economic growth?

\* • Why is it important to study?

a harder question how do we achieve growth?

(\*) Economic Growth: the growth rate of per capita real GDP

[graph of economic growth]

(\*) The average <sup>of</sup> economic growth in the US through the 20<sup>th</sup> & 21<sup>st</sup> century was about 2%

→ doesn't sound like much

→ but if something grows at 2% every year for 100 years it adds up to a lot.

<u>Year</u>	<u>Income</u>	<u>Increase</u>
1	50,000	$\xrightarrow{0.02} 1000$
2	51,000	$\xrightarrow{0.02} 1020$
3	52,020	$\longrightarrow 1040.40$
4	53,060.4	$\longrightarrow 1061.21$
5	54,121.61	mm

→ What a pain

↳ Wouldn't it be nice if there was some nice mathematical approximation? Like: how long will it take to double?

\* The Rule of 70: With an annual growth rate of  $x\%$ , the level of a variable doubles every  $70/x$  years.

→ so let's apply this to the avg. US economic growth rate.

we should use the rule of 70

(\*) About how long does it take the US per capita real GDP to double?

annual growth rate =  $2\% \times \frac{70}{x}$

doubles every  $\frac{70}{2} = 35$  years

(\*) If it's \$55,000 now, what will it be in 2054?

↳ that's 35 years from now

↳ that's how long it takes to double

↳ double it: \$110,000

(\*) For the following growth rates of annual vars, how long will they take to double & in what year will they have doubled from their value today

→ so these are the growth rates of different variables

↳ we don't know the values of these variables, we just know their growth rates

↳ we don't know their value today, but want to know when whatever 3<sup>rd</sup> variable will have doubled

(3)

## Growth Rate

1%  
2%

Time to Double  
 $70/1 = 70$   
 $70/2 = 35$

Year Doubles From Today  
2089  
2054

3%  
5%  
7%  
10%

$70/3 = 23.\overline{3}$   
 $70/5 = 14$   
 $70/7 = 10$   
 $70/10 = 7$

2043  
2033  
2029  
2026

→ as growth rate goes up, time to double goes down

↳ dramatically so: some of us may not be around for that 1% growth rate variable to double

that 10% one is almost by the time you graduate.

① What does this look like in the real world?

↳ real GDP per capita & its growth rate for several countries

## Real GDP per capita

	<u>growth rate</u>	<u>1950</u>	<u>2010</u>
Nicaragua	0.1%	2,476	2,53
El Salvador	1.2%	2,282	4,45
Mexico	2%	3,625	11,68
Japan	4.1%	2,944	33,20
South Korea	5.5%	1,309	32,85

↑                                   ↑  
 started                           ended  
 out lowest                       almost highest

→ remember that this is real GDP per capita

↳ income per person.

↳ the US is ~ \$55,000

↳ India's is \$1,939.61

↳ Gambia's is \$483.02

④ Economic Growth (especially a lack of growth) affects people's lives and well being.

↳ what I'm worried about

↳ what someone in Gambia is worried about

↳ economic growth is the way that changed.

	Avg. Across <u>Poor Countries</u>	Avg. Across <u>Rich Countries</u>
• GDP per capita	\$ 599	\$ 38,926
• Infant Mortality Rate (per 1000)	51	6
• Under 5 Mortality Rate (per 1000)	73	7
• Life Exp.	62	81
• Physicians per 10,000 people	2.1	29.3

• Access to Drinkable Water	69%	99.6%
• Ratio of Women to Men enrolled in HS	0.89	0.99
• Ratio of Women to Men enrolled in College	0.65	1.24

## Growth Models (Ch. 11 & 12)

\* Economic Growth: the growth rate of per-capita real GDP

→ Things it is not:

- inflation
- long term GDP growth  
(not adjusted for population)

\* Rule of 70:

→ used to approximate how long it takes an annual series to double.

"With an annual growth rate of  $x\%$ , the level of the variable will double every  $70/x$  years."

Example: Suppose a country's economic growth is currently 5% & their per capita real GDP is \$2000. What will it be in 2047?

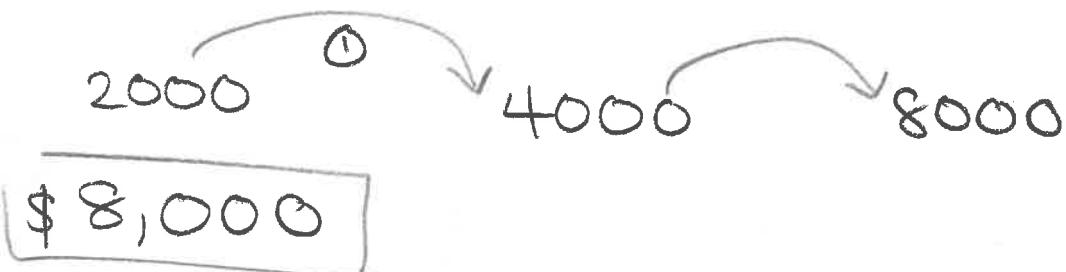
→ how many years does it take to double?

$$70/5 = 14$$

→ how many times does it double between now & 2047

$$\frac{2047 - 2019}{14} = \frac{28}{14} = 2$$

→ double it twice



## 2. Growth Theory

\* Attempting to explain the mechanisms behind Economic Growth

Production Function: describes how inputs are turned into output

$$Y = F(\text{Capital, Labor, Land})$$

↑  
Output                      Inputs

Marginal Product: change in output due to a change in an input, everything else held constant.

$$500 = F(20, 17, 14)$$

$$530 = F(21, 17, 14)$$

$$MP_K = 500 - 530 = 30$$

\* The Law of Diminishing Marginal Product:  
The marginal product of an input is positive but decreasing.

Steady State: no longer an incentive to change  $K$  ( $K^*, Y^*$ )

### \* Implications

1. Steady State Levels of Capital & Output ( $K^*$  &  $Y^*$ )

→ no net investment (= investment - depr.)  
(the only investment is to maintain our  $K^*$  level of capital when it depreciates)

→ no new growth

2. Convergence

→ nations gravitate towards the same GDP per capita

### \* Problem: Rich countries get richer & poor countries get poorer

→ no convergence

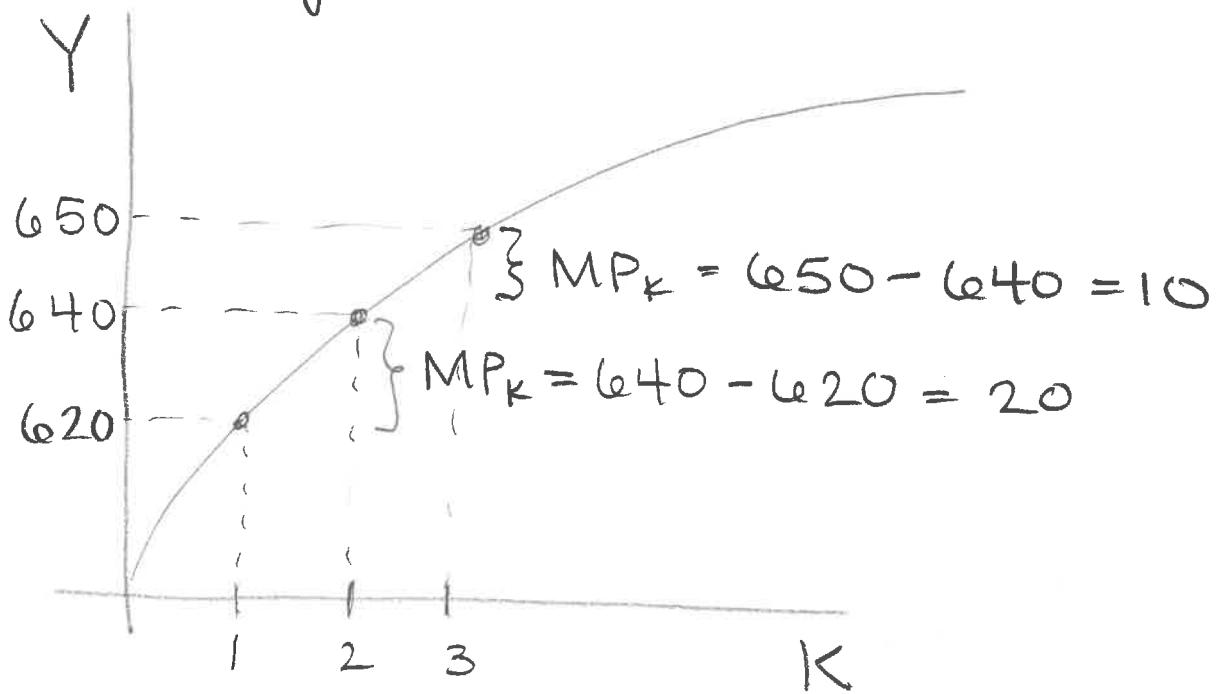
4. Solow II

Technological Advancement: New techniques or methods that enable production of more valuable output per unit of input.

## Growth Models (Day 2)

- Last time: started looking at models of how inputs get turned into outputs
- Most growth models involve a Production Function
  - ↳ describes how much output you get from a specific set of inputs
- From this production function we can also find how much output we get for one additional input
  - = Marginal Product
- So we can find the Marginal Product of Capital ( $MP_K$ ), Marginal Product of Labor ( $MP_L$ ), or the Marginal Product of Land ( $MP_{Land}$ ). (1)

→ if we don't mess with Labor & Land,  
we can graph  $Y$  with respect to  $K$



① The Solow Model (Part I) makes the following assumptions about how the world works:

1.  $MP_K > 0$  (always)
2.  $MP_K$  decreasing (always)

→ and that's it

→ everyone has the same  $F$ .

↳ they might be at different points (different levels of capital) but when they get more, they'll end up in the same place.

→ so the implications of the model are

- There's a steady state ( $K^*$ ,  $Y^*$ ) where there's no longer an incentive to buy more capital
- All nations end up at the same steady state eventually  
    ↳ convergence

### Worksheet

→ the problem is that nations don't converge to the same amount of capital & output.

↳ need to add an ingredient to the model.

= technological advancements

\* A new variable:  $A$

→ measures the level of technological advancements for a given country.

Aus

England

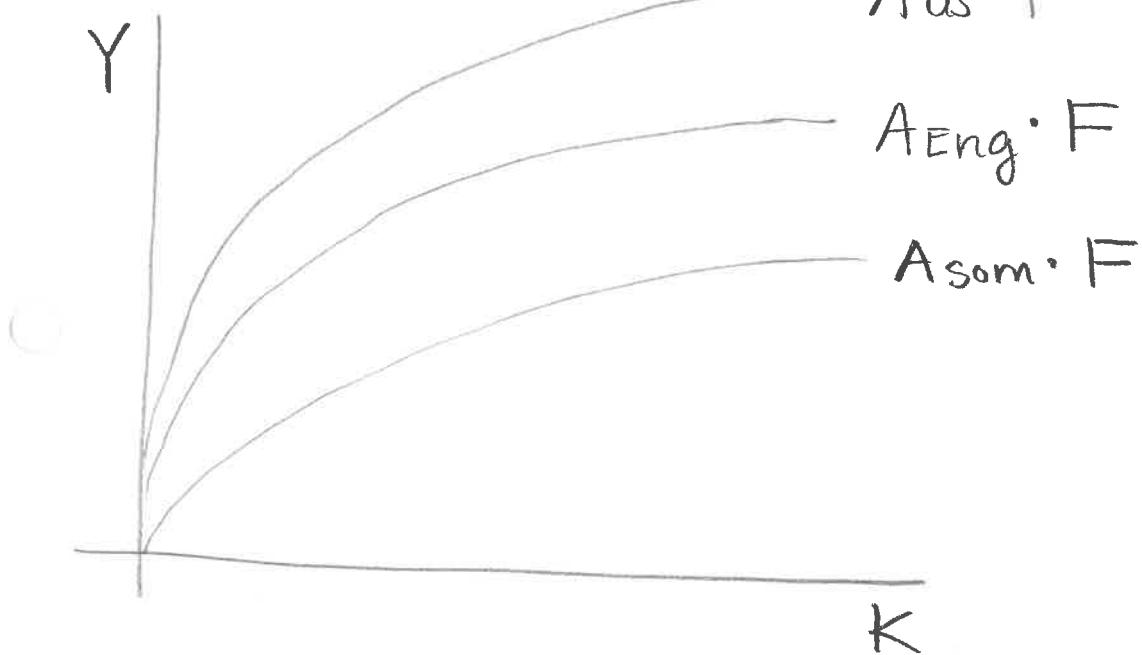
Asomalia

→ multiply the production function by this  $Y = A \cdot F(K, L, \text{Land})$

$$Y_{\text{Aus}} = A_{\text{Aus}} \cdot F(K, L, \text{Land})$$

$$Y_{\text{Eng}} = A_{\text{Eng}} \cdot F(K, L, \text{Land})$$

$$Y_{\text{Som}} = A_{\text{Som}} \cdot F(K, L, \text{Land})$$



④ The Solow II Model assumes that countries just wake up in the morning with this  $A$

↳ can't do anything to change it

↳ Whatever determines  $A$  happens outside of what we model

= exogenous

\* The assumptions of Solow II are:

1.  $MP_K > 0$

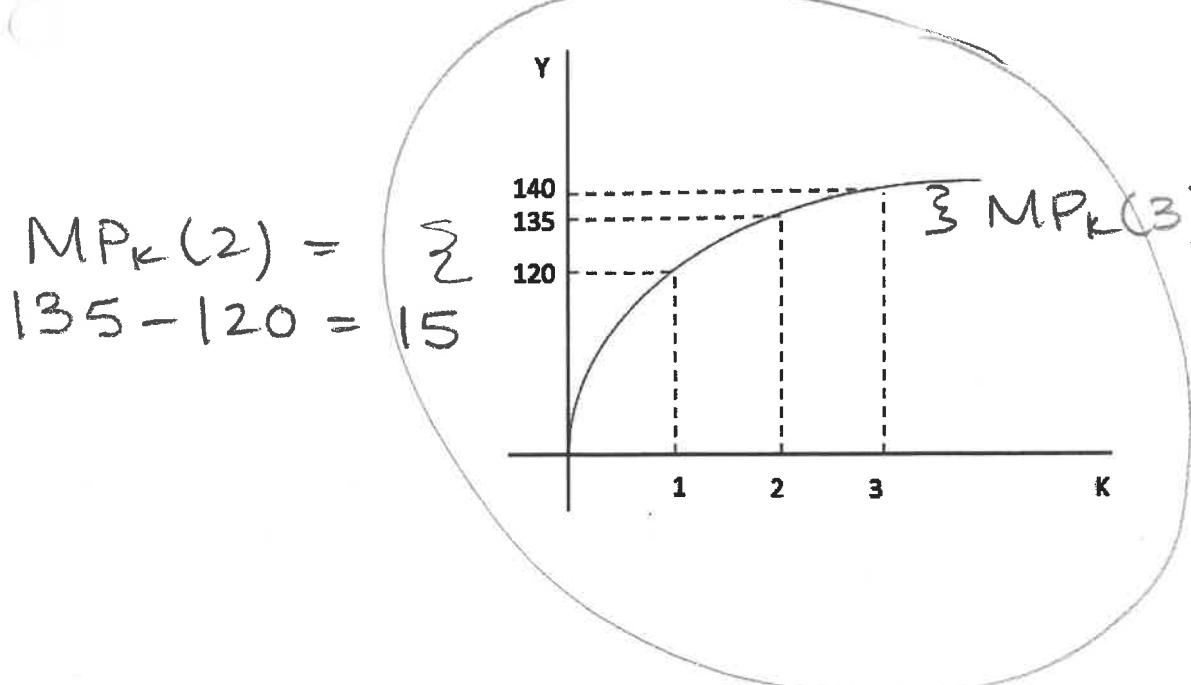
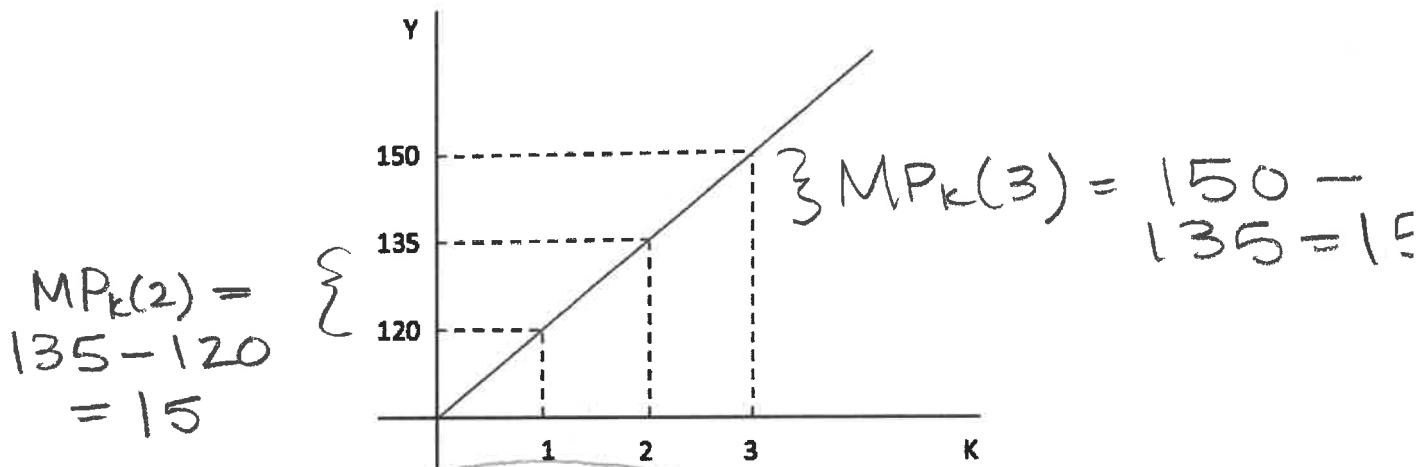
2.  $MP_K$  decreasing

3. Technological Advancements are exogenous.

Name:

Key

1. For each of the following production functions, find the marginal product of capital from moving from 1 unit of capital to 2 and from moving from 2 units of capital to 3.

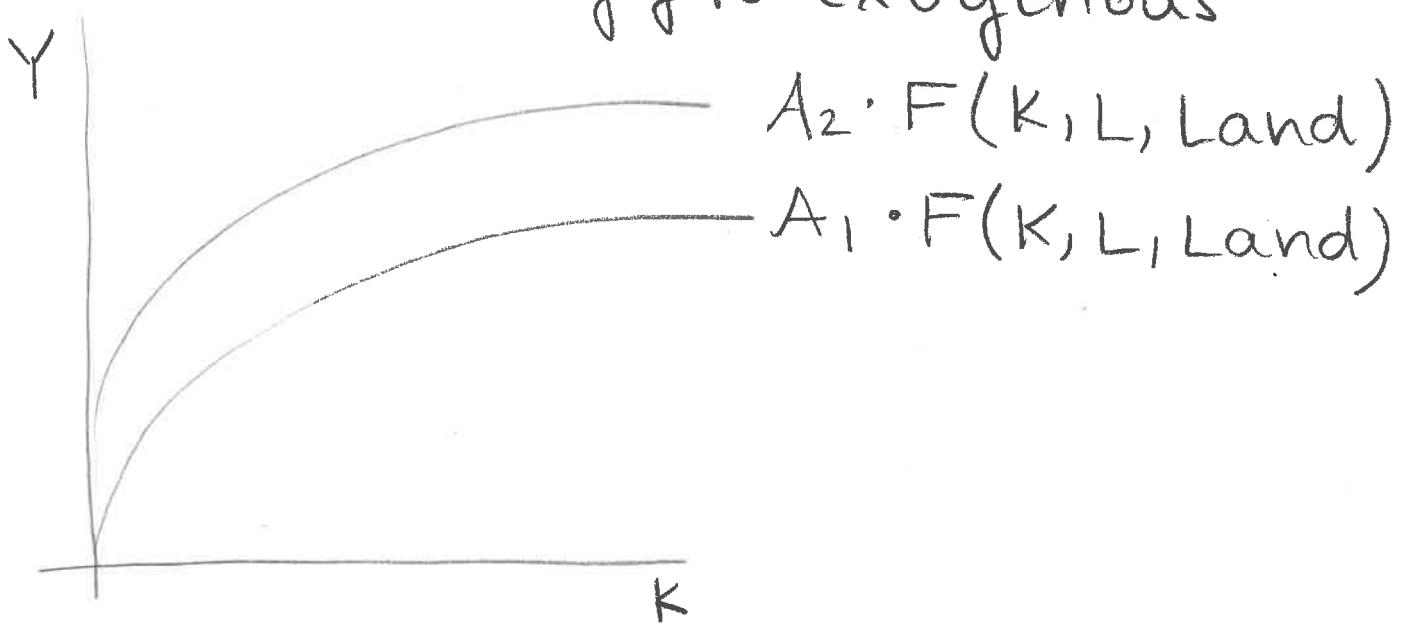


# Modern Growth Theory

(finishing  
Ch. 12)

## ① Before Break:

- economic growth is very important for people's well being
- how do we get it?
  - Solow Growth Model
- assumptions:
  1.  $MP_K > 0$
  2.  $MP_K$  diminishing
  3. Technology is exogenous



- successfully replicated the differences between countries w/  
similar K, L, & Land : A
- ↳ But: assumed A is exogenous  
exogenous: happens outside the model
- ↳ there's nothing we can do about our levels of technology
- endogenous: happens inside the model
- ↳ would allow us to model how it comes about
- ↳ figure out how to make it happen!

\* We'd like to endogenize technological advancements

## \* Think - Pair - Share:

What encourages / leads to / helps technological advancements?

\* Institutions: significant practices, relationships, or organizations in society

\* Modern Growth Theory: institutions create incentives for endogenous growth

\* How?

→ Start with some general observations:

1. Investment & Production require sacrifice & patience

↳ you have to do the work today for a payoff tomorrow

→ What if you can't be confident that'll happen?

2. Investment & Production will naturally happen if there is a positive return on investment expected.

3. Many factors affect this expected return

- political risk
- corruption
- inflation risk
- taxes

→ if things are risky, it's less likely people will do them.

Growth-Friendly  
Institutions

Growth-Friendly  
Incentives

Physical  
Capital

Technological  
Innovations

Human  
Capital

Economic Growth!

④ What are some growth-friendly institutions?

1. Political Stability & the rule of law

2. Competitive & Open Markets

- Competition
- international trade
- flow of funds across borders  
(Brexit)

3. Efficient Taxes

- high enough for the government to run effectively
- low enough for production to be profitable

4. Stable Money & Prices

5. Private Property Rights

④ The three sources of economic growth are resources, technology, and institutions.

# Aggregate Supply & Aggregate Demand

→ We just finished talking about long run growth (Solow, MGT).  
↳ today: short run fluctuations (recessions & expansions)

## \* Questions We Should Answer:

1. Why do we have recessions?
2. Why are recessions shorter (except for the Great Recession) and occur less often than in the history of the US?
3. What can the government do to influence the business cycle?

→ We're going to use the Aggregate Supply & Aggregate Demand model to answer these, (ASAD)

## \* Today: Aggregate Demand

→ the demand for all goods & services

→ demand for GDP

(Aggregate Supply: the supply of all final goods & services)

→ it's a demand curve like the other demand curve we've seen but the "good" is "all goods" and the "price" is the overall price level

Aggregate Demand Curve: the quantities of GDP that purchasers are willing & able to buy at different price levels.



(\*) The Aggregate Demand curve is downward sloping (Law of Demand)

↳ but it's a special demand curve so we should think carefully about why

→ What does downward sloping mean?

When the Price Level ( $P$ ) rises, the quantity of Aggregate Demand - GDP - ( $Y$ ) falls.

$$\rightarrow Y = C + I + G + NX$$
$$(E - I)$$

If  $Y$  changes, it must be because  $C, I, G$ , or  $NX$  changes

(\*) The Three Reasons AD is Downward Sloping:

I. The Wealth Effect

An increase in the price level reduces the real value of wealth, which reduces AD.

Note: wealth not wages

- Wages go up with the price level
- Wealth is the money you've built up over time (What's in your bank account)

Ex: You have \$100 in your bank account. That buys 10 burritos if the burritos cost \$10 each.

↳ But if the cost increases to \$11, you can now only buy  $100/11 = 9.09$  burritos

↳ Your real wealth - as measured in burritos - has decreased.

↳ Total consumption will decrease ( $= C$ )

\* As the price level increases, GDP decreases (= downward sloping AD)

Summary:

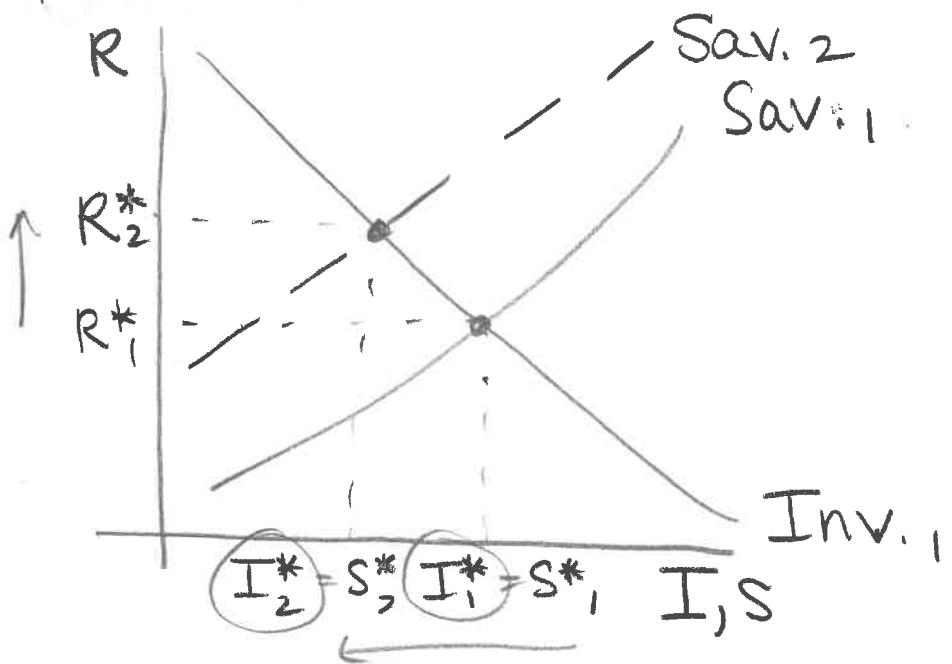


## 2. Interest Rate Effect

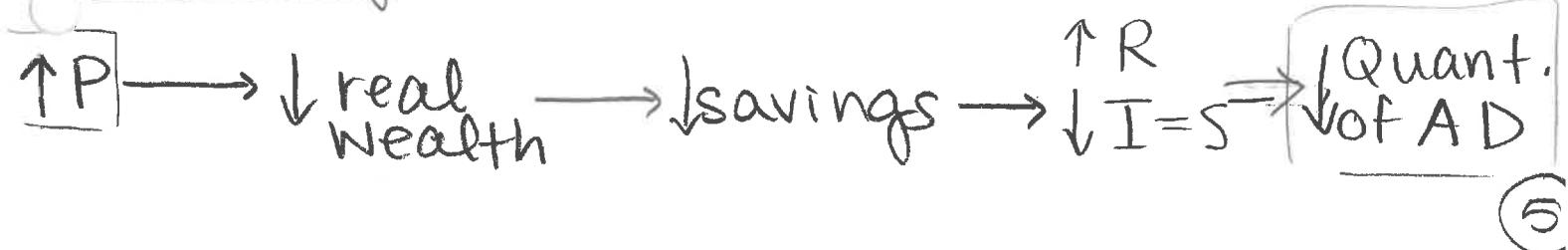
When the price level rises, your real wealth decreases and you save less. This increases the interest rate and decreases the amount of Invest. ( $= I$ )

→ In addition to buying fewer burritos, you also have less wealth to put in your savings account.

→ The Loanable Funds Market!



Summary:



### 3. International Trade Effect

Exports become relatively more expensive and imports become relatively cheaper. Therefore, net exports fall.  
(=  $NX$ )

Note: When we say "the price level" we (usually) mean the US price level (or a specific country)

- \* If our price level goes up, but other countries' price levels don't:
  - the stuff we sell them has become more expensive to them
  - the stuff we buy from them becomes more attractive b/c it didn't become more expensive.

$$NX = Ex - Im$$

A diagram showing the components of Net Export ( $NX$ ) in a subtraction equation. 'Ex' and a minus sign are on the left, and 'Im' is on the right. Arrows point from 'Ex' and 'Im' to a circled minus sign between them, indicating they are being subtracted.

Summary:

'Pus' → relative price of US Goods →  $\downarrow Ex, \uparrow Im \rightarrow \downarrow NX \Rightarrow \downarrow$  Quant. of AD (6)

## Aggregate Demand (Continued)

① Aggregate Demand: the demand for GDP

\* Aggregate Demand Curve:

the quantity of GDP demanded at different price levels.

② The AD Curve is downward sloping because of:

1) The Wealth Effect

2) The Interest Rate Effect

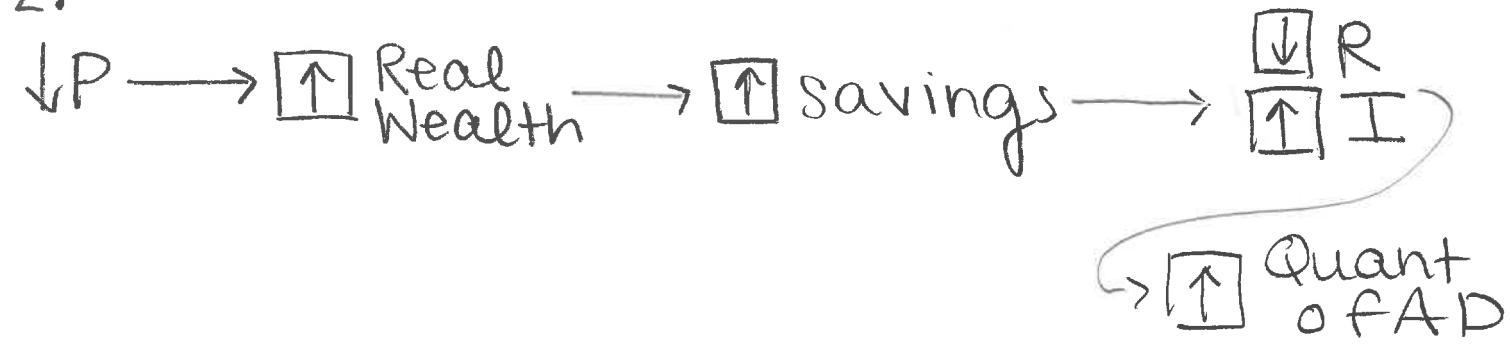
3) The International Trade Effect

→ fill in the arrows for the summaries.

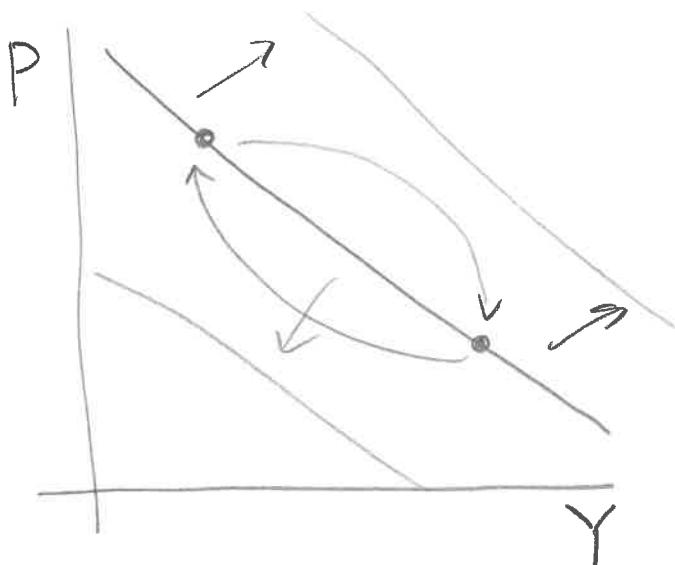
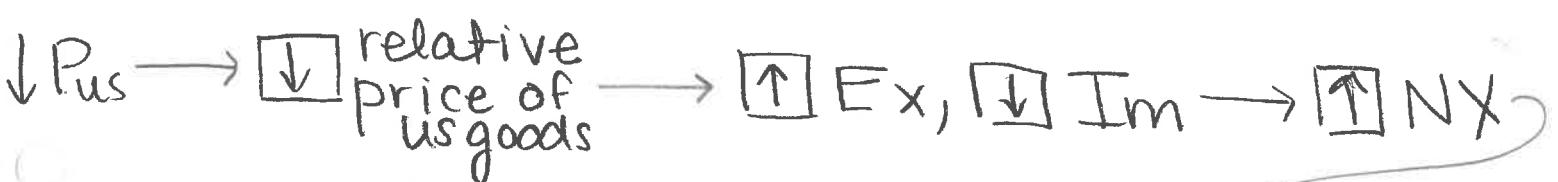
1.



2.



3.



(\*) So what moves the AD Curve around

↳ shift factors?

↳ moves the demand for GDP at all price levels

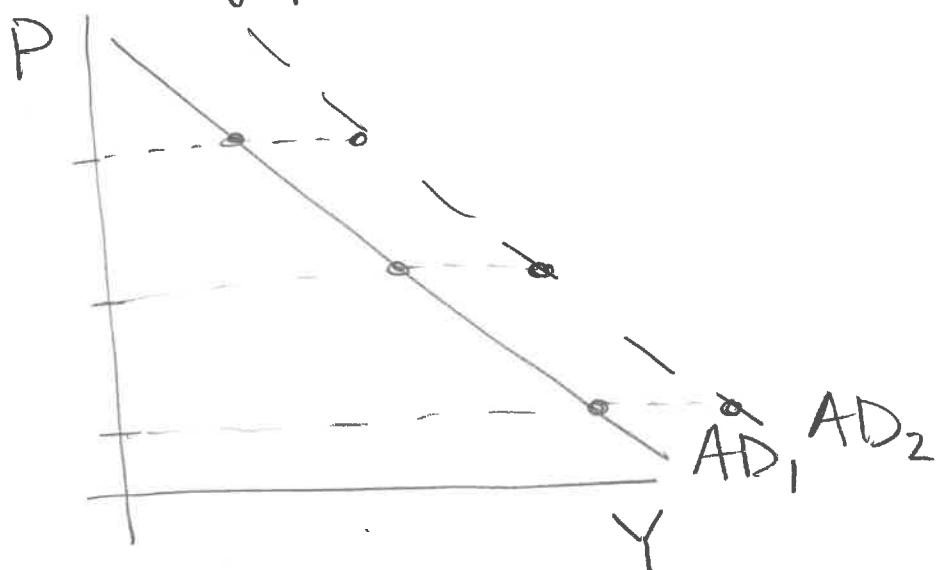
(2)

## \* Shift Factors of AD:

### 1. Real Wealth

→ lots of things can affect real wealth that aren't the price level.

→ if your real wealth goes up then you will consume more ( $C \uparrow$ ) at every price level



### 2. Expected Future Income

→ if you expect your income to rise in the future, you'll buy more today

↳ if everyone expects their income to rise, everyone will consume more. ( $C \uparrow$  at every P)

## Example: Tax return season!

- Even before we get our tax returns we buy things.

### 3. Expected Future Prices

→ if you expect the price level to increase tomorrow, you will buy more today

Ex: When Hurricane Harvey hit the Houston area, we knew gas prices would go up (20% of our oil refineries are there) so everybody went out & bought gas before that happened.

→ this is like that except it's the price of everything

### 4. Foreign Income & Wealth

→ if people in other countries have more income or more wealth, they will buy more

= Ex ↑ at all price levels

## 5. Value of the Dollar (Relative)

→ sometimes a dollar is worth more of another currency & sometimes it's worth less. (Value of \$↓)

Ex: Suppose \$1 is worth 3 euros, but then falls to being worth 2.

$$\begin{array}{ll} \$1/3 = 1 \text{ e} & \$100 \text{ worth of steel} \\ & \text{did cost } \cancel{\$300} \text{ e} \\ 1/2 = 1 \text{ e} & \text{now it costs 200e} \end{array}$$

→ exports rise, imports fall. ( $NX \uparrow$ )  
at all price levels

→ AD increases.

## 6. Taxes

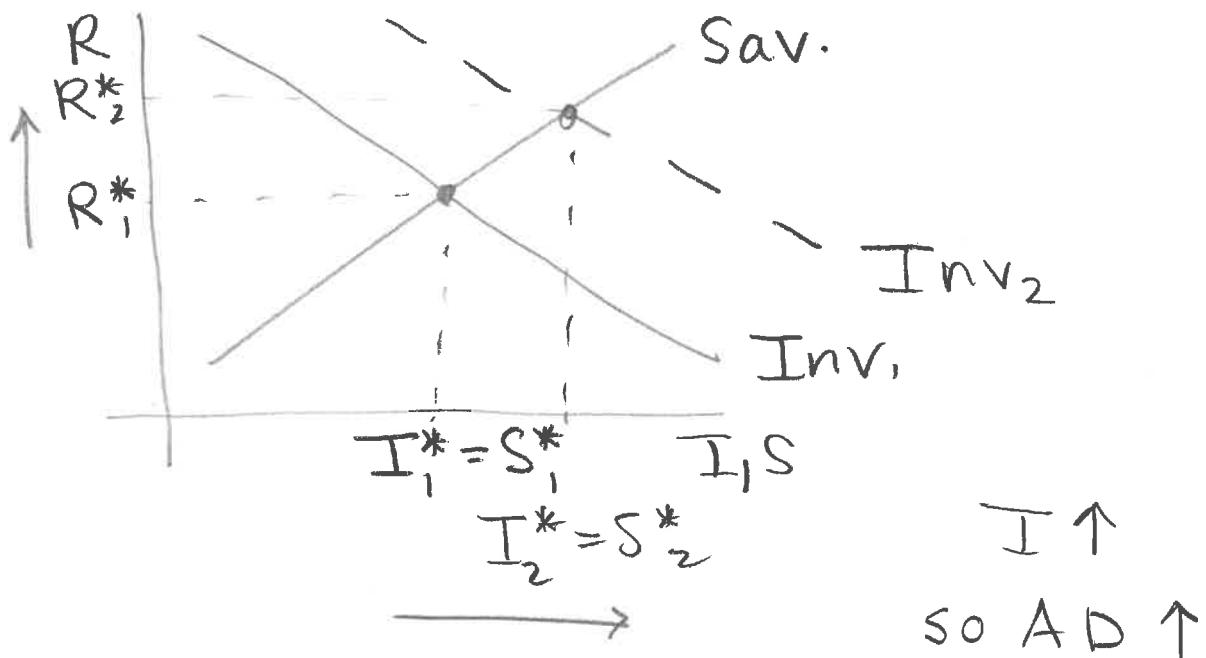
→ When taxes go up, your spending goes down

→ (we're going to ignore the effect it may have on  $G$ ; not an immediate change)

## 7. Investor Confidence

→ as you recall, this is also a shift factor for the Investment curve

↳ IF investor confidence increases the Investment Curve increases



## 8. Government Spending

→ If G goes up,  $Y = C + I + G + NX$  goes up (at all price levels)

## Scenario

- Congress passes a bill to cut spending

- There is a recession in England & their Income falls

- It's announced on the news that inflation is expected next month

## Which Shift Factor

Government Spending

Foreign Income & Wealth

Expected Future Prices

## Which Way does AD shift



## AS-AD : Supply!

Extra Credit

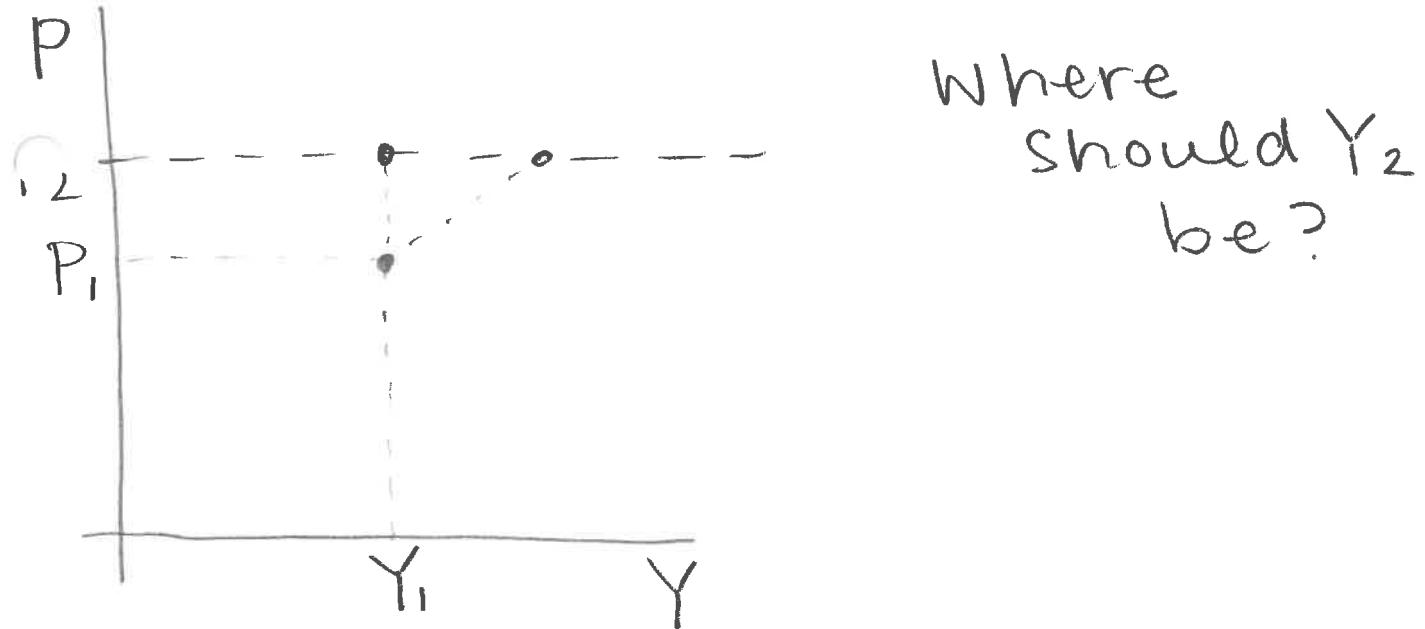
Jeopardy Ques

1pt.: turn in

3pts: closer

→ 4 answer opt

- ④ We know how aggregate demand works.
  - ↳ pretty much like any other demand curve
  - ↳ but Aggregate Supply is weird
- ④ Aggregate Supply: the total supply of final goods & services (GDP) from all the producers in the economy
- ④ Aggregate Supply Curve: the relationship between the price level ( $P$ ) and the quantity of goods supplied by all producers.
  - But what does this relationship look like?



→ When the price level goes up, the price of outputs go up

↳ producers get more for their products; produce more.

→ BUT! Eventually, the price of inputs (wages, intermediate inputs, rent, etc.) go up too.

↳ by the same amount as the output prices

→ So in terms of real output, nothing changed.

→ so which is it?

BOTH!

\* What do you think the difference is?

→ Time

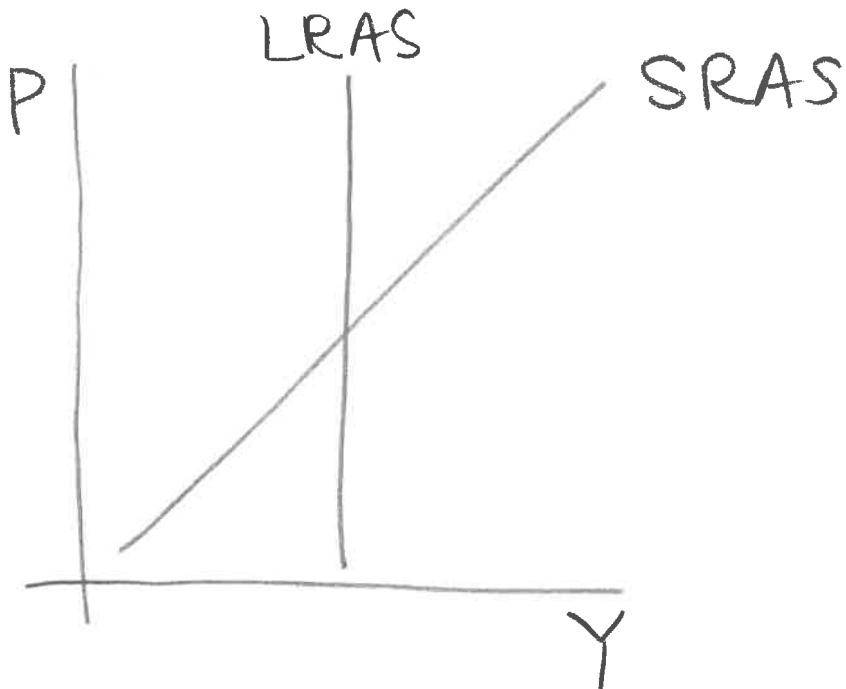
→ it's much easier to adjust output prices.

- reprint menus
- update your website
- etc...

↳ than your input prices (most of them are contracts over many months)

\* So in the Short Run, Aggregate Supply is upward sloping.

\* In the Long Run, Aggregate Supply is straight up and down.



④ How long is the Long Run?

- Long Run: a period of time sufficient for all prices to adjust
- Short Run: a period of time in which some prices may be inflexible.

→ We call prices that take a long time to adjust sticky (really).

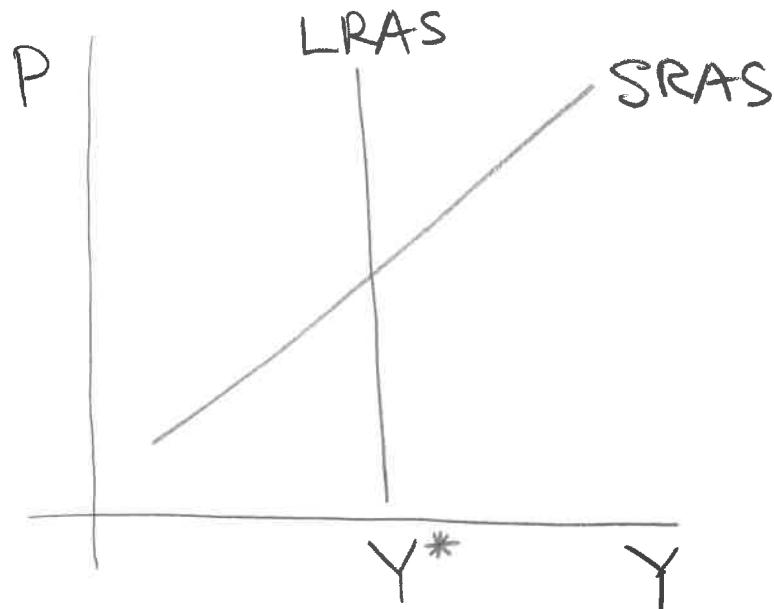
④ Why are the two different Aggregate Supply curves?

→ Because input prices are sticky.

\*) So if output always returns to the same place in the long run (w/o significant change in the economy), what is that level of output?

$Y^*$  = full employment output

Recall:  $Y^*$  is the GDP when  $u=u^*$



\*) Shift Factors for LRAS

→ a shift in the LRAS requires an increase in  $Y^*$

↳ this requires a structural change in the economy.

→ the only way that can happen is if there's economic growth

→ "The three sources of economic growth are resources, technology, & institutions.  
① ② ③

### LRAS Shift Factors

#### \*) Shift Factors for SRAS

1. Temporary events that change production costs.

Ex: Weather, gas example from last class

2. Corrections of Past Errors in Expectations,

Ex: sign wage contracts but anticipate the incorrect level of inflation

3. Expected Future Prices

Ex: if workers expect a higher price level in the future, they'll ask for higher wages.

## Shift Factors of ...

### Aggregate Demand

1. Real Wealth
2. Expected Future Income

3. Expected Future Prices

4. Foreign Income & Wealth

5. Value of the Dollar

6. Taxes

7. Investor Confidence

8. Government Spending

### Short Run Aggregate Supply

1. Temporary events that change production costs

2. Expected Future Prices

3. Corrections to past errors

5. Value of the Dollar

6. Taxes

7. Investor Confidence

8. Government Spending

### Long Run Aggregate Supply

1. Resources
2. Technology

3. Institutions

5. Value of the Dollar

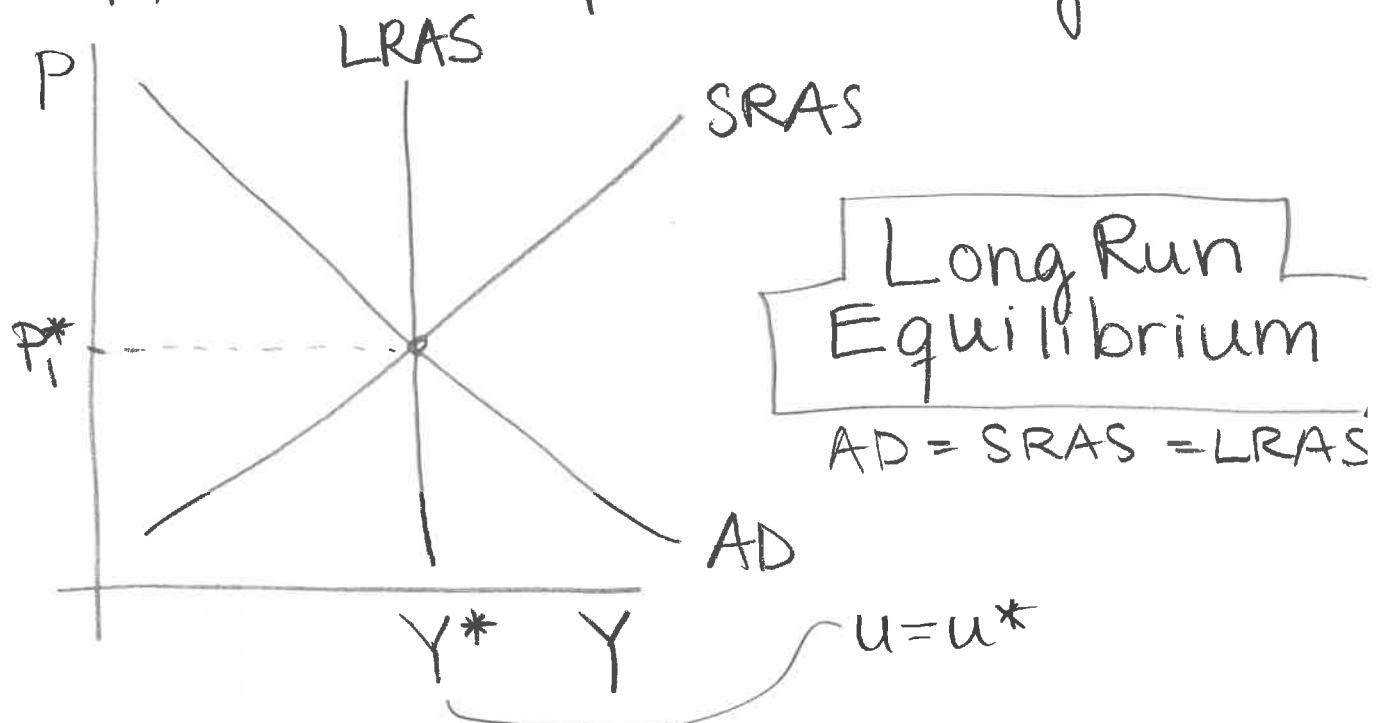
6. Taxes

7. Investor Confidence

8. Government Spending

## AS-AD Equilibrium

→ We have our demand, we have our supplies, let's put them together!



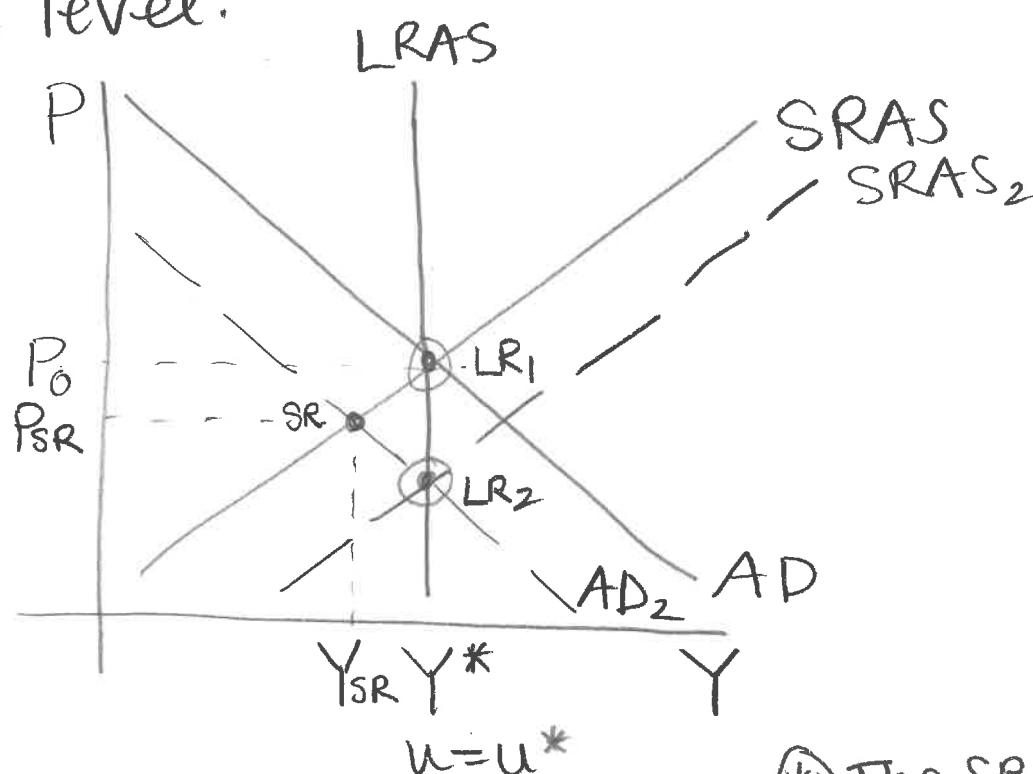
→ You should be very comfortable drawing this graph

\* We use this model to analyze the effect on the macroeconomy of different events:

- hurricanes
- recessions in other countries
- increases in taxes
- etc.

- something happens
- ↳ one (or more) of the curves moves
  - ↳ there's a short-run equilibrium
  - ↳ time passes, more curves move
  - ↳ there's a long-run equilibrium

Example: There's a recession in England because of Brexit. Find the short-run and long run effect on output, unempl., & price level.



$$\begin{array}{l} \text{SR} \\ \checkmark < Y^* \\ u > u^* \\ P \downarrow \end{array}$$

$$\begin{array}{l} \text{LR} \\ Y = Y^* \\ u = u^* \\ P \downarrow \end{array}$$

\* The SR is where AD meets the SRAS

\* The LR is where they're all =.

## \* Important Things to Remember:

- in the LR, we always end up back on the LRAS curve.  
↳ if you're not on the LRAS curve, you're not done.
- the SRAS curve is always the thing that gets us to the LR

AD shift  $\longrightarrow$  SRAS

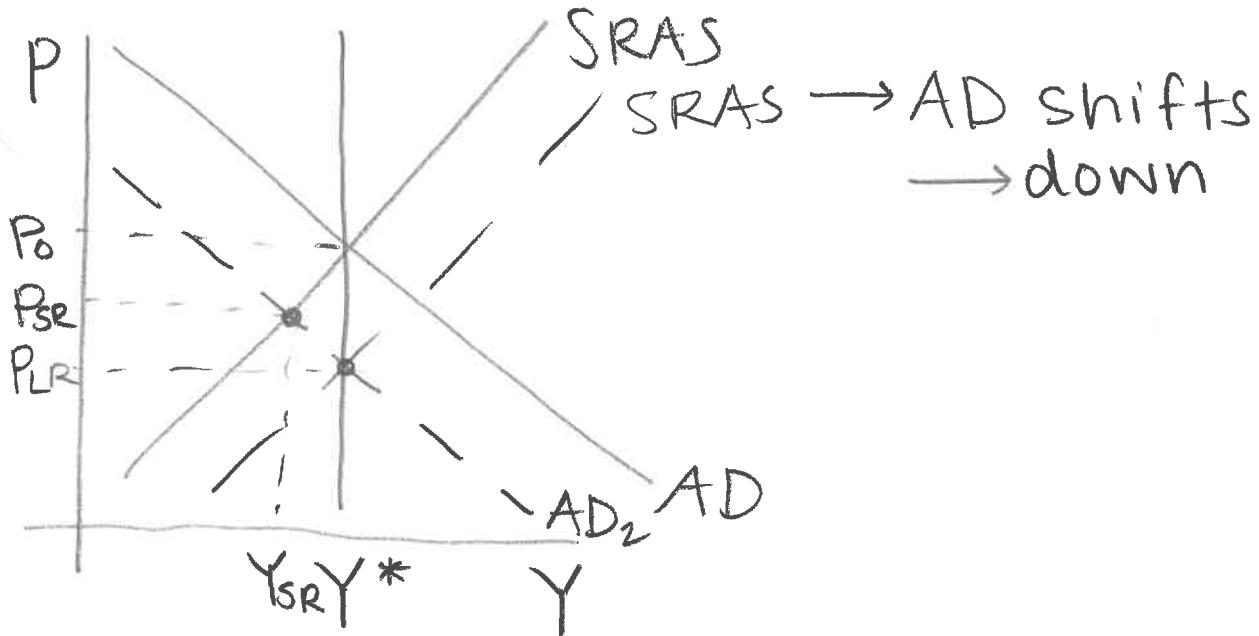
SRAS shift  $\longrightarrow$  SRAS

LRAS shift  $\longrightarrow$  SRAS

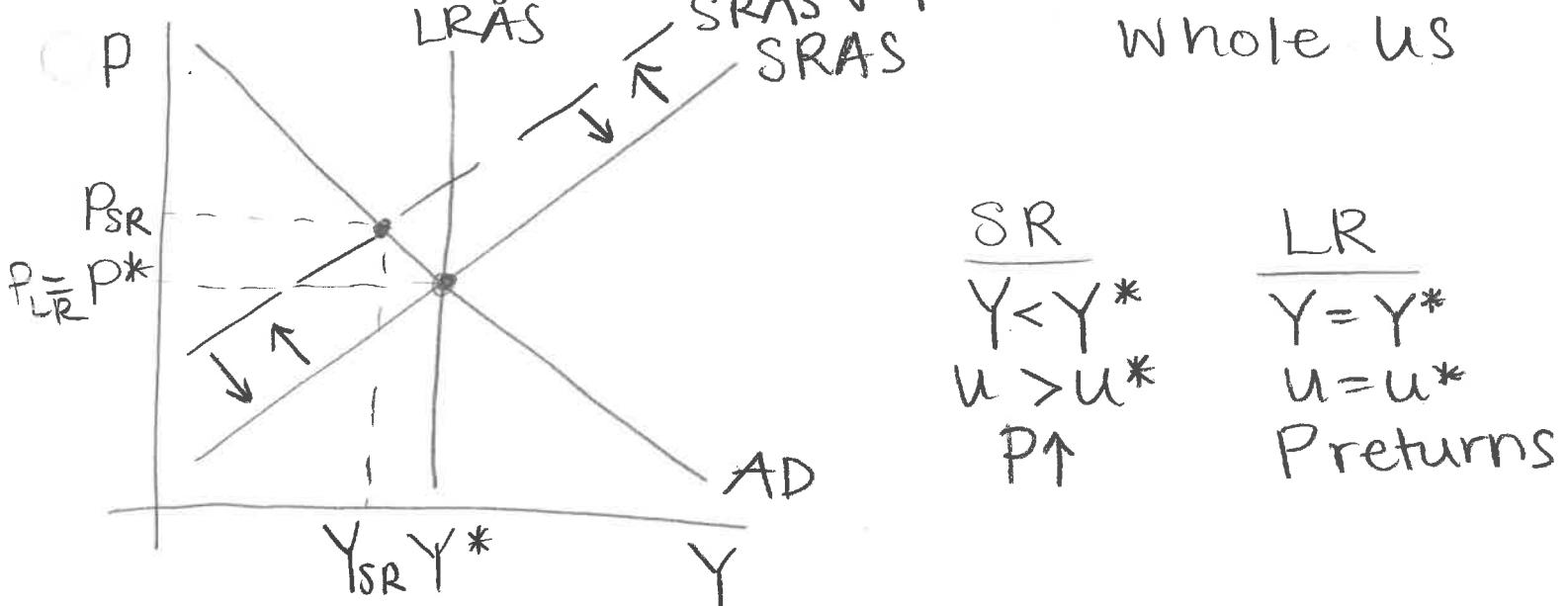
- it always moves the opposite way to Y.

## ○ Step-By-Step: (redo Brexit example)

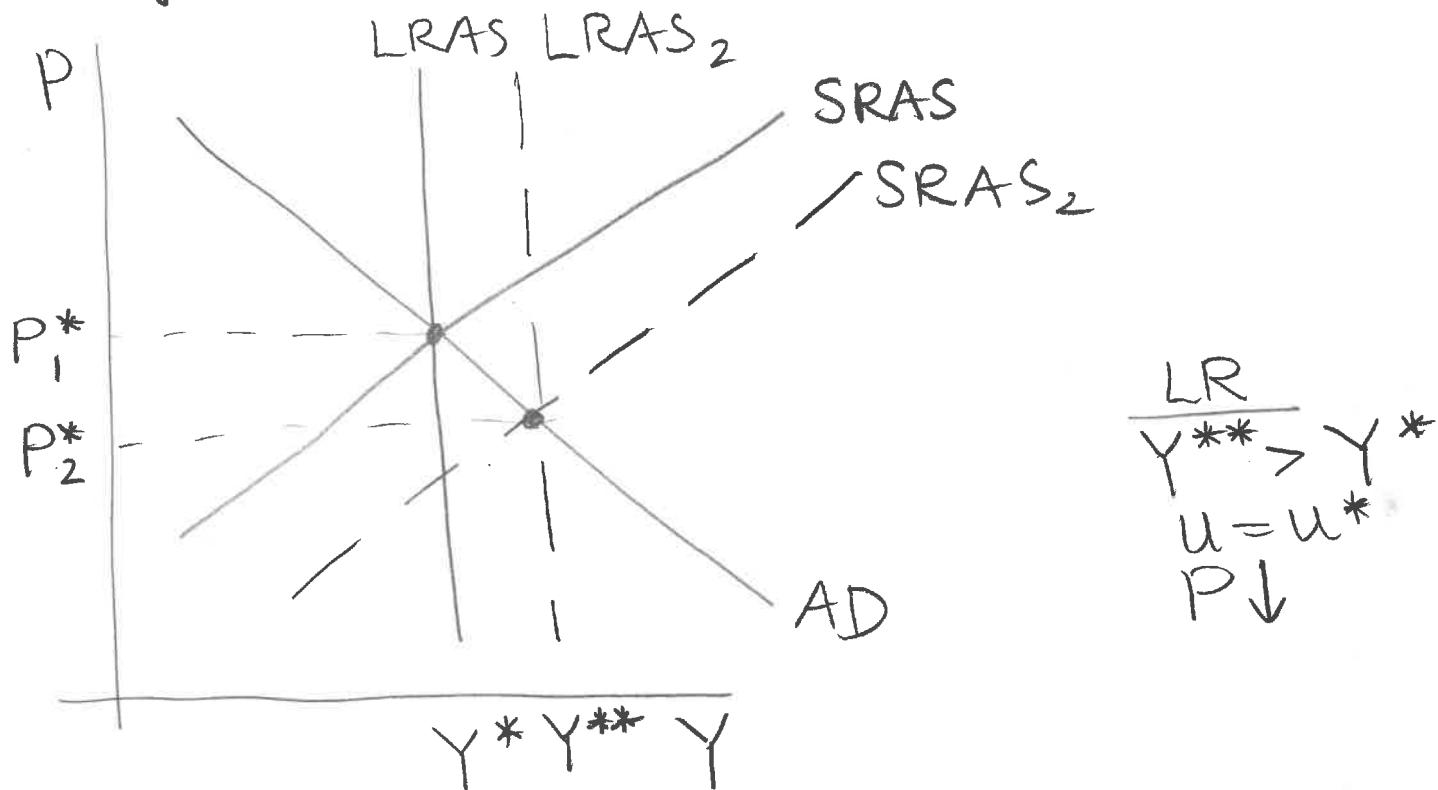
1. Set up the initial equilibrium.
2. Determine which curve(s) shift(s)
3. Determine which direction they shift
4. Determine the new SR equilibrium
5. Determine the new LR equilibrium.



Example 2: There's a huge flood in the Dakotas, affecting production in the whole US



Example 3: We develop a more efficient tax system, improving our institutions.



→ moves immediately to the new LR (no intermediate SR).

④ If AD shifts:

- move AD
  - ↳ find SR equilibrium
- move SRAS
  - ↳ find new LR equilibrium

\* IF SRAS shifts:

→ move SRAS

  ↳ find new SR equilibrium

→ move SRAS back

  ↳ find new LR equilibrium

\* IF LRAS shifts:

→ move both LRAS & SRAS at the same time

  ↳ find new LR equilibrium  
(no SR equilibrium)

Scenario:	Curve Affected:	Shift Factor:	Shift Direction:
1. The new tax bill goes into effect and we face lower taxes.	AD	Taxes	↑
2. The population in the country decreases, thereby decreasing our resources.	LRAS ( $\downarrow$ SRAS)	Resources	↓
3. Our economy enters an expansion and we see our incomes rise.	AD	Real Wealth	↑
4. Employers announce that next year everyone will face a pay cut.	AD	Expected Future Income	↑
5. The political upheaval in Venezuela temporarily increases our oil prices.	SRAS	Temporary Costs	↓
6. There is an expansion in China.	AD	Foreign Income & Wealth	↑
7. New laws are put in effect to fight corruption.	LRAS	Institutions	↑
8. Hurricane Katrina permanently damages our infrastructure in Louisiana and Mississippi.	LRAS	Resources	↓
9. Hurricane Harvey temporarily damages our infrastructure in Texas.	SRAS	Temporary Events	↓

# The Great Depression & the Great Recession

[Graph of log real GDP]

- Great Depression
- Great Recession

## ④ Classical Economic Theory

→ all prices adjust so quickly  
that there really isn't a short run  
↳ When AD falls, we just move  
immediately to the LR, return  
to  $Y^*$

Classical Economist: economists who  
stress the importance of AS & generally  
believe that the economy can adjust  
back to  $Y^*$  on its own.

## \* Key Aspects of Classical Economics

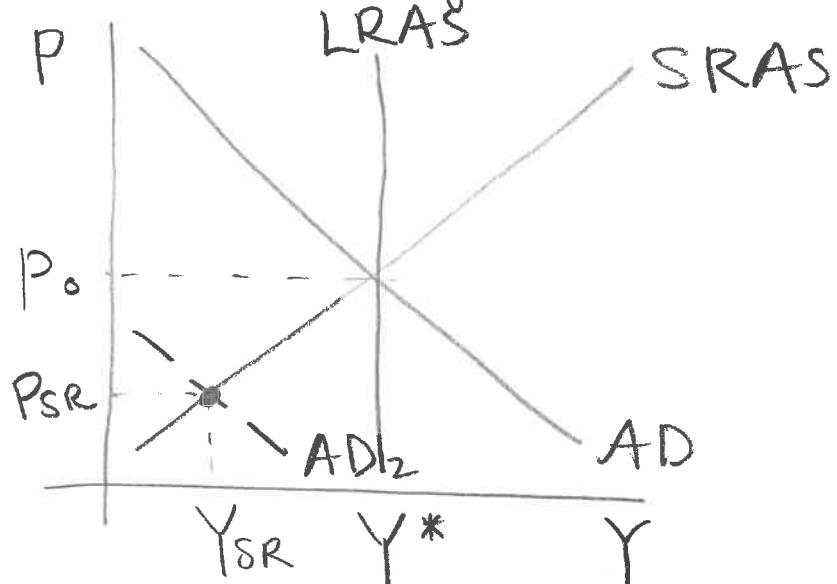
- all prices adjust
  - no extended unemployment
  - no significant recessions
  - economy inherently stable
- major focus on supply
  - then the Great Depression happened.
    - ↳ real GDP fell by 30%
    - ↳ extended & huge unemployment
      - $U > 25\%$  in 1933
      - $U > 14\%$  for the entire 30's.
    - ↳ massive deflation
      - P fell by 25%
  - it was unprecedentedly terrible and it lasted for a decade.
    - ↳ so what happened?

## \* Causes of the Great Depression

1. Real Wealth fell A LOT

2. The government fumbled the fix.

↳ they raised taxes



→ and it just stayed there for 10 years.

↳ needed to update the theory

## \* Keynesian Economic Theory

→ named for John Maynard Keynes

→ he said 2 fairly helpful things:

1. Prices are stickier downward

↳ so when AD falls (like in the Depression), it takes longer for SRAS to get us to the LR.

2. "In the long run, we're all dead."

↳ maybe prices adjust, maybe they don't, but regardless there is an intermediate time & we have to live in that time.

## ④ Key Features of Keynesian Economics

- many prices are inflexible
  - especially downward.

Keynesian Economist: stress the importance of AD & believe the economy needs help  
→ So if supply isn't going to get us to the LR, maybe the government can.

↳ opportunity for gov. to play a role.

↳ gov. spending is a shift factor in AD

↳ maybe shift it back

→ But then the Great Recession happened.

- ↳ (relatively) small drop in output
- ↳ but the recovery took so long.  
(unusually so)

## ④ Causes of the Great Recession

### 1. Real Wealth Fell

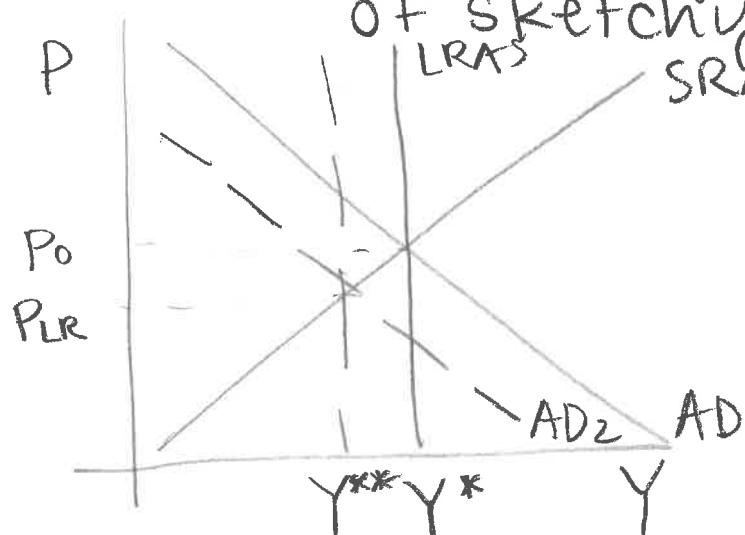
→ the housing market crashed

### 2. The government somewhat fumbled the response

↳ regulated the financial sector

↳ stabilized things

↳ but decreased our institutions  
(harder to get huge amounts  
of sketchy loans)



## Ch. 15 [Intro to Fiscal Policy]

\* There are 2 ways for the federal government to affect the macroeconomy

\* 1. **Fiscal Policy:** how the federal government spends their money (& collects yours)

2. **Monetary Policy:** how the Federal Reserve sets interest rates & the Treasury affects the money supply

(Money & Banking, Spring 2020!)

\* The Federal Budget

→ the federal government's plan  
outlays & revenue → mostly taxes

→ Government Spending ( $G$ )  
Transfers (Medicare,  
Social Security, etc)

[graph of how outlays have changed over time]

→ two types of outlays:

- mandatory (mandated by current laws)
- discretionary (at the discretion of the President & Congress)

→ mandatory outlays are larger than discretionary

↳ in part because they include Social Security, Medicare, & income assistance.

\*) Social Security: government administered retirement program

→ everyone needs to save for retirement

↳ this is the gov. doing it for you.

→ While you're working the gov. "sets aside" some of your paycheck

→ then when you retire, they "give it back."

→ they spent (& continue to spend) the money though

↳ at the current rate, they'll run out of money before we retire  
↳ so plan accordingly

(\*) Medicare: government-fund (and administered) insurance for people over 65

→ "Medicare for all" is in the news right now.

↳ it's not clear whether it would help or hurt the macro economy  
↳ it would cost an insane amount of money but we already spend an insane amount of money on insurance / health care.

[us age distribution]

[federal government outlays]

→ take aways from this graph

1. Mandatory > Discretionary
2. Biggest Component of Mandatory:  
Social Security & Medicare
3. Biggest Component of Discretionary  
Defense

→ so that's what the government is spending its money on.

↳ Where does the money come from?

### \* Taxes

→ almost all of the government's revenue (money coming in) is from taxes

↳ and almost all of that comes from income & social security taxes (= payroll taxes).

→ When you get a paycheck, they take these out before you get the money.

[tax revenue pie graph]

[tax revenue over time]

→ note that tax revenue goes down during recessions because people's incomes go down.

④ How do income taxes work?

marginal tax rate: the percentage of the next dollar that you pay in taxes.

→ We have a progressive tax system

↳ this means the marginal tax rate gets bigger for higher income levels.

# Income Tax Schedule; (2017)

Between:	Marg. Tax Rate
[0, 9,325)	10%
[9,325, 37,950)	15%
[37,950, 91,900)	25%
[91,900, 191,650)	28%
;	
;	
;	

→ so it's not just like oh you make \$30,000 so you pay  $0.15(30,000) = \$4,500$

→ you pay 10% on the first 9,325 and 15% on the remaining  $30,000 - 9,325 = 20,675$   
 $0.10(9325) + 0.15(20,675)$   
 $932.5 + 3,101.25 = 4,033.75$   
(which is less).

# Money & Banking

## \* Overview of the Banking System

→ We're going to talk about commercial banks (like the ones you & me use for checking accounts)

↳ hot investment banks

→ Commercial banks are:

- the middle man for loanable funds
- the channel for monetary policy

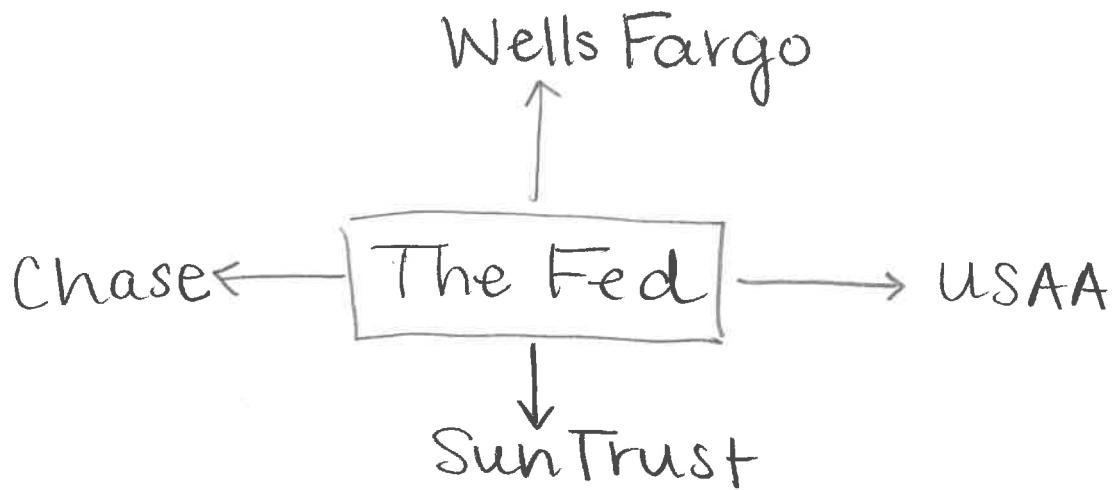
↳ how the Federal Reserve increases or decreases the money supply

→ banks keep your money safe

→ banks loan out money

→ the Federal Reserve is the central bank of the US.

↳ it's the bank for commercial bank



④ The Fed has 2 tools for affecting the money supply ( $M$ ):

1. The Reserve Requirement Ratio ( $r$ )
2. Open Market Operations (OMO)

(the book lists 3, but Quantitative Easing is just a kind of OMO)

1. The Reserve Requirement Ratio  
→ the Fed tells banks what proportion of the money they have that they can lend out & the proportion that they have to hold in reserve.

Bank Reserves: bank assets that are kept in the form of cash in the vault or deposits in the central bank (the Fed)  
= TR (for total reserves)

Required Reserves: the dollar amount of reserves a bank is required to set aside (& not loan out) = RR

↳ this is determined by the required reserve ratio

$$RR = rr \times \text{deposits}$$

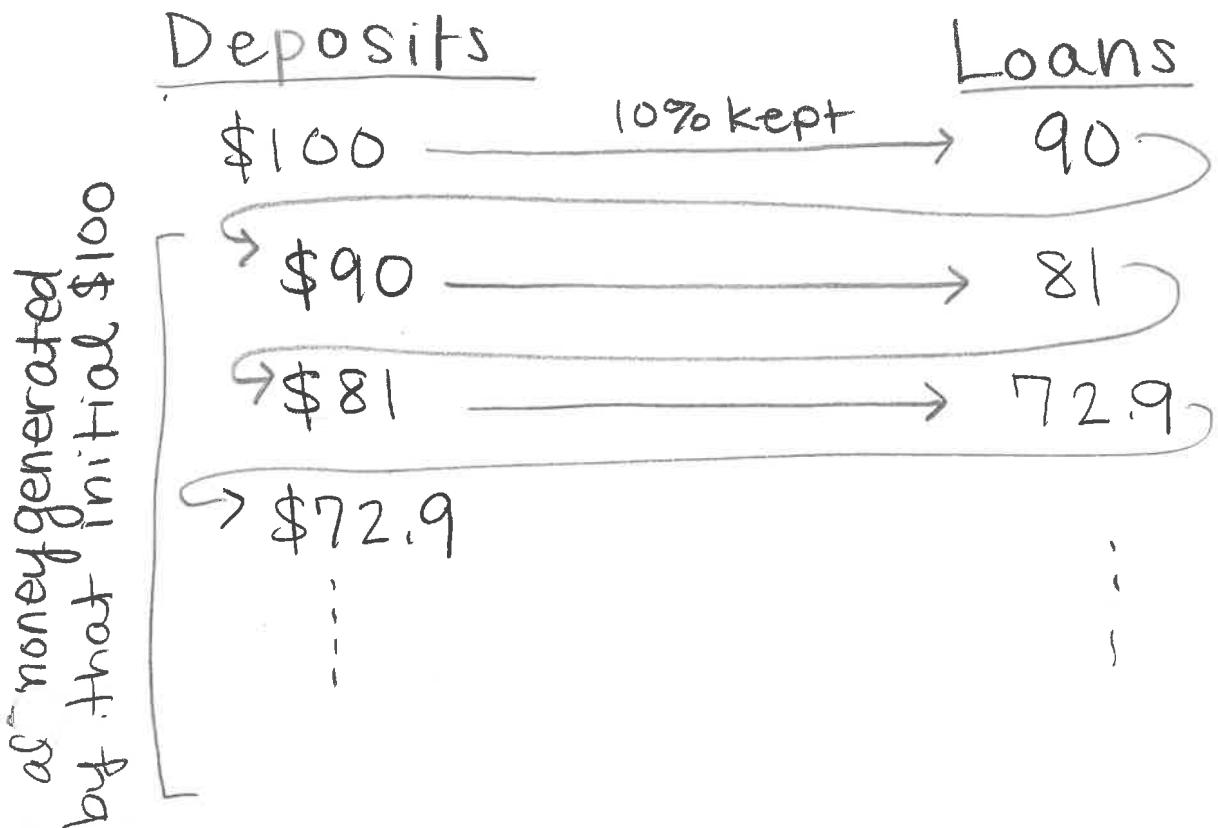
Excess Reserves: Reserves held in excess of the Fed requirements = ER

↳ because banks make money by loaning out money, they usually keep excess reserves pretty low.

$$TR = RR + ER$$

→ Ok, but how does this create money?

→ Let's say a bank has \$100 in deposits and the  $rr = 10\%$ .



→ if the Fed lowers the required reserve ratio, the amount of money in circulation.

→ the simple money multiplier,  $m^m$ , describes how the initial deposit multiplies based on the required reserve ratio.

$$m^m = \frac{1}{rr}$$

→ so \$100 turns into  $(\frac{1}{0.10})(100)$   
= \$1000 when the rr is 10%.

↳ this is how the Fed changes  
the amount of money in the  
Economy w/ the rr.

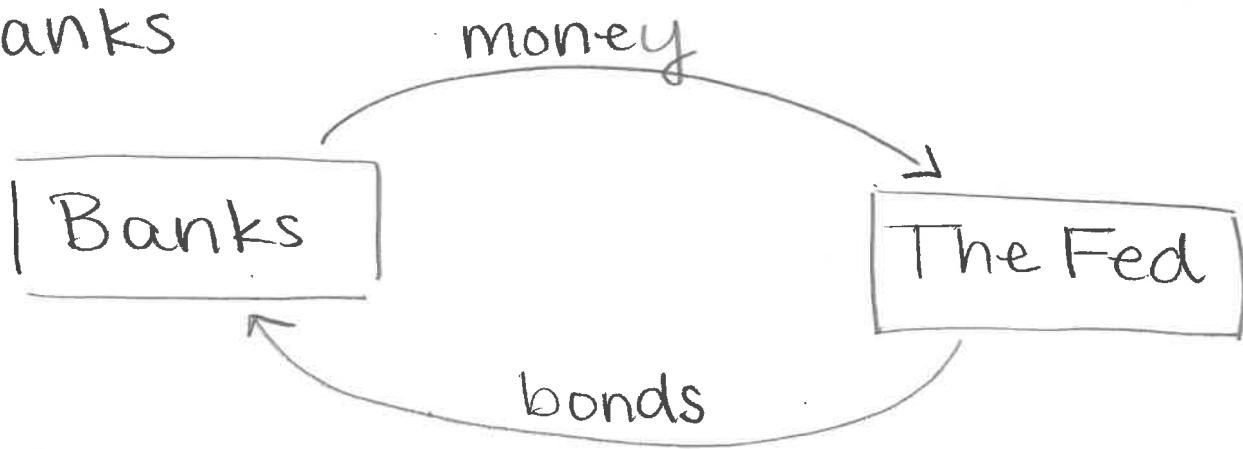
↳ if they increase it to 15%  
\$100 turns into  $(\frac{1}{0.15})(100) = \$666.67$

↳ if they decrease it to 5%  
\$100 turns into  $(\frac{1}{0.05})(100) = \$2000$

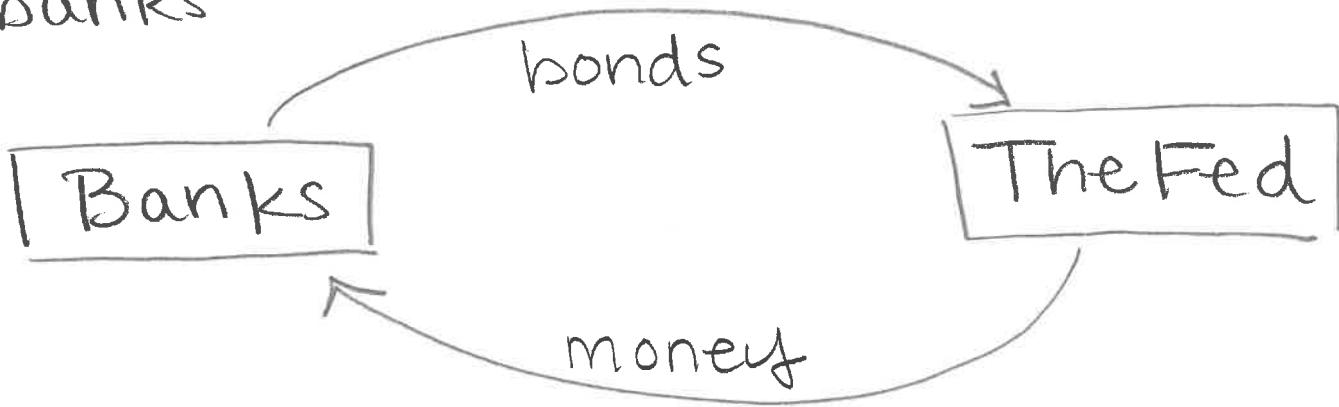
## 2. Open Market Operations

= buying and selling government  
bonds ("treasury securities")

→ to decrease the money supply  
the Fed sells bonds to commercial  
banks



→ to increase the money supply  
the Fed buys bonds from commercial banks



→ this is a more direct way of affecting the money supply  
↳ just drop money straight into the economy