Gwinnett School of Math, Science, and Technology

Macroeconomics Yearlong Notes

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1st Period

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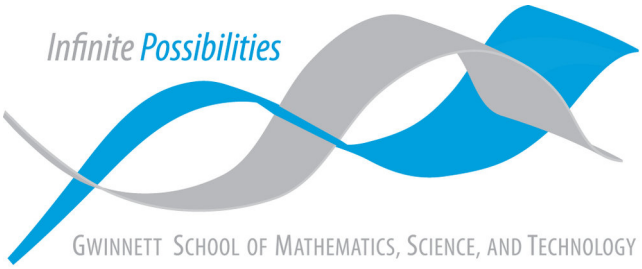

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1 Types of Goods (01/08)

1.1 Characteristics of the Four Types of Goods

- **Rivalrous** goods are those that can only be consumed by one person at a time.
- **Non-rivalrous** goods are those that can be consumed by multiple people at the same time.
- **Excludable** goods are those that can be restricted to certain people.
- **Non-excludable** goods are those that cannot be restricted to certain people.
- If a public good is overcrowded enough, it can become a common resource

1.2 The Four Types of Goods

	Non-rivalrous	**Rivalrous**
Non-excludable	*Public Goods* (e.g. Sunset, Common Knowledge)	*Common-Pool/Common Resources* (e.g. Irrigation Systems, Libraries)
Excludable	*(Toll/Club/Artificially Scarce) Goods/Natural monopolies* (e.g. Day-Care Centers, Country Clubs)	*Private Goods* (e.g. Donuts, Personal Computers)

1.3 Examples

Case Scenario	Type of Good/Service
A college education	Artificially scarce
A manicure or pedicure	Private good
Stone Mountain park	Artificially scarce
State park campgrounds	Artificially scarce
National defense	Public good
Peach Pass lane on I-85	Artificially scarce
Fish in the ocean	Common resource
Street lights	Public good
Netflix/Hulu	Artificially scarce
Flu shot	Private good
Tornado safety shelter	Public good
Bottled water in a tornado safety shelter	Common resource
Hearing a tornado siren	Public good
Going to an almost empty public beach	Public good
Going to an overcrowded public beach	Common resource
St. Lawrence SeaWay	Natural monopoly
Flying on a commercial airplane	Natural monopoly
Flying a single seat private airplane	Private good
Wedding guests eating a slice of the wedding-cake	Common resource
Cake sold at a bakery	Private good

2 Introduction to Externalities (01/09-01/10)

2.1 Overview

- An **externality** is a cost/benefit that affects a *third party* who did not choose to incur that cost/benefit.
- They are a type of **market failure** because they are *not* accounted for in the price of the good/service.
- The deadweight loss (DWL) of positive externalities will point to the right and vice-versa for negative externalities.
  - Which means the DWL triangle always points to the social optimum quantity.

2.2 Internalizing an Externality (aka *how to fix an externality*)

2.2.1 Problems with externalities

1) Private individuals won't take into account the external costs/benefits
2) Public goods and common pool resources tend to lack property rights

2.2.2 Coase Theorem (the fix!)

"We can fix externalities without the government if we..."

1) Give property rights to people
2) Minimize transaction costs

2.2.3 Examples

Methods the government can employ to internalize an externality in a free market:

- Pollution or emission limits
- "Pollution credits" for private firms to buy and sell in the market

2.3 Positive Externality in Consumption

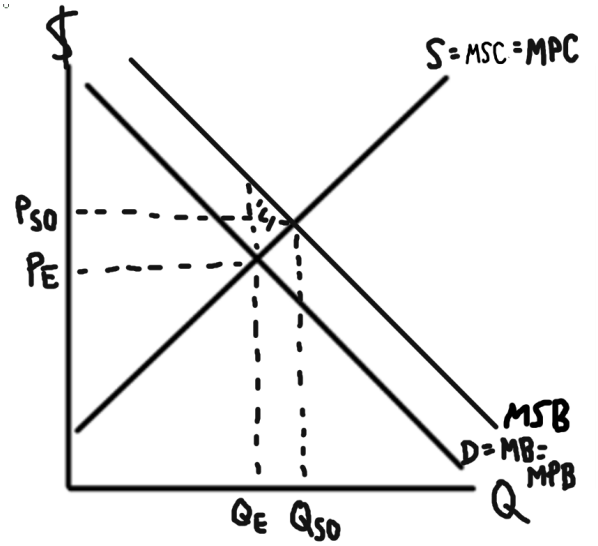


Figure 1: Positive Externality in Consumption

2.3.1 Examples

- Consumption of education
- Consumption of health care
- Advertisement can lead to an increase of demand in the free market ∴*MPB* goes up and moves the market toward *MSB*.

2.3.2 Spillover Effect

- The spillover effect is $MEB = MSB - MPB$.
- $MPB < MSB$
- $MPC = MSC$

2.3.3 Internalizing the Spillover Effect

- The external **benefits** can be internalized by **subsidizing** the product/service to the consumers of the good/service.
- The government intervention will move the private market to **social optimum** where $MSB = MSC$.

2.4 Negative Externality in Consumption

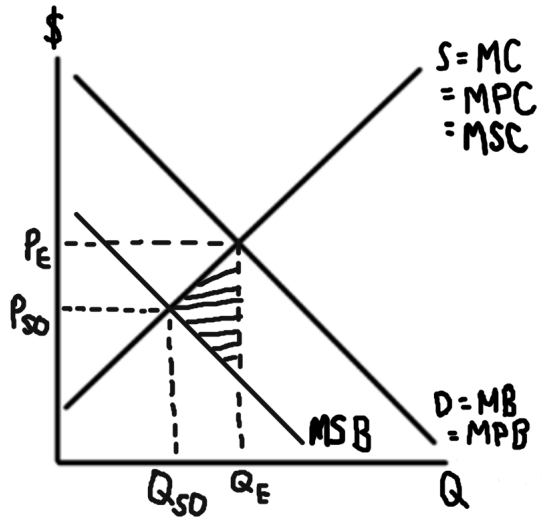


Figure 2: Negative Externality in Consumption

2.4.1 Examples

- Smoking in public/passive smoking
- Pollution due to fossil fuels
- Playing loud music
- Discarding garbage in public places

2.4.2 Spillover Effect

- The spillover effect is $MEB = MSB - MPB$.
- $MPB > MSB$
- $MPC = MSC$

2.4.3 Internalizing the Spillover Effect

- The external **benefits** can be internalized by **imposing a tax** on the product/service to the consumers of the good/service.
- The government intervention will move the private market to **social optimum** where $MSB = MSC$.

2.5 Positive Externality in Production

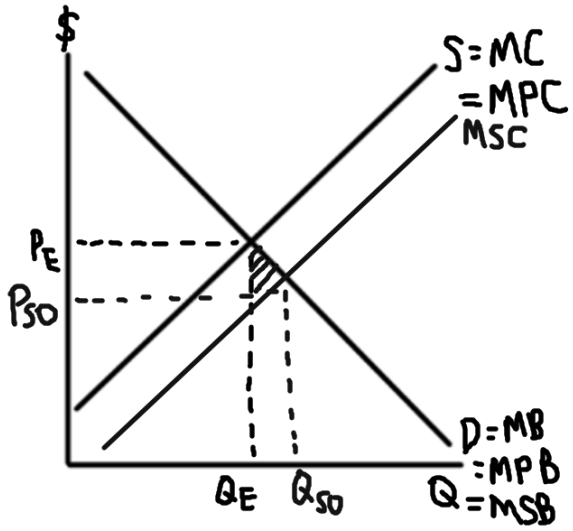


Figure 3: Positive Externality in Production

2.5.1 Examples

- Companies invest in training/professional development of their employees.
- Firms invest in research and development (R&D).

2.5.2 Spillover Effect

- The spillover effect is $MEC = MSC - MPC$.
- $MPB = MSB$
- $MPC > MSC$

2.5.3 Internalizing the Spillover Effect

- The external **costs** can be internalized by **subsidizing** the product/service to the producers of the good/service.
- The government intervention will move the private market to **social optimum** where $MSB = MSC$.

2.6 Negative Externality in Production

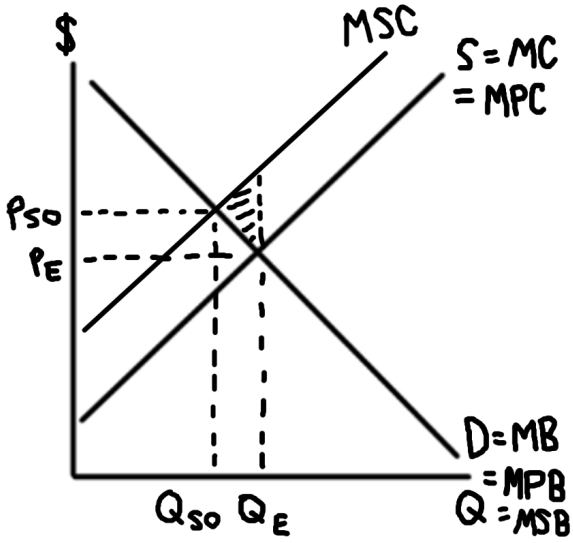


Figure 4: Negative Externality in Production

2.6.1 Examples

- Firms produce chemicals that cause pollution ∴ local fisherman cannot catch fish.
- Construction of roads lead to change of landscape and parks
- Coal fired power plants

2.6.2 Spillover Effect

- The spillover effect is $MEC = MSC - MPC$.
- $MPB = MSB$
- $MPC < MSC$

2.6.3 Internalizing the Spillover Effect

- The external **costs** can be internalized by **imposing a tax** on the product/service to the producers of the good/service.
- The government intervention will move the private market to **social optimum** where $MSB = MSC$.

3 Income Inequality (01/12)

3.1 The Lorenz Curve and Gini Coefficient

- The **Lorenz Curve** $L(x)$ is a graphical representation of the distribution of income in a country.
  - The x-axis is the cumulative percentage of the population (0%-100%).
  - The y-axis is the cumulative percentage of income (0%-100%).
  - It is always accompanied by the line $y = x$ which represents **perfect equality**.
- The **Gini Coefficient** G is a numerical representation of the Lorenz Curve.
  - It is the ratio of the area between the Lorenz Curve and the line $y = x$ to the area under the line $y = x$.
    - $G = \frac{A}{A+B}$ where $A = \int_0^1 [x - L(x)]\ \mathrm{d}x$ and $B = \int_0^1 L(x)\ \mathrm{d}x$.
  - The closer G is to 1, the more unequal the distribution of income is.

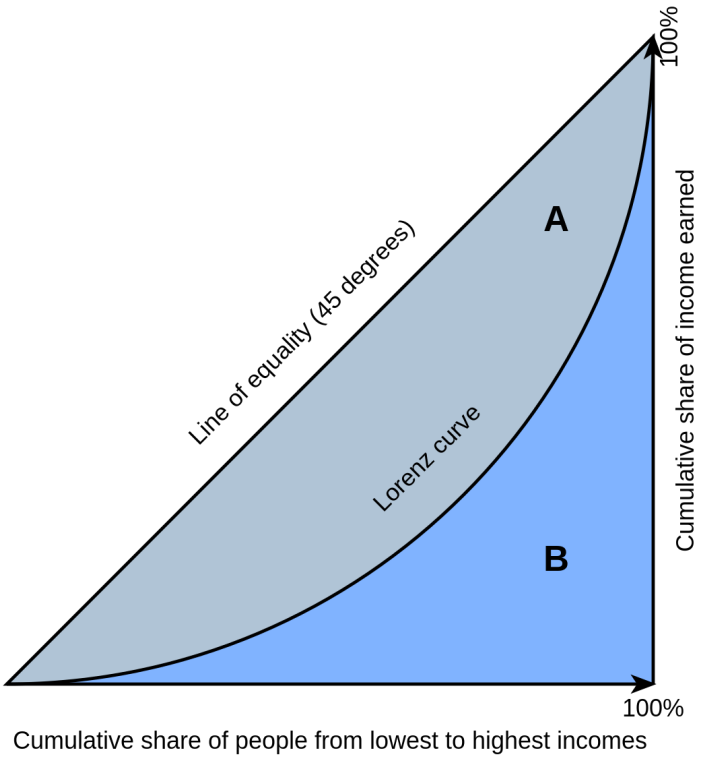


Figure 5: Visual depiction of the Lorenz Curve

As demonstrated in *Figure 6* below:

- If G is 0, then the Lorenz Curve is **also** the line $y = x$ because the area between both curves A is 0.
- If G is 1, then the Lorenz Curve is the x-axis ($y = 0$) because $A + B$ must also equal the area under $y = x$, or $\frac{1}{2}$.

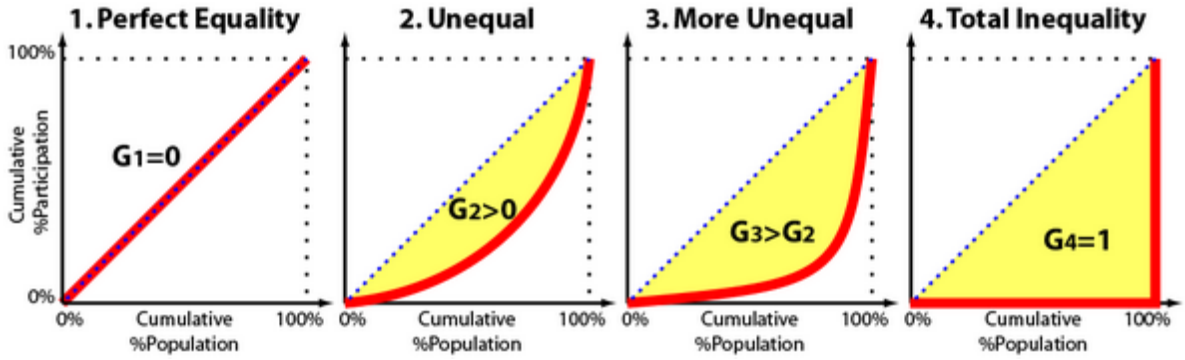


Figure 6: Varying Gini Coefficients and their corresponding Lorenz Curves

3.2 Deriving Simpler Expressions for the Gini Coefficient

Since we know that $A + B = \int_0^1 x \, dx = \frac{x^2}{2}\Big|_0^1 = \frac{1}{2}$, we can derive "easier" expressions to calculate the Gini Coefficient G.

3.2.1 Deriving $G = 2A$

$$G = \frac{A}{A + B} \qquad \text{(Initial Gini Coefficient formula)}$$

$$\frac{1}{G} = \frac{A + B}{A} \qquad \text{(Reciprocate)}$$

$$\frac{A}{G} = A + B \qquad \text{(Multiply by } A\text{)}$$

$$\frac{A}{G} - A = B \qquad \text{(Subtract } A\text{)}$$

Now we can substitute B into the original area formula:

$$A + B = \frac{1}{2} \quad \text{(Area under } y = x\text{)}$$
$$A + \left(\frac{A}{G} - A\right) = \frac{1}{2} \quad \text{(Substitute } B\text{)}$$
$$\frac{A}{G} = \frac{1}{2} \quad \text{(Simplify)}$$
$$\frac{A}{\frac{1}{2}} = G \quad \text{(Simplify)}$$
$$2A = G \quad \text{(Multiply by 2)}$$

3.2.2 Deriving $G = 1 - 2B$

Since we've already expressed B in terms of A, we just need to get A in terms of B.

$$G = 2A \quad \text{(Previous derivation)}$$
$$\frac{G}{2} = A \quad \text{(Divide by 2)}$$
$$\frac{G}{2} = \frac{1}{2} - B \quad \text{(Substitute } A \text{ using the expression } A = \tfrac{1}{2} - B\text{)}$$
$$G = 1 - 2B \quad \text{(Multiply by 2)}$$

Therefore, two **alternate expressions** for the Gini Coefficient are:

$$G = 2A \quad (1)$$
$$G = 1 - 2B \quad (2)$$

4 Negative Externalities: Public vs. Private Resolution and More on the Coase Theorem (01/16)

4.1 Conditions

Recall that the **Coase Theorem** states market failures will always be resolved by the free market. Here are all the conditions for Coase Theorem to hold true:

- Both sides are rational and willing to negotiate to maximize their own utility.
- Low to no transaction costs
- Private property rights are well-defined
- Perfect information is available to both sides and they have the same leverage

4.2 Miscellaneous Market Failures

There are a couple of other market failures that the government should try to combat, based on the types of markets we learned about *in previous units*:

- **Monopoly**: A single firm controls the entire market.
  - This will cause the firm to produce *less* than the social optimum and still charge a *greater price*.
- **Monopsony**: A single firm controls the entire labor market.
  - This will cause the firm to hire *less* than optimum and for a *lower wage*.

5 Intro to Macronomic Indicators (01/22-01/23)

GDP stands for **Gross Domestic Product.** Those three words are important to understand:

- Gross: Not just profits - *total* value
- Domestic: Made WITHIN the borders of the US
- Products: Goods and services which have been produced

Formal definition of GDP: **GDP** is: the sum of the market value of all final goods and services produced within the United States in a given time period (usually a year).

Concept	Is	Is NOT
Sum	TOTAL	Single industry or market
Value	Based on the market price of the goods and services	subjective
Final	new and complete goods and services; ready for use	intermediate goods/services; used goods
G&S	ONLY a good or service	FINANCIAL ASSETS (Stock/Bonds/ETFs/Crypto)
Produced Domestically	MADE WITHIN US borders	transfer payments or foreign aid US citizens abroad
Time	This year (NEW production)	OLD G&S, Goodwill

5.1 Calculating GDP

GDP is known as tam easure of *national income accounting*. What are the two accounting techniques used in measuring GDP?

- **Expenditure Approach**: Measures GDP by adding up all the spending on final goods and services produced in the nation during the year.
  - $GDP = C + I + G + (X - M)$; C=Consumption, I=Investment, G=Government Spending, X=Exports, M=Imports
- **Income Approach**: Measures GDP by adding up all the income earned by the factors of production (land, labor, capital, entrepreneurship) during the year.
  - $GDP = W + I + R + P$; W=Wages, I=Interest, R=Rents, P=Profits
- Therefore, $GDP = C + I + G + (X - M) = W + I + R + P$

5.2 Circular Flow Model and Leakages

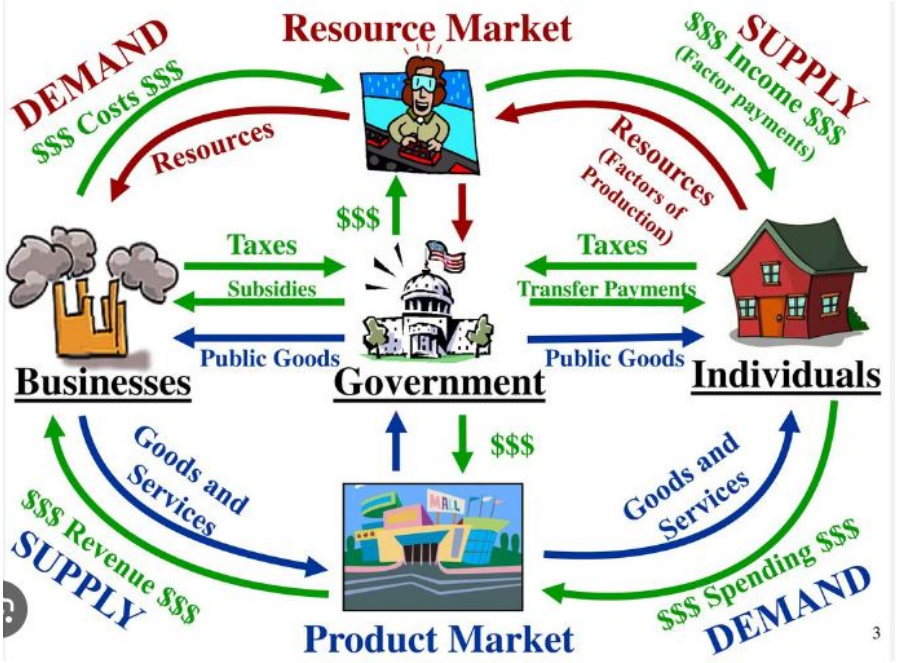


Figure 7: Circular Flow Model

- **Leakages** are the non-consumption uses of income, such as savings, taxes, and imports.
- Your piggy bank and transfer payments are leakages.

5.3 Gross National Product

- **GNP** is the sum of the value of all final goods and services prodced by Americans anywhere in the world during a time period.

5.4 Examples of Factors that Affect GDP

5.4.1 Which of these is Counted in GDP?

- A monthly check received by an economics student who has been granted a government scholarship ×
- **A farmer's purchase of a new tractor**

- A plumber’s purchase of a two-year-old used truck ×
- Cashing a U.S. government bond ×
- The services of a mechanic in fixing the radiator in his own car ×
- A Social Security check from the government to a retired store clerk ×
- **An increase in business inventories**
- **The government’s purchase of a new submarine for the Navy**
- **A barber’s income from cutting hair**
- Income received from the sale of Nike Stock ×

5.4.2 Which of these is counted in GDP and part of consumption?

- **You Spend $7 at the movies**
- A family pays a contractor $200k for a house he built them this year ×
- A family pays $75k for a house built three years ago ×
- **An accountant pays a tailor $175 to sew a suit for her**
- The government increases its defense expenditures by $1 billion ×
- The government makes a $300 Social Security payment to a retired person ×
- You buy General Motors Corp. stock for $1k in the stock market ×
- At the end of the year, a flour-milling firm finds that its inventories of grain and flour are $10k above the amounts of its inventories at the beginning of the year ×
- A homemaker works hard caring for her spouse and two children ×
- Ford Motor Co. buys new auto-making robots ×
- **You pay $300 a month to rent an apartment**
- Apple Computers builds a new factory in the US ×
- RJ Reynolds Co. buys control of Nabisco ×
- You buy a new Toyota that was made in Japan ×
- **You pay tuition to attend college**

5.4.3 Which of these is Counted in GDP and part of investment?

- **A family pays a contractor $200k for a house he built them this year**
- A family pays $75k for a house built three years ago ×
- The government increases its defense expenditures by $1 billion ×
- The government makes a $300 Social Security payment to a retired person ×
- You buy General Motors Corp. stock for $1k in the stock market ×
- **At the end of the year, a flour-milling firm finds that its inventories of grain and flour are $10k above the amounts of its inventories at the beginning of the year**
- A homemaker works hard caring for her spouse and two children ×
- Ford Motor Co. buys new auto-making robots ×
- **Apple Computers builds a new factory in the US**

- RJ Reynolds Co. buys control of Nabisco ×
- You buy a new Toyota that was made in Japan ×

5.4.4 Which of these is Counted in GDP and part of government spending?

- A family pays $75k for a house built three years ago ×
- **The government increases its defense expenditures by $1 billion**
- The government makes a $300 Social Security payment to a retired person ×
- You buy General Motors Corp. stock for $1k in the stock market ×
- A homemaker works hard caring for her spouse and two children ×
- RJ Reynolds Co. buys control of Nabisco ×
- You buy a new Toyota that was made in Japan ×

5.4.5 Which of these is Counted in GDP and part of net export/import?

- A family pays $75k for a house built three years ago ×
- The government makes a $300 Social Security payment to a retired person ×
- You buy General Motors Corp. stock for $1k in the stock market ×
- A homemaker works hard caring for her spouse and two children ×
- RJ Reynolds Co. buys control of Nabisco ×
- **You buy a new Toyota that was made in Japan**

5.4.6 We count only the final price of a good or service in GDP. Why?

We don't count intermediate and used goods/services because then we would be **double-counting**; also, the good/service in question might have not been made in the time period analyzed if it wasn't final.

5.4.7 A purely financial transaction will not be counted in GDP. Why?

Because a purely financial transaction doesn't involve consumption, investment, government spending, exports, or imports.

5.4.8 When a home-owner does home-improvement work, the labor is not counted in GDP. Why?

They're not paying themself or making any profits off of their work to contribute to the income approach for calculating GDP.

5.5 Calculating GDP Examples (I didn't finish this)

5.5.1 Example 1

Suppose that personal income is $500 billion, personal taxes are $100 billion, and depreciation is $50 billion. Disposable income is equal to which of the following?

$DI = PT - PT = 100 - 50 = \$50$ billion

5.5.2 My Practice

Suppose that personal income is $100 billion, personal taxes are $50 billion, and depreciation is $25 billion. Disposable income is equal to which of the following?

5.5.3 Example 2

Wages	$50 Billion
Rent	$20 Billion
Private Investment Spending	$10 Billion
Exports	$30 Billion
Interest Payments	$40 Billion
HH Profit	$80 Billion

What is the GDP? $GDP = W + R + I + X + P = 50 + 20 + 10 + 30 + 80 = \$190$ billion

5.5.4 My Practice

Wages	$90 Billion
Rent	$40 Billion
Private Investment Spending	$10 Billion
Corporate Taxes	$50 Billion
Interest Payments	$100 Billion
HH Profit	$90 Billion

What is the GDP? $GDP = W + R + I + X + P = 90 + 40 + 10 + 0 + 90 = \$230$ billion

5.5.5 Example 3

Consumption Spending	$50 Billion
Individual Income Taxes	$20 Billion
Private Investment Spending	$10 Billion
Corporate Taxes	$20 Billion
Exports	$30 Billion
Imports	$40 Billion
Government Purchases	$80 Billion

What is the GDP?

5.5.6 My Practice

Consumption Spending	$70 Billion
State Income Taxes	$10 Billion
Private Investment Spending	$50 Billion
Corporate Taxes	$80 Billion
Net Exports	-$40 Billion
Government Purchases	$50 Billion

What is the GDP?

Using the prior table and the expenditure approach, what percent of GDP is comprised of consumption, investment, and government spending?

How is this possible?

If a firm experiences depreciation of factor resources, which component of GDP is negatively affected?

5.5.7 Example 4

Aggregate Data	Value (Billions)
Consumption Spending	10
Employee Compensation	7
Government Spending	60
Interest Payments	10

Net Exports	-50
Profits	5
Rents	5
Savings	10

Calculate GDP using both approaches.

Do both approaches yield equal GDP values? Why or why not?

5.5.8 My Practice

Aggregate Data	Value (Billions)
Consumption Spending	190
Employee Compensation	200
Government Spending	100
Interest Payments	100
Investment Spending	90
Net Exports	60
Profits	50
Rents	50
Savings	50

Calculate GDP using both approaches.

Do both approaches yield equal GDP values? Why or why not?

5.5.9 Example 5

A country consists of 2 firms. Firm A's total revenue is $200 million. The cost of their inputs is $50 million. Firm B's total revenue is $100 million. The cost of their inputs is $10 million. What is the total value added in this economy?

5.5.10 My Practice

Kingdom of Burbonia	Firm A	Firm B	Firm C
Firm's Sales	20	50	100
Cost of Intermediate Goods Purchased by Each firm	10	40	40

What is the total value added in the Kingdom of Burbonia, measured in millions of dollars?

5.5.11 Challenge Problem

Consumption is one third of total GDP. Gross Private Investment Spending and Government Spending, Combined, are equal to consumption spending. Exports are twice the number of imports. Imports are $50 million. Government spending is four times as much as investment.

What is consumption spending?

What is investment spending?

What is government spending?

What are exports?

What is GDP?

6 Advanced GDP Calculations (01/25)

6.1 NGDP vs. RGDP

6.1.1 If we want to measure the amount of production using current prices, what economic measure should we use?

Nominal GDP

6.1.2 If we want to measure the amount of production using base year prices, what economic measure should we use?

Real GDP

6.1.3 Define "REAL"

Accounting for inflation by referencing some initial level of price.

6.1.4 What does RGDP show?

The measure of true product, accounting for inflation

6.1.5 What are the formulas for types of GDP?

Nominal GDP	Real GDP
$\Sigma(Q_c \cdot P_c)$	$\Sigma(Q_c \cdot P_{c,\text{base}})$

6.1.6 Growth rate (percent change) formula:

$$\frac{\text{New GDP} - \text{Old GDP}}{\text{Old GDP}} \cdot 100\%$$

For the base year, the RGDP always equals the NGDP.

6.1.7 Standard of living

- We use RGDP to measure the standard of living because it accounts for inflation.
- RGDP per capita is the best measure of standard of living.

6.1.8 Inflation/Deflation

- $\frac{NGDP}{RGDP} \cdot 100\%$ is the deflator value (DF).
- If $DF > 100\%$ ($NGDP > RGDP$), there is inflation.
- If $DF < 100\%$ ($NGDP < RGDP$), there is deflation.
- If $DF = 100\%$ ($NGDP = RGDP$), prices are staying the same.
- Disinflation is when the rate of inflation is decreasing, but inflation is still occurring nonetheless.
- The deflator is always 100% in the base year.

6.1.9 What limitations does GDP have as an economic measure?

- It doesn't account for non-market production (e.g. stay-at-home parents)
- It doesn't account for the underground economy (e.g. drug dealers)
- It doesn't account for negative externalities (e.g. pollution)

7 Unemployment (01/29)

7.1 Questions on introductory unemployment terms

1. Who constitutes as being employed?

If they worked full or part time during the past week or is on vacation or sick leave from a regular job.

2. Who constitutes as being unemployed?

If they did not work during the preceding week but made some effort to find work in the past four weeks.

3. Who constitutes as being out of the labor force?

People who are not employed and haven't looked for a job in four weeks. Institutionalized (prison), military, and those younger than 16 as well. Discouraged workers, full time students, unpaid homemakers, and retirees are examples.

4. Who constitutes a discouraged worker? Do they cause an underestimate or overestimate of the unemployment rate?

Workers tha thave given up looking ofr a job, now considered out of the labor force.

5. Is the entire population considered for unemployment calculations?

Only adults (16+), non-institutionalized, civilian, nonretired population.

7.2 Types of unemployment

Frictional unemployment

- Unemployment that is initiated by workers themselves, who are in between jobs.
- "You quit your job and are looking for a new one"

Structural unemployment

- When the firm doesn't need the worker anymore
- "Your skills are no longer needed"
- This could indicate a displacement of workers by technology

Cyclical unemployment

- Unemployment that is caused by a recession
- "Your skills are still needed, but the economy is not doing well"

7.3 Unemployment calculations

1. Total Population:

18+9+2+1 = 30

2. Total Adult Working-Age Population

18+9+2 = 29

3. Total Employed

18

4. Total Unemployed

9

5. Total Labor Force:

$EM + UE = 18 + 9 = 27$

Finding the three important rates

Note: $ER + UR = 100\%$

1. Labor Force Participation Rate (LFPR):

$\frac{LF}{TAWAP} \cdot 100\% = \frac{27}{29} \cdot 100\% = 93.1\%$

2. Employment Rate (ER)

$\frac{EM}{LF} = \frac{EM}{EM+UE} \cdot 100\% = \frac{18}{27} \cdot 100\% = 66.7\%$

3. Unemployment Rate (UR)

$\frac{UE}{LF} = \frac{UE}{(EM+UE)} = \frac{9}{27} = 33.3\%$

7.4 The Flow Problem

Day 1: Country of Burbonia has 10 citizens. All citizens are of the working-age population. 3 are UE. 1 is Discouraged. 6 are EM.

ER: 67.66%, UR: 33.33%, LFPR: 90%

Day 2: One worker loses their job to the machine, but they continue to look for employment.

- 4 UE, 1 Discouraged, 5 EM
- ER: 55.56%, UR: 44.44%, LFPR: 90%
- ER: Decreases, UR: Increases, LFPR: Stays the same

Day 3: One unemployed laborer becomes discouraged.

- 3 UE, 2 Discouraged, 5 EM
- ER: 62.5%, UR: 37.5%, LFPR: 80%
- ER: Increases, UR: Decreases, LFPR: Decreases

Day 4: One discouraged worker starts looking for a job, but there are no available positions.

- 4 UE, 1 Discouraged, 5 EM
- ER: 55.56%, UR: 44.44%, LFPR: 90%
- ER: Decreases, UR: Increases, LFPR: Increases

Day 5: Another discouraged worker finds a new job and starts working immediately.

- 4 UE, 0 Discouraged, 6 EM
- ER: 60%, UR: 40%, LFPR: 100%
- ER: Increases, UR: Decreases, LFPR: Increases

	EM → UE	EM → OoLF	UE → OoLF	UE → EM	OoLF → EM	OoLF → UE
Change in LF	NC	Dec	Dec	NC	Inc	Inc
Change in LFPR	NC	Dec	Dec	NC	Inc	Inc
Change in UER	Inc	Inc	Dec	Dec	Dec	Inc

8 CPI and Inflation Rate (01/31)

8.1 The Auction Game

8.1.1 Classroom Data

Product	Round 1 Quantity	Round 1 Price	Round 2 Quantity	Round 2 Price	Round 3 Quantity	Round 3 Price
Candy Bag	1	4	2	20	3	145

Rnd 1 Price	Round 1 Remaining Money Supply	Round 1 Additional Money Supply	Rnd 2 Price	Round 2 Remaining Money Supply	Round 2 Additional Money Supply	Rnd 3 Price	Rnd 3 Remaining Money Supply
10	90	10	20	80	20	30	70

8.1.2 Questions (I didn't finish these but I'll come back to them later)

1. What do the beans held by each person represent?

Money

2. What do all the beans in the room reperesent?

All of the money in the economy

3. What do you notice about the quantities across the 3 different rounds of the auction?

Placeholder answer

4. What do you notice about the prices across the 3 different rounds of the action?

Placeholder answer

5. With respect to your observations in #4, why did this happen?

Placeholder answer

6. Does this simulation demonstrate price stability or price instability?

Placeholder answer

7. Who was hurt the most across the 3 rounds? The least?

Placeholder answer

8. Did the quality of the goods change across the rounds of gameplay? Was this in line with the tendency of prices?

Placeholder answer

9. Did quantity or price appear to have the greater percentage of change across the rounds?

Placeholder answer

10. Does the total spending across the 3 rounds reflect the change in production or consumption? What econmic measures are used to reflect this phenomenon?

Placeholder answer

11. Under what conditions did increasing the money supply (beans) cause inflation? Under what conditions did increasing the money supply (beans) not cause inflation?

Placeholder answer

8.2 CPI

The **CPI** (consumer price index) is a measure of the average change over time in the prices paid by urban consumers for a market basket of consumer goods and services.

- The 8 major groups of the CPI
  - Food and beverages
  - Housing
  - Apparel
  - Transportation
  - Medical care
  - Recreation
  - Education and communication
  - Other goods and services
- It **does not include** life insurance, social security, or income taxes.
- The core CPI is the CPI excluding food and energy prices.

8.3 Calculating CPI

The formula for calculating the CPI is:

$$CPI = \frac{\Sigma(P_c \cdot Q_b)}{\Sigma(P_b \cdot Q_b)} \cdot 100\%$$

Where P_c is the current price, P_b is the base year price, and Q_b is the quantity of the good/service.

In other words, the CPI is the **ratio** of the cost of the market basket in the current year to the cost of the market basket in the base year times 100%.

8.4 Inflation Rate

The formula for calculating the inflation rate is:

$$\text{Inflation Rate} = \frac{CPI_c - CPI_b}{CPI_b} \cdot 100\%$$

8.5 Main Idea: What is the difference between the CPI and the GDP deflator?

The **CPI** inflator is for *consumers*, while the **GDP** deflator is for *producers*.

9 The Business Cycle (02/02)

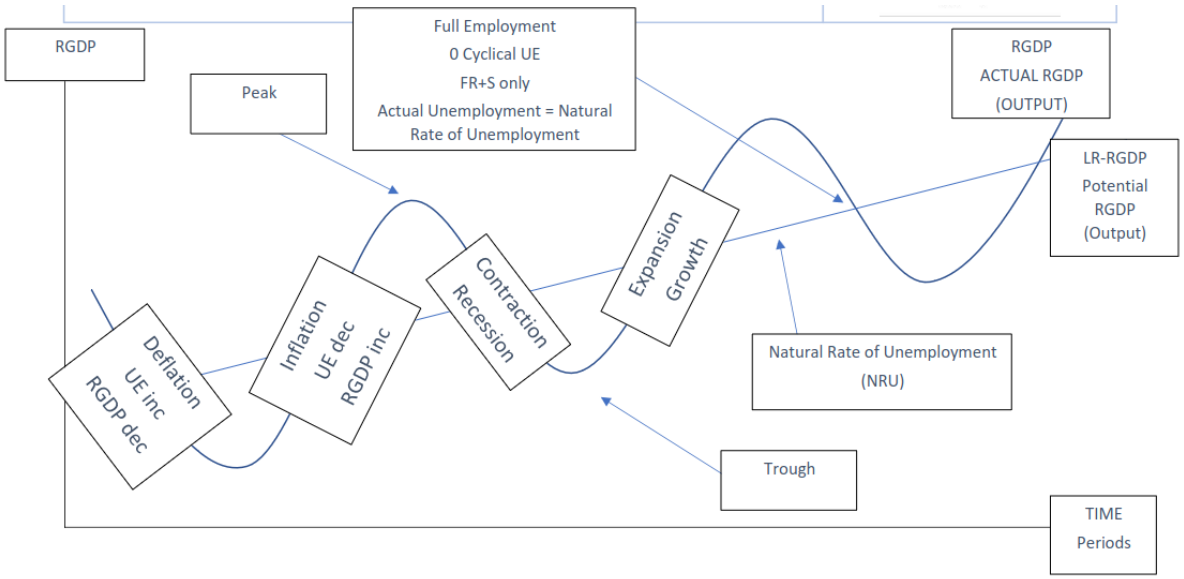


Figure 8: The Business Cycle

10 Who Is Hurt/Benefits from (Unanticipated) Inflation? (02/05)

Technically, normal inflation is fine. That's because normal inflation is expected and accounted for in the market. Unanticipated inflation is the problem.

10.1 How to know who is hurt/helped by inflation (π)

10.1.1 If Actual π > Expected π:

- **Creditors/Lenders** are *hurt* because they loan money at a **fixed rate** based on the expected interest rate and will therefore receive less than if they based it off of the actual interest rate
- **Savers** are *hurt* because their savings have less purchasing power
- **Consumers with fixed incomes** are *hurt* because they can only buy less with their fixed income
- **Borrowers/Debtors** are *helped* because they pay back their loans with money that has less purchasing power than when they borrowed it

- **Firms with small resource costs** are *helped* because product prices are rising faster than the costs of production, increasing their total revenue

10.1.2 If Actual π > Expected π

Flip the above statements.

10.1.3 Groups unaffected by inflation

- Workers that have a **cost-of-living adjustment** (COLA) in their contracts (typically union workers)
  - **Social Security** *does* have a COLA, but it's fairly minimal and not always enough to keep up with inflation.
- Pretty much anything else with an **adjustable rate**

10.2 How to Calculate Real Income from Inflation:

- Real Income = $\frac{\text{Nominal Income}}{\text{CPI}} \cdot 100$
- %ΔReal Wage = %ΔNominal Wage – %ΔCPI

10.3 Why does inflation happen?

There are three main theories to explain inflation:

10.3.1 Quantity Theory

- An increase in the supply of money drives prices up
- This causes the value of currency to decrease and prices to rise by the same magnitude
  - For example, if the value of the dollar decreases by 50%, prices will double to compensate, yielding 100% inflation
- This theory can easily lead to hyperinflation ($\pi \geq 200\%$ in < 1 yr.) if the money supply is increased too much

10.3.2 Demand-Pull Theory

- A spike in consumerism causes an increase in demand for goods and services, which causes prices to rise
- Very common around the holiday season or Black Friday

10.3.3 Cost-Push Theory

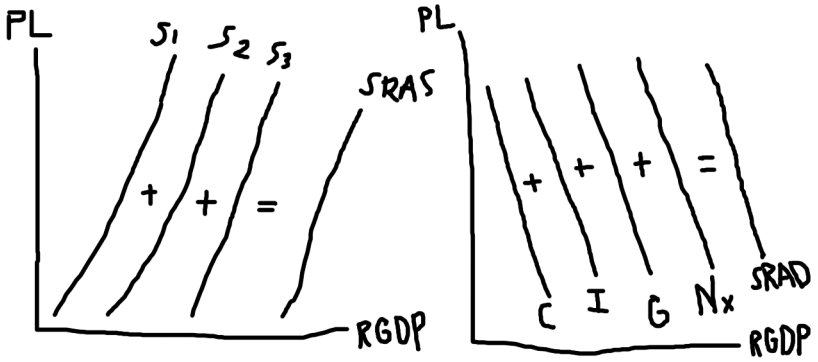
- Increased resource costs in the factor market causes firms to scale back production and raise prices
- The **wage-price spiral** is a common example of cost-push inflation
  - Workers demand higher wages to keep up with inflation, which causes firms to raise prices, which causes workers to demand higher wages, and so on
- Can also be caused by an overall decrease in the supply of resources because of a natural disaster or war

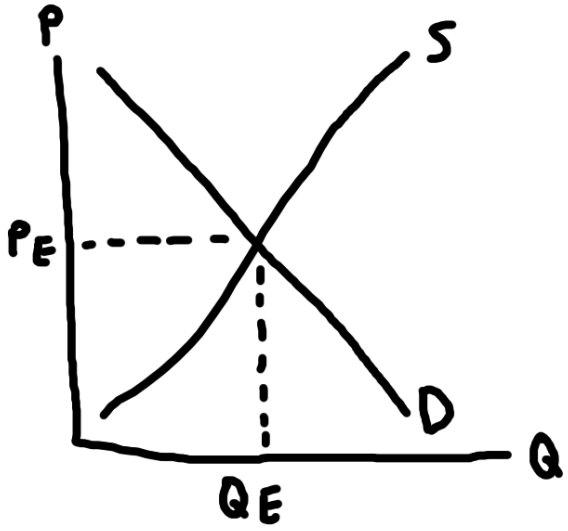
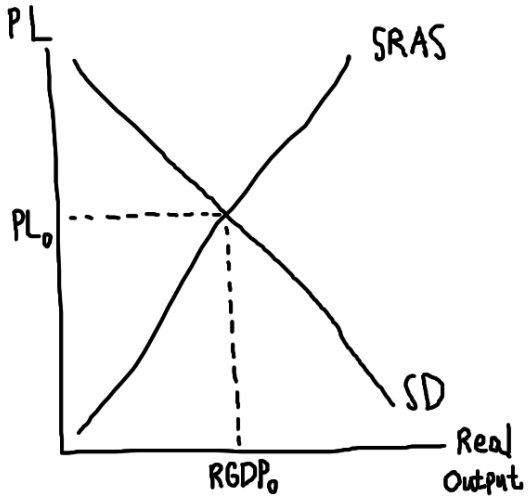
10.4 Costs of Inflation

- Menu costs result from a firm having to change prices.
- Shoe leather costs refer to the time and effort that people spend to counteract the effects of inflation.

11 Introduction to Aggregate Demand/Supply (02/12)

11.1 The Aggregate Models (Graphs)



Supply and Demand Model (Graph)	Aggregate Supply and Demand Model (Graph)
What are the two laws? Law of Supply and Law of Demand	**What does the term "aggregate" mean?** Sum
	
What/Who does the demand curve represent? Inverse relationship between P and Q_d	**What/Who does the AD curve represent?** Aggregate Expenditure = Aggregate Income $C + I + G + N_x = W + R + I + P$

Supply and Demand Model (Graph)	Aggregate Supply and Demand Model (Graph)
What/Who does the supply curve represent? Direct relation between P and Q_s	**What/Who does the AS curve represent?** Aggregate production
Reason for Change in Quantity Demanded Price ONLY!	**Reasons for Change in Quantity of AD** Price level only
Reason for Change in Demand BITER	**Reasons for Change of AD** $C + I + G + N_x = W + R + I + P$
Reason for Change in Quantity Supplied Price ONLY!	**Reasons for Change in Quantity of AS** Price level ONLY!
Reason for Change in Supply TONERS	**Reasons for Change in AS** IRAP: Inflationary Expectations Resource Cost and Availability Acts of Mother Nature and Government Regulations Productivity

11.2 Why is aggregate demand downward sloping?

All of these effects demonstrate that $PL \propto \frac{1}{Q_d}$: - **Real Wealth Effect**: *PL* decreases, purchasing power increases, consumption increases - **Interest Rate Effect**: *PL* decreases, interest rate decreases, investment increases - **Exchange Rate Effect**: *PL* relative to another country decreases, exports increase, RGDP increases

11.3 Why is short run aggregate supply upward sloping?

All of these effects demonstrate that $PL \propto Q_s$:
- **Sticky Wage Theory (wage rigidity)**: Wages adjust slowly to *PL*, so when *PL* increases, the real wage falls and employment increases - **Sticky Price Theory (price rigidity)**: *PL* adjusts slowly to economic changes, and businesses don't want to incur menu costs often, so they increase production instead - **Misperception Theory**: For a single firm, *PL* decreasing increases buyer consumption, so they increase production; however, for the economy as a whole, this is not the case and they should have increased prices instead

11.3.1 Real Wealth Sequence

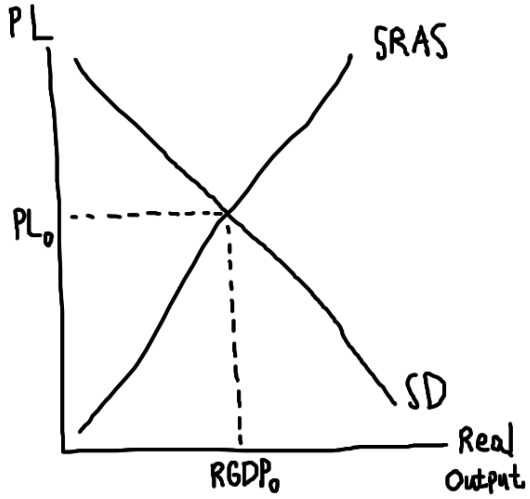
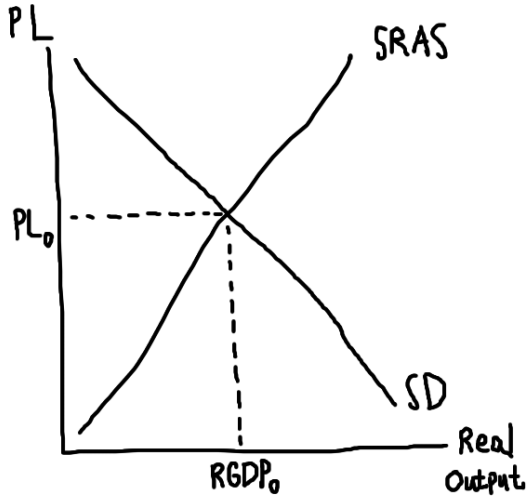
PL

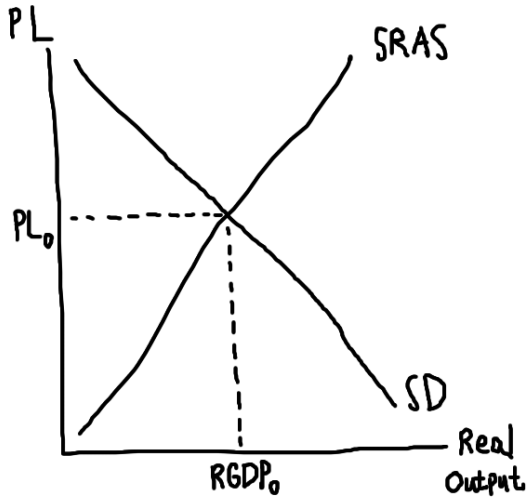
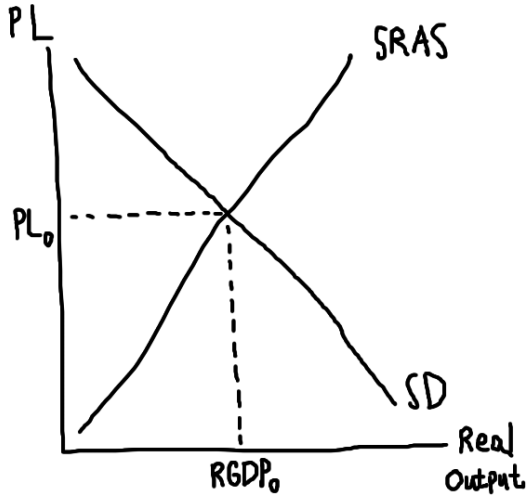
12 Shifters in AD/AS (02/13)

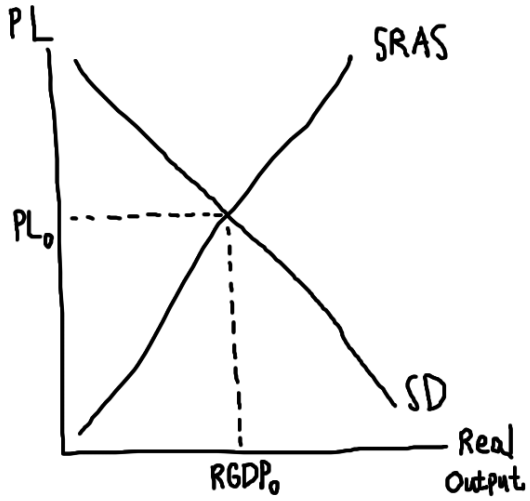
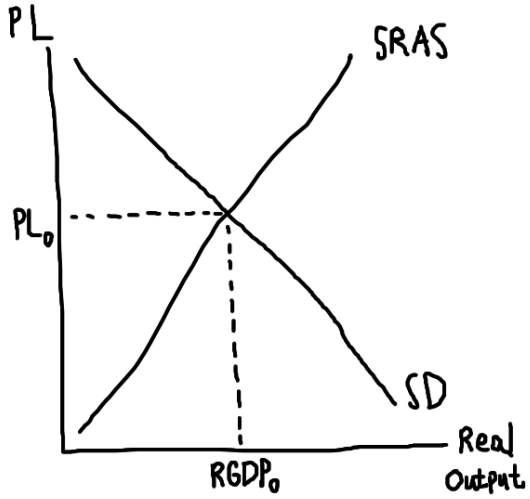
12.1 AD/AS You Decide

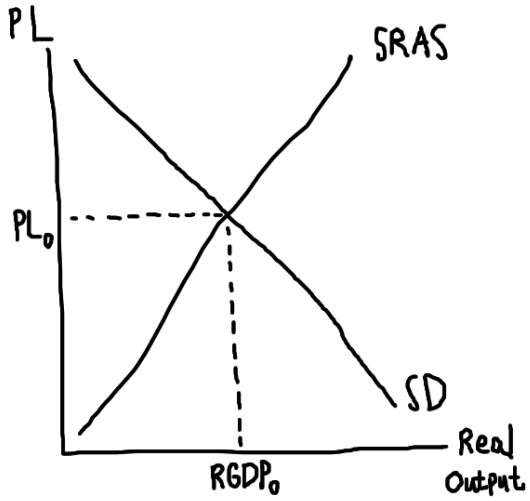
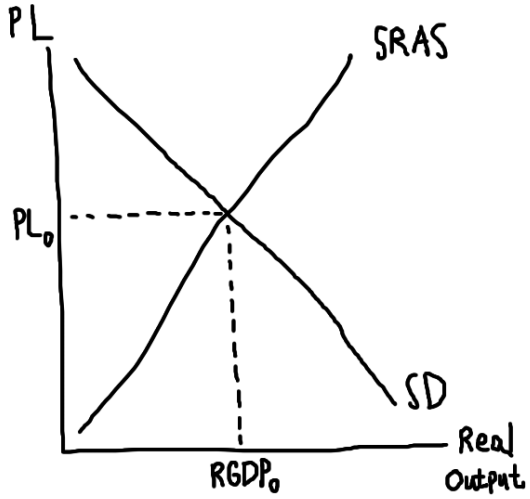
Case Scenario	Draw a correctly labeled graph indicating the change in AD or AS	Increase or Decrease of PL and RGDP	Which Gap or Economic Growth?
Tar sand/Oil sand in Canada and Nebraska allows the US to gain energy independence from the Middle East		PL Inc. RGDP Inc.	
More seniors eat waffles topped with whip cream at their senior breakfasts all pver the US		PL Inc. RGDP Inc.	
A squirrel invasion destroys the harvest of Walnuts in California		PL Inc. RGDP Inc.	
CIA spends a greater portion of its budget on drone strikes		PL Inc. RGDP Inc.	
More seniors eat waffles topped with whip cream at their senior breakfasts all pver the US		PL Inc. RGDP Inc.	

12.2 AD vs AS Shifters

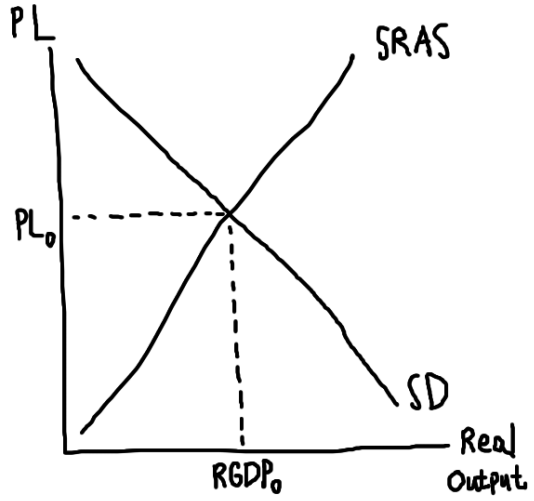
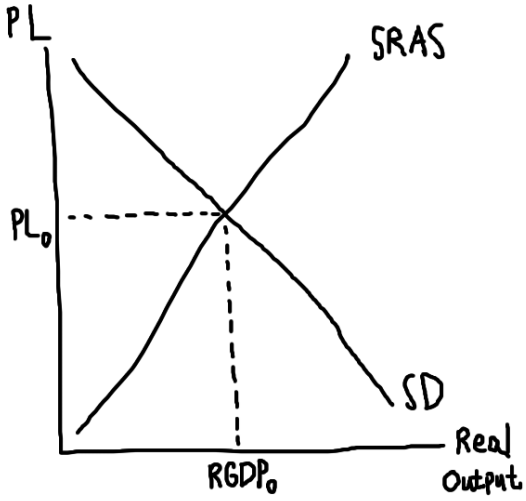
Scenario	Shifter	Graph	
			
Congress passes a tax increase	Taxes	Price Dec. RGDP Dec.	AD Left
			
The Government is increasing its spending on infrastructure	Government Spending	Price Inc RGDP Inc	AD Right

Scenario	Shifter	Graph	
			
Microchip shortages are hitting the car industry	Supply Shortage	Price Inc. RGDP Dec.	AS Left
			
Producers believe that future prices are expected to rise	Expectations	Price Inc. RGDP Dec.	AS Right

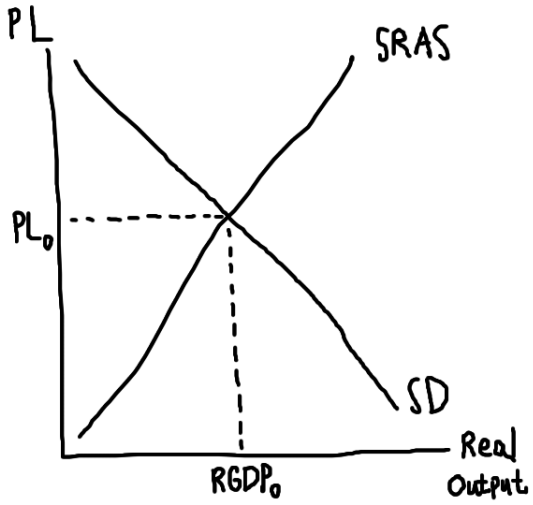
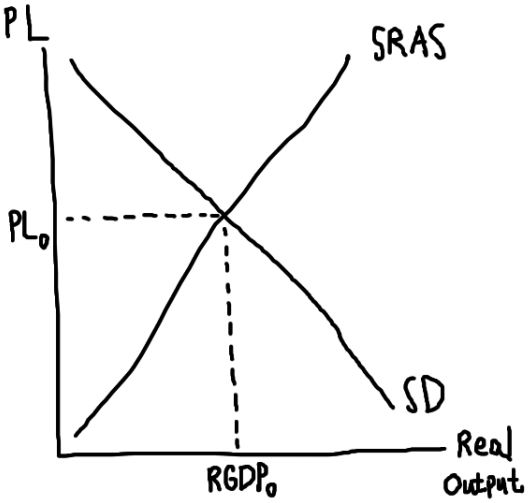
Scenario	Shifter	Graph	
			
The cost of plastic for toy manufacturers has fallen	Costs of Production	Price Dec. RGDP Inc.	AS Left
			
Consumers are worried about the future of the US economy	Expectations	Price Inc RGDP Inc	AD Left

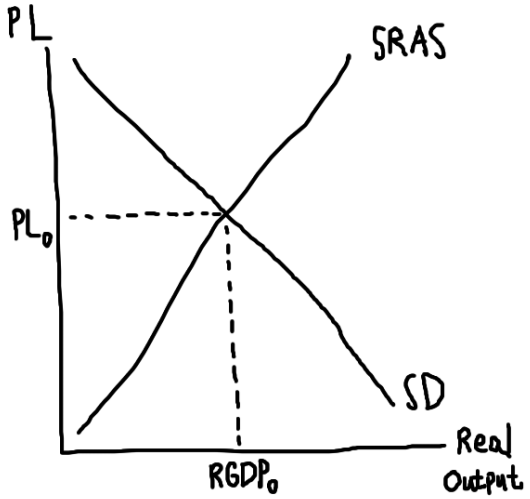
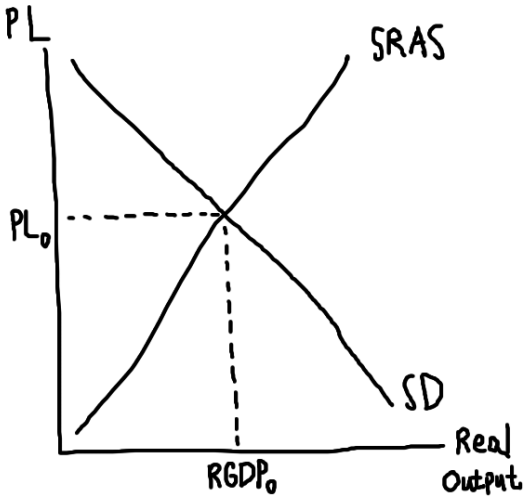
Scenario	Shifter	Graph	
			
New regulations make less forest available for timber mills	Acts of the Government	Price Inc. RGDP Dec.	AS Left
			
Firms increase their spending on education for employees	Investment	Price Inc. RGDP Inc.	AD Right

12.3 PPF vs LRAS model

Production Possibility Frontier	Long-Run Aggregate Supply Model
What does the term "production possibility" mean? The ideal production for a given resource.	**What does the term "potential" mean?** a
	
What/Who does the PPF represent? a	**What/Who does the LRAS curve represent?** All producers in LR
What does being under the curve represent? Inefficient	**What does beign below the curve represent?** Below full employment (negative output gap)
What does being on the curve represent? Efficient	**What does being at the curve represent?** Zero output at AD
What does being above the curve represent? Unattainable in the long run	**What does being above the curve represent?** Above full employment (positive output gap)
What are the shifters? 1. Tech 2. Resources 3. Productivity	**What are the shifters?** 1. Tech 2. Resources/Capital stock 3. Productivity

12.4 The four aggregate positions

Inflationary Gap \ Type of inflation: Demand-Pull \	**Recessionary Gap**\
$RGDP_{actual} > RGDP_{potential}$	$RGDP_{actual} < RGDP_{potential}$
Effect on UE: Decrease	Effect on UE: Increase
	
Graph	Graph
	

Period of SR Economic Growth	**Period of Stagflation**		Type of inflation: Cost-Push	$RGDP_{actual} > RGDP_{potential}$	$RGDP_{actual} < RGDP_{potential}$	Effect on UE: Decrease	Effect on UE: Increase
					
Graph	Graph				
					

13 LR-Adjustments (02/20)

14 Propensity and the Multiplier (02/23)

15 Fiscal Policy (02/26)

Expansionary Fiscal Policy	Contractionary Fiscal Policy
Applied durnig which phase of the business cycle:	Applied during which phase of the business cycle: $G \downarrow \therefore AD \downarrow$ $T_{bus} \uparrow \therefore I \downarrow \therefore AD \downarrow$
Tools:	Tools:
Effect on AD (Graph):	Effect on AD (Graph):

15.1 Government Multipliers

The federal government gives you $100.

The economy's MPC = 0.9 and MPS = 0.1.

Multiplier	Formula	Multiplier Effect
Government Spending Multiplier for Fiscal Policy	$\frac{1}{MPS}$	$\Delta G \cdot$ Mult = ΔReal Output

From the government's fiscal spending, the total additional spending in our economy is $1000. What should the government do to close the gap?

Propensity	Multiplier	Aggregate Economy	Size of Gap	Government Spending
MPS = 0.2	5	Recessionary Gap	-$100 million	Increase $
MPS = 0.5	2	Inflationary Gap	$50 million	Decrease $
MPS = 0.33	3	Stagflation	-$200 million	N/A

Now, the federal government reduces taxes by $100 while allowing the economy to keep what is already has.

The economy's MPC = 0.9 and MPS = 0.1.

Multiplier	Formula	Multiplier Effect
Tax Multiplier for Fiscal Policy	$-\frac{MPC}{MPS}$	$\Delta T \cdot$ Mult = ΔReal Output $-100 \cdot \frac{-0.9}{-0.1}$ = $900

The total spending in the economy is $900. What should the government do to cloes the gap?

Propensity	Multiplier	Aggregate Economy	Size of Gap	Government Spending
MPS = 0.2	-4	Recessionary Gap	-$100 million	Increase $

MS = 0.5 MPS = 0.33	-1 -2	Inflationary Gap Stagflation	$50 million -$200 million	Decrease $ N/A

ALSO do nothing because the economy is still in Stagflation.

15.2 Balanced Budget Multiplier

Goals of fiscal policy:

1. No surplus spending
2. No deficit spending
3. No change to our national debt

Therefore...

Spending Increase by \$100 $\Longrightarrow$ $\downarrow$ \$400	Taxes $\uparrow$ \$100$\Longleftarrow$\$ Decrease by \$400

16 Money and Interest Rates (03/06)

16.1 Notetaker for this video on money

1. Before money, what was used to facilitate exchanges?

Bartering

2. Name and describe the 3 functions of money.

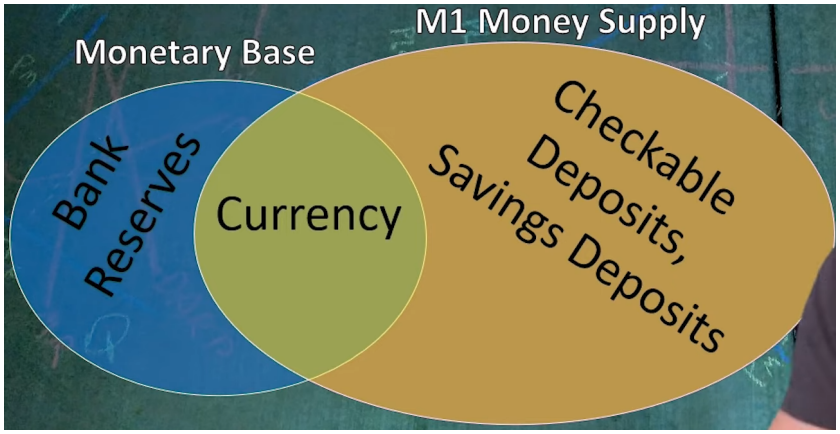
- **Medium of Exchange**: Money facilitates exchanges.
- **Unit of Account**: Money measures the value of items.
- **Store of Value**: Money can be saved and used later.

3. Define the following types of money:

- **Commodity**
  - Mediums of exchange with intrinsic value
- **Representative**
  - Each bill has a commodity that gives it value
- **Fiat**
  - Currency that gets its value from what it will buy

4. What are the measures of money?

- **M0 (Monetary Base):** Currency in bank reserves/circulation
- **M1 (Money)**: Currency in circulation, checkable deposits, and savings deposits
- **M2 (Money and Near Money)**: Money not immediately available as a medium of exchange but can be converted to a medium of exchange (M1 + small time deposits and money market mutual funds)



16.2 Refresher on interest rates + Fisher Formula (video notes)

16.2.1 The variables

- i: Nominal interest rate
  - Interest banks charge for loans
  - Not adjusted for inflation
- r Real interest rate
  - Inflation-adjusted interest that banks charge
- π: Inflation rate
  - Rate at which prices are rising/falling
  - Measured by the CPI or GDP deflator

16.2.2 The Fisher Formula

$i \approx r + \pi$

This means that banks will charge the real interest they desire plus the expected inflation rate.

16.2.3 Expected vs. Actual Inflation

- Actual inflation impacts the real interest rate because $r \approx i - \pi$.
  - This means that **higher than expected inflation** *helps* borrowers and *hurts* lenders, and vice-versa

16.2.4 Other applications

The Fisher Formula can be mirrored for changes in nominal/real wages and GDP:

- GDP changes: $\%\Delta rGDP \approx \%\Delta nGDP - \pi$
- Wage changes: $\%\Delta rW \approx \%\Delta nW - \pi$

17 Fractional Reserve Banking (03/08)

17.1 The Money Multiplier

The money multiplier is the amount of money that banks generate with each dollar of reserves.

The formula for the money multiplier is:

$$MM = \frac{1}{\text{Reserve Requirement Ratio}}$$

If you multiply new money by the money multiplier, you get the total amount of money that banks can create (known as money expansion),

17.2 Money from Nothing Note-taker

Reserves - *Required Reserves* - *Excess Reserves*	Total Reserves = Required Reserves + Excess Reserves Required Reserve = Amount of demand deposits that cannot be leant Excess Reserves = Amount of demand deposits that can be leant
Reserve Ratio	The fraction of demand deposits that banks must keep on hand
Liability	What you owe to someone Banks liabilities are demand deposits Borrower's liabilities are the loan they have taken from the bank
Asset	What you have... Bank assets are loans or property Saver's assets are the deposits in a bank
Checkable (or Demand) Deposits	When you save your money in your checking account Liability for the bank, Asset for the saver
Loans	Borrowers borrow money from the bank Loan is a liability for the borrower Loan is an asset for the bank

1. When a Central Bank changes the reserve requirement, they are acting to change the money supply. How does this happen?

- Required reserves increases ∴ less excess reserves ∴ less expansionary lending ∴ less money supply.

2. What information does the money multiplier formula give us, and how does it relate to question 1?

- RR

Most bonds pay a fixed interest rate that becomes more attractive if interest rates fall, driving up demand and the price of the bond. Conversely, if interest rates rise, investors will no longer prefer the lower fixed interest rate paid by a bond, resulting in a decline in its price.

18 The Money Market (03/11)

To address macroeconomic gaps (recessions and inflationary periods, a central bank can use the following tools to adjust the money supply:	**Expansionary Policy**	**Contractionary Policy**
Conduct Open Market Operations FED buys and sells bonds! (also known as OMOs)	Fed buys bonds	Fed sells bonds
Change the Reserve Requirement FED changes the reserve requirement, changing the multiplier, and decreasing the money supply	Fed lowers the RR	FED raises the RR
Change the Discount Rate Fed changes the interest rate it charges member banks for money	FED lowers the DR	FED raises the DR

18.1 What's the point?

By changing the S_M they are **targeting** the intra-bank lending rate, called the Fed(eral) Funds Rate.

The use of the policy tools above shifts the S_M. So what shifts the D_M?

19 Monetary Policy

19.1 Shifters of S_M and D_M

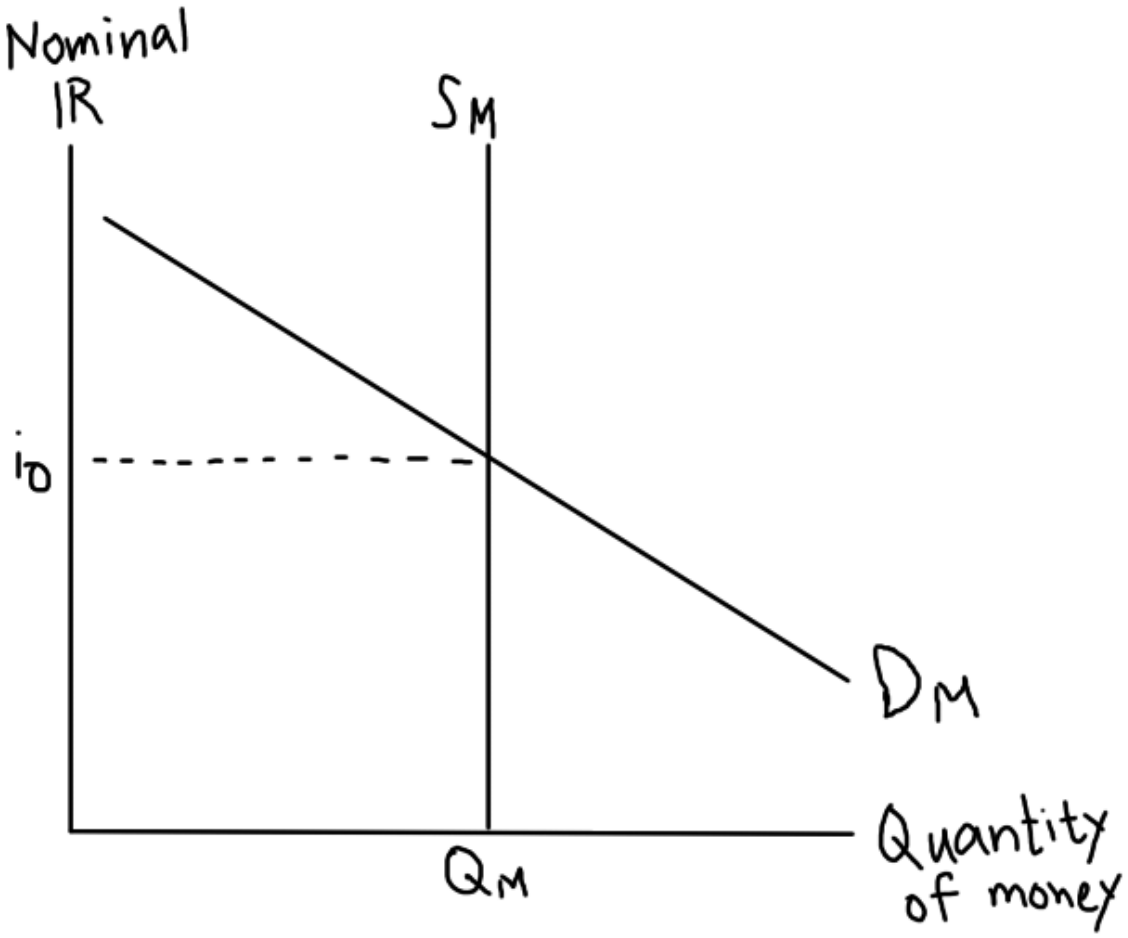
19.1.1 Shifters of S_M:

- The Federal Reserve and its tools
  - Buy Bonds ↑ $\therefore S_M \uparrow$
  - Any form of interest ↑ $\therefore S_M \downarrow$
  - $RRR \uparrow \therefore S_M \downarrow$

19.1.2 Shifters of D_M:

- $PL \uparrow \therefore D_M \uparrow$
- $DI \uparrow \therefore D_M \uparrow$
- $Transaction Costs ↑ D_M ↓$
- CC Usage ↑ $\therefore D_M \uparrow$

19.2 Basic Money Market Graph

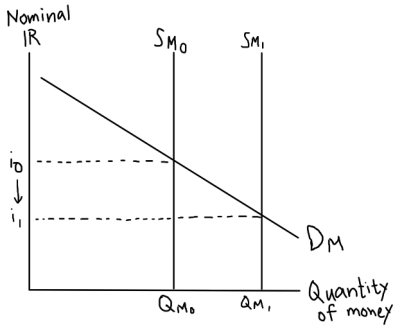


19.3 More on nominal interest rates

A nominal interest rate is the **cost** to borrow money. Changes to nominal interest cates have a direct impact on investment spending, which is a shifter of aggregate demand.

The monetary thinking behind this is...

- Fed Buys Bonds.$\therefore S_M \uparrow \therefore i \downarrow \& Q_M \uparrow \therefore C \& I \uparrow \therefore AD \uparrow \therefore PL \& RGDP \uparrow$ (stabilizes in LR)$\& UER \downarrow$
- Fed Sells Bonds.$\therefore S_M \downarrow \therefore i \uparrow \& Q_M \downarrow \therefore C \& I \downarrow \therefore AD \downarrow \therefore PL \& RGDP \downarrow$ (stabilizes in LR)$\& UER \uparrow$

Expansionary Policy Options	Money Market Graph	Aggregate Model Graph
Federal Reserve... Decrease RR Decreaes DR Buy Bonds		

Contractionary Policy Options	Money Market Graph	Aggregate Model Graph
Federal Reserve... Increase RR Increase DR Sell Bonds