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EDITION



ECONOMICS

ALPACA-IN-CHIEF
Daniel Berdichevsky

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POWER GUIDE ECONOMICS



ECONOMICS

POWER GUIDE[®]

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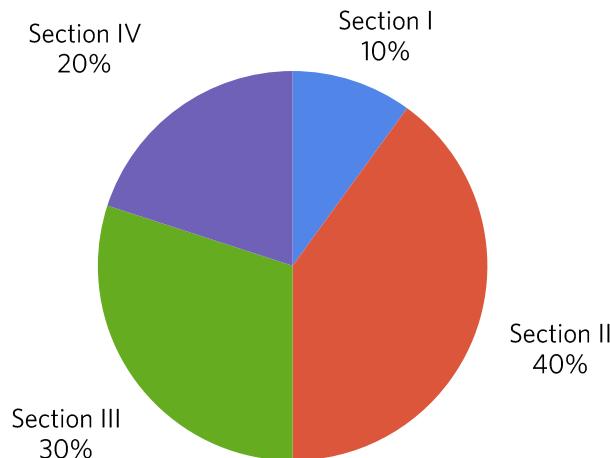
NOTE ON USAGE AND CURRICULUM OVERVIEW

Long-time competitors will recognize the usual features of DemiDec style in this power guide:

- **Bolded terms** flag important words and phrases, whose definitions you should know. For a quick, alphabetized, and themed review of all these terms, head to the power lists at the end of the guide.
- Pull-quotes, or text boxes, may appear that replicate quotes in the official resource. While not strictly factual material for testing, you should still be familiar with any observations made there – they can still be fair game in the exams! Otherwise, any divergence from the guide will be footnoted – either as a plain footnote that clarifies areas of vagueness or inaccuracy in the guide, or as an Enrichment Fact for the curious.
- Additional commentary, sarcasm, and humor can be found in signed footnotes.

This year's economics curriculum covers basic economic theory and African economies.

- Section I: Fundamental Economic Concepts covers the broad study of economics and basic assumptions about economic reality. These ideas lay the foundation for microeconomics and macroeconomics.
- Section II: Microeconomics focuses on the behaviors of members of individual markets. Topics include supply, demand, trade advantages, elasticity, and the role of government.
- Section III: Macroeconomics discusses the study of the national economy as a whole. Ideas in this section include measurement of GDP, inflation, and unemployment, as well as market fluctuations and financial markets.
- Section IV gives a basic overview of the economics of water, including different pricing schemes, economics and environmental considerations, and a selection of brief case studies.





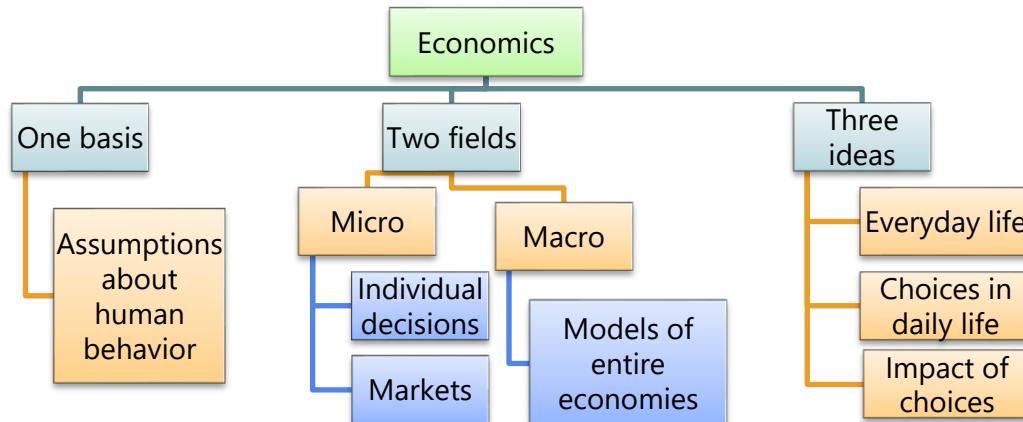
FUNDAMENTAL ECONOMIC CONCEPTS

POWER PREVIEW	POWER NOTES
<p>This section will ease you into the field of economics. It opens with the logic and common sense of economic analysis, continues with important definitions, and concludes with some basic assumptions of economics. Most of microeconomics and a good portion of macroeconomics will rely on these concepts.</p>	<ul style="list-style-type: none">▪ According to the USAD outline, 5 questions (10%) should come from Section I▪ 5 questions (10%) come from the Section I on the USAD Economics Practice Test▪ Section I covers pgs. 6 – 9 of the USAD Economics Resource Guide

Economics: Premises

□ What does economics address?

- The field of **economics** explains how individuals make choices about allocating scarce resources to satisfy unlimited wants
 - Economists study how human societies organize themselves to transform available resources into goods their members wish to consume
 - The field emerged around 200 years ago
 - **Adam Smith** established the field of modern economic analysis with ***An Inquiry into the Nature and Causes of the Wealth of Nations* (1776)**
 - However, Aristotle's writings contain early examples of economic thought
 - Examining life through the lens of economics illuminates the everyday world
 - The average supermarket carries nearly **47,000** different items
 - Each item purchased at a grocery store results from a long chain of decisions
 - No single factor can ensure that any of these products will be there
 - No one issues any orders to create all of these items
 - At each step in production, each person made decisions based on self-interest
 - Supermarkets are only one of the millions of businesses in our economy
 - Economics explains why our economy functions and why it does not



□ Basic assumptions about human behavior

- **Scarcity** characterizes our existence
 - Scarcity is the finite nature of resources to which we have access



- We only have a finite amount of time to devote to our activities
- Only a finite amount of energy and capital are available for our use
- Humans have limited (i.e. finite) knowledge
- However, they have **unlimited wants**
 - When one desire is satisfied, people will think of something else that they want
- This situation can be understood through the concept of **utility**
 - Utility refers to "happiness," or how much we benefit from something
 - Economists assume humans seek to maximize utility
 - **Marginal utility** refers to the utility obtained from "one more of" a good or service
 - The more goods consumed, the smaller the marginal utility
 - Example: The first slice of pizza tastes very good, but the tenth not so much!
- Individuals and institutions must therefore choose where to devote resources
 - They must make **trade-offs**, giving up some goods to obtain others
 - The **opportunity cost** of a good refers to what you give up to obtain it¹
 - More formally, opportunity cost equals the lost utility of the next best alternative
 - This utility includes monetary gains as well as other benefits
- The *costs* of an alternative do not form part of opportunity cost, just its *benefits*
 - The opportunity cost of attending college equals the potential earnings from whatever job you would have taken instead
 - You would still need a place to live and food if you went to work
 - Therefore, these factors do not form part of college's opportunity cost
- Economists assume human beings maximize their utility under these constraints
 - In other words, human beings act **rationally**²
 - People compare the benefits and opportunity costs of each action, and pick the action with the greatest perceived benefit
 - This process is known as **cost-benefit analysis**
 - Benefits need not be monetary
 - Cost-benefit analysis often serves at best as an intuitive approximation
 - Most people cannot innately calculate costs and benefits with precision
 - Studying economics allows us to become better decision makers

Approaches to Economic Analysis

□ Economic analysis

- Economic analysis involves a more rigorous process



- Theoretical models describe economic interactions while stripping away unnecessary detail
 - They clarify how observed economic phenomena fit together
- Models can take the form of diagrams or mathematical formulae
 - These models may appear too simplistic

¹ Arguable, and one of the reasons I've never trusted economists. -Josephine

² Pay attention to the distinction between trade-offs (choices made) and opportunity costs (resultant benefits you forgo).

³ This assumption is obviously very contentious.



- The simplicity allows us to identify what assumptions and characteristics are important
- The true test of a model is how well it captures what we want to understand
- **Types of economic study**
 - **Positive economics** makes provable statements about phenomena
 - Positive statements describe reality with simple models
 - They also predict the result of a potential action
 - Positive statements do not have to be true
 - Economists can provide counterexamples or by applying a theoretical model
 - Positive economics does not involve value judgments
 - **Normative economics** combines economic analysis with value judgments
 - Tools like cost-benefit analysis can inform a discussion of choices
 - Choosing between outcomes usually requires criteria beyond the scope of economic theory
 - Some outcomes may hurt some and help others, such as austerity policies
 - Normative statements describe *what should be* in a society, not *what is*
 - These statements cannot be proved false directly as they represent an opinion
 - They often address the desirability of a positive economic statement
 - Example: "Taxing socially undesirable products produces inefficiency, but the long term social benefits are worth it"
- **Microeconomics** starts to examine the economy from the individual level
 - Microeconomists make assumptions about individuals and their behavior
 - These assumptions create models of decision making for firms and households
 - Combining these individual models, microeconomics can explain markets
 - Putting models of markets together creates a model for the whole economy
- **Macroeconomics** takes a top-down approach
 - It tries to make sense of economy-wide fluctuations
 - Macroeconomists model broad components of the economy, not individuals
 - Models typically use aggregated variables, such as the price level
- Microeconomics and macroeconomics have close links
 - Both share common assumptions about human behavior
 - Different scales emphasize different aspects of behavior



MICROECONOMICS

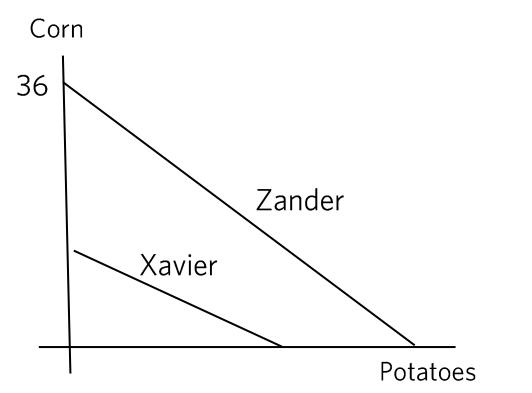
POWER PREVIEW	POWER NOTES
<p>This section covers basic microeconomics. We will build a model of competitive markets from assumptions about consumer and producer behavior and then address weaknesses in the model. In addition, we will cover concepts like basic supply and demand and the production possibilities frontier.</p>	<ul style="list-style-type: none"> ▪ According to the USAD outline, 20 questions should come from Section II ▪ 21 questions (42%) come from the Section II on the USAD Economics Practice Test ▪ Section II covers pgs. 10-61 of the USAD Economics Resource Guide

Microeconomic Basics

□ Gains from trade

- One of economics' fundamental insights is that voluntary exchange facilitates trade
 - People would not engage in interdependent trade if they did not receive benefits
 - Individuals differ in their interests, abilities, and resources
 - Therefore, we excel at and derive more pleasure from differing activities
 - By specializing and then trading with someone else, both parties are better off
- Modern society is highly interdependent
 - We rely on people whom we do not know to supply goods for our daily lives
- The **production possibilities frontier** (PPF) demonstrates how this benefit can occur
 - PPFs summarize an economy's production options
- Imagine two nearby but isolated islands
 - Xavier lives on the first island, which only grows corn
 - Zander lives on the second island, where only potatoes flourish
 - In this state, Xavier will only eat corn and Zander will survive on potato
- Say a volcanic eruption occurs, and a land bridge forms between the two islands
 - Both individuals are tired of eating just their own produce
 - Trade benefits everyone, allowing them to enjoy both potatoes and corn
- On the other hand, suppose they can both produce potatoes and corn
 - Plotting various combinations will yield their respective PPFs

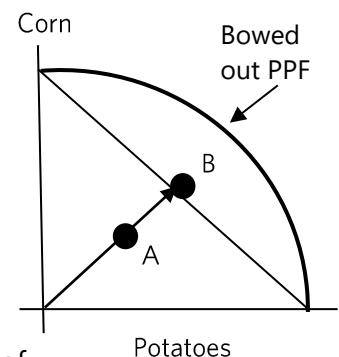
Xavier		Zander	
Potatoes	Corn	Potatoes	Corn
24	0	36	0
21	1	32	4
18	2	28	8
15	3	24	12
12	4	20	16
9	5	16	20
6	6	12	24
3	7	8	28
0	8	4	32
		0	36



- The slope of the curve measures the opportunity cost of production
 - Xavier's curve has a slope of -3: he has to give up three potatoes to get one corn



- Zander's curve has a slope of -1: he trades one potato for one corn
- Moving along the PPF substitutes production of one good for another
 - Producing more potatoes must mean producing less corn
 - Any combination on the curve is completely efficient
 - Production cannot be expanded at the current ratio of goods
 - The point chosen depends on the person's preferences
- Points inside the curve are inefficient
 - There will be another point on the frontier with that same ratio of production
 - Points A and B both have the same ratio of goods, but B has more output
 - Any point outside the curve cannot be produced
- Linear curves indicate a constant opportunity cost of production
 - Production of the goods is perfectly interchangeable
- Most PPF curves usually "bow out" from the origin
 - Most resources are more suited to produce one good
 - Using them for another good decreases efficiency and increases production costs



□ Absolute and comparative advantage

- A party has an **absolute advantage** if it produces the good more efficiently
 - In other words, it uses the least amount of inputs for a given amount of production
 - Given equal inputs, if one trader's PPF is higher on a good's axis than the other's PPF, that trader has an absolute advantage for that good
- Absolute advantage compares the direct costs of production for two traders
 - The party with the lowest direct costs has the advantage
 - Hilary has an absolute advantage in both potatoes and corn
 - Her PPF is above and to the right of Bernie's at every point
 - However, she cannot have a comparative advantage in everything
- **Comparative advantage** indicates a producer's skill at making Good A and Good B
 - It measures efficiency based on opportunity costs
 - A lower opportunity cost leads to a comparative advantage in producing that good

Opportunity cost of	1 corn	1 potato
Xavier	3 potatoes	1/3 corn
Zander	1 potatoes	1 corn
<ul style="list-style-type: none"> • Xavier is more efficient at producing potatoes (gives up less corn) • Zander is more efficient at producing corn (gives up fewer potatoes) 		

- Any two parties with differing comparative advantages will benefit from trade
- The opportunity cost of good A is the inverse of the opportunity cost of good B
 - If Xavier's opportunity cost of corn production is higher than Zander's, Zander's opportunity cost of corn potato production must be higher than Xavier's
- Assume both Xavier and Zander prefer to have equal amounts of potatoes and corn

	Xavier	Zander	Total output
No trade	6 potatoes, 6 corn	18 potatoes, 18 corn	24 of each
With trade	24 potatoes	4 potatoes, 32 corn	28 potatoes, 32 corn



- Xavier and Zander can pick another combination and still benefit from trade

□ **Pareto efficiency**

- Pareto efficiency exists if no one benefits without hurting someone else
 - Italian economist **Vilfredo Pareto** (1848-1923) developed this concept
- Pareto efficient states do not have to be equal
 - Example: If one person has everything in a society, the state is Pareto optimal
 - They must lose something for someone else to benefit
- An economy contains multiple Pareto optimal-distributions
 - Moving from one state to another requires redistribution
- Changes in competitive markets can redistribute wealth
 - Pareto efficiency provides no way to judge which distribution is superior
 - Value judgments remain a part of normative economics
 - Economists will often offer their own opinions alongside positive analysis

□ **Microeconomics**

- Microeconomics centers on supply and demand
 - Interactions between supply and demand produce a highly coordinated market
- The actions of buyers and sellers dominate the market
 - They determine the price and quantity of each product or service bought or sold

	Demand	Supply	Goal
Consumers	Goods	Factors of production	Maximize utility
Firms	Factors of production	Goods	Maximize profit

- Microeconomics focuses on the economic decisions of individual agents
 - Agents are typically individual consumers, groups of consumers, and producers
 - Microeconomics explains how these agents behave and interact
 - These interactions distribute scarce resources by determining prices
- A **market** consists of all of the buyers and sellers of a particular good or service
 - Some markets are highly organized, with a single location for buyers and sellers
 - An auctioneer sets a price at which exchanges take place

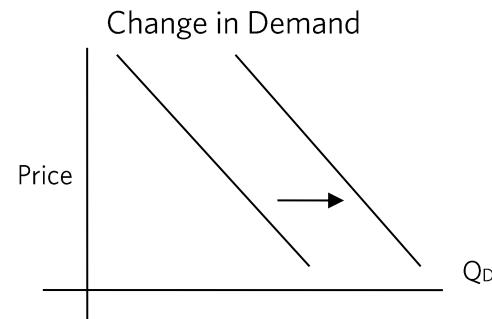
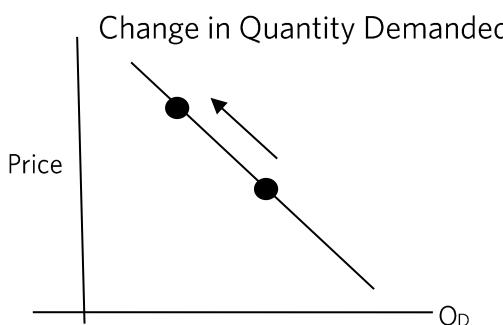
Formal markets		
New York Stock Exchange (NYSE)		Chicago Mercantile Exchange (CME)
Informal market: gasoline market in a town		
Buyers	Drivers	Purchase gas based on price and convenience
Sellers	Gas stations	Post their own prices

□ **Law of demand**

- The **quantity demanded** (Q_D) for any good refers to the amount that buyers are willing and able to purchase
 - The main determinant of quantity demanded is the good's price
 - If the price is low, then consumers will demand more
 - If the price is high, then buyers will demand less of the good
- The **law of demand** refers to the inverse relationship between price and Q_D
 - It results from the cost-benefit analysis that rational decision-makers use
 - As the price of a good increases, its opportunity cost also increases
 - The consumer must consume less of other goods in order to afford the good



- Therefore, they will want less of that good and more of other goods
- Consumers must decide how much of each good they want based on their limited wealth
 - The consumer's preference determines the marginal utility of a good
 - Marginal utility decreases with each increase in quantity consumed
 - The goal of a consumer is to equate all ratios of marginal utility to price
 - If these ratios are all equal, consumers do not gain utility from substituting goods
- Higher prices must be accompanied with an increase in the marginal utility of that good
 - Marginal utility can be increased by decreasing the amount consumed
 - Decreasing the price requires a diminished marginal utility to maintain the price : utility ratio, increasing the amount consumed
- The **demand schedule** lists the price and corresponding quantity for a good
 - It can be shown as a downward-sloping demand curve
 - Price is on the vertical axis and quantity is on the horizontal axis⁴
 - The dependent variable is the variable that responds - in this case, Q_D
 - Quantity demanded refers to the amount demanded at any given point
 - Demand is the *curve* itself - i.e. the relationship between price and Q_D
 - Price changes lead to a movement along the curve and a change in Q_D



- External changes to demand cause the entire curve to shift⁵
- Summing the demand curves of individuals forms a **market demand curve**
 - Add up the quantity that every consumer demands at each possible price
 - This process is equivalent to adding the demand curves *horizontally*
- The market demand curve relates price to quantity for the whole market
 - Note that this assumes an individual's purchasing patterns do not affect other's

□ Shifts in the demand curve

- The law of demand only accounts for Q_D as a function of price
- Five⁶ main external factors can affect the entire demand curve
 - Q_D changes at *all prices*, creating a whole new demand curve
 - An inward shift (to the left) means Q_D at all prices has decreased
 - An outward shift (to the right) means that Q_D at all prices has increased
- (1) A change in the *income of consumers* will cause a shift
 - The direction of the shift depends on the type of good in question
 - Most goods fall under two categories: **normal goods** and **inferior goods**

⁴ Independent variables usually lie on the horizontal axis – except here, where price is the independent variable.

⁵ NEVER forget that demand ≠ Q_D . Price changes Q_D and anything else changes demand (the entire curve).

⁶ Six, if you split “prices of related goods” into substitutes and complements, but for testing purposes, five.



- Consumers buy more normal goods and fewer inferior goods when income increases
 - They prefer to buy normal goods over inferior goods

Type of good	Increase in income →	Relationship	Curve shifts	Example
Normal	Increase in demand	Positive	Right	New car
Inferior	Decrease in demand	Inverse	Left	Used car

- (2) The *prices of related goods*, i.e. substitutes and complements, also affect demand
 - Substitute goods serve the same purpose as another good
 - A consumer can switch from one good to the other without a decrease in utility
 - Two substitute goods are usually of the same quality
 - A rise in the price of one good leads to a decrease in demand for its substitute
 - A fall in the price of a good leads to an increase in demand for its substitute
 - Complementary goods are goods that are required to use the other good
 - Having extra of only one of the complementary goods provides no utility
 - For example, if the price of mechanical pencils increases, the quantity demanded of mechanical pencils will decrease
 - Consumers will need less pencil lead, decreasing demand for pencil lead
 - The demand curve for pencil lead will shift to the left
 - Note that the market for mechanical pencils *moves along the same demand curve*, while the market for pencil lead gets a new demand curve through a *shift*
- (3) Changes in consumer preferences or tastes can affect demand
 - Preferences reflect the utility value that consumers assign to goods
 - If the popularity of electric cars increases, demand for electric cars increases
- (4) Changes in *consumer expectations* can also affect demand
 - Current demand will decrease if consumers expect a future price decrease or issue of a newer, better good
 - Consumers wait for the lower price or better good
 - If consumers expect a future price increase, they will demand more now in order to take advantage of the price while it lasts
- (5) Changes in the *number of consumers* will also affect demand
 - If consumer numbers drop, then the demand will decrease
 - If consumers increases, the demand will increase

□ Elasticity of demand

- The shape of the demand curve is related to its **elasticity**
 - Elasticity measures the relative percentage changes of two variables

$$E = \left| \frac{\% \Delta \text{Quantity}}{\% \Delta \text{Price}} \right| \approx \left| \frac{\frac{Q_f - Q_i}{Q_i}}{\frac{P_f - P_i}{P_i}} \right|$$

where f = final, i = initial

- Elasticity gives an idea of one variable's sensitivity of to changes in another
- Elasticity is *inversely related* to the slope of a curve
 - A steep line will have a low elasticity, i.e. the good has an inelastic demand
 - A shallow line will have a high elasticity
- The **price elasticity of demand** measures the sensitivity of Q_D to price changes



- According to the law of demand, quantity demanded is negatively (inversely) related to price, so this ratio is always negative
 - Conventionally, we ignore this sign and give elasticity as an absolute value
- Elasticity is useful because it does not rely on units of measurement
 - The slope of the demand curve for milk differs when given in gallons or liters
 - However, in both cases, the elasticity of the demand curve will be the same

Price Elasticity of Demand				
Elasticity (E)	Term	Relation to Total Revenue (TR)	Slope	Application
$E = 0$	Perfectly inelastic ⁷	↑ price → ↑ TR ↓ price → ↓ in TR	Perfectly vertical line	Purely theoretical - any good would eventually become prohibitively expensive
$E < 1$	Inelastic	↑ price → ↑ TR ↓ price → ↓ TR	Steep decline	Necessities and goods with few substitutes; short run
$E = 1$	Unit elastic	Change in price has no effect on TR	Line with a slope of -1	Q_D and price change in exact proportion
$E > 1$	Elastic	↑ price → ↓ TR ↓ price → ↑ TR	Gentle decline	Luxuries and goods with many substitutes; long run
$E = \infty$	Perfectly elastic ⁸	Change in price leads to loss of all TR	Perfectly horizontal line	Purely theoretical Consumers only buy at one price
Factors influencing price elasticity of demand				
Substitutes	<ul style="list-style-type: none"> - Goods with substitutes tend to have high elasticity of demand - Consumers can easily switch from one to another if price changes - When close substitutes do not exist, elasticity of demand tends to be lower 			
Necessity	<ul style="list-style-type: none"> - Necessities tend to have lower price elasticity than luxuries - Since people need the good, they will buy it at any price until they cannot afford it 			
Time horizon	<ul style="list-style-type: none"> - In the short run, individuals have less time to look for alternative goods - As a result, goods are generally more inelastic in the short run - In the long run, individuals can find alternatives or change their lifestyles - Consequently, goods are generally more elastic in the long run 			
Scope (size) of market	<ul style="list-style-type: none"> - Markets with a larger scope tend to have lower elasticity - The broader the category of good, the more inelastic the good - Since the market is bigger, there are fewer substitutes available - Example: It is easier to find a substitute for Gatorade than for all beverages 			

- Elasticity falls continuously along the demand curve

⁷ You can also call this “inelastic with respect to price”.

⁸ Perfectly competitive markets have perfectly elastic demand. Consumers only demand the good at the market price.



- A linear demand naturally has a constant slope, i.e. a constant price - quantity ratio
- Moving down the demand curve, price falls while quantity increases
 - 1 unit of change in price will constitute a higher percentage change
 - 1 unit of change in quantity will constitute a lower percentage change
- Hence, $E = \left| \frac{\% \Delta \text{Quantity}}{\% \Delta \text{Price}} \right|$, decreases

□ Law of supply

- **Quantity supplied** (Q_s) refers to the amount sellers are willing and able to produce
- Price is the most important factor affecting quantity supplied
 - The higher the price received, the more suppliers are willing to produce
- The **law of supply** refers to the positive (direct) relationship between price and Q_s
 - It results from the cost-benefit analysis performed by rational suppliers
 - Suppliers compare the benefits of the marginal good sold with the opportunity cost of their time, effort, and expense
 - As price rises, they should devote more resources to supply that good
 - As long as price received exceeds opportunity cost, they will supply the good
- As with demand, the **supply schedule** tabulates price and corresponding quantity
 - The supply law of supply creates a table called a **supply schedule**
- A supply schedule plotted on a plane becomes a **supply curve**
 - The curve is a "continuous" relationship
 - It allows the calculation of quantity supplied at any price
 - "Quantity supplied" is a *point* on the supply curve
 - "Supply" refers to the *entire supply curve*
 - The supply curve slopes upward
 - In other words, producers are more willing to supply a good at higher prices
- The **market supply curve** sums all the quantities supplied at each price by all suppliers
 - This is equivalent to adding individual supply curves horizontally

□ Shifts in the supply curve

- A *movement* along the supply curve indicates a *change in quantity supplied*
 - A movement along the curve is from one point to another on the curve
- A *shift* of the entire supply curve indicates a *change in supply*
 - When the supply curve shifts, the quantity supplied of a good at all prices changes
 - An inward shift (left) means the quantity supplied at any given price decreases
 - An outward shift (right) means the quantity supplied at any given price increases⁹
- Four important factors cause shifts in the supply curve

Factor	Increase	Decrease
Change in cost of factors of production	Left (cannot produce as much for given price)	Right
Technological progress	Right	N/A
Expectations of price changes	Left (firm waits for higher price)	Right (firm sells now at higher price)

⁹ Economists often use the terms "left" and "right" to describe decreases and increases in supply. Be careful not to use "up" and "down": a shift *upward* in the supply curve actually represents a *decrease* in supply.



Change in number of supplying firms	Right	Left
-------------------------------------	-------	------

- A change in price leads to a movement along, not of, the supply curve

□ Elasticity of supply

- The **price elasticity of supply** describes the shape of the supply curve
 - Supply elasticity measures how sensitive supply is to changes in price
 - Additionally, it reflects how easily suppliers can alter the quantity of production
 - Elasticity of supply is defined analogously to elasticity of demand

$$E_{\text{supply}} = \left| \frac{\% \Delta \text{Quantity supplied}}{\% \Delta \text{Price}} \right| \approx \left| \frac{\frac{QS_f - QS_i}{QS_i}}{\frac{P_f - P_i}{P_i}} \right|$$

- Three factors affect elasticity of supply
 - (1) *Difficulty of entry and exit* decreases elasticity
 - If few **barriers to entry** exist, supply tends to be more elastic
 - (2) Elasticity for supply curves typically has a *time* factor
 - In the short run, firms will have already made their production decisions
 - Firms cannot change the quantity supplied in response to price changes
 - Quantity supplied is thus inelastic to changes in price
 - In the long run, firms are able to plan all of their production decisions
 - Firms will enter or leave the market if the market price differs from the price that yields normal profit¹⁰
 - Quantity supplied is elastic, or very responsive to changes in price
 - (3) *Scarcer inputs* lead to more inelastic supply
- Unlike for demand, perfectly inelastic *supply* curves exist
 - Such goods are no longer produced or their inputs no longer exist¹¹

Price Elasticity of Supply			
Range	Name	Relation to Total Revenue (TR)	Representation
E = 0	Perfectly inelastic	↑ price → ↑ TR ↓ price → ↓ TR	Perfectly vertical line
E < 1	Inelastic	↑ price → ↑ TR ↓ price → ↓ TR	Steep incline
E = 1	Unit elastic	Change in price → no effect on TR	Line with a slope of 1
E > 1	Elastic	↑ price → ↓ TR ↓ price → ↑ TR	Gentle incline
E = ∞	Perfectly elastic	Change in price → loss of all TR	Perfectly horizontal line

□ Using elasticity

- If a good is inelastic, an increase in price will cause a smaller decrease in Q_D or Q_S
 - The firm can increase the price, thereby increasing revenue
 - The increased price makes up for the lost quantity

¹⁰ In a perfectly competitive market, the profit level will eventually return to the norm due to firm movements.

¹¹ For example, suppliers cannot make any more antique cabinets from the year 1850.



- Revenue** = price * quantity
- Revenue is graphically depicted as a rectangle
 - The intersection of supply and demand form one corner
- Unit elasticity means a price increase will cause an equivalent decrease in quantity
 - A change in price will not affect revenue
- If a good is elastic, an increase in price will cause a greater decrease in quantity
 - The firm will lose revenue if they increase prices

Equilibrium

What is equilibrium?

- Equilibrium** refers to the point where all forces in a system are balanced and stable¹²
 - In economics, no market actor has any reason to change their behavior
 - Market equilibrium occurs where the market supply and demand curves meet
 - Since the curves slope in opposite directions, only one point of intersection exists
- Prices in a competitive market act as a signal
 - At the right price, consumers will purchase equilibrium Q_D
 - If the price is too high, consumers will refuse to buy the product
 - The price tells suppliers about the value consumers place on a good
 - They also inform consumers about the opportunity cost of supplying the good
- A market is **perfectly competitive** when it has four qualities

Qualities of a perfect competitive market Example: gasoline market

Highly standardized/ homogeneous product All stations sell similar gasoline

Large number of buyers and sellers All actors trade only a small quantity

Transparent information about market price Gas prices publicly posted

No barriers to entry¹³ Customers can fuel up elsewhere easily

- No actor can influence the price or quantity sold
 - They result from the combined actions of all buyers and sellers
- Each buyer and seller is a **price taker** – they accept the market price
- Only a few markets conform to the assumptions of perfect competition
 - However, many real world markets have a high degree of competition
 - The model serves as a useful comparison to other types of markets

Characteristics of competitive market equilibrium

- Perfectly competitive markets** tend to move toward equilibrium quantity and price
 - Scarce goods and services are produced by those who can produce it most cheaply
 - They go to those who value the good the most
- Hence, competitive markets effectively allocate resources
 - It also maximizes benefits for both buyers and sellers
- Buyers receive a number of benefits from participating in the market
 - The height of the demand curve at each point reveals the willingness of the marginal buyer¹⁴ to pay
 - Some consumers value the good more than they pay for it

¹² However, something that is in equilibrium is not necessarily static.

¹³ If no barriers to entry exist, firms can easily enter and leave the market until economic profits fall to zero. In imperfectly competitive markets, economic profits exist because barriers to entry prevent other firms from entering.

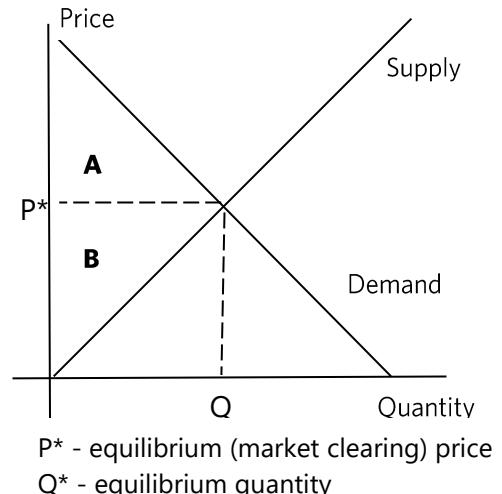
¹⁴ The marginal buyer is the buyer, who at a certain price, is indifferent between buying the good or not buying it.



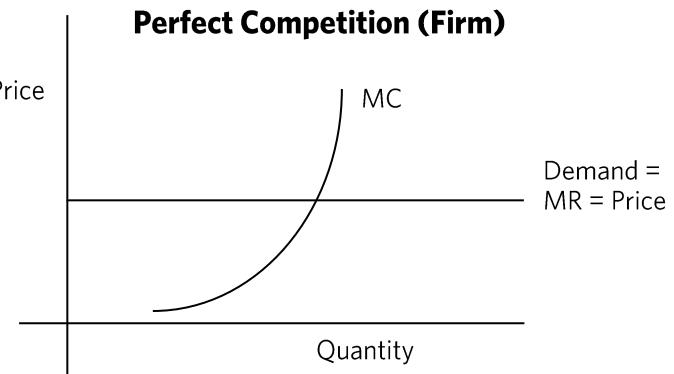
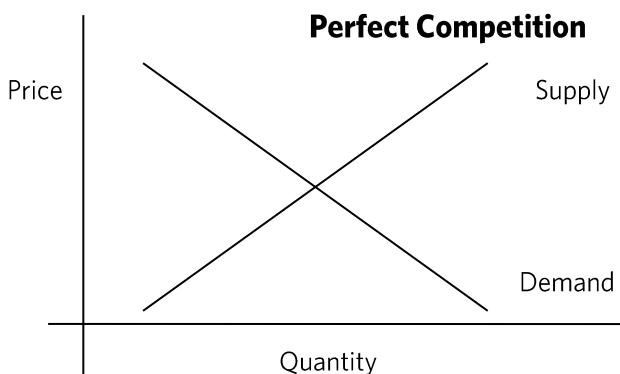
- This extra benefit is known as **consumer surplus**
- To find consumer surplus, draw a line from the market price to the price axis
 - The triangle between the demand curve and this line is the consumer surplus
- Suppliers benefit from participating in the market
 - The height of the supply curve at each quantity measures the willingness of the marginal seller to supply
 - It also measures the opportunity cost to the marginal seller
 - If the market price exceeds the opportunity cost, producers receive **producer surplus**
 - The total producer surplus is the sum of all suppliers' surplus
 - It occupies the triangle above the supply curve and below the market price
- Triangles A plus B equal **total market surplus**
 - Total market surplus measures the total benefits market participants receive
 - Maximizing total surplus satisfies Pareto efficiency
- Planned maximization would be very difficult
 - The planner would need to know how much every consumer values the good and how much each unit costs to produce
 - In addition, the market planner must answer the *three fundamental questions* of economics: how much to produce, who should produce, and who should consume
- A competitive market achieves this outcome naturally through changes in market price
 - Participants' self-interested actions lead the market to equilibrium

□ Basics of market equilibrium

- The demand curve for an individual *producer* is perfectly elastic
 - Since goods are homogenous, consumers have no preference for one seller
 - A seller that increases its prices will lose all of its customers
- In a perfectly competitive market, firms obey the market price
 - If the market price is below the equilibrium point, firms will leave the market
 - Supply decreases and price increases until economic profits are nonnegative
 - If the market price is above the equilibrium point, economic profits will be made
 - More firms will enter the market and drive up supply



P* - equilibrium (market clearing) price
Q* - equilibrium quantity

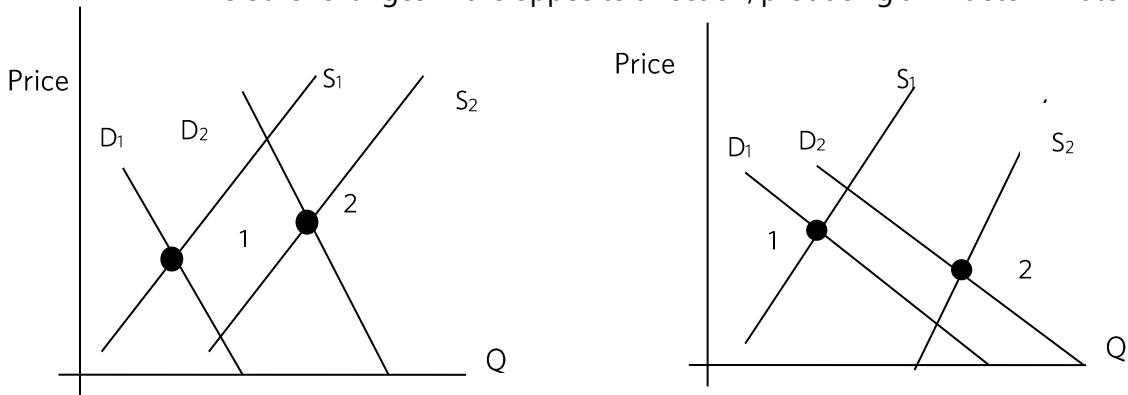




- Since demand is perfectly elastic, it always equals **marginal revenue**
 - Marginal revenue refers to the revenue earned by selling one more unit
 - Firms only sell their good at one price, so every unit earns the same revenue
 - Both marginal revenue and demand equal the price of the good
- Perfectly competitive markets include most **primary commodity** markets
 - A classic example is the wheat market, since all wheat is essentially the same
- **Changes in market equilibrium**
 - Market curves can shift, altering price and quantity

Shift		Change				
Supply	Demand	P	Q	Producer surplus	Consumer surplus	Total surplus
↑	No shift	↓	↑	ambiguous	↑	↑
↓	No shift	↑	↓	ambiguous	↓	↓
No shift	↑	↑	↑	↑	ambiguous	↑
No shift	↓	↓	↓	↓	ambiguous	↓
↑	↑	ambiguous	↑	↑	↑	↑
↓	↓	ambiguous	↓	↓	↓	↓
↑	↓	↓	ambiguous	ambiguous	ambiguous	ambiguous
↓	↑	↑	ambiguous	ambiguous	ambiguous	ambiguous

- Shifts of both curves create ambiguous effects as they create opposing forces
 - For example, an increase in demand would raise the price
 - The increase in supply, however, tries to bring the price down
 - Quantitative data is needed to determine the final effect
- If both curves shift to D_2 and S_2 then the new market equilibrium is point 2
 - Quantity has increased, but price is ambiguous
 - If demand shifts more, the price is higher than the original value
 - Price or quantity will change in the same direction in both cases
 - The other changes in the opposite direction, producing an indeterminate result



The Profit Motive and the Behavior of Firms

- All about firms
- **Firms** are economic actors who (1) combine labor, capital equipment, and raw materials to (2) produce goods with (3) the aim of maximizing profits



- **Total revenue** is the amount the firm receives from selling its goods or services
 - $TR = \text{quantity of output} \times \text{price}$
- **Total costs** are the cost of supplying the good or service
 - **Accounting costs** include actual monetary costs
 - **Accounting profit** is the monetary profit earned
 - **Economic costs** include both monetary and opportunity costs
 - **Economic profit** is monetary profit minus opportunity costs
 - In the long-run, economic profits always equal zero

Analysis	Revenue
Economic	Economic profit - implicit costs - explicit costs
Accounting	Accounting profit - explicit cost

- Firms evaluate their position by examining their marginal costs
 - Marginal costs have two components
 - **Fixed costs** are costs a firm must pay regardless of how many units it produces
 - As a firm produces more, average fixed cost decreases in **economies of scale**
 - Fixed cost is spread over more units of output
 - By definition, firms cannot change fixed costs such as a lease in the short run
 - The firm must pay its rent regardless of how many units it produces
 - In the long run, however, the firm can alter all costs, including fixed costs
 - In other words, all costs are variable in the long run
 - **Variable costs** change with the amount produced
 - A firm only incurs variable costs when it produces something
 - Examples of variable costs include wages and purchases of raw materials
 - Producing more units of goods requires more laborers and more raw materials
 - If no units are produced, a firm will not need to hire workers or buy material
 - By definition, firms can alter variable costs in the short run
 - The **marginal cost** is the cost incurred by producing one more unit of output
 - Marginal costs generally increase as production increases
 - Producers sell until **marginal revenue** equals marginal cost
 - Marginal revenue is the revenue from producing one additional unit
 - **Average cost** is the total production cost of each unit of output

$$\text{Average Total Cost (ATC)} = \frac{\text{Total fixed costs} + \text{Total variable costs}}{\text{Total number of units produced}}$$

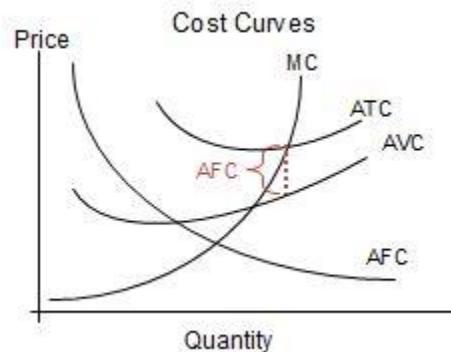
- For all short-run decisions, firms face a mix of fixed costs and variable costs
 - The marginal cost curve is usually U-shaped
 - If a firm initially produces more of a good, the marginal cost drops
 - The fixed costs of production are spread over more units



- Average fixed costs (AFC) fall continuously
- After a certain point, the marginal cost (MC) curve climbs upward as variable costs increase
- This increasing marginal cost represents **diminishing returns to scale**

□ Entry, exit, and the market supply curve

- In a competitive market, all owners earn zero economic profits in the long run and will be content with it
 - The owners are earning their opportunity wage
 - It remains their best alternative
- Prices not only ration scarce goods but allocate productive resources
 - Say prices exceed production costs when Art first issues his card game
 - Positive economic profits causes Joey to enter the market
 - They signal that more resources should be deployed to game-making



□ The political economy of trade

- We can extend the perfectly competitive market model to include international trade
 - Assume a small domestic economy with little influence on the world economy
 - The domestic economy acts as a price taker
 - It cannot affect world prices
 - International trade acts similarly to price controls, but without deadweight loss¹⁵
 - The world economy will buy up surplus or fill in shortages
- If the world price is lower than domestic equilibrium price, the economy **imports**
- If the world price is higher than the domestic equilibrium, the economy **exports**

Importing economy	Exporting economy
<p>Price</p> <p>Quantity</p>	<p>Price</p> <p>Quantity</p>
<p>Triangle A = consumer surplus</p> <ul style="list-style-type: none"> • Consumers gain surplus - they have access to the lower world price <p>Triangle B = producer surplus</p> <ul style="list-style-type: none"> • Producers lose customers to imports and have to produce at the lower world price 	<p>Triangle A = consumer surplus</p> <ul style="list-style-type: none"> ▪ Consumers generally lose surplus - they have to compete with other consumers in the world <p>Triangle B = producer surplus</p> <ul style="list-style-type: none"> • Domestic surplus plus gains from international trade

¹⁵ Think exporting economy = price floor, importing economy = price ceiling



<p>Triangle C = gains from trade</p> <ul style="list-style-type: none">• All go to the consumer, who gets to enjoy lower prices• Total social welfare increases <p>Rectangle D = value of the goods imported</p> <ul style="list-style-type: none">• Quantity times price	<p>Triangle C = gains from trade</p> <ul style="list-style-type: none">▪ Producers receive all of this surplus▪ Total social welfare increases <p>Rectangle D = value of the goods exported</p> <ul style="list-style-type: none">• Quantity times price
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Failures of the Perfectly Competitive Model

Market failures

- A **market failure** occurs when competitive markets fail to produce socially desirable outcomes
 - These failures come about due to externalities or the presence of public goods
 - Addressing such failures constitutes a core role of the government
- Externalities** refer to costs or benefits that affect a third party uninvolved in the transaction in question
 - Individuals usually do not factor externalities into their decision-making
 - They do not pay the costs or receive the benefits
- Externalities take two forms
 - Negative externalities** occur when a decision imposes some harm on others
 - It results in non-socially optimal outcomes
 - For example, companies undertake fracking without considering the impact on community health
 - Positive externalities** result when a decision results in positive effects for society or other individuals
 - Since the individual does not benefit from these effects, he does not factor them into his decision
 - Positive externalities also lead to suboptimal situations
 - The positive action will occur at below optimal levels
 - You might plant more roses if you factored in other people's enjoyment
- Decisions with negative externalities do not have an optimal level of zero
 - The activity that generates the externality still has a positive value
 - The cost of reducing this activity too much outweighs the additional benefits of reducing the externality
 - We can depict the true social cost of production by shifting the supply curve left (for negative externalities) or right (for positive) by the cost of the externality
- Market participants have incentives to address problems created by externalities
 - Often, the two parties pay off one another to prevent or encourage the externality
- Another approach is to internalize the externality – i.e. build it into the market
 - An individual internalizes a cost when he pays it directly (building it into the market)
 - Taxes, fines, and regulations discourage an activity by increasing its cost
 - An individual internalizes a benefit when he enjoys it
 - Subsidies, tax incentives, and other inducements encourage an activity by increasing its benefit
- Internalizing externalities help move the individual (or firm) toward the socially optimal level of activity



- According to the **Coase Theorem** developed by **Ronald Coase**, private parties should be able to resolve inefficiencies created by externalities
 - However, its theoretical conditions rarely apply in practice
 - The parties need to be able to negotiate with each other
 - Property rights need to be clearly defined
 - Pollution has a large total impact
 - However, the individual effects are small - no one has any incentive to negotiate, and a lawsuit would be long and drawn out
 - Governments may step in via taxes or subsidies
 - Using taxes is most effective when the externality's value is easily estimated
 - Otherwise, they may use a **quota** – a numerical limit on quantity
 - Quotas may prevent the people who value the good most from obtaining it
 - Consequently, some regulators create a market where people buy and sell the permit for that good or service¹⁶
- **Property rights and public goods**
 - Goods fall under one of four categories, based on **rivalry** and **excludability**
 - One person's consumption of a rival good prevents others from using that good
 - If a good is non-rival, one person's consumption does not limit others'
 - Non-rival goods have a marginal cost of near-zero
 - Access to an excludable good can be limited

Types of Goods			
	Excludable	Non-excludable	
Rival	<i>Private Goods</i> (food, clothes, cars)	<i>Common Resources</i> (free roads, fishing ponds)	
Non-Rival	<i>Collective Goods</i> (toll roads, electricity)	<i>Public Goods</i> (national defense, air)	

- Property rights ensure the security of *private goods*
 - Owners of private goods can exclude other persons from using their goods
 - They have the right to dispense, rent out, or lease their private property
- *Common goods* are rival and non-excludable
 - They suffer from the **tragedy of the commons**
 - Individual users exploit or overuse a common resource
 - Examples include environmental situations like overfishing
 - A more optimal outcome results when people regulate the good collectively
 - They thereby internalize the externality
- Society at large holds *public goods*, which are non-rival and non-excludable
 - Public goods include publicly funded transportation systems (like highways), public education, public parks, clean water, and the global environment
 - The quantity supplied tends to be too low
 - Since public goods are free, consumers tend to overuse or abuse them
 - Government intervention usually helps negate the effects of the externalities
- *Collective goods* are non-rival but highly excludable
 - They can be easily privatized and tend to be natural monopolies

¹⁶ For instance, the cap and trade system of carbon permits.



- However, monopolies tend to set prices too high and supply too little
- Hence, governments often regulate or directly provide collective goods
- Good examples include satellite radio and pay-per-view television

□ Imperfect competition

- Perfect competition can only approximate the real economy
 - Some very important markets have only a few dominant firms
 - Examples include air travel, cars, and mobile phones
 - Other times, only one supplier exists – e.g. electricity, cable, and water
 - Markets with only one or a few suppliers are **imperfectly competitive**
 - Unlike perfectly competitive firms, they face a downward sloping demand curve
 - Their decisions about how much to supply affect the price they receive
 - They therefore possess **market power** – i.e. they can choose their price
 - Market demand determines the range of possible price-quantity combinations
 - Monopolistic markets have only one firm
 - Monopolies can purposefully create scarcity, called **contrived scarcity**
 - The monopolist produces less than what consumers demand at the market price
 - Profits increase but some demand will be unmet, producing welfare loss
 - Consumer surplus is transferred to the monopolist
 - Demanders still buy the good at the monopoly's price
 - However, they would have paid less in a perfectly competitive market
 - Overall social well-being decreases
 - In a monopoly, supply is less than the competitive quantity
 - Consumer surplus disappears as **deadweight loss**
 - Monopolies can be inefficient, while still seeking to maximize profit
 - In competitive markets, efficient firms run inefficient firms out of business
 - Monopolies result in wasted resources, higher costs, and higher prices
 - Some monopolies "earned" their position through innovation
 - Economic profits can reward such successes
 - Monopoly can give a firm a stable position that facilitates innovation
- Monopolies arise from barriers that prevent competitors from entering the market
 - (1) Monopolies own key resources, such as electricity
 - **DeBeers** owned 80% of the world's diamond mines until around 2000
 - (2) Government-created barriers include patents, copyrights, and other protections
 - Patents provide exclusive rights to a technology for **20** years
 - An author has a monopoly over their book under copyright laws
 - Licensing or similar regulations can create artificial monopolies
 - The government authorizes only one firm to provide a good in a given region
 - (3) Natural monopolies emerge due to **economies of scale**
 - Large fixed costs cause the firm's average costs to fall as more goods are produced
 - It becomes economically preferable for only one firm to operate
 - The government usually regulates the monopolist to ensure public welfare
 - Examples include train services and utilities (electricity, gas, water, etc.)
- Monopoly supply resembles supply for a perfectly competitive firm
 - A monopoly sets their price and quantity supplied where $MR = MC$
 - However, increasing supply until $MR = MC$ increases *economic* profits
 - No other firms can enter the market and drive economic profits to zero



- Review of large mergers and acquisitions to ensure they do not reduce competition in certain markets
- Power to break up large companies or other actions

Examples

- Break-up of AT&T in 1984
- Microsoft had to unbundle Internet Explorer from Windows

Regulation	Utilities not allowed to set prices independently – public agencies approve their rates
Ownership	Municipal governments often own local water and sanitation services

- Firms separate their customers into different groups
 - This strategy is called **perfect price discrimination**
 - Price discrimination refers to charging different consumers different prices
 - Obviously, each consumer values certain goods at different prices
 - Normally, to expand sales a firm would have to lower its prices
 - With price discrimination, a firm would be able to charge more to customers who valued the good more
 - The MR curve would be identical to the market demand curve
 - Price discrimination allows monopolies to capture more profits
 - Perfect price discrimination transfers all consumer surplus to the producer as profit
 - However, it also increases social welfare in monopolies
 - The market moves closer to the socially efficient quantity
 - For price discrimination to be successful, a firm must meet two requirements
 - (1) It must be able to separate the market into groups based on demand elasticity
 - (2) The firm must be able to prevent the resale of its products
 - In other words, those who are buying the good for less than others must not be able to resell the good to those who would otherwise pay more
 - Price discrimination restores some efficiency lost when firms with market power increase the price above the market price
 - It allows more consumers to purchase the product
 - It is not as efficient as pricing in a perfectly competitive market
 - In practice, companies chunk consumers into different groups
 - Cable companies offer differently priced packages of channels
 - Colleges offer need-based financial aid for lower income students
- **Oligopoly**
 - Few industries are truly monopolies
 - In most cases, a small number of producers supplies most of the market
 - A market with a few interdependent firms is an **oligopoly**
 - Firms in an oligopoly produce highly differentiated or homogenous products
 - In either case, oligopolistic markets have long periods of price stability
 - The markets have almost no price competition, only non-price competition
 - Oligopolies are common in the real world
 - The car market is an oligopoly of highly differentiated products
 - The market for steel is an oligopoly of homogenous products
 - The cartel **OPEC** (Organization of Petroleum Exporting Countries) controls oil prices
 - OPEC played a major role in raising prices from \$11 a barrel in 1972 to \$35 in 1981
 - **Collusion** commonly occurs in many oligopolies
 - Producers must consider both market demand and the choices of other producers

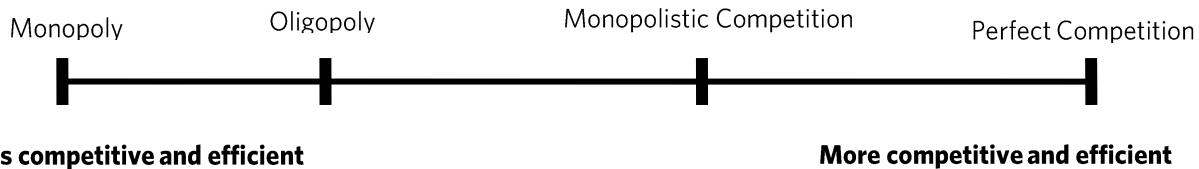


- Firms cooperate to artificially raise market prices by restricting supply
 - This group of firms is known as a **cartel**
 - American anti-trust law bans such collusion
 - A cartel essentially acts as a monopoly because all the firms work together
 - The main problem with collusion is the high incentive to "cheat"
 - Since the market price is artificially high and the quantity supplied is artificially low, a firm could make a lot of profit by supplying more than the other firms
 - Doing so, however, would drive up quantity supplied and decrease price
 - Other firms would have to lower their prices, resulting in price competition
 - Thus, the collusive agreement effectively self-destructs
 - In 1986, oil prices dropped to \$13 a barrel when OPEC lifted production limits
 - To prevent price wars, oligopolies generally work together
 - Each firm relies on other firms to maintain the same prices
 - However, oligopolies become unstable given the incentives to "cheat"
 - Oligopolies may try to sanction cheaters through imposing costs or punishments
 - Oligopolies also maximize profits at $MR = MC$
 - This outcome lies between the extremes of monopoly and perfect competition
 - It cannot be pinpointed without exact numbers and market conditions
 - Some reduction to social welfare results, but the degree depends on the market
- Monopolistic competition**
- The monopolistically competitive model forms the most common type of market
 - Examples include restaurants, clothing, and local service industries
 - It features a large number of firms and product differentiation, i.e. variations between similar goods in a market, such as PCs versus Macbooks
 - Many competing sellers exist, so firms do not have absolute market power
 - However, they still have some control over price due to barriers to entry
 - Firms still produce at a point that maximizes profits, i.e. $MR = MC$
 - They can charge a price above the market price
 - Since the firm's demand curve slopes downward, MC is less than market price
 - Hence, some social inefficiencies exist
 - Some consumers value the good at more than the marginal cost of more production
 - Some mutually beneficial exchanges do not occur
 - Monopolistically competitive firms have an incentive to restrain production
 - A firm in a monopolistically competitive market will not earn economic profits
 - Barriers to entry in a monopolistically competitive market are relatively low
 - Firms can easily enter and start supplying similar goods and services
 - Existing firms will see their demand curves shift left, and profits fall
 - Product differentiation causes firms to engage in non-price competition through advertising, branding, and other activities
 - Firms can charge higher prices for a differentiated product
 - They gain market power, allowing them to imitate monopolist pricing techniques
 - Advertising does not make sense in a perfectly competitive market since all goods are the same
 - Advertising is also not necessary for a monopolist due to lack of competition
 - However, it can play other roles e.g. attracting new consumers into the market
 - Diversification of products gives consumers more choices



- Differentiated products present a barrier to entry for new firms
 - Product differentiation involves extremely expensive advertising
 - The fashion industry is a great example of monopolistic competition based on advertising to differentiate brands

Types of Markets



Influences on Microeconomic Markets

- **Barriers to entry**
 - Economic profits, as seen, are a payment above and beyond the opportunity wage
 - Economic agents can achieve economic profits by creating barriers to entry that in turn create imperfect competition
- **Entrepreneurship**
 - To establish market power, firms can **innovate**
 - **Entrepreneurs** take on the risk of creating new products, services, markets, or methods of production
 - They can earn significant economic profits by being the first to market a new product
 - Entrepreneurs can obtain a legal monopoly through patents
 - In other cases, market power arises due to product differentiation, such as unique characteristics of their product or having trade secrets
 - While innovation creates barriers to entry, it can also reduce market imperfections
 - Potential profits encourage firms to figure out how to overcome barriers to entry
 - Economist **Joseph Schumpeter** calls this process **creative destruction**
 - Continuing to develop new and improved products forms a key source of long-run improvements in well-being
 - Many economists think the inefficiency of market transition constitutes a small price to pay for innovation
- **Collective decision-making**
 - Collective decision-making institutions mitigate the impact of imperfect competition
 - The institutions' formation has a very complex but important history
 - Worldwide variations in standards of living and how to deal with such differences stem from challenges in collective decision-making
 - Markets rely upon **institutions** to ensure that they function properly
 - Institutions are formal or informal rules that structure human interaction
 - They ensure functioning of markets by facilitating exchange
 - Institutions can include government institutions, private institutions, laws, regulations, and even general codes of conduct or social norms
 - Most markets are also institutions themselves
 - Like institutions, **organizations** also organize human interactions
 - They have more formal rules and structures than institutions
 - Examples include commodity and stock exchanges or corporations
 - Institutions and organizations require voluntary cooperation to be effective



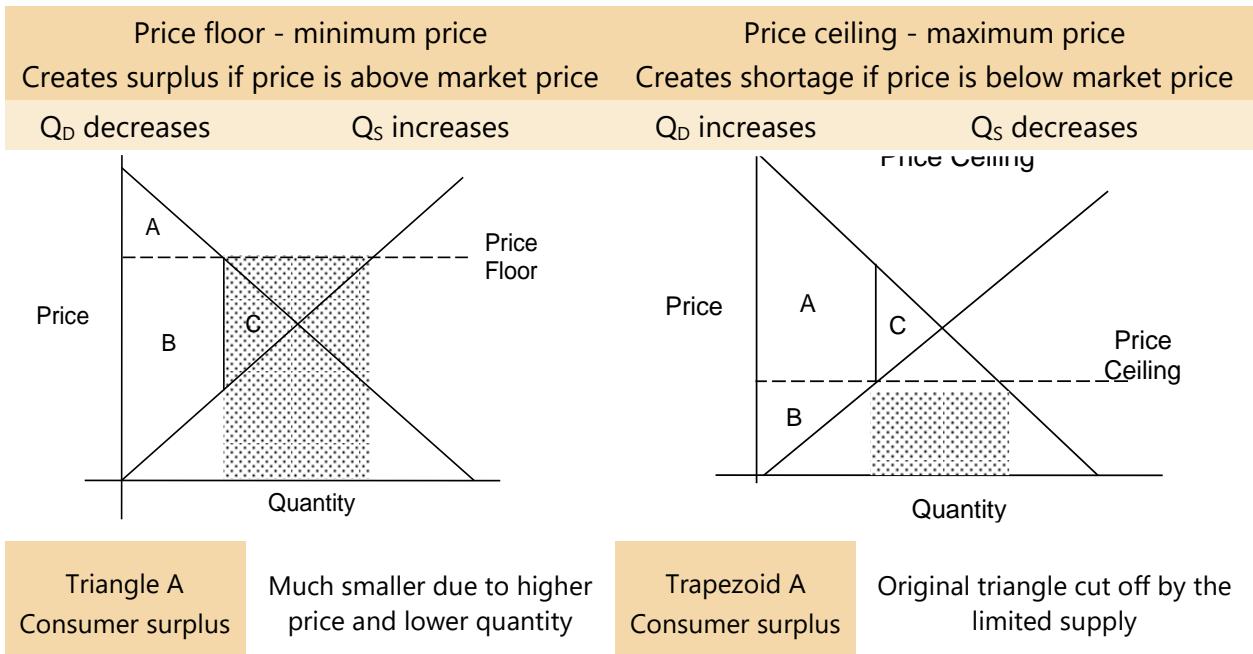
- Self-interested individuals only conform to rules as long as they benefit
- As we have seen, powerful incentives exist for cheating on voluntary agreements

□ Government

- Unlike institutions, governments possess two distinctive powers
 - They have powers of taxation
 - However, this ability is not absolute
 - If people do not like the level of taxation in one area, they can move elsewhere¹⁷
 - Usually though, international mobility is limited
 - Governments have possess a legal monopoly on the legitimate use of force
 - They can restrain criminals, compel military service, and protect national security
 - This monopoly underlies its ability to compel taxation and other actions not in the individual's immediate self-interest
 - Taxation is essential to support a system of private property
- Deciding the proper role for government lies in the realm of normative economics
 - Economics helps to clarify and frame these issues more clearly
- While market economies do not require governments to function, governance enables a broader range of exchanges than otherwise would occur
 - Governments enforce contractual obligations
 - **Contracts** are voluntary agreements where both parties anticipate benefiting
 - If circumstances change, one party might regret entering into the contract
 - Without the court system, individuals would be more reluctant to enter into them
 - Most accept losing some autonomy in exchange for individual and property protection
 - However, unconstrained government can end up reducing individual freedom

□ Price controls

- The government can implement **price controls** through **ceilings** or **floors**
 - The market will not clear as Q_S and Q_D are not equal



¹⁷ Well, in *theory*. Like so many other things in economics, practice is quite different. Let's say you live in a state where you don't like the taxation, but you have a family, job, and house. Are you really going to leave all those behind—not to mention spend the thousands of dollars a move can cost—to move across the country to a state with lower income tax?



Trapezoid B
Producer surplus

Original triangle cut off by
lower consumption

Triangle B
Producer surplus

Much smaller due to lower
price and quantity

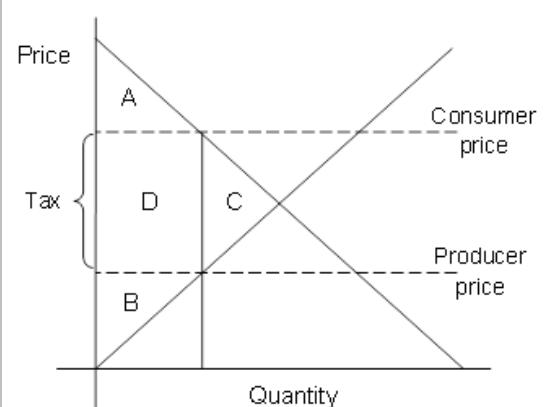
- Note that any deviation from the competitive market price in a closed economy leads to a deadweight loss (Triangle C)
- This loss to inefficiency represents the surplus someone would have received if the market was in equilibrium
- Therefore, moving toward the market price is a Pareto efficient move
- Usually, government intervention comes with significant social cost
- Consider placing a price ceiling (below the market price) on apartments
 - (1) The consumer surplus of some renters increases, while the producer surplus of landlords decreases
 - Landlords will supply fewer apartments, so some renters have no place to live
 - (2) Total surplus falls as the price ceiling prevents some beneficial transactions
 - Landlords would like to rent apartments at a high price
 - Some consumers would be willing to pay a higher price
- Additionally, rent controls disrupt how apartments are usually allocated
 - In the competitive market, everyone who wants an apartment at or above the market price can get one from landlords willing to supply at or below this price
 - With rent controls in place, landlords can discriminate between tenants
- In the short-run, supply and demand for housing in a city is highly inelastic
 - Rent controls can lower prices without creating a large excess of demand
 - However, supply and demand become much more elastic over time
 - Landlords will cut back on maintenance costs, lowering housing quality
 - Eventually, landlords will remove apartments completely, decreasing supply
 - Meanwhile, low prices attract more people to the city

□ Taxes

- All levels of government use taxes to raise revenue to pay for public expenditures
 - An important issue is who should bear the burden of a particular tax
 - Governments attempt to control the distribution of burdens through legislation
- A **marginal tax** creates a difference between producer revenue and consumer cost
 - Example: A \$20 tax on a \$600 computer would lead to consumers paying \$620 and producers only receiving \$600
 - Therefore, consumers only demand as much quantity as they would at \$620, and producers only supply as much quantity as they would at \$600

Marginal taxation

- A = consumer surplus
- B = producer surplus
- C = deadweight loss, as quantity under tax is less than under equilibrium
- D = tax revenue (tax per unit × quantity)
- Tax forms a 'wedge' between consumer and producer prices
- Tax revenue sits between consumer and producer surplus



- The effect of taxes on a diagram depends on the actor to whom the tax applies



- (1) Shift the market demand curve down by the amount of the tax
- (2) Shift the market supply curve up by the amount of the tax
- (3) Find the point where the distance between curves equals the amount of the tax
- Taxes reduce social welfare and increase government revenue
 - Tax revenues tend to be higher for goods with inelastic demand or supply
 - With a more elastic demand or supply, quantity decreases more
 - Tax revenue (D) shrinks while deadweight loss (C) increases
 - On the other hand, the government can tax inelastic goods effectively
- Although only consumer prices increase, both consumers and producers lose surplus
 - In a competitive market, a marginal tax cannot target only consumers or producers
 - The more inelastic party will bear more of the tax
 - Governments typically cannot affect market elasticities
- **Inefficiencies in government**
 - Governments can also be a source of inefficiency and corruption
 - Elected officials and government employees' interests may diverge from the majority
 - Economics identifies these conflicting forces more clearly
 - Inefficiencies arise when gains from government programs are concentrated while their costs are spread widely
 - The United States provides price supports for domestic sugar and restricts sugar imports
 - Sugar prices are almost twice world levels, costing consumers over \$1 billion annually
 - Sugar growers can hire lobbyists to support such policies
 - The cost to each individual is small and not worth mobilizing against
 - **Pork barrel politics** refers to steering money to officials' constituencies through projects
 - These projects increase the cost of governance
 - The community in question only pays a fraction of the total cost
 - By supporting others' projects, legislators can get votes for their own pet projects
 - Vote trading among elected officials is known as **logrolling**
 - In 2010, pork barrel projects consumed 0.45% of the federal budget
 - Even projects with more benefit than cost can generate wasteful resource allocation
 - Lobbyists spend a lot of money to attract projects to their region
 - This type of **rent-seeking** activity redirects, rather than creates, benefit



MACROECONOMICS

POWER PREVIEW	POWER NOTES
<p>This section covers the basics of macroeconomics. We will construct two different models in the process of understanding the economy better. These models will then be applied to government policy and international trade.</p>	<ul style="list-style-type: none"> ▪ According to the USAD outline, 15 questions (30%) should come from Section III ▪ 14 questions (28%) come from the Section III on the USAD Economics Practice Test ▪ Section III covers pgs. 62-113 of the USAD Economics Resource Guide

Macroeconomic Basics

- **Economics on the national level**
- **Macroeconomics** studies national economies
 - It uses different models and data from the study of individual markets
 - Important aggregate economic indicators include **Gross Domestic Product (GDP)**, cost of living, and unemployment¹⁸
 - **Aggregation** combines different factors into one variable
 - It clarifies the big picture but can obscure important details
 - To understand these aggregates and what they tell us, we need to take them apart
- Macroeconomics has two main concerns: the long and short run

Long-run	Short-run
<ul style="list-style-type: none"> •Size of economies •Standard of living •Price level 	<ul style="list-style-type: none"> •Level of economic activity •Unemployment •Inflation

Money and Inflation

- **What is money?**
- **Money** refers to any item that fulfils three functions
 - (1) It acts as a **medium of exchange**
 - Sellers need to be confident they can use the money they earn to buy goods
 - Though money does not earn interest, it lets people make transactions quickly
 - (2) It uses a **unit of account** to serve as a yardstick for the values of goods
 - A single system of measurement lets us compare the prices of goods
 - (3) It acts as a **store of value**, i.e. keeps its purchasing power into the future
 - Sellers can hold onto money for weeks, months, or years before becoming a buyer
- **Wealth** refers to all the value in an economy
 - Different types of wealth have different **liquidity**

¹⁸ Unemployment is a state of being, unemployment rate is a number (glossary). These will be touched on later.



- Liquidity measures the ease of converting an asset into the medium of exchange
 - Currency is the most liquid asset
 - Checking accounts, most stocks and bonds, and mutual funds are highly liquid
 - Real estate and antiques are more difficult to sell and therefore less liquid

□ Measuring money

- To analyze the effects of money on the economy, we must know how much money exists
- The **money supply** refers to the stock of liquid assets in an economy that can be exchanged for goods
 - **Currency** takes the form of paper or coins and is used in everyday transactions
 - It can take the form of commodity or fiat money
 - Commodity money uses material that has intrinsic worth, such as gold or silver
 - During World War II, prisoners of war used cigarettes as money
 - Fiat money derives its worth from government order
 - A fiat is an order or decree
 - Fiat money comprises most of the world's money today
 - In early America, the government exchanged currency for silver
 - In other words, American currency was backed by the commodity of silver
- **Demand deposits** consist of money stored in accounts, typically checking accounts
 - Demand deposits can be withdrawn at any time without prior notice
 - They are more commonly known as **savings deposits**
- **Time deposits** also consist of money stored in accounts, typically at banks
 - Time deposits cannot be withdrawn for a predetermined period of time
 - Examples include certain savings accounts and certificates of deposit (CDs)
- **Money market accounts** are another form of deposits with restrictions
 - They require a larger initial deposit and balance in exchange for higher interest
 - They limit the number of transactions their owners can make in a given time period (usually a month)
- Other forms of money include **traveler's checks**, types of liabilities, and **Eurodollars**
 - Eurodollars refer to dollar accounts held outside of the United States
 - Credit cards and similar devices do not constitute money
 - Credit cards serve as a type of temporary loan, reducing the need for currency
- Money supply has several definitions, usually based on differing liquidity
 - The **monetary base**, or **M0**, is the narrowest possible definition of the money supply
 - It counts only the most liquid money, coins and paper currency
 - M0 includes all currency in bank vaults and held by the general (non-bank) public
 - **M1** refers to very liquid forms of money
 - It includes currency in the hands of the public, traveler's checks, demand deposits, and other deposits against which checks can be written
 - This definition of the money supply emphasizes transactions
 - **M2** includes everything in M1 plus savings accounts, time deposits of under \$100,000, and balances in money market funds/retail money funds
 - Time deposits under \$100,000 are considered "small"
 - M2 is less liquid than M1 but includes forms of money which are still useful for everyday transactions
 - Many economists consider M2 the best definition of the money supply



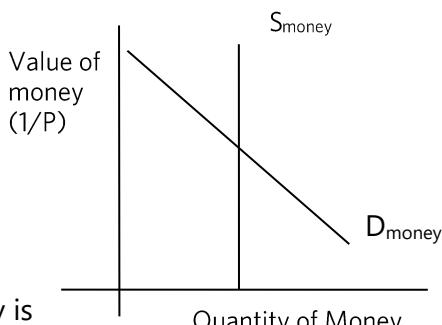
M1	\$ (billions)	M2	\$ (billions)
Currency	758.7	M1	1366.6
Nonbank travelers checks	6.3	Savings deposits	3033.7
Demand/checking deposits	294.8	Small denomination time deposits	1218.9
Other checkable deposits	306.8	Retail money funds	959.9
Total M1	1366.6	Total M2	6579.1

□ Price level and inflation

- The CPI has increased more than seven times from **29.6** in 1960 to **215.3** in 2008
 - This does not mean that people enjoy these goods more
 - More likely, the money they used to purchase these goods has lost value
 - Inflation focuses on changes in the value of money, rather than the value of goods
- The **price level** measures prices relative to a base
 - The aggregate price level represents the price level for the entire economy
 - It rises and falls over time
 - In the long-term, prices have actually fallen during some years
- When the price level rises, it takes more money to buy a fixed basket of goods
 - Suppose "P" is the price level as measured by the CPI and GDP deflator
 - The amount of goods and services that can be bought with \$1 is $1/P$
 - $1/P$ equals the value of money, measured in goods and services

□ The money market in the long run

- The **long run** is the time period for the price level to adjust such that $D_{\text{money}} = S_{\text{money}}$
 - The value of money depends on the interaction of supply and demand
- D_{money} slopes downward
 - People need less money to purchase goods as the value of money rises
 - Demand for money depends on how much wealth people want to hold as money
 - People mainly hold money because it is useful as a medium of exchange
 - More ATMs or credit cards reduces the demand for money
 - The volume and prices of transactions form the main determinants of demand
- The money supply is inelastic, as it is set by the Fed
- Change in the money supply results in a proportionate increase in the price level
- The **quantity theory of money**, or **equation of exchange**, states that $M \times V = P \times Y$
 - M is the stock of money or money supply (how much money exists)
 - M is an independent variable
 - V is the **velocity of money**, or how often money is used in a transaction in a period
 - V can vary over time but is considered to have a constant equilibrium value
 - Y (or T or Q) is the output of goods and services
 - Y is said to be given: real output at a given point in time is fixed
 - Note that $P \times Y = \text{nominal GDP} = M \times V$
 - P is the average current price level, the dependent variable in the equation
- The equation states that the amount of money spent equals the amount of money used
 - Increasing the money supply will cause a fall in V or an increase in P or real GDP





- Given V and Y are fixed, increases in M lead to increases in P – i.e. inflation
 - A key foundation of macroeconomics is the long term neutrality of money
 - Changing monetary variables can only change the price level, not physical variables
 - Increasing real output would require increasing productivity, investment, etcetera
- **Financial institutions**
 - Financial institutions coordinate the saving and investment decisions within the economy
 - **Saving** happens when someone has more income than he wants to spend
 - **Investment** describes the purchase of new capital equipment
 - **Financial markets** are institutions where people who wish to save can supply their funds to those who wish to borrow for investment
 - **Debt finance** involves bond issuance
 - A bond certifies a borrower's obligations to the bond holder
 - It includes a **date of maturity** when the loan will be repaid and the interest rate
 - The original amount of the bond is called the **principal**
 - The bond purchaser receives the principal and periodic interest payments
 - Usually, large corporations sell bonds to the public to finance their investments
 - The purchaser of the bond can hold the bond until maturity or sell on the bond
 - Market interest rates fluctuate with the fortunes of the marketplace
 - A bond's price will adjust to match promised payments with the new interest rate
 - The bond purchaser assumes the risk of this price fluctuation
 - The longer the maturity of the bond, the greater the risk of changes in price
 - Hence, borrowers must pay more to the buyers of the bond
 - The bond purchaser risks a **default** if the borrower declares bankruptcy
 - To compensate for this, a borrower must offer high enough rates of interest
 - The United States government is a safe credit risk, so it can borrow at lower rates
 - **Equity finance** involves the sale of **stocks**, a share of ownership in a firm
 - The company only make money on the initial sale of its shares
 - Resales of the share do not contribute to the nation's investment
 - Stocks can be sold on an organized stock exchange
 - **NASDAQ** (National Association of Securities Dealers Automated Quotation System) or **NYSE** (New York Stock Exchange) are two major exchanges
 - The ease of trading stocks increases people's willingness to hold such assets
 - Their prices depend on the supply and demand for shares in the company
 - These factors depend on the firm's current profits and future prospects
 - Most companies use both equity and debt finance
 - Shareholders receive **dividends** or more valuable shares if a company does well
 - The bondholders only get interest payments
 - If the company runs into trouble, bondholders receive payments before shareholders
- **Financial intermediaries**
 - An **intermediary** is a third party that connects other actors
 - Important intermediaries include **banks** and **mutual funds**
 - Banks supply small businesses with funding from depositors
 - Banks charge a higher interest rate on loans than they pay depositors
 - Deposits bear little risk, since most are insured and can be withdrawn at will
 - Checking accounts facilitate purchases of goods and services
 - Mutual funds allow savers with little money to purchase stocks and bonds
 - They purchase portfolios of stocks and bonds, and then sell shares in them to savers



- The shareholders assume the risks of decline in the value of the portfolio
- Mutual funds make diversification possible, lowering risk
- They also let laypersons use the expertise of professional money managers

The Federal Reserve

- The amount of money in the United States depends on the interaction between the public, commercial banks, and the **Federal Reserve System**
- Often known as the **Fed**, the latter serves as the United States' **central bank**
- Central banks oversee a country's banking system and regulate the money supply

About the Federal Reserve (created 1913)	
12 regional banks owned by commercial banks in each region	<ul style="list-style-type: none"> • Oversee commercial banks in their regions Facilitate transactions by clearing checks • Allow banks to borrow funds – • Acts as a lender of last resort when they cannot get funds elsewhere
Run by seven-member board of governors	<ul style="list-style-type: none"> • Appointed by President • Confirmed by Senate • Serve 14 years – long term protects them from political pressure
Federal Open Market Committee (FOMC)	<ul style="list-style-type: none"> • Composed of seven governors, president of the New York regional bank, plus four rotating regional presidents • Meets every six weeks in Washington, D.C. • Assesses the economy and determines if changes in monetary policy are necessary

Changing the money supply

- Monetary policy affects the money supply, which influences aggregate demand

Tools of Monetary Policy				
Policy Tool	Actor	Fed Action	Money Supply	Frequency
Open-Market Operations	FOMC	Buys and sells securities (treasury bonds) → injects or removes money	Expand: Buy Contract: Sell	Daily
Discount Rate	Board of Governors	Changes interest rate for loans to banks (to meet cash shortfalls or reserve requirements)	Expand: ↓ Contract: ↑	Rarely
Federal Funds Rate		Changes overnight interbank lending rates via open-market operations	Expand: ↓ Contract: ↑	About quarterly
Reserve Requirement		Changes the reserve requirements (reserve-deposit ratio) for banks	Expand: ↓ Contract: ↑	Very rarely

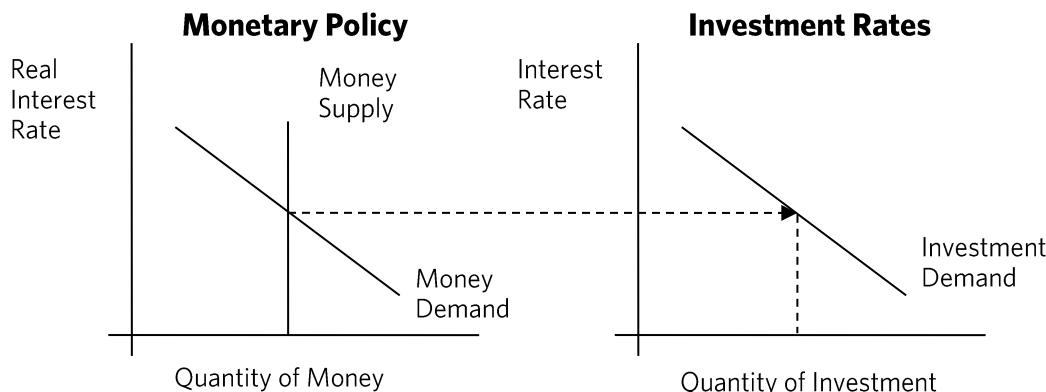
- The reserve requirement is rarely changed because it requires large adjustments by banks
 - Banks must keep some **reserves** and not loan out all their deposits
 - If banks run out of deposits, they can collapse and savers may lose their money
 - If reserves dip below the required amount, banks have to borrow money
- Fractional reserve banking** enables the reserve requirement



- Banks keep a fraction of their deposits and loan the rest
- These loans will eventually be re-deposited, whether by the borrower or others who receive the loans further on
 - Part of that re-deposit will be loaned out again, in a continuing cycle¹⁹
- Changes in the reserve requirement accelerate or hinder this activity
 - A bank's reserves and the loans it makes are called **assets**
 - Likewise, the deposits in the bank are called **liabilities**
- Fractional reserves can become a problem when the public decides it needs currency
 - A **bank run** is a rush of depositors to a bank to withdraw deposits prior to others
 - Even **solvent** banks, whose assets exceed liabilities, cannot pay everyone
 - At points like this, the Fed must act as a lender of last resort to prevent disruptions
 - In the past, bank runs occurred much more frequently

Quantifying fractional reserves	
Money multiplier = $1 \div \text{reserve requirement}$	Change in money supply = amount of new deposit x multiplier
<ul style="list-style-type: none"> • Monetary base (M) = total currency • Public holds C dollars • Bank reserves = M - C • R = fraction held in reserve 	$\text{Money supply} = \text{deposits} + C =$ $\frac{M - C}{R} + C = \frac{R \times C + M - C}{R} = \frac{M + (R - 1) \times C}{R}$

- The Federal Reserve does NOT change the money supply by creating new currency
 - The printing of new currency requires special Congressional legislation
 - Instead, the Federal Reserve changes the *effective supply* of money (M)
- The diagrams below illustrate how monetary policy functions



- All monetary policy tools increase or decrease the effective money supply
 - **Contractionary** policy decreases the money supply (supply curve shifts left)
 - **Expansionary** policy increases the money supply (supply curve shifts right)
- A change in the interest rate influences the amount of investment in an economy
 - Expansionary monetary policy leads to lower interest rates, which encourages investment and in turn increases GDP
 - Contractionary monetary policy decreases investment and hence GDP
- **Saving and investment in aggregate**
 - Remember that GDP equals production, income, and expenditures

¹⁹ Mathematically, this is equal to summing a series.

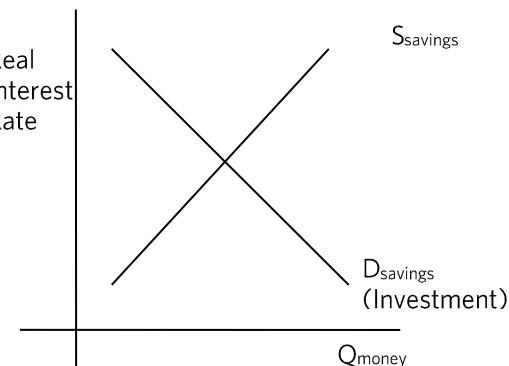


- This equality is an **identity**, an equation that is always true
- Let us assume that the economy in question is closed to trade

$$GDP = Y = C + I + G \therefore I = Y - C - G = S \text{ (national savings)}$$

Taking into account net taxes (T), $S = (Y - C - T) + (T - G) = I$

- Hence, savings equals private savings plus government saving
 - Private savings is the amount that households have after taxes and consumption
 - For households, taxes are an expense, but they are income for the government
- If $(T - G)$ is positive, the government runs a **budget surplus**
 - Otherwise, the government runs a **budget deficit**
 - This reduces investment, which in turn slows growth in living standards
- In an open economy, domestic savings no longer have to equal domestic investment
 - There are two types of international capital flows
 - (1) **Foreign direct investment** describes when a company or individual acquires assets in a foreign country that they will actively manage
 - Mitsubishi bought Rockefeller Center in 1989
 - (2) **Portfolio investment** occurs when an individual or company purchases stocks or bonds issued by a foreign corporation
- **Net capital outflow (NCO)** equals the purchase of foreign capital or financial assets by domestic residents minus foreign purchase of domestic assets
 - In an open economy, NCO always equals NX (another identity)
 - Recall that $Y = C + I + G + NX$
 - Hence, $(Y - C - G) = S = (I + NX) = (I + NCO)$
 - Savings can differ from investment only as far as net capital outflow offsets the gap
- Though many financial markets exist, they are closely linked and can be analyzed together
 - Individuals can move their funds between markets to maximize return
 - We graph quantity on the horizontal axis and the **real interest rate** on the vertical axis
- In the financial market, the real interest rate acts as the price of a loan
 - The real interest rate is the nominal interest rate minus the rate of inflation
 - The higher the real interest, the more people will save
 - Saving is a decision to postpone consumption until the future
 - By receiving interest, people can consume more in the future
 - The lower the real interest, the more investment businesses will pursue
 - Businesses only invest if they believe new revenues will exceed the cost of borrowing
- Consider three possible changes in market equilibrium
 - (1) New, more productive technology shifts the money demand curve out
 - Interest rates rise and more people save and invest
 - (2) The government increases its deficit and causes the supply of savings to shift left
 - Interest rates are higher, but total saving and investment decreases
 - (3) The government gives a tax credit that ends up encouraging savings
 - Interest rates fall, while saving and investment increase



**□ Inflation**

- **Inflation** refers to a sustained rise in the general price level
 - The rate of inflation measures the rise in the price level per unit of time
 - Most official measurements of inflation go by quarters (three months)
- The rate of inflation in the United States has varied considerably over time
 - Prior to 1940, prices actually decreased during certain periods
 - Since World War II, inflation has been positive
 - Inflation peaked during the World Wars and the 1970s but has slowed since 1980
- Money is neutral in the long run, but inflation can have powerful short-term effects
- (1) Inflation reduces the value of money and **purchasing power**, the amount that a person can purchase with one unit of currency
 - Inflation acts as a tax on those that choose to hold money
 - They need more money to buy the same goods
 - People will have to go to the bank or ATM more often
 - Firms will have to adjust the prices of their products more frequently
- (2) Inflation distorts prices, reducing the usefulness of prices as signals
 - Not all firms adjust prices at the same time
 - Relative prices will not always accurately reflect the costs of production
- (3) Inflation introduces confusion about the value of goods in the future
 - When someone lends their savings, they are postponing consumption
 - If people cannot predict the rate of inflation, they cannot predict purchasing power
 - Borrowers and lenders face more risk
 - The supply of and demand for investment decrease, reducing economic growth
- Governments use the CPI to measure inflation
 - It compares the prices of a basket of goods between the current and base year
 - It uses goods which an average household would buy on a regular basis
 - Housing forms the main component
 - The variety and quantity of individual items in the basket must be the same so that comparisons can be made between years
 - The baskets vary by income and region to account for consumption patterns
 - The BLS calculates it each month
 - The Consumer Expenditure Survey dictates what will be in each basket
- The CPI in the base year always equals 100
 - Hence, a CPI of X means that prices are X% of that in the base year

$$\text{CPI}_{\text{year}} = \frac{\text{cost of bundle}_{\text{year } t}}{\text{cost of bundle}_{\text{base year}}} \times 100$$

- Social Security benefits reflect changes in the cost of living based on the CPI
- Many union employment contracts tie wage increases to the CPI
- Firms generally take CPI changes in consideration when adjusting wages
- The CPI helps to easily calculate the inflation rate
 - The CPI measures how changes in price affect the cost of a fixed bundle
 - It shows changes in price for basic consumer goods
 - These goods form one of the largest parts of aggregate demand
 - Hence, CPI changes indicate changes in people's standard of living
- The CPI has shortcomings
 - *New goods and services* are introduced all of the time that the CPI does not count



- New trends or technology may make the basket inaccurate or irrelevant
- The CPI does not account for *substitution biases*
 - If one good in the basket becomes too expensive, consumers may switch to a cheaper substitute not in the CPI
- The CPI does not account for changes in quality
 - While the price of cars has increased, cars also have better technology
- The CPI tends to overstate the true increase in cost of living
 - In 1996, economist **Michael Boskin** headed the **Boskin Commission**
 - This commission reviewed the methods used to calculate CPI
 - They found that the CPI overstated the rate of price inflation by **1.3%** a year
- The **GDP deflator** is a CPI alternative that corrects for price increases in nominal GDP
 - It converts nominal GDP to real GDP

$$\text{Nominal GDP} = \frac{\text{GDP deflator}}{100} \times \text{Real GDP}$$

OR GDP deflator = $\frac{\text{Nominal GDP}}{\text{Real GDP}} \times 100$

GDP deflator	< 100	100	> 100
State	Deflation	No inflation	Inflation

- The GDP deflator is less volatile than CPI and shows lower overall inflation
 - It rises less at peaks and decelerates less at troughs
- The GDP deflator has two main differences compared to the CPI
 - The GDP deflator only reflects prices of domestically produced goods
 - The CPI market basket can include imports
 - At the start and end of the 1970s, the CPI rose much faster than the deflator
 - Rising oil prices pushed the CPI upward as oil imports became expensive
 - The GDP deflator and CPI weight goods and services differently
 - The CPI uses a fixed basket, while the GDP deflator weights prices by production level
 - The GDP deflator adjusts to changing consumption patterns over time
- The GDP deflator is hard to accurately calculate and hence is only published once a year
 - Consequently, it cannot track inflation closely, making it less useful
 - Like CPI, the GDP deflator fails to account for changes in quality

Production and Growth

- Measuring total output: GDP**
 - Gross Domestic Product (GDP)** is the market value of all final goods and services produced in a country in a specific period
 - Usually, economists consider annual or quarterly (three-month) periods
 - Toyota and Honda are Japanese car makers, but cars they produce within the U.S. country count toward the United States' GDP
 - A McDonald's restaurant in South Korea contributes to South Korean GDP
 - It follows that $\text{GDP} = \text{sum of (value of each good)} \times (\text{quantity of each good})$
 - More expensive goods contribute more to GDP
 - Market prices reflect the value the marginal consumer places on that product
 - Goods that have a higher value to consumers have higher prices
 - Only end products count toward GDP
 - Intermediate goods** do not count - they will be used up in the **final good**



- ❑ Excluding intermediate goods ensures GDP is not affected by **vertical integration**
 - ❑ Vertical integration combines industries making different parts of a product
 - ❑ For example, Toyota may own both car assembly factories and steel refineries
 - ❑ The value of the steel is included in the final price of the cars
 - ❑ Even if it bought steel from elsewhere, GDP would only count the cars' value
 - ❑ Some goods can be either final goods or intermediate goods
 - ❑ Only the portion of production sold to final users counts toward GDP directly
 - ❑ The portion used as an intermediate good is reflected in the cost of its final product
 - ❑ **Capital goods** produce other goods and services, and are not used up in production
 - ❑ Examples include machinery or factory buildings
 - ❑ Capital goods count towards GDP in the year they were produced
- ❑ **What GDP measures**
- ❑ Interest in measuring economic output dates back to the mid-17th century
 - ❑ The British crown assigned **Sir William Petty** to assess Ireland's ability to pay taxes
 - ❑ **Simon Kuznets** developed the modern concept of GDP in **1934**
 - ❑ The United States needed information on economic activity to deal with the Great Depression
 - ❑ He received a commission to develop a system of measuring national output in **1932** from the **Department of Commerce**
 - ❑ Kuznets received the Nobel Prize in Economic Science in 1971
 - ❑ The United States perfected techniques for measuring GDP in World War II
 - ❑ Despite their usefulness, Kuznets' concepts have a number of limitations
 - ❑ (1) It is not always easy to determine what good or service is final
 - ❑ Conventionally, spending on national defense (the military) falls within GDP
 - ❑ Kuznets noted that military spending could be viewed as an intermediate good, since it enables a country's citizens to enjoy final goods and services
 - ❑ (2) GDP excludes goods that are not bought and sold in markets
 - ❑ Housekeeping and childcare performed by those in a family do not count toward GDP
 - ❑ But these same services are included when purchased through a market
 - ❑ Over the past 60 years, women have increasingly entered the paid labor force
 - ❑ Some purchased commercially provided childcare and housecleaning
 - ❑ GDP has risen twofold as a result, but the childcare *would* have taken place anyway²⁰²¹
 - ❑ Anything sold on the black market will not be counted in GDP
 - ❑ (3) Measuring GDP ignores activities that deplete natural resources or pollute
 - ❑ Measuring the value of natural resources and the environment is difficult
 - ❑ Only normative economics provides a way to judge what goes into GDP
 - ❑ GDP can be measured in two main ways
 - ❑ The first way measures expenditure as a proxy for output

$$\text{GDP} = \text{expenditures} = \text{Consumption} + I + G + NX$$

²⁰ If the labor of all stay-at-home parents were valued at the wages I pay my nanny, our GDP would look a LOT different.
-Josephine

²¹ This is the reason we have the wages for housework campaign. – Jac



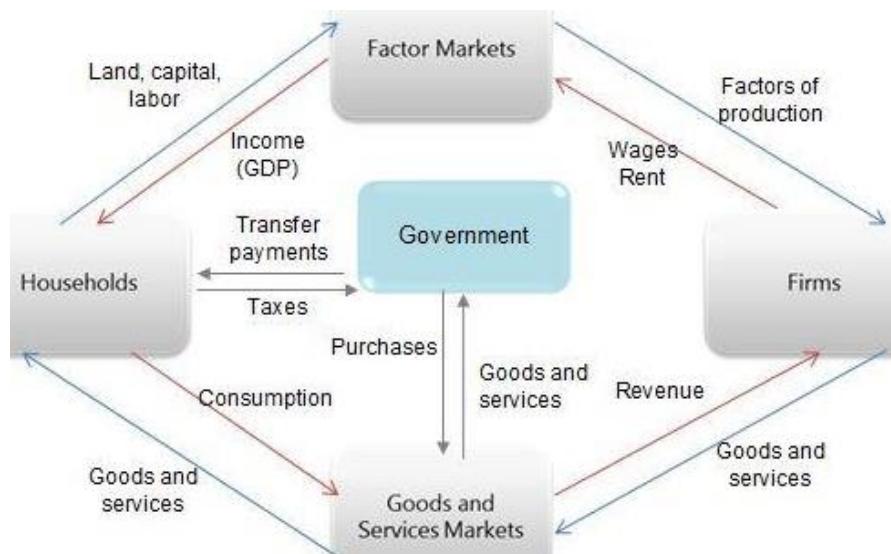
Household consumption (C)	<ul style="list-style-type: none"> ▪ Consumer durables - long-lived consumer goods - cars, furniture ▪ Consumer nondurables e.g. food and clothing ▪ Services - intangible goods, e.g. education and legal services ▪ Does not include purchase of houses
Firm investment (I)	<ul style="list-style-type: none"> ▪ Business fixed investment - purchase of capital equipment e.g. factories, offices, and machinery ▪ Residential fixed investment - new homes and apartment buildings ▪ Inventories – unsold goods added to company inventories ▪ Does not include purely financial assets such as stocks and bonds, which transfer ownership without creating new assets
Government purchases (G)	<ul style="list-style-type: none"> ▪ Wages; government-purchased goods ▪ Military spending ▪ Does not include transfer payments made by the government, such as social security benefits, or interest on government debt
Foreign net exports (NX)	<ul style="list-style-type: none"> ▪ Difference between the value of locally produced goods sold to foreigners and the value of foreign-produced goods bought domestically ▪ Exports-imports <ul style="list-style-type: none"> ○ Exports > imports: trade surplus; GDP increases ○ Imports > exports: trade deficit; GDP decreases

- The United States depends slightly less on trade than other countries
 - However, trade has been increasing in recent years
 - In the long run, the levels of imports and exports move in similar ways²²
 - Since the 1970s, the United States has switched from surplus to deficit
- The income approach is equal to expenditure
 - Revenue for each good is split between workers and owners of capital
 - With some technical adjustments, income of labor + capital = expenditure
- Hence GDP = production = expenditures = income
- The size of GDP depends on the quantity and price of goods produced
 - Economists need a way to separate the effects of changes in these two factors
 - Prices and quantities do not change evenly across the board
- Economists calculate **real GDP** by converting current prices to those of a baseline year
 - **Nominal GDP** is calculated in prices from the current year
 - **Nominal** measurements are measured with respect to the current year
 - **Real GDP** is adjusted to remove inflation
- **Economic growth**
 - The United States and western Europe have seen sustained growth since the 19th century
 - Growth spread to Japan and Latin America, then other parts of the world in the 1950s
 - Since 1900, real GDP for the United States has increased by a factor of nearly 32
 - The **Great Depression**, from **1929** to **1933**, saw a crash in output
 - Output expanded from **1941** to **1945**, during **World War II**
 - Total output determines how much people can consume
 - Since population has been increasing, it follows that production has risen as well
 - Output has grown much faster than population since 1900
 - The United States population has increased by a factor of four since 1900

²² Meaning that imports and exports will either both increase or both decrease in the long run.



- Average output per person has risen by a factor of eight
- Output (or GDP) per person is also termed output **per capita**
- The **circular flow model** shows the relationship between sectors of the economy
 - It contains two basic markets
 - Firms buy factors of production from households in the **factor market**
 - Households buy final goods and services in the market for goods and services
 - Households provide **factors of production**, such as labor, land, and capital
 - Households use income to buy goods, pay taxes, and save in **financial markets**
 - Firms (the **business sector**) consume resources to produce goods
 - Firms use income to pay households for factors of production
 - The government sits between consumers and the goods market
- Goods and services move clockwise below, while money moves counter-clockwise
 - In addition to these actors, all sectors borrow from financial markets



- The only places at which new wealth enters the cycle are households
 - Households provide human labor that can be used to work
 - They also own inputs such as land and generally all factors of production
- **Differences in GDP per capita**
 - The economy's output depends on the quantity of goods and services firms can produce
 - This depends on the factor market and firms' ability to turn inputs into final goods
 - All else being equal, larger economies should produce more than smaller economies
 - Real GDP per capita measures the amount of goods and services available to be consumed by each person
- Real GDP per capita = real GDP per worker x fraction of population employed
 - Real GDP per capita also depends on **average labor productivity**
 - Average labor productivity is the average amount each worker can produce
- Most differences in GDP per capita are explained by differences in average labor productivity
 - The proportion of the population engaged in production has been remarkably consistent
 - In the United States, labor force participation increased as women entered the market and had fewer children
 - Earlier retirement and longer education have checked this steady increase
- Variations in production per person can be very large
 - In 2008, the average output per person in the United States was \$43,000



- China has a population five times that of the United States
 - Production per person is about 20% of the United States'
 - It produces about 5% of the United States' output per capita
 - Africa has countries with the lowest level of production per capita
 - Ghana's averages **\$458** – under \$2 a day, and just over 1% of the United States'
- Five factors affect average labor productivity
 - (1) Better quality of physical capital increases productivity
 - Increasing future capital stock means giving up consumption in the present
 - (2) **Human capital** refers to intangible skills and experience acquired through education, training, and on-the-job experience
 - Creating human capital also usually requires sacrificing current consumption
 - (3) The wealth of many countries depends on their vast natural resources
 - However, they are not essential to a high standard of living or labor productivity
 - (4) **Technological knowledge** improves techniques of production
 - It has been the *single most important* factor in raising historic labor productivity
 - Progress in technological knowledge comes in two main categories
 - (1) Inventing new products, like semiconductors or genetic engineering
 - (2) Developing better methods of organization, such as **Henry Ford**'s assembly line
 - (5) The political and legal environment can affect productivity
 - Japan, South Korea, and China advanced by adapting other countries' techniques
 - However, technological knowledge may be kept as trade secrets or under patent
 - Dysfunctional political and legal systems also prevent countries from advancing
 - North and South Korea had similar resources and standards of living in 1945
 - Achieving a high standard of living requires appropriate incentives for investment
 - However, investment provides diminishing returns
 - If all output were used to invest, we would have nothing to consume
 - Research and development encourages knowledge creation
 - Knowledge is a public good and will be under-produced in a free market
 - Government can encourage R&D in various ways: tax credits, subsidies, directly sponsoring research, or legal protections e.g. patents
- **Unemployment**
 - Macroeconomists also study **employment**, the fraction of labor force with a job
 - **Unemployment** is the state of actively seeking paid work and not finding it
 - A **labor force** includes all employed or work-seeking (unemployed) people

People not in the work force

Children under 16	People in jail	Stay at home parents
Retirees	Military servicemen	Others not looking for work

- The percent of the eligible population in the labor force equals the **participation rate**
 - A critical factor is the number of women in the workforce

Employment rate	$\text{Persons employed} \div \text{persons in labor force}$	Total = 100%
Unemployment rate	$\text{Unemployed persons} \div \text{persons in labor force}$	}

- With a high unemployment rate, finding work is difficult
 - People who do have jobs find it harder to get promoted or to get a pay raise
 - Unemployment increases during recessions and drops during expansions
- However, zero unemployment can never be achieved
 - New job-seekers constantly enter the market



- Fortunes change within industries or regions all the time
- The **Bureau of Labor Statistics (BLS)** measures the unemployment rate each month
 - It surveys about 60,000 households a month
 - The American unemployment rate has not increased in the long-run
- Three main types of unemployment exist
- **Structural unemployment** results from changes in consumer tastes or technology
 - It can occur even while the rest of the economy may be in perfect health
 - Not enough jobs exist in a specific market for the number of job seekers
 - A mismatch exists between a workers' skills and the skills the market demands
 - In the 1980s, the steel industry contracted while the computer industry expanded
 - Laid-off steel workers mostly came from the industrial northeast
 - They also lacked the skills for jobs in new industries
 - Most of the newly expanding industries were located in the Sunbelt
 - Structural unemployment can only be reduced by retraining workers
 - It persists unless the labor force catches up with demand
- **Cyclical unemployment** results from changes in the business cycle
 - If the economy is in recession, unemployment will be above normal
 - Companies selling less will need fewer workers
 - If the economy is growing, then unemployment should be lower than normal
- **Frictional unemployment** results from the time-lag between a worker leaving his job and finding a new job
 - Relocation and the process of job search contribute to frictional unemployment
 - This time-lag can never be zero - frictional unemployment will always occur
 - Time lags can be reduced, though, by ensuring that a dynamic and flexible labor market exists so that new jobs are readily available²³

Group	Number, '000s	Unemployment	9.7%
Adult, non-incarcerated population	236,086	Teenagers	25.5%
Labor force	154,577	White	8.9%
Employed - worked for pay during past week or on leave	139,649	Hispanic or Latino	13%
Unemployed - did not work during the past week AND tried to find paid work during the past four weeks	14,928	Adult men	10.1%
Not in labor force Did not work in past week / try to find work in past four weeks	81,509	African-American	15.1%
Total labor force participation	~66%	Adult women	7.6%

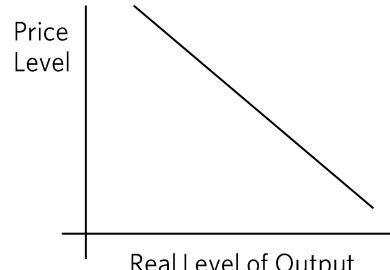
- All economies have a **natural rate of unemployment**
 - This unemployment exists in an economy at full employment
 - It equals the overall unemployment rate minus cyclical unemployment
 - Full employment does *not* mean that 100% of all adults have paid jobs

²³ The following two tables are from Figure 41 of the guide, "Employment and Unemployment in the U.S., August 2009". Yes, USAD has not updated its numbers since 2009.



- Frictional unemployment plus some structural unemployment will exist
- Cyclical unemployment should be negligible in a healthy economy
- The natural rate of unemployment itself can fluctuate
 - During the 1970s and 1980s, women entered the labor force and subsequently raised the natural rate of unemployment
 - More recently, the natural rate of unemployment has fallen
- Unemployment cannot drop below its natural rate in the long run
 - When unemployment drops, firms compete for workers
 - They increase wages or benefits to attract workers, increasing labor costs
 - As labor costs increase, the price of goods will also increase, increasing inflation
 - The natural rate of unemployment can thus be described as the level of unemployment that corresponds to zero inflation
- **Unemployment and output**
 - GDP (Y) can be expressed as potential output (Y^*), plus the output gap
 - Potential output is the quantity of goods and services that the economy could produce when using all its resources at normal rates
 - The level of potential output can increase over time as technology improves and the country obtains more resources
 - The **output gap** is the difference between actual and potential output
- When an output gap exists, the economy's resources are not being fully utilized
 - Unemployment rises when the economy is below its potential output
 - In the 1960s, **Arthur Okun** noted that there was a relationship between the output gap and the level of cyclical unemployment
 - Okun was one of President Kennedy's chief economic advisors
 - **Okun's Law** states that for every 1% the unemployment rate differs from the natural rate of unemployment, the output gap deviates by 2%

Aggregate Demand

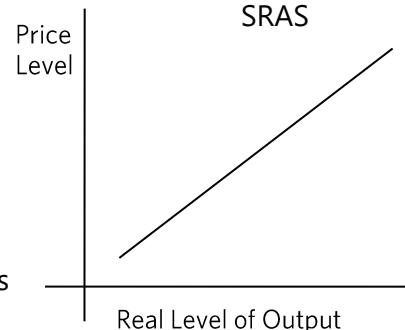


Short-Run Fluctuations

- **The aggregate demand curve**
- **Aggregate demand (AD)** contains the four components of GDP ($C + I + G + NX$)
 - Unlike microeconomics, AD maps the price level, *not* price, to real output
 - We built the microeconomic demand curve from substitution and income effects
 - These effects do not directly apply on the economy's level
 - A decline in the aggregate price level means the prices of all goods decreased
 - Instead of substitution and income effects, three other effects apply
 - The curve is downward sloping
- (1) The **wealth effect** works similarly to the income effect
 - As the price level decreases, incomes increase, allowing consumers to buy more
 - Remember that real incomes are adjusted for the price level
 - If the price level goes down but nominal wages stay constant, the real value of the nominal wages increase
 - Increased purchasing power leads to an increase in the level of output demanded
 - Recall $M \times V = P \times Y$: if V and M remain the same, lower P leads to higher Y



- (2) The **interest effect** implies that AD decreases as price level increases
 - As the price level increases, more money is needed for transactions
 - As a result, more people try to borrow money, and real interest rates increase
 - Higher rates discourage consumption and (primarily) investment
 - When people have more money than they want, they will save in financial markets
 - Increased savings cause interest rates to fall and encourages borrowing
 - (3) The **foreign exchange effect** resembles the substitution effect
 - When domestically-produced goods become cheaper, domestic and foreign consumers desire more of the good compared to other goods from abroad
- **Shifts of the aggregate demand curve**
 - (1) Changing consumption (local and foreign) decisions can shift the AD curve
 - (2) Firms altering investment levels shift the AD curve
 - To increase investment, a firm spends more on capital goods, increasing AD
 - Firms do so because they expect to do well in the future
 - If firms expect rough times, they will decrease planned investment and hence AD
 - (3) Consumer sentiment can change, affecting consumption
 - In the wake of the 9/11 attacks, consumer confidence and stock prices dropped
 - Wealth decreased and AD shifted leftwards
 - (4) Governments can spend directly or impose taxes
 - Many state governments cut spending during the 2008 recession, decreasing AD
 - When the government cuts taxes, consumers have more to spend, shifting AD right
 - Remember that a shift in the AD curve represents a change at all price levels
 - A change in the price level itself only causes a *movement* along the demand curve
- **The aggregate supply curves**
 - Different supply curves have different time frames
 - **Short-run aggregate supply (SRAS)** is the potential supply of all goods in the short-run²⁴
 - It positively relates output and the price level
 - The individual supply curve sloped upward as higher prices attracted firms into the market
 - At the aggregate level, resources cannot be shifted from other activities
 - The curve slopes upward due to the relation between price and anticipated sales
 - Firms fix prices in the short run and sell as much as consumers demand
 - The AS curve depends on long-run potential output and expectations for the price level
 - With no output gap, the SRAS and LRAS intersect at a price level equal to the expectation about aggregate prices at potential output
- **Shift in the aggregate supply curves**
 - Changes in the price level are the most common cause of shifts in SRAS
 - At the expected aggregate price level, SRAS is equal to Y^*
 - An increase in the expected price level will cause SRAS to shift upward
 - A decrease in the expected price level will cause SRAS to shift down
 - Aggregate supply shocks also shift the aggregate supply curve



²⁴ "Aggregate supply" usually refers to short-run aggregate supply.



- Positive climate conditions enable a larger harvest, which shifts SRAS rightward²⁵
- In 1973, OPEC initiated an oil embargo, creating shortages in the United States
 - SRAS subsequently shifted leftward
- Technological progress can cause the LRAS to shift rightward
 - This increase in potential output accounts for the long-run growth of real GDP
- **The business cycle**
 - Economies alternate periods of growth and decline in total output
 - **Business cycles** have characterized industrial societies since the late 18th century
 - It trends upwards on the whole
 - The **short run** is the period in which the performance of the economy deviates from the long-run predictions²⁶
 - Real GDP increases in an expansion (upturn)
 - Expansion continues until the economy reaches a peak
 - A downturn occurs after a peak as real GDP declines
 - It continues until the economy reaches a **trough**, after which the economy begins to expand
 - Most governments work to moderate the business cycle
 - They dampen expansions to prevent inflation and to ease future downturns
 - Policy during recessions relieves social problems e.g. unemployment
 - Macroeconomic policy aims to reduce the severity and durations of recessions
 - Fluctuations in the economy's aggregate growth track unemployment and inflation
 - Recessions occur when real GDP declines for two consecutive quarters (six months)
 - Recessions are characterized by increased unemployment and slowing inflation²⁷
 - Businesses are slow to increase hiring in the early phases of an expansion
 - Increased employment tends to lag behind the next stage of economic growth
 - A very severe recession is called a **depression**
 - The Great Depression constitutes the most severe episode seen to date
 - Periods of expansion feature accelerating inflation
 - Between 1960 and 1979, the rate of inflation trended upward with the business cycle
 - The National Bureau of Economic Research (NBER) studies these short-run fluctuations
 - The Great Depression lasted for **43** months, starting in August 1929
 - The nation's real GDP fell by more than **25%**
 - Since World War II, recessions have generally been short and mild
 - Only three have exceeded 12 months
 - Expansions lasted longer than most recessions, generally lasting more than two years
 - Real GDP has trended upward
 - Various causes contribute to changes in the rate of output growth

Recession: "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" – National Bureau of Economic Research

²⁵ If the climate and weather are permanently beneficial to agriculture, then LRAS would eventually shift right.

²⁶ How long is the short run? USAD remains somewhat vague: the short run is effectively the period of time in which the economy deviates from long-run predictions - based on typical economic cycles, usually one to three years.

²⁷ If inflation occurs during a recession, an economy is experiencing stagflation—high inflation *and* unemployment. This happened in the United States during the 1970s oil crises.



Variations in rate of growth of output

LONG RUN

Changes in growth rate of potential output

Growth rate of population

Rate of increase of capital stock

Changes in pace of tech advances

SHORT RUN

Actual output relative to potential output

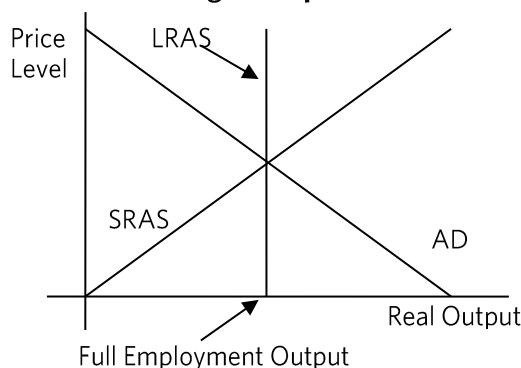
- ❑ Most firms fix prices in the short run and change production in response to demand
 - ❑ Hence, short-run output depends on aggregate demand
- ❑ This price lag also creates short-run output gaps
 - ❑ Over the long run, firms will adjust prices to the normal level of production
 - ❑ These price changes eliminate the gap between actual and potential output
- ❑ Since adjustments take time, government action can close output gaps more quickly

The Keynesian Model

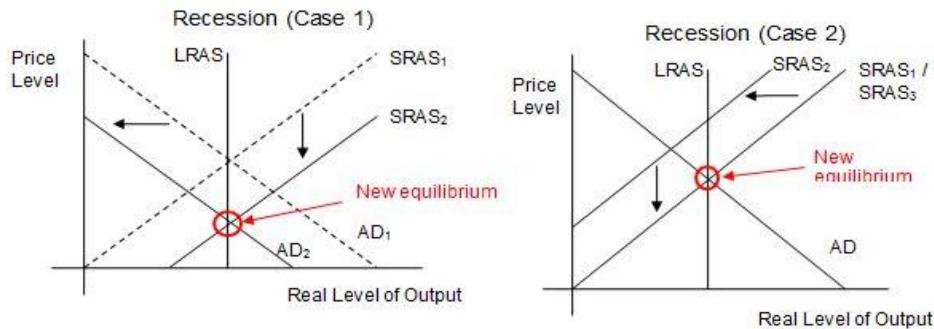
❑ Overview

- ❑ British economist **John Maynard Keynes (1883-1946)** developed the Keynesian model
 - ❑ He wrote **The General Theory of Employment, Interest, and Money** (1936)
 - ❑ Keynes believed current microeconomic models could not account for short-run fluctuations like the contemporary Great Depression
- ❑ Short-run fluctuations depend on the interaction of AD and SRAS
 - ❑ These two curves intersect at an equilibrium price and real output (GDP)
- ❑ Long-run aggregate supply (LRAS) is perfectly inelastic
 - ❑ The curve is vertical at the point where $Y = Y^*$ (output = potential output)

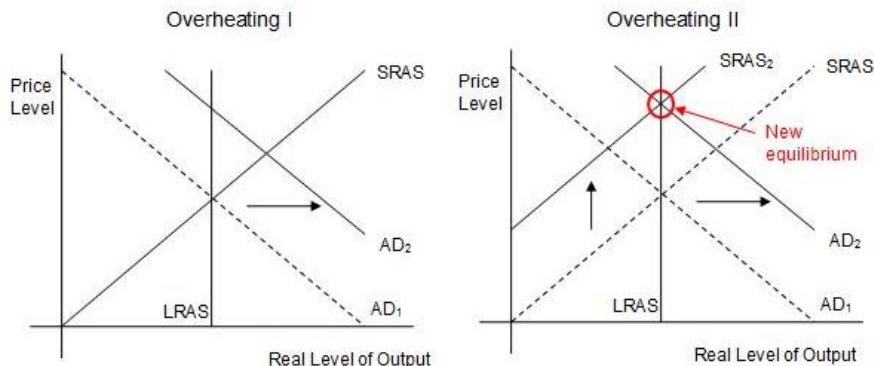
Long-Run Equilibrium



- ❑ LRAS depends on the availability and productivity of factors of production
 - ❑ Supply is fixed at the full employment level of output regardless of price
 - ❑ Changes in the curve can only come from *real* changes in productivity
 - ❑ The perfect inelasticity of the curve reflects monetary neutrality
- ❑ The output level of LRAS is at full employment
 - ❑ If LRAS intersects with SRAS and AD, the economy is in long-run equilibrium
 - ❑ Otherwise, the economy is experiencing inflation or recession
- ❑ A recession occurs when the production level of LRAS exceeds current production
 - ❑ According to classical theory, prices will fall and consumption and production increase
 - ❑ The economy will move back toward long-run equilibrium



- One case in the Keynesian model occurs when AD decreases
 - The 2001 recession occurred due to declining investment amid rising interest rates
 - Some businesses will lower prices, causing the aggregate price level to decrease
 - Falling prices shift SRAS downward
 - Eventually, the economy returns to equilibrium – but at a lower price level
- Recessions can also occur when SRAS decreases
 - In 1973, OPEC significantly reduced oil supply, decreasing SRAS
 - Firms reduced prices, causing SRAS to shift down
 - The economy returns to equilibrium at the same price level and potential output
- Inflation occurs when the production level of LRAS is lower than current production



- Factors are being over-utilized and the economy is "overheated"
- According to classical economic theory, prices will rise, consumption and production will drop, and the economy will move back toward long-run equilibrium
- Suppose excessive government spending causes AD to shift too far right
 - The new equilibrium is now right of potential output
 - The economy cannot stay in such a state for long
 - Firms will cut back on production once they see the higher aggregate price level
- The economy returns to equilibrium at a higher price level and same potential output
- **Inflation in the Keynesian model**
 - So far, we have assumed the level of inflation is zero
 - The long-run price level rises only if the money supply grows faster than the economy's potential output
 - This conclusion directly follows from the quantity equation, $MV = PY$
 - In the Keynesian model, increasing the money supply shifts the AD curve right
 - If people are accustomed to the price rise, the SRAS will shift upward
 - The AD and SRAS curves will intersect at the economy's potential output
 - Full employment equilibrium can exist with any level of inflation
 - Unexpected shocks will cause employment not to follow equilibrium levels



- In the 1960s, President Johnson financed a military build-up through borrowing
- His actions were unexpected, so inflation increased
- In the long run, no policy will maintain output at a level different from potential output
- **Fiscal policy**
 - **Fiscal policy** allows the government to impact overall economic activity
 - Fiscal policy refers to government spending - direct, or via indirect taxation
 - Increased government spending results in increased aggregate demand
 - GDP thus rises
 - Cutting taxes increases income, which increases spending
 - **Expansionary fiscal policy** increases government spending and/or lowers taxes
 - It offsets recessions and restores full employment
 - **Contractionary fiscal policy** decreases government spending and/or increases taxes
 - It cools down expansions and brings employment back down to the natural rate
- **Arguments for and against government intervention**
 - Supporters of intervention argue that deviations of actual from potential output are costly
 - The economy loses the goods that could have been produced
 - Unemployment causes significant hardships
 - Whenever resources are overemployed, inflation results
 - However, it is difficult to accurately pinpoint potential output and interventions needed
 - It takes time to collect information about the aggregate economy
 - The first estimates of yearly GDP take three months to calculate, and need to be revised
 - Most information about the economy has a time lag
 - Policymakers must act on incomplete data
 - It may not be practical to carry out fiscal and monetary policy
 - Once policies are enacted, the effects of actions take time
 - Businesses will not invest right away, as investments must be planned and funded
 - When Congress approves a spending bill, it can take six months or a year to implement
 - Some fiscal policy may not take effect until the economy is already recovering
 - As a result, the economy may overshoot full employment—resulting in inflation
 - Activist policies might turn out to be counterproductive



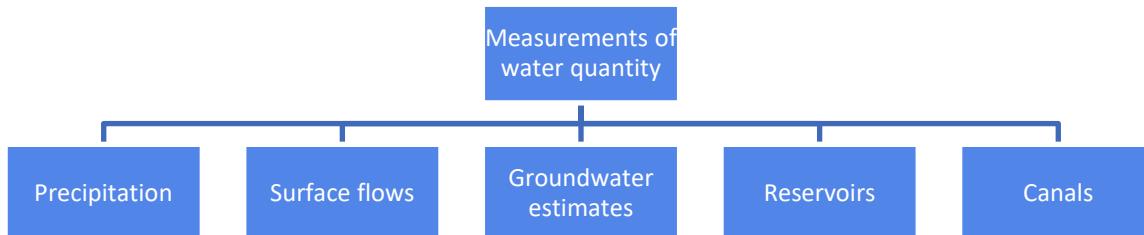


IV. THE ECONOMICS OF WATER

POWER PREVIEW	POWER NOTES
<p>This section gives a very brief overview of the economics of water, with a particular emphasis on a series of short case studies. Even though the United Nations and other institutions think of water as human right, it can still be discussed and understood in economic terms.</p>	<ul style="list-style-type: none">▪ According to the USAD outline, 10 questions should come from Section IV▪ Section IV covers pages 111-128 of the USAD Resource Guide

Water Uses

- **Historically, there have been three categories that describe the uses of water:**
 - Agricultural uses comprise the vast majority of worldwide water usage
 - Irrigated agriculture represents 70% of worldwide consumptive water usage
 - In some regions of the western United States, 90% is used for agriculture
 - Urban uses are those in cities
 - Commercial uses are those in factories
 - Recently, there has been more attention paid to water for the environment
 - "Water for the environment" used simply to mean leftover water
 - Now it is often considered an independent category
 - Some of these categories are more sustainable than others
 - **Consumptive use** occurs when water is not returned to the system
 - **Non-consumptive use** is when water is returned to the system
- **Background on where water comes from**
 - Water is classified by its source
 - **Surface water** is contained in reservoirs and travels through pipes or canals
 - Surface water often requires treatment to ensure purity and safety
 - It requires significant infrastructure investment
 - 68% of withdrawals in the United States are from surface water systems
 - **Ground water** comes from wells
 - Underground rivers called **aquifers** fill wells
 - Pumping is often near the site of usage
 - Using aquifers does not require much infrastructure investment
 - There is an energy investment, though, as pumps need to get the water to the surface
 - Ground water needs less treatment
 - Soil and rock filter the water
 - Both forms of extraction face problems
 - Using surface water reduces flows in rivers and depletes groundwater
 - Using groundwater shrinks the water table, increasing the cost of pumping
 - It also invites seawater in and depletes surface water
- **Quality vs Quantity**
 - **Quantity** is how much water is available at a particular time and place



□ Water is frequently used for irrigation

- Crops all need different amounts of water
 - Staple cereals require, in general, between **450mm and 700mm** of water per year
 - From 1961 to 2003, the land that the world uses to harvest crops increased by **24%**
 - **28%** of that land is irrigated
 - Most (**70%**) of the world's irrigated land is in Asia
 - **35%** of all cultivated land is irrigated
- The advent of irrigation greatly influenced human societies
 - The **Hohokam (American Southwest)** created **850** miles of waterways in the **1400s**
 - This system allowed for the largest population (at the time) in what is now the United States
 - Some remnants of this system still exist
 - **Spain** also is known for extensive usage of irrigation
 - There were few sites for dams
 - Water use associations dug and managed canals
 - These associations still exist and oversee the majority of irrigated land in Spain.
- Modernization of irrigation has not been consistent worldwide
 - In the American West, irrigation systems were modern by the late **1800s**
 - In Asia, irrigation systems only modernized with the **Green Revolution**
 - The Green Revolution describes the development and introduction of high-yield crop varieties, modern fertilizers, and powerful pesticides.
 - These pesticides and fertilizers are challenging from an environmental perspective
 - Runoff from irrigated land often pollutes groundwater severely
 - The Green Revolution is responsible for a huge increase in food output
 - Irrigation has also helped
- Irrigation generally involves moving water over long distances
 - Often, users use the same irrigation canals or pipes
 - Thus, they share some organizational responsibility
 - Historically, individuals and corporations founded irrigation projects in the United States
 - These systems of organization were difficult to execute properly
 - Canals and farmers depended on each other
 - Corporations needed farmers; farmers needed water
 - A situation in which both sides have bargaining power is called a **bilateral monopoly**
 - Farmers could withhold payment and canals could withhold water
 - **Mutual ditch companies** arose
 - In these systems, irrigator-owners worked together to dig a ditch in exchange for a set amount of water from the canal
 - The problem of bilateral monopoly was solved
 - The owners became the operators



- With more and more demand, though, these projects became untenable
 - Government stepped in and created the **irrigation district**
 - Irrigation districts used taxes and electable boards to contract canal digging and codify rules for water delivery
 - Some regions of the western United States has a different system
 - Acequia developed
 - They are canals co-managed by the farmers
 - Everyone shares responsibility for cleaning and maintaining them
 - The rules are decentralized and stem from Spanish and Anglo-American water law
 - They arose from the fact that Spain and Mexico were in control in this region
 - Irrigation districts replaced many of these districts in the early 1900s in an effort to standardize and centralize systems
 - Where they remain, acequias are as effective as irrigation districts
 - The United States has also used irrigation to bring water across the west
 - The western United States is arid
 - The **98th meridian** is used as the divide
 - Not having access to water was a major theme of the West
 - Projects like the **Hoover Dam** and other federal reclamation efforts distributed water across the West
 - From 1940 on, innovations allowed more irrigation on the Great Plains and west,
 - Irrigated acreage doubled from **20 million acres** (1940) to **40 million** (1978)
 - These areas increased crop production by **\$19 billion**
 - This amount was **90%** of the increase in the overall value in crop output
 - Irrigation helps ensure that drought does not ruin a crop
 - In **India**, energy subsidies combined with high agricultural intensity are unsustainable
 - A government passes **subsidies** to make a resource accessible
 - The Indian government passed many in the 1970s
 - These subsidies made it possible for farmers to pump water for almost zero cost
 - They could irrigate their high-yield crops
 - Irrigatable land increased by **300%**
 - Groundwater irrigation contributes 10% of India's GDP
 - **70-80%** of irrigated output uses groundwater
 - It is nearly impossible to effectively install and monitor pumps
 - Lack of oversight has resulted in overextraction and unsustainable use
 - Flat fee pricing, too, contributed to the problem
 - Removing these subsidies is important for the environment
 - It may threaten people
 - These subsidies have nearly eliminated famine in India
 - Removing them might harm rural and low-income families
 - There is little political support for removal among farmers
 - Conservation pricing is also unpopular²⁸
- Irrigation has resulted in the draining of the **Aral Sea**, **Great Salt Lake**, and **Owens Lake**
 - Water diversions across the world have drained **terminal saline lakes**
 - Saline lakes are created when watersheds drain into inland lakes or basins instead of the ocean

²⁸ To be focused on in the next section! – Robert



- These lakes are often extremely shallow
 - They are delicate ecosystems
- The Aral Sea is located between **Kazakhstan** and **Uzbekistan**
 - Its waters were been diverted to increase **cotton production** in the **Soviet Union**
 - The Aral Sea's surface area has decreased by **74%**
 - Its volume has decreased by **90%**
 - However, the amount of salt in the lake has stayed relatively constant
 - Thus, the water's salinity has spiked
 - The water has become toxic for fish
 - The commercial fishing industry has collapsed
 - This industry used to harvest **40,000 tons** annually
 - It employed workers
 - The Great Salt Lake in **Utah** has undergone a similar path
 - Feeder rivers were diverted for irrigation
 - Land area has decreased by **50%**
 - Restoring the ecosystem will take a **29%** increase in the amount of water in the lake
 - **Los Angeles** diverted all the water that fed Owens Lake
 - The lake is now entirely dry
 - It spreads toxic dust into the air
 - The fallout has cost Los Angeles billions and increased air pollution
 - There are a few ways to preserve saline lakes
 - First, authorities can build another lake or reservoir to help make up for reduced inflows
 - This solution helps to divert water
 - It does not prevent dust pollution
 - It also costs a significant sum of money
 - Second, authorities can determine the minimum amount of water that is necessary to preserve the lake
 - This approach was tested with California's **Mono Lake**
 - Los Angeles was legally required to decrease diversions to protect the lake

Thinking Like Becker²⁹

- Water is critical for human survival
 - People need drinking water to survive
 - People also need water for agriculture, electricity, and sanitation³⁰
 - Some animals also need water as a habitat
- Adam Smith's idea of **scarcity value** is important the economics of water
 - Scarcity value is the idea that a good is worth something because it is not abundant
 - Water, like other goods, can be cheap when resources are plentiful
 - Because water is so heavy and needed in large amounts, it is hard to transport
 - As such, local conditions determine its scarcity
 - Like other goods, water can be very expensive when it is scarce
 - Water is an inelastic good because it is so vital for human survival

²⁹ Gary Becker won the Nobel Prize in Economics for arguing that the study of economics can be applied to nearly everything.

³⁰ This list is not exhaustive; this is simply the list provided in the guide



- The value of having water, even when it is expensive, is greater than the price
 - Water is a renewable resource
 - Water that was originally sold for drinking can later be resold for farming
 - Once water is used, it goes through the water cycle
 - That is, water is a commodity that can be bought and sold
 - The rules of economics apply to water
 - Every market has buyers and sellers, and every good has a price
 - Thus, water is both a human right and a commodity
 - The study of how we allocate water is very much an economic question
 - This fact does not mean that water is not a human right
 - Nor does it mean we do not have obligations to ensure access to it
 - Economics can provide information and solutions as to how to allocate water more effectively
 - When this allocation breaks down, there is **market failure**

□ Market failure happens when there is an inefficient allocation of resources

- Market failure can happen more often when something is particularly important
 - Externalities and monopolies are oft-cited examples of market failure
 - To manage these failures, **economic institutions** exist
 - The name "economic institution" is a bit of a misnomer
 - These institutions comprise everything from the legal system to the regulatory industry and markets
 - These institutions are responsible for setting up rules that govern economic activity
 - They start with property rights

Property Rights

□ For water to have a price, and for it to be bought and sold, it must be owned

- In other words, someone needs to own the right to water so that they can sell it
 - As such, economic institutions have codified **property rights**

What does it
mean to own
water?

How can you
own water?

How can you
sell water?

- what it means to own water, how you can own it, and how you can sell it
 - These are called **property rights**
 - They also provisions for how property can be used and exchanged
- Water law is the term for this formal codification of property rights**
 - Different areas around the world have different laws
 - Spanish water law** has rules that are based on fairness
 - It prioritizes the public good
 - It also considers prior usage, intent of usage, existing legal rights, and need
 - English **common law**, by contrast, only relies on legal precedent
 - In countries with common law systems, there are different legal precedents
 - In **England** and the **Eastern United States**, this precedent is the **riparian doctrine**
 - Water belongs to the person who owns land that borders the water³¹
 - It is allocated equally to the various owners along the body of water

³¹ More on this later! – Robert



- The rights are not rights to the specific liquid
- Instead, they give the owner the right to all water that flows in their area
- When land is sold, the riparian rights are also transferred
- There are two subtypes: **natural flow** and **reasonable use**

Natural Flow	Reasonable Use
Use for domestic purposes Maintain watercourse	Divert water for lawful purposes

- Owners cannot store water, nor are they penalized for not using it
- Another system is the **appropriative rights doctrine**
 - This doctrine uses a seniority system³²
 - These rights are given through a doctrine of "first-in time, first-in-right"
 - They require that water be put to **beneficial use**
 - The water must be used in such a way that is consistent with common, accepted practice
 - In other words, you cannot horde water in order to become a water baron
 - They also require that usage does not harm **third parties**
 - A third party is someone outside of the initial transaction
 - Effectively, these rights give access to a fixed quantity of flow from a stream
 - The earlier the claim, the stronger the right
 - In a drought, water is rationed such that newer claimants lose access faster
 - When overall consumption is less than stream flow, diversion is easy, cheap, and efficient
 - Appropriate rights are also legally simple
 - They are not tied to the land, so water markets and securities have a strong backbone
 - However, greater water use in modern times means that people often demand more water than flows in a stream
 - In this system, people must work together
 - Junior diverters are rely on senior diverters to use water responsibly
 - As little as 50% of senior diverters' water is consumed
 - Much of it flows back
 - In other words, although a senior water user might use a lot of water to turn his water mill, he also returns a lot of it to the stream
 - It is thus free for a junior water user to use
 - These systems all rely on existing **water rights**
 - **The introduction of property solves the tragedy of the commons**
 - Recall that the tragedy of the commons occurs when no one has an interest in conserving and maintaining a resource
 - Property rights mean that someone now owns capital
 - Someone else must buy it
 - This introduces the price mechanism
 - The price mechanism ensures that the owner and renter (buyer) are both compensated

³² This differs much from place to place, but always does ignore a relationship between land and water (you don't necessarily get water that borders your property). USAD does not go into great detail.



- The owner wants to get their due
 - Thus, they charge a price that will limit usage and maximize profit
- The buyer needs the resource
 - However, they must pay for it
 - Thus, they will consume the economically efficient amount
 - A side effect of property rights is that resources are not overused
- In times when property rights are not clearly defined, people must negotiate
 - Per the Coase Theorem, this means that a pareto optimal solution can be found³³

□ **Property mechanics work differently for groundwater**

- Pumping water from an underground aquifer often drains the water supply over a large amount of land
- If one person's well drains too much water, their neighbors will run out
 - Drilling on your own land affects your neighbors
 - Hence, property rights must be codified differently
- Local governments can limit pumping
 - Such an approach is costly and unpopular
- Another solution might be a **permit system**
 - A permit system allows users to trade their water usage
- Or, users can find a collective solution, working together to create unspoken guidelines
 - **Elinor Ostrom** won the **Nobel Prize** for explaining how users can work together to govern common-pool resources
 - These agreements are alternatives to property rights to prevent the tragedy of the commons

Thinking Like Keynes³⁴

□ **Water Supply**

- Water resources are often extremely large
- Extracting water can benefit from **economies of scale**
- "Economies of scale" is an economic term which implies increasing returns to scale
 - It becomes cheaper to produce when you produce more
- The best way to produce water may be through a monopoly
 - For example, homes only have one water company's pipes providing water
 - It would be expensive, complicated, and inefficient to build more sets
 - A notable side-effect is that this means that consumers cannot choose their water company
- If water is scarce, the value of water is more than the cost of extraction
- Traditionally, in competitive markets, price is set at marginal cost
 - Demand for water would exceed supply
 - A **shortage** would result
 - The market should respond to this, increasing price
 - As consumers demand less water, the shortage will end
 - In the real world, though, water can be difficult to trade, or inelastic
 - Raising prices does not always end a shortage
- **San Francisco** provides a case study

³³ In the real world, the Coase Theorem does not often apply. There are a myriad of assumptions that are nearly never met.

³⁴ This is the part where I talk about AD/AS lines (the kind that we no longer use in economics ☺) – Robert



- In **1900**, the city was entirely supplied by **Spring Valley Water Works**, which limited flow into the city to drive up prices
- The **1906** fires were said to be worsened by the lack of water
 - Many blamed the company
 - The actual impact of the water shortage on firefighting was not clear
- Hence, the city took over the water company
 - They turned it into a **regulated monopoly**
 - A regulated monopoly is one that has limits set on it
 - These limits generally take the form of the price that it can set
- The new company decided to use the **Tuolumne River**
 - This river is found in **Hetch Hetchy Valley in Yosemite National Park**
- It still receives most of its water from the Tuolumne River
 - It pays **\$30,000** per year for the privilege
 - The city sells the water for over **\$440 million**, returning a huge surplus
- Water pricing does not function like a traditional competitive market
 - Consumers buy water from water utilities, who set a price schedule
 - There are four important types
 - Each charges per-unit prices, usually in units of **1,000 gallons**
 - **Flat fee**, where an instillation charge is applied, but the fee does not change with the amount of water consumed
 - **Constant marginal price**, where each unit of water has the same charge
 - **Decreasing block rate** (bulk discount), where buying more means paying less on the margins
 - **Increasing block rate**, where buying more means paying more on the margins
 - The type of rate *should* change the incentives of consumers
 - With a flat fee, consumers have every incentive to use as much water as possible, as they'll be charged the same amount
 - Decreasing block rates also create this incentive
 - Constant marginal prices have conservation incentives
 - People are charged per unit of water that they use
 - Increasing block rates do the same, but to a higher degree
 - People are charged more and more with every unit of water they use
 - This approach is also called **conservation pricing**
 - It reduces demand and helps to conserve water
- **Water Demand**
 - Water demand *seems* self-explanatory
 - People need water, so they must procure it
 - However, water is unlike other goods other goods
 - Its difference partly arises from the way that customers are billed
 - Traditionally, people make economic decisions by thinking *marginally*
 - In other words, they decide whether to buy one more unit of a good
 - They implicitly compare the utility of one more unit against the cost
 - "Is using one more gallon of water worth the extra \$0.30?"
 - Importantly, the price of a good is not static
 - The fortieth gallon of water costs a different amount than the first
 - Modeling this calculation underpins much of modern microeconomics
 - Water bills do not show marginal price



- Instead, they only show *total cost*
- Consumers only have access to the average price per unit
- Because of economies of scale or limited resources, marginal price per unit is different than average price per unit at the stopping point
 - The *average cost* of water over forty gallons is different than the *marginal cost* of the fortieth gallon
 - In some cases, the average cost is less than the marginal cost
 - This situation might arise when there are abundant resources
 - With more water demand, production is more efficient
 - In other situations, the average cost is more than the marginal cost
 - This situation might arise when there are few resources
 - Each gallon of water is more valuable than the last because there is so little
- The takeaway is that consumers make decisions that may not be in their interest
 - Consumers do not know the marginal cost
 - Their decision-making calculus is off
- Even if the marginal price of water were known, planners³⁵ would still need estimate elasticity
 - The elasticity of demand is a measure that shows how a percentage change affects percentage change in demand
 - One³⁶ meta-analysis showed that this number was **-.41**
 - "A one percent increase in the price will decrease demand by .41 percent"
 - If something has an elasticity between -1 and 1, we call this good inelastic
 - If something has an elasticity outside of this range (<-1 or >1), we say it is elastic
 - Often, this would look like goods that have substitutes
 - If the price of Froot Loops increases, I might buy something else instead
 - There's no *reason* to spend extra on Froot Loops if I also like other cereals

□ Markets and Trading

- At a glance, a market for water is straightforward
 - Water is bought and sold voluntarily
 - The quantity of water being bought and sold can be determined by equating marginal cost to marginal benefit³⁷
 - The marginal cost comes from the supply side (sellers)
 - Sellers extract water, and each unit of extraction costs a different amount
 - This is represented by the supply curve
 - The marginal benefit comes from the demand side (buyers)
 - Buyers demand water, and each unit of water is demanded less
 - This is the law of diminishing marginal returns
 - The demand curve represents this situation
 - Water is extracted by the sellers until the marginal cost of extraction is equal to the marginal benefit to consumers
- If water can be transported, buyers and sellers can react differently
 - Buyers in a different market might be willing to pay more for water
 - Sellers would thus be motivated to transport water there

³⁵ That is, someone interested in understanding the market (perhaps a water company executive who wants to set higher prices).

³⁶ Dalhuisen et al 2003

³⁷ This assumes that we are in a competitive market



- This requires a trade off with buyers in the old market
 - They are less willing to pay the high price, so they demand less water.
- Because sellers get more per unit of water, they can extract more water
 - That is, the marginal benefit of water is higher (because demand is higher), so the marginal cost can be higher too
- The way that marginal benefits are equalized across markets is called the **epimarginal principle**
- Sometimes, people have property rights to water that they do not need
 - In the United States, **Chile**, and Australia, water can be extremely scarce
 - This fact incentivizes institutions to separate property rights to water and land
 - Thus, water rights can be traded separately from land rights
 - Irrigators need their land but can sell conserved water
 - Careful planning is still required
 - Other kinds of selling activity also require careful planning
- In the United States, selling *only* water rights requires filing an application with an individual state
 - Different states have different requirements
 - Generally, these applications need to be specific about the amount of water, duration of the contract, and timing
 - They also must specify the expected **consumptive use**
 - Consumptive use describes how much water will be used and *not* return to the system
 - Many groups can and often do try to block these transfers
 - The applicant has the burden of proof
 - Third-party interference only arose commonly in the second half of the twentieth century
 - Before then, water was rarely transported
 - Now, there is demand to pump water to far-away locations
 - Local groups block transfers more often
- In China, water transfers often occur when the government moves large quantities of water over long distances to increase water supply in dry areas
 - Most of China's freshwater is in the South
 - Its population and important agricultural areas are concentrated in the North and East
 - These populations and farms have caused the northern **Yellow River** to dry up for periods in twenty-two of twenty-eight years
 - In the South, the **Yangtze** has had increasing water levels that have endangered millions, and killed thousands
 - The **1998** flood killed around **4,000** people
 - To help resolve some of these problems, the Chinese Government created the South-North Water Transfer Project
 - It uses inter-basin transfers to move water from the Yangtze to the Yellow River
 - **Forty-eight billion cubic meters** are moved per year
 - The water quality from these transfers is often poor
 - Regions suffer from agricultural and industrial pollution
 - **300,000 people** were forcibly resettled to make land space for the project



- In Chile, water transfers have been important to mitigate the problems associated with severe water scarcity
 - The **Atacama Desert** is one of the driest places on Earth
 - The **Antofagasta Region** only receives **5mm** of annual precipitation
 - It is also the world's largest **copper** producer
 - The copper industry is extremely water intensive
 - Agriculture only accounts for **33%** of water use in Chile
 - Mining accounts for **56%**
 - Mining firms can do this efficiently by way of purchasing water rights from farmers
 - Markets, then, help to avoid the economic cost of having to transport water from extremely far away
 - Industrial and urban users in arid areas can get a deal that benefits both them and the owners of water
 - There are huge gains to trade³⁸
- Environmental transfers also exist
 - Water has value as surface water because it provides an **ecosystem service**
 - **Instream flows** can also be valuable
 - In other words, water helps to clean up pollution or provide habitats
 - It provides these services to the ecosystem
 - Hence, the very flow of the water matters
 - In many of the Western United States, people can purchase rights to instream flows
 - They can have access to more waterflow
 - In other words, owners upriver can extract less water and there is more flow downstream
 - The side-benefit is that water prices stay equal along a river
- **Water quality markets** also exist
 - Water quality markets are a way for companies to do what is best for them, while still reducing pollution
 - In practice, these look like a **cap-and-trade system**
 - In this system, the policymaker establishes the total amount of pollution that an ecosystem can tolerate
 - Each firm is allocated a set amount of pollution
 - This amount can be determined in a variety of ways
 - Regulators can auction off permits
 - Or regulators can use historic data, a process called **grandfathering**
 - Firms can then engage in **water quality trading**
 - If firm A doesn't pollute, they can sell their rights to firm B, which pollutes more than their allotted amount
 - This analysis becomes more complicated once firms change their strategy
 - Firms can change the amount they pollute over time
 - Then, firms that would have a higher cost from shifting benefit more from trade than those that can easily shift
 - Firms use the term **marginal abatement costs** (MACs) to describe this phenomenon
 - In theory, cap-and-trade should go a long way towards economic efficiency

³⁸ Assuming this negotiation is possible! – Robert



- In the real world, it faces several obstacles:
 - Firms are often uncertain about the future both in terms of regulation and their ability to abate pollution
 - Firms do not know how much other firms are polluting, meaning they do not buy the credits
 - If one or two firms use all of the credits, areas with extreme pollution arise
 - **Pollution hot spots** are locations with intense pollution
 - Regulators can cap the number of credits one firm can use
 - This approach limits the efficacy of the free market
 - Pollution, in general, remains an unresolved issue

Pollution

- **Firms often pollute in water**
 - Pollution is a very common externality
 - Recall that an externality is a benefit or cost from a transaction that is uncompensated
 - That is, they have no specific price
 - Consumers neither pay nor are paid for them
 - Pollution is an exactly of a negative externality
 - The positive societal effects of higher education are a positive externality
 - Pollution can have a very high **social cost**
 - Social cost is the sum of the fiscal costs that the firm endures and the **external cost** of pollution



- Pollution's external cost is the harm that it does to the society
- Absent regulation, firms do not have to incorporate these costs into their production schemes
 - The consequence is a choice of output that is productively efficient but not socially efficient
 - In general, people care about pollution
 - The firm's bottom line does not reflect this concern
 - There is market failure in this situation
 - With regulation, firms have incentives to incorporate these costs
 - A socially efficient production scheme results
 - Notably, there still is *some* pollution; just less
 - There are also more costs associated with production
 - The result is that people are happier, but they pay more
 - They are *willing* to pay more because they value having less pollution
 - They perform a **benefit-cost analysis**
 - They decide how much they're willing to pay to get less pollution.
 - Those types of regulation strategies are varied
 - **There are different strategies for regulation**
 - Regulation can help to correct market failure
 - The regulatory industry must determine both how *much* to regulate and *how* to do it



- A common way to calculate the optimal regulation strategy is to return to a familiar strategy
 - Regulators will attempt to equate marginal cost to marginal benefit
 - In this case, they compare the marginal cost of polluting one fewer unit with the marginal benefit that society gets from not having that unit of pollution
 - The marginal cost, in this case, is called the **marginal control cost (MCC)**
 - These MCCs differ across firms
 - Hence, to be optimal and meet the equimarginal principle, they must be able to exchange
 - The marginal benefit is called the **social marginal damage**
 - Once economists have solved for the optimal amount of pollution, policymakers still must determine how to execute their plan
 - In other words, they must select their **regulatory instruments**
 - There are two types of plans: **prescriptive regulations** and **economic regulations**

Prescriptive Regulations	Economic Regulations
Pre-sets which firms need to pollute less, how they pollute less, and how much less they pollute	Sets policies that shift the incentives of firms away from pollution
Requires significant knowledge about the firm's operation and the industry	Does not require knowledge of firms—the incentive operates in the same way on them all
If executed properly, can result in assured reductions in pollution	Hard to estimate social cost of pollution to set economic incentives properly; political opposition often intense
Easy to verify which firms are complying	No verification needed; only need to measure pollution levels

- One common example of an economic regulation is a **Pigouvian tax** system
 - This tax system mandates that firms pay a tax on every unit of pollution that they produce
 - The effect is clear
 - Firms are pushed away from pollution
- Other common examples of economic regulation are pollution markets and water quality trading
- **Nutrient credit markets** also exist
 - In these, entities are compensated for the efforts they make to improve water quality

□ **The Clean Water Act (CWA) was a major regulatory effort**

- In **1972**, the United codified that the Environmental Protection Agency could mandate and affect water quality
- Since then, over \$1 trillion has been invested under the CWA
- The Act has been largely successful
 - Water pollution levels have massively decreased
 - However, many parts of the country continue to be in excess of standards
 - Over half of stream and river miles fall into this category
 - This result is likely due to the CWA's failure to deal with **nonpoint sources**



- **Point sources**, like a pipe that feeds pollution into a river, are heavily regulated under the CWA
 - A point source pollutant is a pollutant that enters the ecosystem from an easily identifiable location
- Nonpoint sources are the opposite
 - They are hard to pinpoint, and the CWA does a poor job of regulating them
 - Water runoff after a storm, for example, often contains large amounts of pollution that the CWA cannot regulate
- **Drinking water is similarly important to regulate**
 - In the United States, the **Safe Drinking Water Act** lets the EPA set national standards for water quality
 - The problem that the EPA is solving is a question of balance
 - It needs to make sure that drinking water is *safe* but not *too expensive*
 - Standards that are too strict run create water that is too expensive
 - Standards that are too lenient create water that is not safe
 - Access to safe drinking water remains an important health concern around the globe
 - **1.1 billion** lack access to safe drinking water, causing millions of deaths
 - The journey to retrieve water in many countries is a significant time commitment
 - Because girls are often sent to collect water, it sets women's education back years
 - Even in industrialized nations, rural areas often rely on well water
 - Well water can be contaminated
 - Delivery infrastructure continues to be a vector for contamination
 - Improvements to water quality have huge upsides
 - Usually these improvements greatly outweigh the fiscal costs
- **Pollution Case Studies:**
 - Flint
 - To cut costs, **Flint, Michigan** officials stopped using **Detroit's** water supply in **April 2014**
 - They would instead treat water from the **Flint River**, saving **\$5 million**
 - Treatment would clean it and ensure it would not pick up lead from the city's ageing lead pipes
 - This did not happen
 - Over the next year and a half, residents were exposed to dangerous amounts of lead
 - Residents have spent **\$20 million** on safe drinking water
 - Flint houses fell in value by **\$345 million** (to a new value of **\$500 million**)
 - State and federal spending is more than **\$343 million**
 - North Carolina
 - In North Carolina, **phosphorous** and **nitrogen** are issues
 - Both are very nutritious, which can lead to **eutrophication**
 - Eutrophication results in algal blooms
 - These starve the water of oxygen
 - Fish and other animals die
 - The economic cost is severe
 - The **North Carolina Department of Environmental Quality** (NCDEQ) oversees regulation



- They regulate water quality markets between point sources in watersheds and basins
 - Trading water requires permits
 - Trades must also occur between firms in the same watersheds
 - Only seven trades have occurred since 2004
- North Carolina also lets firms satisfy their requirements by purchasing offsets from **private mitigation banks** (PMBs)
 - Effectively, firms are required to donate to restore or preserve other water bodies
 - PMBs most often construct or repair zones near rivers
 - These regions are called riparian buffers
 - Credits are often bought by urban development projects that are compensating for new stormwater runoff systems
- Great Lakes
 - Pollution does not always take the form of a chemical
 - It can also take the form of an animal
 - **Invasive species** often are transported because of human activity
 - The **Zebra Mussel** is native to Asian and European freshwaters
 - They arrived in the Great Lakes in the **1980s** in cargo ships
 - Since then, they have dominated the ecosystem
 - They are algae-eating filter feeders
 - However, they outcompete native species
 - Once an invasive species is introduced, controlling the source does not matter as much as containing the population
 - As such, a few strategies have been attempted:
 - 1) **Biological strategies**, aimed at using predators to curtail populations
 - Such as the salmon being deployed against the alewife population
 - 2) **Mechanical**, aimed at preventing further spread of the population
 - These strategies include those such as the electrical gate being used to keep Asian Carp from spreading
 - 3) **Chemical**, aimed at killing or controlling invasive species
 - These strategies include those such as using chemicals to kill sea lamprey
 - When pursuing these strategies, economists still consider marginal cost to marginal benefit
- Coal Ash in Virginia
 - Using coal to produce power results in heavy metals entering the air and water
 - **Lead** and **mercury** are a negative externality of coal combustion
 - Historically, **coal ash** was stored at power plants
 - Because plants needed water for both cooling and steam, they were often located near waterways
 - Thus, waterways were particularly at risk of pollution from coal ash
 - Ash could spill or runoff into rivers and lakes
 - There are a few potential strategies to resolve this issue
 - **Cap-in-place** involves covering up coal ash to prevent runoff and seepage
 - Recycling the coal ash
 - Removing the coal ash, lining the areas with protective material, and returning the ash



- Transportating the coal ash to off-site facilities that are in better locations
- In **Virginia**, this process is estimated to cost between **\$2.4 and \$5.6 million**
- These numbers comes from **Dominion Energy**
- The extraordinary cost pushes us towards a **benefit-cost analysis**
 - This type of analysis can be used to study different potential methods
 - It tries to assign a dollar amount to actions
 - Then, the actions can be compared with the nominal costs of an action



POWER LISTS

All numbers in parentheses refer to the page numbers of the USAD Resource Guide where you can find the first reference to the defined term. Some dates are vaguer because precise dates are not given in the USAD guide.

TERMS — FUNDAMENTALS OF ECONOMICS

- Absolute advantage (36) One party's ability to produce more of a good than another; compares direct cost of production
- Comparative advantage (36) One party's ability to produce a good at a lower opportunity cost than another; results in gains from trade; makes specialization efficient
- Cost-benefit analysis (7) How rational decision-makers decide on one choice by weighing the pros and cons of a decision in an attempt to maximize utility
- Economics (6) Study of how individuals allocate resources to satisfy unlimited wants; divided into micro and macro, positive and normative; fundamental assumptions include scarcity, trade-offs, opportunity cost, rational actors, and gains from trade; field founded by Aristotle and formalized by Adam Smith's 1776 *An Inquiry into the Nature and Causes of the Wealth of Nations*; uses models and diagrams to study markets
- Normative economics (8) Economic analysis that focuses on what *should* be, rather than what actually *is* or can be; involves opinion
- Opportunity cost (7) The cost of what is given up when you make a decision; the cost (monetary or otherwise) of the "next best" alternative
- Pareto efficient (8) A state where it is impossible to improve one person's well-being without reducing someone else's well-being
- Positive economics (8) Economic analysis that seeks to describe and explain economic phenomena; does not involve value judgments
- Production Possibilities Frontier (PPF) (36) Diagram of the different combinations of output that can be produced; all points on the PPF are efficient, all points within the PPF are inefficient, and all points outside the PPF cannot be attained; represents the trade-offs a producer faces and all possible combinations of output in an economy
- Scarcity (6) Finite nature of resources; fundamental assumption of economics; requires actors to allocate scarce resources to fulfil unlimited wants
- Trade-offs (7) The need to give up some good to obtain another good; decisions about which are represented on the Production Possibilities Frontier
- Unlimited wants (7) Assumption that all people have unbounded desires that can never be fully fulfilled; clashes with the scarce nature of resources; requires people to make judgments about utility and trade-offs



TERMS — MICROECONOMICS

- Accounting costs (40) Part of total costs; includes only actual monetary expenditures
- Accounting profit (40) Profit that does not include opportunity costs
- Average cost (40) Total production costs divided by quantity produced; total production cost of one input
- Barriers to entry (43) Prevent competitors from entering a market
- Binding (33) Describes a price floor above the equilibrium price, or a price ceiling below the equilibrium price
- Cartel (48) What results when firms in an oligopoly agree to behave as a monopolist
- Coase Theorem (51) Theory that any private market can resolve externalities given low negotiation costs and clearly defined property rights
- Collusion (48) A situation in which firms in an oligopoly make decisions as one; common in oligopolies; banned by American anti-trust law
- Complement (14) Two goods for which a rise in the price of one leads to decline in demand for another; cross-price elasticity is negative
- Consumer surplus (20) The surplus that consumers receive when buying something at a lower value than they would be willing to pay; represented by the area below the demand curve and above the price level
- Contracts (58) Agreements entered into voluntarily, where both parties anticipate receiving benefit; enforced by courts
- Creative destruction (49) Phenomenon whereby old practices or goods disappear in favor of newer, more efficient, better goods that increase social welfare; first described by Joseph Schumpeter; allows entrepreneurs to earn economic profit
- Deadweight loss (33) Reduction in social welfare that results from a distortion of the market, such as government intervention; represented by a triangular wedge on the market curves
- Demand curve (13) Diagram of quantity demanded against a good's price; shifts in demand are represented by a movement in the demand curve while changes in quantity demanded are shifts along the demand curve
- Demand schedule (13) Table depicting the quantity demanded of a good at certain prices; corresponds to the demand curve
- Economic costs (40) The total cost of producing a good; includes accounting costs and opportunity costs
- Economic profit (42) Difference between the revenue a producer receives and the opportunity cost of producing the good
- Elasticity (25) Percent change in quantity due to a percent change in price
- Entrepreneurs (49) Individuals who take on risk when creating new goods and services, and are rewarded with economic profits



- Equilibrium (15) In economics, the single combination of price and quantity where a market settles; in general, the state of stability of a system
- Excludability (56) Ability to prevent someone from consuming a good; property of a private good
- Externalities (50) Result when the actions of one person affects another's well-being, but neither party pays or is paid for these effects; may be positive or negative; can be resolved if Coase theorem is fulfilled; results in deadweight loss
- Firms (40) The economic actors who supply goods and services for an economy; seek to maximize profit; face a downward sloping demand curve if they possess market power; are price takers in a perfectly competitive market
- Fixed costs (42) Costs that cannot be changed in the short run
- Imperfectly competitive (43) Markets with only one or a few suppliers; may be monopolies or oligopolies; firms in which face a downward-sloping demand curve and are price setters and possess market power
- Inferior goods (13) Goods for which quantity demanded falls as income rises
- Law of demand (12) Negative relationship between price and quantity demanded
- Law of supply (14) Positive relationship between price and quantity supplied
- Logrolling (58) Vote trading by legislators to gain support for pet projects
- Marginal cost (42) The additional cost of producing one more of a good; does not include fixed costs
- Marginal revenue (42) The additional revenue of selling one more of a good
- Market (10) Composed of all of the buyers and sellers of a good
- Market demand curve (13) Relationship between quantity demanded of a good and its price; obtained by adding the quantities demanded by all buyers
- Market failure (49) Lack of a socially desirable outcome in competitive markets
- Market power (43) Firms with a downward sloping demand curve that can choose from combinations of price and quantity
- Market supply curve (15) Shows relationship between quantity supplied of a good and its price; obtained by adding the quantities supplied by all firms
- Microeconomics (5) Branch studying supply and demand within markets
- Monopolistic competition (48) Combines parts of the monopoly and perfectly competitive models; firms sell similar, but differentiated, products
- Monopoly (43) A market with only one supplier
- Necessity (26) Type of good for which elasticity is lower compared to luxuries
- Negative externalities (50) Externalities that harm third parties; tend to be over-produced; can be resolved by the Coase theorem
- Normal goods (13) Goods whose quantity demanded rises as income rises
- Oligopoly (47) A market with a small number of sellers; often involves collusion



- Perfect price discrimination (47)
When firms can sell their product to each customer at the exact value the customer placed on the product
- Perfectly competitive market (11)
Market characterized by price taking behavior, homogenous goods, no barriers to entry, no transaction costs, and perfect information
- Perfectly price-elastic (26)
A characteristic in which increasing prices above equilibrium results in nothing supplied or demanded, and decreasing prices results in an infinite amount being supplied or demanded; purely theoretical; represented as a completely flat or horizontal demand curve
- Perfectly price-inelastic (26)
A characteristic in which prices can be raised or lowered without changing the quantity demanded or supplied; on the demand side, purely theoretical; represented as a vertical demand curve
- Pork barrel politics (58)
The tendency for elected officials to steer money to their constituents via pet projects; causes a net increase in government spending without necessary increase in utility
- Positive externalities (50)
Externalities that benefit third parties; tend to be under-produced
- Price ceilings (29)
A maximum price on a good; if set below market equilibrium, will cause a supply shortage
- Price controls (29)
Limits on the prices of a good
- Price elasticity of demand (25)
Measures how much the quantity demanded of a good responds to changes in price
- Price elasticity of supply (26)
Degree to which the quantity supplied of a good responds to changes in price
- Price floors (32)
A minimum price on a good; if set above market equilibrium, will cause a shortage of demand relative to supply
- Price taker (130)
For a perfectly competitive market; when buyers and sellers must accept the market price
- Price-elastic (25, 28)
Goods where a change in price results in a greater change in quantity; describes goods that are luxuries, with many substitutes, and a narrow market definition, and in the long run
- Price-inelastic (25, 28)
Goods where a change in price results in lesser change in quantity; describes necessities, short-run time horizons, goods with a broad market definition and those with few substitutes
- Producer surplus (20)
The surplus that producers receive when selling something for more than they would be willing to; represented by the area between price and the supply curve
- Product differentiation (48)
Distinguishing between different goods that serve the same purpose in the same market
- Property (53)
Social institution that allows an individual exclusive use of a good
- Quantity demanded (12)
The amount of a good that consumers are willing and able to buy
- Quantity supplied (14)
The amount of a good that sellers are willing and able to produce



- Quota (53) A numerical limit on how much of something is allowed
- Rent seeking (59) Socially unproductive activities that redirect economic benefits
- Rivalry (56) Goods whose quantity is reduced when consumed by one person
- Shortage (104, 106) When quantity demanded exceeds quantity supplied; often happens with an effective price ceiling
- Specialization (34) When individuals and countries focus on producing what they produce best (for the lowest opportunity cost relative to others)
- Substitute (13) Goods for which an increase in the price of one increases the demand of the other
- Supply curve (15) Diagram of quantity supplied of a good and that good's price
- Supply schedule (15) A table depicting the quantity supplied of a good at certain prices
- Surplus (18) When quantity supplied exceed quantity demanded; often happens with an effective price floor
- Tax revenue (35) The tax per unit times the quantity of units; sits as a rectangle between producer and consumer surplus
- Time horizon (25) Factor determining the elasticity of a good; over longer time horizons, prices will be more elastic
- Total costs (40) The comprehensive cost of supplying a good or service
- Total revenue (26) Equal to equilibrium price times equilibrium quantity; shown graphically as a rectangle
- Tragedy of the commons (55) When a resource that is owned jointly is overused because no one accounts for negative externalities caused by overuse
- Unit elastic (25) Situation in which a 1% change in price results in a 1% change in quantity
- Variable costs (42) Costs that can be altered in the short run
- $\Delta Q/\Delta P$ (26) See *price elasticity of demand* and *price elasticity of supply*

TERMS — MACROECONOMICS

- Aggregate demand (101) Total demand in the economy at all price levels; reflects the total expenditures in the economy
- Aggregate supply (101) Total supply in the economy at all price levels; maps price levels to the real output supplied by firms
- Aggregation (66) Combining many different things into a single variable
- Average labor productivity (79) Total output of the economy divided by number of workers employed
- Bank run (91) When depositors rush to withdraw their deposits from a financial institution
- Banks (82) Financial intermediary; loans to businesses and accept deposits from savers



- Bond (81)
A certificate of indebtedness with interest; highly liquid; involved in debt finance; certifies a borrower's obligations to the bond holder; involve a principal and interest payments; often sold by large firms to finance investment; can be held by a purchaser until maturity or sold earlier; priced according to changes in the interest rate; may be part of mutual fund investments; bought and sold in open-market operations
- Bureau of Labor Statistics (BLS) (72)
Agency that calculates the Consumer Price Index (CPI) every month
- Business cycle (96)
Alternation of expansions and recessions in an economy; results in cyclical unemployment; characterized by peaks and troughs; often moderated by government policy; moved in tandem with inflation from 1960 to 1979
- Business fixed investment (71)
Firms' purchase of factories, offices, machinery, and other capital goods
- Capital goods (71)
Goods that are long-lived and produced to make other goods
- Central bank (89)
Institution that regulate the supply of money and oversees a country's banking system
- Circular flow model (77)
A model that traces the path of money, goods, and services through an economy
- Commodity money (88)
Money with intrinsic value
- Consumer durables (71)
Long-lived consumer goods
- Consumer nondurables (71)
Short-lived consumer goods
- Consumer Price Index (72)
Measures the cost of purchasing a representative basket of goods and services at market price; used to measure inflation
- Consumption (72)
Spending by households
- Currency (87)
Bills and coins owned by the public; the most liquid asset
- Cyclical unemployment (77)
Unemployment caused by the ups and downs of the business cycle
- Date of maturity (81)
Specifies the date a loan will be repaid
- Debt finance (81)
The sale of bonds
- Default (81)
When the borrower of a bond fails to pay some or all of the principal or interest
- Demand deposits (88)
Another name for checking accounts
- Discount rate (91)
Interest rate that the Federal Reserve charges on loans to banks
- Dividends (82)
The profits enjoyed by shareholders whenever stocks are sold
- Employment (75)
The state of either working or being on leave from a paid job
- Employment rate (75)
The percentage of the labor force that has a job or is on leave from a regular job
- Equity finance (81)
Sale of shares of stock



- Expansion (96) Periods when the economy grows faster than its long-run trend
- Factor market (71) The market where labor, land, and capital are bought and sold
- Factors of production (77) The name for land, labor, capital, and entrepreneurship; see *factor endowments*
- Federal funds rate (91) The interest rate that banks charge when loaning to other banks
- Federal Open Market Committee (FOMC) (89) Organization that meets every six weeks in Washington, D.C. to decide on changes in monetary policy; composed of the seven Fed governors and five regional bank presidents
- Federal Reserve System (89) Central bank of the United States; created in 1913; consists of 12 regional banks
- Fiat money (88) Money with no intrinsic value
- Final good (67) Good sold to consumers, not used to produce other goods
- Financial institutions (81) Coordinate the saving and investment decisions in an economy
- Financial markets (81) Institutions where savers can supply their savings to those who wish to borrow the money for investment
- Fiscal policy (108) Government spending
- Foreign direct investment (83) When a company or individual acquires assets in another country that they will actively manage
- Foreign exchange effect (102) At a lower domestic price level, domestic consumers will buy fewer imports, causing net exports to increase and GDP to increase; one of the reasons aggregate demand slopes downward
- Fractional reserve banking (90) A type of banking where the bank will loan out some of the deposits, keeping only some in reserve
- Frictional unemployment (76) Unemployment due to the process of matching employees and employers; this type of unemployment is always present
- GDP deflator (74) A measurement of the relationship between real and nominal GDP that tells about the degree of inflation
- GDP per capita (62) GDP divided by the number of people in a country; correlated with labor productivity; much lower in sub-Saharan Africa compared to the rest of the world
- Gross Domestic Product (GDP) (67) The market value of all final goods produced within a country during a certain period of time
- High-powered money (90) Another name for the monetary base; currency plus reserves
- Human capital (80) Skills and experience acquired by humans through training, education, and on-the-job experience
- Inflation (65) When all prices rise together
- Intermediary (82) A third party that links two others
- Intermediate goods (68) Goods used up while producing another, final good
- Inventories (71) Additions of unsold goods to company inventories



- Investment (71)

Spending by firms on final goods; purchases of houses by households; equals domestic savings in a closed economy; categories include foreign direct investment, business and residential fixed investment, and portfolio investment, or the purchase of stocks and bonds; has an inverse relationship with the real interest rate; changes in firm investment levels cause shifts in the aggregate demand curve; decline in which caused the 2001 recession; coordinated with savings through banks and other intermediaries
- Keynesian model (101)

Model using aggregate curves to explain short-run economic fluctuations; developed by John Maynard Keynes in The General Theory of Employment, Interest, and Money; depicts long-run equilibrium as an interaction of price level and real output, with equilibrium occurring at the intersection of long-run and short-run aggregate supply and aggregate demand; in which increasing the money supply causes a rightward shift of the aggregate demand curve
- Labor force (64)

All people that are either employed or unemployed
- Lender of last resort (89)

The Fed's responsibility, if a bank looks like it is about to fail
- Liabilities (89)

To a bank, the deposits of depositors; assets of solvent banks exceed their liabilities
- Liquidity (88)

How easily something can be converted into money, M1 being the most liquid form of money, including currency, checking accounts, and stocks and bonds
- Long run (99)

The time period in which an economy moves back to equilibrium; during which all costs are variable
- Long run aggregate supply (LRAS) (101)

Drawn as a vertical line where output equals potential output in the Keynesian model
- M1 (88)

A component of the money stock; includes currency, demand deposits, nonbank travelers checks, and other checkable deposits
- M2 (88)

The best definition of the money supply; includes M1 along with savings accounts, time deposits of under \$100,000, and balances in money market funds/retail money funds
- Macroeconomics (5)

The branch of economics concerned with the performance of national economies
- Medium of exchange (87)

An item that can be used to buy goods
- Monetary base (90)

See high-powered money; the amount of currency plus reserves
- Monetary policy (89)

Instrument used by the Federal Reserve to alter the money supply and offset short-run economic fluctuations
- Money (88)

Anything that is a medium of exchange, unit of account, and store of value; may be fiat money or commodity money
- Money multiplier (90)

The reciprocal of the reserve ratio; determines the effect of altering the reserve ratio on the stock of money in the economy



- Money supply (89) The amount of money in the economy, controlled by the Fed
- Mutual funds (82) A portfolio of stocks that inexperienced savers can purchase, allowing to diversify their holdings
- National savings (83) Equal to national income minus consumption minus government purchases
- Natural rate of unemployment (98) Level of unemployment present when actual output is equal to potential output; includes only frictional and structural unemployment
- Net capital outflow (83) The purchase of foreign assets by domestic residents minus the foreign purchase of domestic assets
- Net exports (71) Value of domestically made goods sold to foreigners minus value of foreign-made goods bought by domestic buyers
- Neutrality of money (94) In the long run, changes in the quantity of money have no effect on real quantities in the economy
- Nominal GDP (74) GDP calculated with current year prices
- Okun's Law (100) Every 1% that the unemployment rate is off from the natural rate of unemployment, the output gap deviated by 2%
- Open-market operations (89) The buying and selling of bonds by the Federal Reserve to change the money supply
- Output gap (98) Difference between actual output and potential output
- Portfolio investment (83) When an individual or firm buys shares of stocks or bonds issued by a foreign company
- Potential output (98) The quantity of goods that can be produced when the economy is using all of its resources at normal rates; not fixed over time
- Price level (61) The sum of all prices in the economy
- Principal (81) The original amount loaned out
- Private savings (83) National output minus consumption minus government spending
- Quantity theory of money (94) See exchange equation; also called quantity equation; $MV = PY$; velocity of money times the quantity of money equals nominal GDP
- Real GDP (78) GDP adjusted for inflation
- Real interest rate (90) The nominal interest rate minus the rate of inflation
- Recession (64) Periods of slow growth (or even decline) in output/GDP
- Reserve requirement (91) The amount of money banks are required to have in their vaults to pay back depositors
- Residential fixed investment (71) When households purchase new homes and apartment buildings
- Saving (81) Difference between a person's earnings and spending
- Services (75) Intangible goods e.g. education, insurance, and financial services



- Short run (96) The period of time the economy deviates from long-run predictions; usually one to three years
 - Short-run aggregate supply (101) SRAS; the potential supply of all goods at all price levels; upward-sloping
 - Solvent (91) When a bank's assets exceed its liabilities
 - Stock (81) Represents ownership of a portion of a company
 - Store of value (87) An item that people can use to transfer purchasing power from the present into the future
 - Structural unemployment (76) Unemployment due to mismatches between job openings and job seekers
 - Trade deficit (66) When imports exceed exports
 - Trade surplus (66) When exports exceed imports
 - Unemployment (75) State of actively seeking paid work, but unable to find it
 - Unemployment rate (75) Percentage of people who would like to work but cannot find jobs
 - Unit of account (87) A yardstick that established the value of different goods
 - Velocity of money (94) The number of times the average dollar bill is used in a year
 - Wealth (88) The total value of assets, as a store of value
 - Wealth effect (102) Phenomenon in which money becomes more valuable and people buy more goods and services when aggregate price level declines
- 9.7% (78) The United States' unemployment rate in August 2009

MISCELLANEOUS

- Boskin Commission (74) 1996 group headed by economist Michael Boskin to review the CPI and determine how much CPI overstated price inflation (1.3%)
- DeBeers company (43) Company that until recently owned 80% of diamond mines
- NASDAQ (82) An example of an organized stock exchange
- New York Stock Exchange (NYSE) (82) An example of an organized stock exchange
- Sherman Anti-Trust Act (45) Passed in 1890 to increase market competition
- *The General Theory of Employment, Interest, and Money* (101) Work published by John Maynard Keynes in 1936; developed an explanation for short-run economic fluctuations to respond to the inadequacy of the microeconomic model
- U.S. Department of Commerce (70) In 1932, commissioned Simon Kuznets to develop a system to measure national output



PEOPLE

- Boskin, Michael (74)
In 1996, he was assigned to head a committee to review the methods used to calculate the CPI
- Coase, Ronald (51)
Reached the insight that the private market ought to be able to resolve externalities, as long as the parties involved can negotiate and property rights are clearly defined
- Ford, Henry (80)
Introduced the assembly line
- Keynes, John Maynard (101)
British economist; wrote *The General Theory of Employment, Interest, and Money*; developed the Keynesian model of the national economy
- Kuznets, Simon (70)
Economist; commissioned by the U.S. Department of Commerce in 1932 to develop a system to measure national output; received the Nobel Prize in Economic Science for 1971
- Okun, Arthur (99)
One of President Kennedy's chief economic advisors in the early 1960s
- Pareto, Vilfredo (8)
Italian economist (1848-1923); first came up with the concept that an outcome was efficient only if there was no way to improve someone's well-being without reducing someone else's well-being
- Petty, Sir William (70)
In the mid-17th century, attempted to measure British national output to assess the ability of the Irish to pay taxes
- Schumpeter, Joseph (49)
Economist; described impact of entrepreneurs as "creative destruction"
- Smith, Adam (6, 111)
Economist and author of the 1776 *An Inquiry into the Nature and Causes of the Wealth of Nations*



POWER LISTS: WATER

All numbers in parentheses refer to the page numbers of the USAD Resource Guide where you can find the original context of the defined term.

FIGURES AND STATISTICS

- \$19 billion (119) Amount by which areas using large streams of groundwater as irrigation sources increased crop production after 1940 in the United States
- \$2.4 and \$5.6 million (124) Estimated cost of recycling and removing all coal ash in the state of Virginia
- \$20 million (126) Amount Flint residents have spent to avoid using piped water
- \$30,000 (115) Amount San Francisco pays per year to Yosemite National Park to lease dam-flooded land in the Hetch-Hetchy Valley as a water supply
- \$5 million (126) Amount of money the city of Flint, Michigan intended to save by switching its water supply from the City of Detroit to the Flint River
- \$345 million (126) Amount of money the value of houses in Flint, Michigan fell by due to the Flint Water Crisis
- \$440 million (115) Amount of money per year the city of San Francisco sells its water for, significantly higher than what it pays
- \$500 million (126) The value of houses in Flint, Michigan after the Flint Water Crisis, down by \$345 million
- .41 (116) The mean elasticity of urban water demand
- 1,000 (115) Number of gallons often contained in one unit as measured by water utilities
- 1.1 billion (126) Number of people worldwide who lack access to safe drinking water
- 24% (117) Percent by which world's harvested land increased between 1961 and 2003
- 28% (117) Percent of the world's harvested land that was irrigated in 2003
- 29% (121) Percent of inflow increase needed to restore ecosystems in the Great Salt Lake
- 300% (116) Percent by which groundwater access in India increased as a result of 1970s subsidies to poor farmers
- 300,000 (114) Number of people who were forced to resettle due to the South-North Water Transfer Project in China
- 33% (123) Percent of freshwater used for agriculture in the dry Antofagasta region of Chile
- 35% (117) Percent of all cultivated land in Asia that is irrigated
- 850 (117) Number of irrigation waterways built in the 1400s by the Hohokam people indigenous to the American Southwest



- 4,000 (113) Amount of people killed in China by the flooding of the Yangtze River in 1998
- 40 million (118) Amount of irrigated acres in the Great Plains and West in 1978, up from 20 million in 1940
- 40,000 tons (120) Amount of harvested fish lost annually due to increased salinity in the Aral Sea
- 450mm and 700mm (117) Amount of water needed annually to grow staple cereals
- 50% (120, 121) Percent of the surface area of the Great Salt Lake that exists today compared to its area when settlers first arrived; as little as 50% of senior diversions in a prior appropriations system are used up by plants or evaporation
- 56% (123) Percent of freshwater used for mining in the dry Antofagasta region of Chile
- 5mm (123) Amount of precipitation the dry Antofagasta region of Chile receives less than annually, in spite of its high need for water
- 60,000 (121) Number of jobs lost due to increased salinity in the Aral Sea
- 70% (112, 117) Percent of the world's irrigated land located in Asia; more than 70% of worldwide consumptive use of water is for agriculture
- 70-80% (116) Percent of India's irrigated agricultural output that relies upon groundwater
- 90% (112, 119, 120) Percent of water used by agriculture in many states in the United States; percent of crop value increase in the United States after 1940 due to use of large streams and groundwater; percent by which Aral Sea volume decreased after agricultural diversions;
- Forty-eight billion cubic meters (114) Amount of water China's South-North Water Transfer Project moves from the Yangtze to the Yellow River
- 20 million (118) Amount of irrigated acres in the Great Plains and West in 1940, which would double by 1978

LOCATIONS AND PLACES

- Antofagasta region (123) Region in Chile that receives a tiny amount of precipitation but needs a large amount of water since it is the largest copper producer in the world
- 98th meridian (118) Approximate location of the divide in the United States between the humid climate of the East and the semi-arid climate of the West
- Aral Sea (120-121) Saline body of water in Uzbekistan/Kazakhstan that has diminished considerably since diversions in the 1970s and 1980s
- Great Salt Lake (121) Saline body of water in Utah
- Owens Lake (121) Body of water in California that has dried up because of diversions from the Los Angeles Aqueduct
- Atacama Desert (123) Desert in Chile with copper mines



- Detroit (126) City that provided Flint, Michigan with water prior to the April, 2014 switch to the Flint River
- Eastern United States (119) A region of the world which recognizes the riparian doctrine as a means for managing water
- England (119) A region of the world which recognizes the riparian doctrine as a means for managing water
- Flint River (126) Water source for Flint, Michigan after the April, 2014 switch from the City of Detroit's water supply
- Flint, Michigan (126) City where in 2014-15 there was a health crisis caused by untreated water leading to lead exposure
- India (116) Country where subsidizing groundwater irrigation eliminated famine but has led to unregulated and unsustainable use
- Hetch Hetchy Valley (115) Location of the Tuolumne River in Yosemite National Park, which serves as a water supply for San Francisco
- Kazakhstan and Uzbekistan (120) International border where the Aral Sea is located
- Mono Lake (121) A drying lake in California that the City of Los Angeles was required by law to stop diverting
- Spain (117) Country with a long tradition of canal-based irrigation systems financed by water-use associations
- American Southwest (117) Region where the Hohokam people of prehistoric America lived
- Tuolumne River (115) River located in Yosemite National Park, which serves as a water supply for San Francisco
- Virginia (124) State in which coal ash recycling and removal will cost an estimated \$2.4-5.6 billion
- Yangtze (113-114) A river in southern China with rising water levels prone to flooding, which the South-North Water Transfer project aims to mitigate
- Yellow Rivers (113-114) A river in northern China that suffers from chronic dry periods, which the South-North Water Transfer project aims to alleviate
- Yosemite National Park (115) National nature preserve, part of which is leased by San Francisco in exchange for access to water supply from the Tuolumne River

TERMS – GENERAL ECONOMICS

- Scarcity value (111) Idea that something's worth is tied to rarity; goods
- Market Failure (111) Inefficient allocation of goods or services in a system of economic exchange
- Economic institutions (111) Bodies, laws, and systems that govern economic activity; can include judicial and legal systems, markets, and the regulatory industry



- Common-pool-resource (113) Type of good that is hard to prevent usage of; it is costly, but not impossible to prevent beneficiaries from benefitting from its use; its usage decreases overall amount available to others
- Economies of scale (114) Type of production which sees increases in efficiency as the size of production increases; marginal cost decreases with more quantity
- Shortage (114) Situation when demand for a good exceeds its supply
- Regulated monopoly (115) Private corporation that has no competitors but is subject to government restriction; often takes form of price capping
- Subsidies (116) Benefit given to a corporation, individual, or business to reduce burdens of production; usually aimed to promote social good
- Bilateral monopoly (118) Situation when a market only has one buyer and one seller; both sides exert high levels of control over market conditions; usually occurs with corporations
- Equimarginal principle (122) Idea that, in a competitive market and an export market, the marginal benefits of local and foreign users are equal; this allocation results in the highest total utility
- Social cost (123) Sum of private costs and external costs
- External cost (123) Costs imposed on consumers as a consequence of being exposed to the transaction; consumers are not compensated or charged for these costs; externalities
- Benefit-cost analysis (124) Method of tabulating whether pursuing an action is sensible; compares future benefits of a project to the cost of completing the project; benefits are converted to units that compare with costs (dollars)
- Bulk discounts (115)** One of four ways water utilities price water, in which unit cost decreases as more units are used (also known as "decreasing block rate")
- Conservation pricing (115, 116)** One of four ways water utilities price water, in which unit cost increases as more units are used (also known as "increasing block rate")
- Constant marginal price (115)** One of four ways water utilities price water, in which each unit costs the same amount regardless of total amount used
- Consumptive use (112, 122)** Use of water that does not return water to the system
- Decreasing block rate (115)** One of four ways water utilities price water, in which unit cost decreases as more units are used (also known as "bulk discounts")
- Increasing block rate (115, 116)** One of four ways water utilities price water, in which unit cost increases as more units are used (also known as "conservation pricing")
- Flat fee (115, 116)** One of four ways water utilities price water, in which an installation fee is applied but the cost is not affected by amounts of water used

TERMS – REGULATORY & ENVIRONMENTAL

- Instream flow (123) Water flowing in a stream channel



- Ecosystem service (111) Benefits that are provided by the natural environment; can include cleaning pollutants, natural irrigation, and nutrient cycling
- Marginal control cost (MCC) (124) Cost to reduce one more unit of pollution
- Social marginal damage (124) Cost to society of having one more unit of pollution
- Regulatory instruments (124) Tools that policymakers can use to limit or control actions taken by private entities
- Economic regulations (124) Regulatory actions that shape behavior of firms by using price, subsidies, penalties, or other economic incentives
- Pigouvian taxes (124) Taxes on market activities that generate negative externalities; forces firms to internalize externalities
- Clean Water Act (CWA) (125) 1972 law that codified the Environmental Protection Agency (EPA)'s ability to mandate and affect water quality; regulates point sources to a great degree; nonpoint sources are less regulated
- Point sources (125) Pollutants that can be traced to a single discrete source; can include sewage treatment plants and industrial factories
- Nonpoint sources (125) Pollutants generated in a vague region rather than a distinguishable source, such as urban or agricultural runoff
- Eutrophication (128) Excessive saturation of nutrients in a body of water; often causes plant overgrowth and consequent decrease in animal life due to oxygen depletion
- Pollution hot spots (127) Areas characterized by dense pollution; commonly linked to adverse health effects in surrounding populations
- Grandfathering (127) Process by which historic data is used to assign water rights
- Water quality trading (127) Exchange where entities can trade pollution credits on the open market
- Nutrient credit markets (127) Exchange where entities are compensated for the efforts they make to improve water quality
- **Biological strategies (126)** One of three options available in the Great Lake Region to control invasive species, using predator species
- **Cap-and-trade system (127)** A system of pollution regulation that sets an overall limit and allocates pollution permits to firms which can be traded
- **Cap-in-place (124)** A way of addressing coal ash by covering it where it is and leaving it there
- **Chemical strategies (126)** One of three options available in the Great Lakes region to control invasive species, using chemical agents
- **Clean Water Act (125)** 1972 legislation in the United States that granted permission to the Environmental Protection Agency to implement and enforce water quality standards
- **Coal ash (124)** A byproduct of coal combustion that can pollute water with heavy metals like mercury and lead
- **Invasive species (125, 126)** Species that move via human activity from their native habitat to nonnative habitats, resulting in pollution



- **Private mitigation banks (128)** Banks that restore or preserve water bodies in order to sell credits, which firms can buy to satisfy their abatement requirements (also known as PMBs)
- **Safe Drinking Water Act (126)** A United States law according to which the Environmental Protection Agency sets minimum drinking water standards that must be complied with by all suppliers
- **Water quality markets (127)** An economic regulatory instrument intended to help achieve the equimarginal principle given a specified level of pollution reduction
- **Marginal abatement costs (127)** The cost to a firm of lowering pollution, also known as MACs
- **Subsidies (116, 122)** A payment (or reduction in an amount owed) by a government to an individual or firm intended to artificially lower their purchase or production price
- **Mechanical strategies (126)** One of three options available in the Great Lakes region to control invasive species, using electric barriers
- **Mercury (124)** A heavy metal that can result from coal combustion and pollute water
- **Zebra Mussel (125)** An example of an invasive species originally from Asia and Europe which has diminished food sources and native species in the Great Lakes
- **Dominion Energy (124)** A Virginia company that estimated the cost of coal recycling and removal to be \$2.4-5.6 billion

TERMS – PROPERTY RIGHTS

- Common law (119) Legal system that derives rules from precedent and custom, as opposed to statutes
- Riparian doctrine (119) Type of water right that states landowners with properties adjoining body of water must share equal rights and usage to respective water
- Property rights (119) Individual or collective ownership allocated to a resource
- Appropriative rights doctrine (119) Priority-based allocation of water rights for beneficial use; the first person to utilize a waterbody secures individual rights to continue using that water
- Third party (120) Individual outside of the two main parties of a negotiation or dispute
- Water rights (122) Legal entitlement of property owners to the usage of water sources
- Acequia (118) A complex decentralized water allocation system that governed the western United States while it was under Spanish Mexican control
- Irrigation district (118) The dominant form of irrigation organization, which is centrally organized by a government with taxing authority
- Spanish water law (117) A set of customs for allocating water based on factors including prior use, need, existing rights, legal precedents, and intentions for use



- Reasonable use (120) A riparian rights system in which each user can use water for any lawful purpose as long as their use does not infringe on the rights of others
- Spring Valley Water Works (115) A private company that took monopoly-like control over San Francisco's water supply in the early 1900s, limiting flow and fixing high prices
- Natural flow (120) A riparian rights system in which water may only be used for domestic purposes such as drinking and bathing and everyone is entitled to the normal flow of watercourses adjacent to them
- Non-consumptive use (112, 119) Use of water in which some that has been diverted is returned to the system to be reused
- Nobel Prize (121) Won in 2009 by Elinor Ostrom for her study of how small groups can successfully manage common resources like water sources
- Permit system (122) A system for organizing use of a common resource such as an aquifer by giving individuals allotments which they are free to use or market
- Mutual ditch companies (118) A private form of irrigation organization in which irrigator-owners invest in a ditch in exchange shares of the water produced
- Consumptive use (122) Water utilized and not returned to an original resource system, such as a waterbody or treatment plant
- Beneficial use (119) Use of water in a reasonable and lawful manner to benefit the property owner or other persons

TERMS – MISCELLANEOUS

- Green Revolution (118) Surge in global agricultural production in the 1960s through the advancement of agricultural innovations and the establishment of high-yield crop varieties
- Irrigation efficiency paradox (119) Principle that the increased efficiency of irrigation systems does not reduce water consumption or increase water availability at a farm scale
- Copper (123) Mined element of which the Antofagasta Region of Chile is the world's largest producer
- Hohokam (117) Prehistoric people indigenous to the American Southwest who built a large irrigation system in the 16th century near present-day Phoenix

TERMS – WATER

- Surface water (112, 113, 119, 123) Water available on the surface of the Earth; the opposite of groundwater
- Terminal saline lakes (120) Sites where watersheds drain into enclosed basins rather than the ocean
- Aquifer (112-113, 121) Underground body of water-bearing rock



- Groundwater (116, 118, 119, 121, 122) Water in an underground aquifer
- Hoover Dam (118) The first federal reclamation project in the United States to deliver water to the semi-arid West, completed in 1936



POWER TIMELINE

The Economics of Water

Time	Event
1400s (117)	The Hohokam people indigenous to the American Southwest build a large irrigation network consisting of 850 waterways
1906 (114)	An earthquake in San Francisco causes fires that destroy 80% of the city, with some blaming the catastrophe on Spring Valley Water Works for monopolizing the city's water supply
1936 (118)	The Hoover Dam is completed, the first of a series of United States reclamation projects to provide water to the semi-arid West
1940	20 million acres of the Great Plains and the American West are irrigated
1952	The Cuyahoga River in Ohio catches fire in November—one of many times
1960s	The Green Revolution greatly increases crop yields across the Global South
1961 to 2003 (117)	During this period, the world's harvested land increases by 24%
1970s	India introduces energy subsidies so farmers can pump water for low or no cost
1972 (125)	The Clean Water Act (CWA) grants the Environmental Protection Agency (EPA) authority to control water pollution and ensure water quality
1978	40 million acres of the Great Plains and the American West are irrigated
1980s (125)	The Zebra Mussel species invades the Great Lakes via cargo ships from Asia and Europe
1998 (113)	A flood of China's Yangtze River kills approximately 4,000 people
2004	Seven nutrient allocation trades have occurred in the North Carolina nutrient market since this date
2014	In April, Flint, Michigan officials switch the city's drinking water supplies from the City of Detroit water system to the Flint River
2015	In October, Flint, Michigan declares a state of emergency



POWER TABLES

TABLES AND DIAGRAMS

Factors Of Production			
Factor	What Is It?	Reward	Examples
Land	Natural resources	Rent	Farmland; oil; water
Labor	Human resources	Wages	Physical or mental activity
Capital	Goods used to produce other goods	Interest	Computers; factory machinery
Entrepreneurship	New/ improved means of production	Profits	Invention of a new, more efficient production process for microchips

Factors That Shift Supply	
Factor	Relationship to Supply
Cost of Inputs	Negative/Inverse: Increase in costs leads to decrease in supply
Technological Progress	Positive/Direct: Increase in technology leads to more supply
Number of Suppliers	Positive/Direct: Increase in number of suppliers leads to increase in supply
Expectations of Changes in Price	Negative/Inverse: Expectations of lower prices in the future leads to increase in supply now

Factors That Shift Demand		
Factor	Relationship to Demand	Other Notes
Number of Demanders	Positive/Direct: Increase in number of demanders leads to increase in demand	N/A
Price of Complementary Good	Negative/Inverse: Increase in price of complementary good leads to decrease in demand	Use cross-price elasticity formula to determine if two goods are complements
Price of Substitute Good	Positive/Direct: Increase in price of substitute goods leads to increase in demand	Use cross-price elasticity formula to determine if two goods are complements
Consumer Income	Normal goods—Positive/Direct: Increase in consumer income leads to increase in demand Inferior goods—Negative/Inverse: Increase in consumer income leads to decrease in demand	Use income elasticity formula to determine if a good is normal or inferior



Factors That Shift Demand

Factor	Relationship to Demand	Other Notes
Tastes or Preferences	Positive/Direct: Increase in popularity leads to increase in demand	N/A
Expectations	Depends on which factor the expectation affects Example: Expectations of higher price in the future lead to increase in demand	N/A

Shifts In Supply And Demand

Demand Shifts...	Supply Shifts...	Effect on Price	Effect on Quantity
To the right	No shift	↑	↑
To the left	No shift	↑	↓
No shift	To the right	↓	↑
No shift	To the left	↑	↓
To the right	To the right	?	↑
To the right	To the left	↑	?
To the left	To the left	?	↓
To the left	To the right	↓	?

Elasticity

Range	Name	Impact	Diagram	Application
$E = 0$	Perfectly inelastic	↑ price > ↑ TR; ↓ price > ↓ TR	Perfectly vertical line	Purely theoretical for demand May exist for supply of goods that can no longer be produced
$E < 1$	Inelastic	↑ price > ↑ TR; ↓ price > ↓ TR	Steep line	Goods that are necessities / have few available substitutes; more inelastic in the short run
$E = 1$	Unit elastic	Change in price has no effect on TR	Line with a slope of 1 or -1	None
$E > 1$	Elastic	↑ price > ↓ TR ↓ price > ↑ TR	Flat line	Goods that are luxuries or have many substitutes; more elastic in the long run
$E = \infty$	Perfectly elastic	Change in price leads to loss of all TR	Perfectly horizontal line	Purely theoretical



Comparing Market Types

Type of Market	Number of Producers	Kind of Competition	Barriers to Entry	Another Name for Firms	Special Traits
Monopoly	One	None	No entry possible	Price-setter	Only one firm
Oligopoly	A few	Primarily non-price	Difficult entry	N/A	Firms can collude and behave as a monopolist
Monopolistic Competition	Many	Non-price and price	Low barriers	Price-maker	Product differentiation and branding
Perfect Competition	A great many	Price	No barriers	Price-taker	Perfectly elastic demand

Unemployment

Type	Cause	When It Occurs
Frictional	Time lag between when workers leave jobs and when they find new jobs	Always present
Structural	Structural economic changes creates mismatch of skills demanded and skills supplied	Always present, but can be reduced by retraining
Cyclical	Changes in the business cycle	During a downturn

Tools of Monetary Policy

Policy Tool	Who Acts?	What Happens?	Change	Frequency
Open-Market Operations	FOMC	Buys and sells securities (treasury bonds) → injects or removes money	Expand: Buy Contract: Sell	Daily
Discount Rate	Board of Governors	Changes interest rate for loans to banks (to meet cash shortfalls or reserve requirements)	Expand: ↓ Contract: ↑	Rarely
Federal Funds Rate	Board of Governors	Changes overnight interbank lending rates via open-market operations	Expand: ↓ Contract: ↑	About once per quarter
Reserve Requirement	Board of Governors	Changes the reserve requirements (reserve-deposit ratio) for banks	Expand: ↓ Contract: ↑	Very rarely



The money supply

M1	\$ (billions)	M2	\$ (billions)
Currency	758.7	M1	1366.6
Nonbank travelers checks	6.3	Savings deposits	3033.7
Demand/checking deposits	294.8	Small denomination time deposits	1218.9
Other checkable deposits	306.8	Retail money funds	959.9
Total M1	1366.6	Total M2	6579.1

GDP

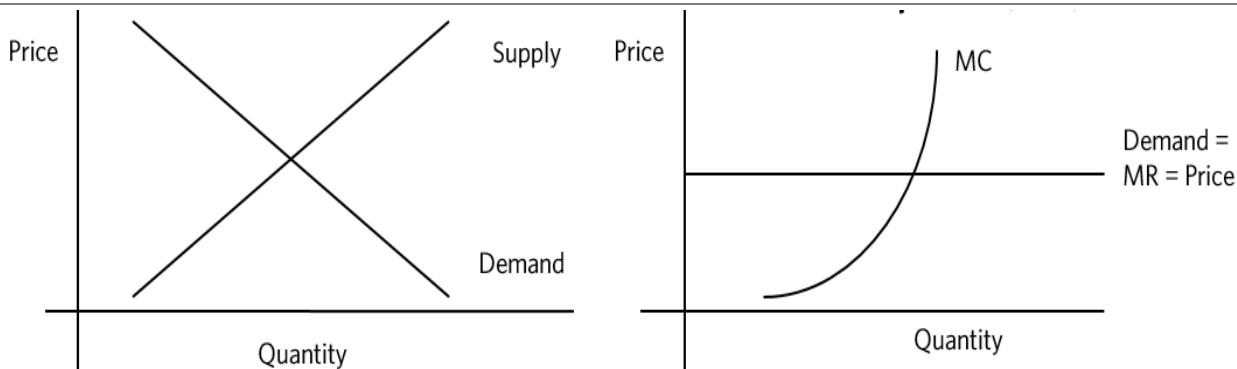
Component	Details
Household consumption (C)	<ul style="list-style-type: none"> ▪ Consumer durables - long-lived consumer goods - cars, furniture, or washing machines ▪ Consumer nondurables e.g. food and clothing run out more quickly ▪ Services - intangible goods, e.g. education and legal services ▪ Does not include purchase of houses
Firm investment (I)	<ul style="list-style-type: none"> ▪ Business fixed investment - purchase of capital equipment e.g. factories, offices, and machinery ▪ Residential fixed investment - new homes and apartment buildings ▪ Inventories – unsold goods added to company inventories ▪ Does not include purely financial assets such as stocks and bonds, which transfer ownership without creating new assets
Government purchases (G)	<ul style="list-style-type: none"> ▪ Wages; government-purchased goods ▪ Military spending ▪ Does not include transfer payments made by the government, such as social security benefits, or interest on government debt
Foreign net exports (NX)	<ul style="list-style-type: none"> ▪ Difference between the value of locally produced goods sold to foreigners and the value of foreign-produced goods bought domestically ▪ i.e. exports-imports



The money supply			
Group	Number, '000s	Unemployment	9.7%
Adult, non-incarcerated population	236,086	Teenagers	25.5%
Labor force	154,577	White	8.9%
Employed - worked for pay during past week or on leave	139,649	Hispanic or Latino	13%
Unemployed - did not work during the past week AND tried to find paid work during the past four weeks	14,928	Adult men	10.1%
Not in labor force Did not work in past week / try to find work in past four weeks	81,509	African-American	15.1%
Total labor force participation	~66%	Adult women	7.6%

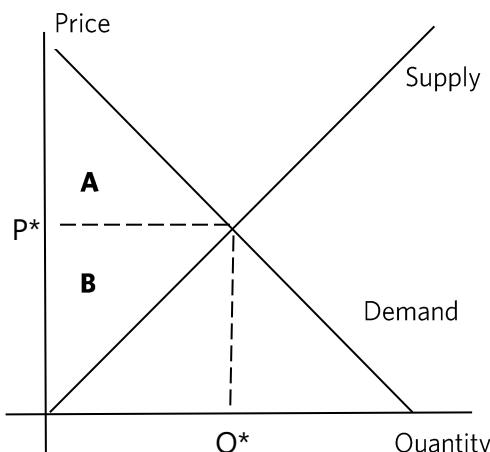
Diagrams: Microeconomics

Perfect competition

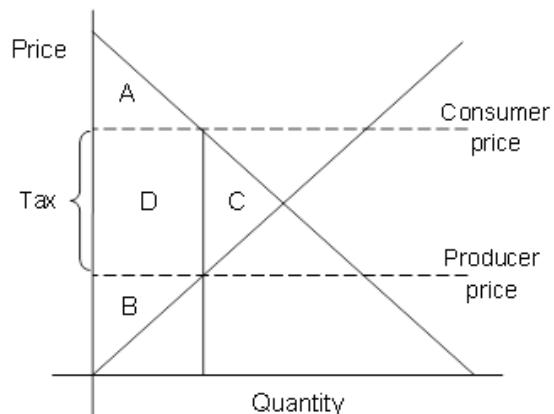


Market equilibrium

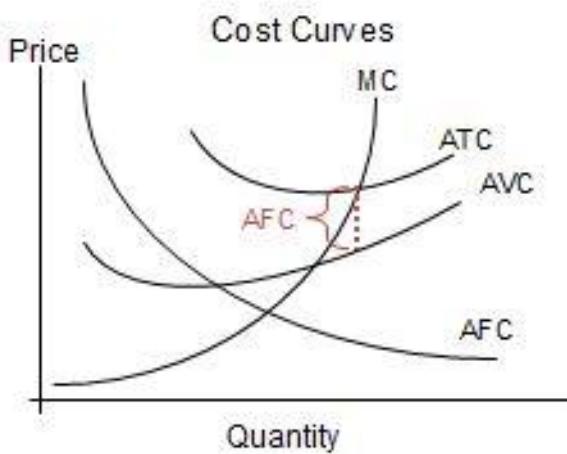
Marginal taxation



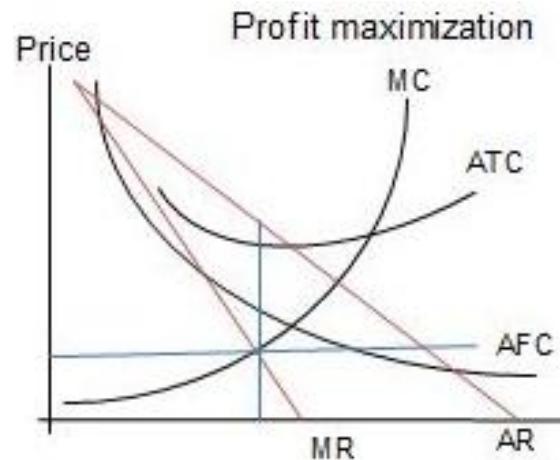
P^* - equilibrium (market clearing) price
 Q^* - equilibrium quantity



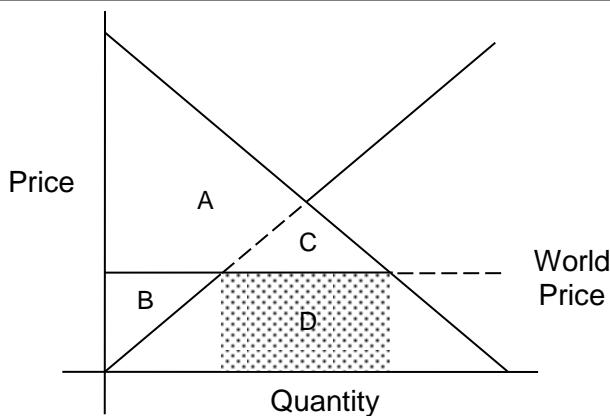
Cost curves



Profit maximization

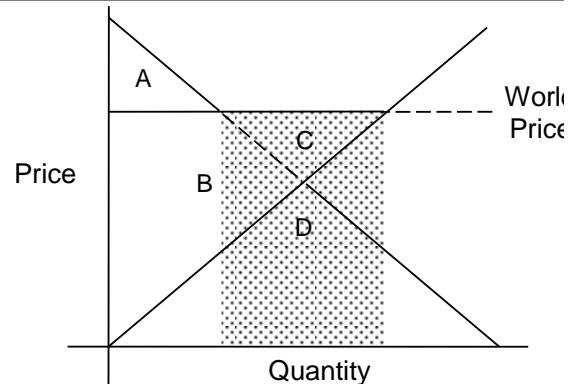


Importing economy



Price floor - minimum price
Creates surplus if price is above market price

Exporting economy



Price ceiling - maximum price
Creates shortage if price is below market price

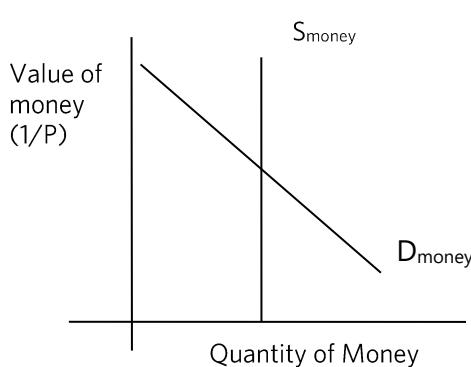


Q_D decreases	Q_S increases	Q_D increases	Q_S decreases
Triangle A Consumer surplus	Much smaller due to higher price and lower quantity	Trapezoid A Consumer surplus	Original triangle cut off by the limited supply
Trapezoid B Producer surplus	Original triangle cut off by lower consumption	Triangle B Producer surplus	Much smaller due to lower price and quantity

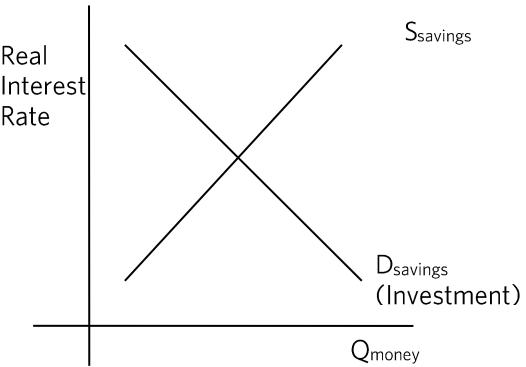


Diagrams: Macroeconomics

Money market

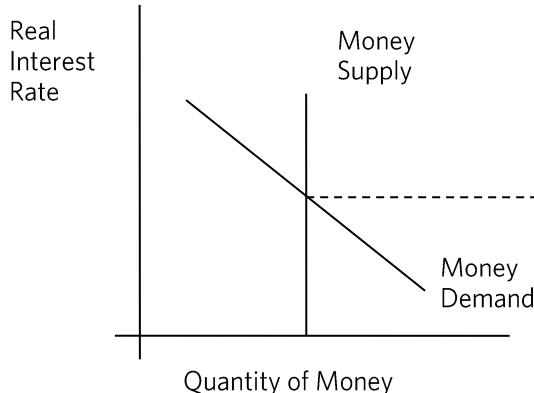


Investment market

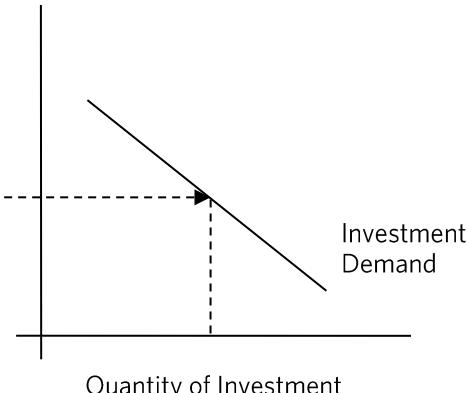


Monetary policy

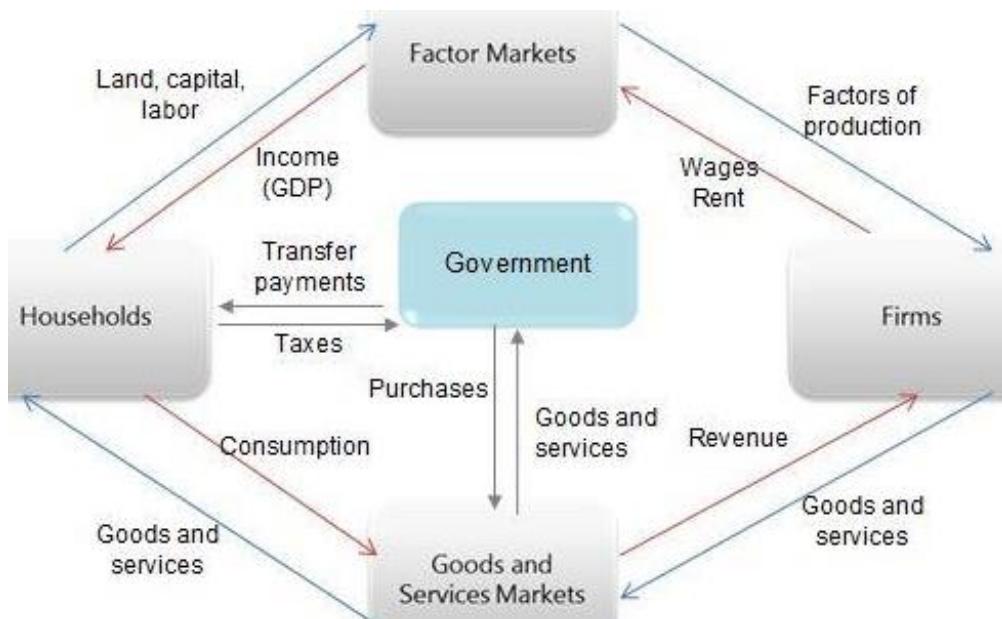
Monetary Policy



Investment Rates

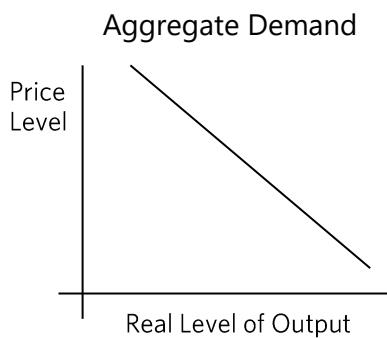


Components of the economy

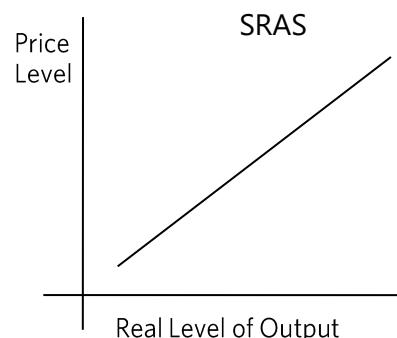




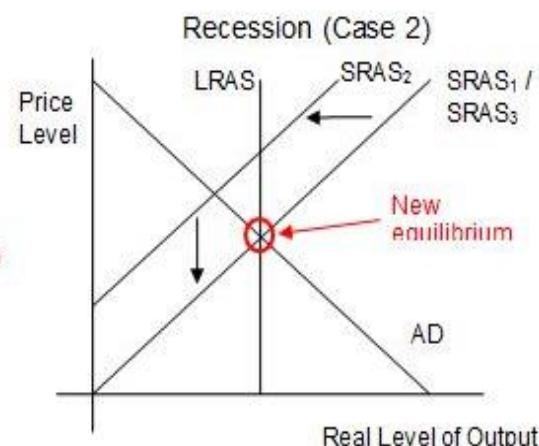
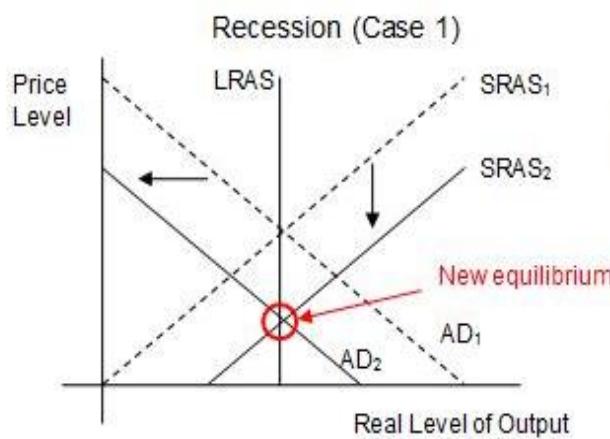
Aggregate demand



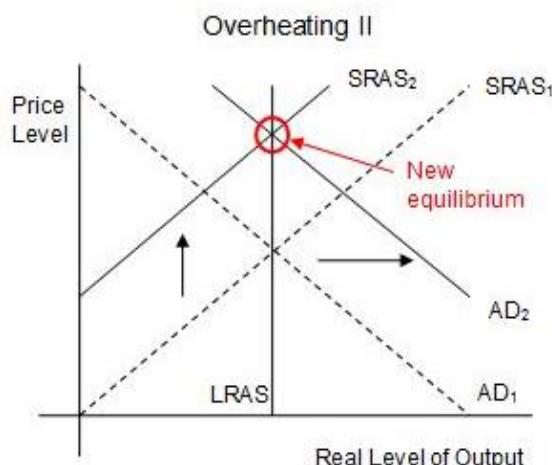
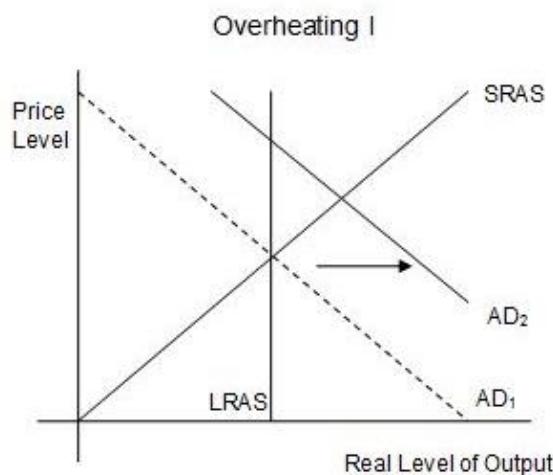
Aggregate supply



Keynesian recession

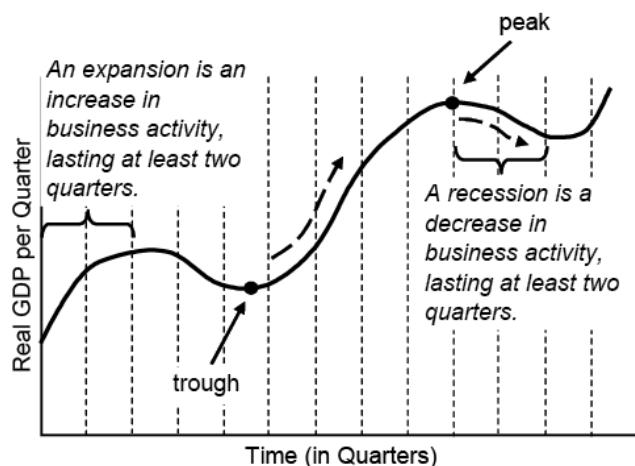


Keynesian overheating

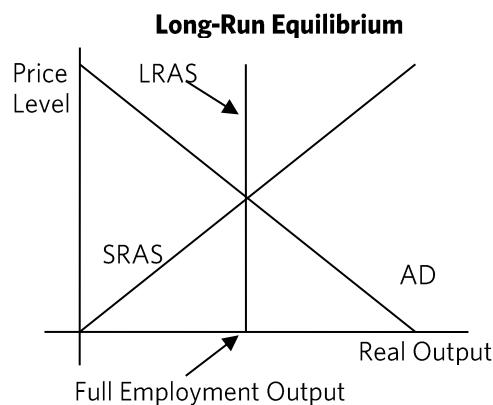




The business cycle



Keynesian equilibrium



Equations: Microeconomics

- Price elasticity of demand

$$E = \frac{\% \text{ change in } QD}{\% \text{ change in } P} = \frac{(QD_1 - QD_0) \div QD_0}{(P_1 - P_0) \div P_0}$$

- Price elasticity of supply

$$E = \frac{\% \text{ change in } QS}{\% \text{ change in } P} = \frac{(QS_1 - QS_0) \div QS_0}{(P_1 - P_0) \div P_0}$$

- General equation

$$E = \frac{\% \text{ change in dependent variable}}{\% \text{ change in independent variable}}$$

- Profit maximization

Marginal revenue = marginal cost; MR = MC

- Profit maximization for firms

Price = marginal cost

- Average total cost

$$\text{Average Total Cost} = \frac{\text{Total Fixed Costs} + \text{Total Variable Costs}}{\text{Total Number of Units Produced}}$$

Equations: Macroeconomics

- Gross domestic product

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

- CPI (to find inflation)

$$CPI = \frac{\text{Basket price in year } t}{\text{Basket price in base year}} \times 100$$

- GDP Deflator (relation to nominal and real GDP)

$$\text{Real GDP} = \frac{\text{Nominal GDP}}{\text{GDP Deflator}} \quad \text{so} \quad \text{GDP Deflator} = \frac{\text{Nominal GDP}}{\text{Real GDP}}$$

- GDP Deflator

$$\text{GDP deflator} = \frac{\text{Nominal GDP}}{\text{Real GDP}} \times 100$$



- Money supply

$$\begin{aligned}\text{Money supply} &= \text{deposits} + C \\ &= \frac{M - C}{R} + C = \frac{R \times C + M - C}{R} = \frac{M + (R - 1) \times C}{R}\end{aligned}$$

- Money multiplier

$$MM = \frac{1}{RR}$$

- Equation of exchange
(quantity theory of money)

$$MV = PQ$$



PRACTICE TEST TABLE

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ABOUT THE AUTHOR

Robert Brown is a rising third year at the University of Chicago, studying economics and political science, with an intent to complete a joint degree (M.A.) in International Relations in his fourth year. Robert, like any good Chicago Economist™, has recoiled at everything having to do with Keynes³⁹ and rejoiced at everything having to do with capitalism⁴⁰. When he's not R&R'ing about economics, Robert can be found fixated on something seemingly random; his recent obsessions include Beat literature (notably exceptions include sidetracks into Ocean Vuong and Aldous Huxley's works), the Ring Road in Afghanistan, and attempting to play catch with his younger sister, who says usually says no.



Vital Stats

- Did not compete in high school!
- Did too much Public Forum Debate, though.
- Would offer a phrase here, but I don't know too much about AcaDec, so, in the words of Spock "shall simply say 'Good luck!'"
- Joined DemiDec in June 2020 (and the World Scholar's Cup Staff in August, 2018)

³⁹ Only half-joking – Robert

⁴⁰ Mostly joking – Robert