Principles of Macroeconomics

Professor Pusateri

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UNIT 1: FOUNDATIONS

THE POWER OF TRADE AND COMPARATIVE ADVANTAGE

Trade

- Why do we trade?
- What are the advantages of trade?
- What is comparative advantage?

Why do we trade?

- Action occurs when the expected benefit of the action is greater than the expected cost of the action
- Trade occurs when people think that they will be better off with the acquired item than they were with the item they are giving up.
  - Trade makes people better off (in expectation)
  - Occurs when preferences differ
- Trade allows us to get the most out of the goods we already have
  - Trade increases value by moving goods from those who value them less to those who value them more

What are the advantages of trade?

- With trade, we can create entirely new goods and services
- ↑ Specialization → ↑ Knowledge → ↑ Productivity
  - Example: Physicians and specialties
- Without trade, specialization isn't feasible
- Specialization and the division of knowledge are critical to productivity
  - Read "I, Pencil" by Leonard E. Read

Opening Economies to Trade

- Trade has clear benefits within house, community, etc.
- Benefits of trade are not limited to local trades, but can be applied between states, countries, etc.
- Globalization greatly increases global division of knowledge and productivity

What is comparative advantage?

- Key Idea in Economics
- Trade allows us to take advantage of individuals skills, preferences, and comparative advantage
- One's ***comparative advantage*** is in what they can produce at the lowest opportunity cost
- Differs from absolute advantage

Production Possibilities Frontier (1/2)

- Model that illustrates the combinations of outputs a society can produce if all of its resources are being used efficiently.
- Abbreviated as PPF.
- Assumptions (*ceteris paribus*):
  - Technology fixed.
  - Quantity of resources fixed.
  - Society produces only two goods.
    - Not that heroic as the two goods can be apple and non-apples

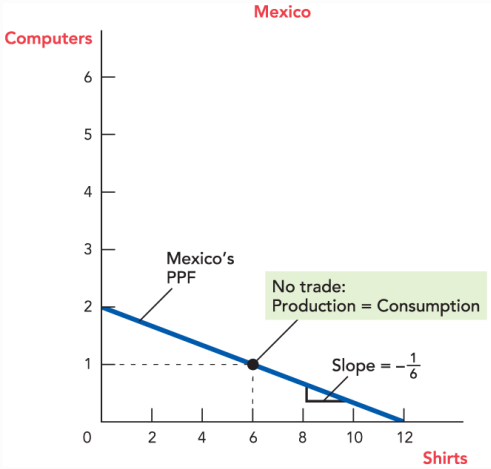
Production Possibilities Frontier (2/2)

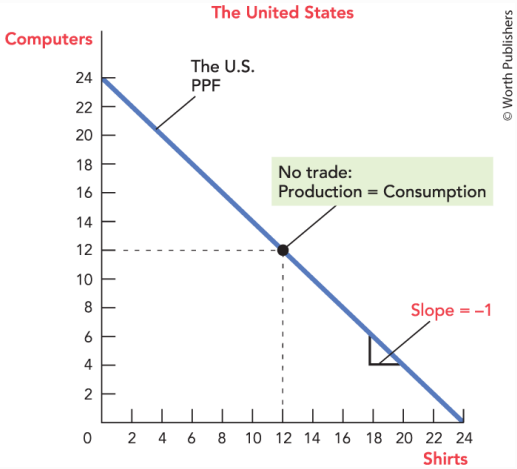
- Downward sloping:
  - must give up one good to increase production of another.
- The slope of the PPF will equal the negative value of the opportunity cost of producing good Y in terms of good X.

PPF Example

- Mexico vs US trade based on comparative advantage
- Two goods: Shirts and Computers
- Mexico - lower opportunity cost for shirts
- US - lower opportunity cost for computers

Fig. 2.1: Production and Consumption in Mexico and the US without Trade





Opportunity Cost

- ***Opportunity cost*** is the value of the next best alternative foregone when making a decision. It represents the tradeoff involved with a choice.
- Understanding opportunity cost is crucial for evaluating decisions and making choices that maximize value.
- For example, the opportunity cost of attending college is the income that could have been earned from working a full-time job instead.
  - This is higher than just the direct costs of college like tuition.
- Opportunity costs guide the decisions of consumers, producers, and society as a whole.
  - Consumers purchase based on comparing opportunity costs.
  - Producers supply goods where they have a comparative advantage, meaning a lower opportunity cost of production.

Comparative Advantage and Trade

- Mexico
  - 24 units of labor
  - 12 units of labor to produce a computer
  - 2 units of labor to produce a shirt
- US
  - 24 units of labor
  - 1 units of labor to produce a computer
  - 1 units of labor to produce a shirt

Opportunity Cost Calculation

Mexico			USA		
Shirts		Computers	Shirts		Computers
12	or	2	24	or	24

Opportunity Cost Calculation

Mexico			USA		
Shirts		Computers	Shirts		Computers
12	or	2	24	or	24
1	→		1	→	

Opportunity Cost Calculation

Mexico			USA		
Shirts		Computers	Shirts		Computers
12	or	2	24	or	24
1	→	$1/6$	1	→	1

Opportunity Cost Calculation

Mexico			USA		
Shirts		Computers	Shirts		Computers
12	or	2	24	or	24
1	$\rightarrow$	$1/6$	1	$\rightarrow$	1
	$\leftarrow$	1		$\leftarrow$	1

Opportunity Cost Calculation

Mexico			USA		
Shirts		Computers	Shirts		Computers
12	or	2	24	or	24
1	$\rightarrow$	$1/6$	1	$\rightarrow$	1
6	$\leftarrow$	1	1	$\leftarrow$	1

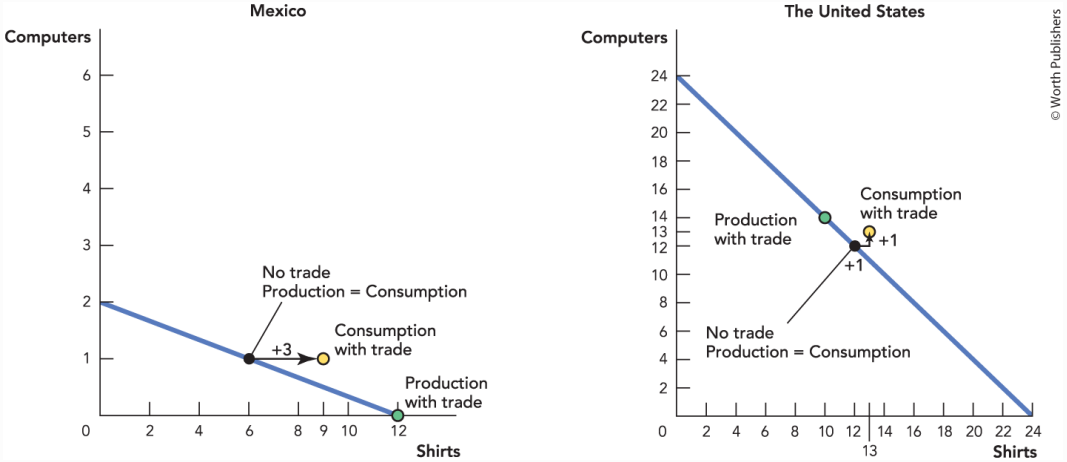
Specialization and Trade (1 Computer for 3 Shirts)

	Mexico			USA		
	Shirts		Computers	Shirts		Computers
Possibilities	12	or	2	24	or	24
P (Autarky)	6	and	1	12	and	12
C (Autarky)	6	and	1	12	and	12
P (S&T)	12	and	0	10	or	14
C (S&T)	9	and	1	13	or	13

Consumption with Trade

- With specialization and trade, consumption exceeds production
- Countries consume outside their PPFs
- Example: US and Mexico consuming more with trade

Fig. 2.2: Production and Consumption in Mexico and the US with Trade



Understanding Trades

- Countries (or people) will only trade when it is beneficial (in expectation)
- Trades are bound by opportunity cost
  - Without knowing preferences, we do not know the specific trade a country (or person) will make
  - But we do know that the trade ratio will be bound by two things:
    - production abilities
    - opportunity cost

Opportunity Cost Calculation

Mexico			USA		
Shirts		Computers	Shirts		Computers
12	or	2	24	or	24
1	$\rightarrow$	$1/6$	1	$\rightarrow$	1
6	$\leftarrow$	1	1	$\leftarrow$	1

- Mexico has a lower opportunity cost of shirts. Therefore, it should specialize in shirts.
- If Mexico "trades with itself" it cost 6 shifts to obtain a computer.
  - If it can get a computer from the US for less than 6 shirts it will be happy.
- If the US "trades with itself" it can get 1 shift by giving up one computer.
  - It will be happy if Mexico will give it more than 1 shirt for one computer.
- So, 1 Computer will trade for more than 1 shirt but less than 6 shirts.

Opportunity Cost Calculation

Mexico			USA		
Shirts		Computers	Shirts		Computers
12	or	2	24	or	24
1	→	1/6	1	→	1
6	←	1	1	←	1

- Would Mexico & the US Agree to the following trades?
  A. 1 Computer for $\frac{1}{2}$ a Shirt?
  B. 1 Computer for 1 Shirt?
  C. 1 Computer for 3 Shirts?
  D. 1 Computer for 7 Shirts?

Key Insight

- Trade allows specialization based on comparative advantage
- Increases productivity and knowledge
- Benefits all trading partners
- Global trade is beneficial just as is local trade

Comparative Advantage Always Exists

- Everyone has a comparative advantage in something
  - All can benefit from trade
- World's most and least productive benefit from trade
- Trade unites humanity
- Trade promotes prosperity and cooperation

Opportunity Cost Calculation, Example 2

Florian			Guilder		
Coffee		Tea	Coffee		Tea
50	or	30	60	or	40

- Who has the absolute advantage in Coffee?
- Who has the absolute advantage in Tea?
- Who has the comparative advantage in Coffee?
- Who has the comparative advantage in Tea?
- Both Countries would likely agree to a trade of 1 Coffee for more then X units of Tea but less than Y units of tea.

Opportunity Cost Calculation, Example 2

Florian			Guilder		
Coffee		Tea	Coffee		Tea
50	or	30	60	or	40
1	→		1	→	

- Who has the absolute advantage in Coffee?
- Who has the absolute advantage in Tea?
- Who has the comparative advantage in Coffee?
- Who has the comparative advantage in Tea?
- Both Countries would likely agree to a trade of 1 Coffee for more then X units of Tea but less than Y units of tea.

Opportunity Cost Calculation, Example 2

Florian			Guilder		
Coffee		Tea	Coffee		Tea
50	or	30	60	or	40
1	→	$3/5$ or .6	1	→	$2/3$ or $.6\overline{6}$

- Who has the absolute advantage in Coffee?
- Who has the absolute advantage in Tea?
- Who has the comparative advantage in Coffee?
- Who has the comparative advantage in Tea?
- Both Countries would likely agree to a trade of 1 Coffee for more then X units of Tea but less than Y units of tea.

Opportunity Cost Calculation, Example 2

Florian			Guilder		
Coffee		Tea	Coffee		Tea
50	or	30	60	or	40
1	→	$3/5$ or .6	1	→	$2/3$ or $.6\overline{6}$
	←	1		←	1

- Who has the absolute advantage in Coffee?
- Who has the absolute advantage in Tea?
- Who has the comparative advantage in Coffee?
- Who has the comparative advantage in Tea?
- Both Countries would likely agree to a trade of 1 Coffee for more then X units of Tea but less than Y units of tea.

Opportunity Cost Calculation, Example 2

Florian			Guilder		
Coffee		Tea	Coffee		Tea
50	or	30	60	or	40
1	→	$3/5$ or .6	1	→	$2/3$ or $.6\overline{6}$
$5/3$ or $1.6\overline{6}$	←	1	$3/2$ or 1.5	←	1

- Who has the absolute advantage in Coffee? **Guilder**
- Who has the absolute advantage in Tea? **Guilder**
- Who has the comparative advantage in Coffee? **Florian**
- Who has the comparative advantage in Tea? **Guilder**
- Both Countries would likely agree to a trade of 1 Coffee for more then X units of Tea but less than Y units of tea. **X** = $3/5$ or **.6**, **Y** = $2/3$ or $.6\overline{6}$

SUPPLY AND DEMAND

The Importance of Supply and Demand

- The model of supply and demand is one of the most powerful theories in economics.
- Supply and demand explain how self-interested buyers and sellers interact in a market to determine prices and coordinate economic activity.
- Supply and demand reflect incentives and constraints imposed on market participants.
- The logic of supply and demand theory is compelling, widely applicable, and essential for understanding how markets function.
- One cannot overstate the usefulness of S&D analysis.

Ceteris Paribus in Economics

- ***Ceteris paribus*** is a Latin phrase that means “all other things being equal.”
  - Simplifies complex economic models and isolates the effect of one variable
- Most economic analysis is *ceteris paribus* (or *cp*).
- Examples
  - Study the effect of interest rates on investment, holding other factors like consumer confidence constant.
- Limitations
  - Real-world scenarios are rarely *ceteris paribus*
  - May oversimplify complex interactions

The Demand Curve

- Shows the quantity demanded at each price
- Negatively sloped due to the law of demand: lower price → greater quantity demanded
- Can read demand curve horizontally or vertically
  - Horizontally: quantity demanded at a given price
  - Vertically: maximum price consumers will pay for a given quantity

The Demand Schedule

- Shows the quantity demanded at each price
- Same information as Demand Curve, but presented in a table

Price ($)	Quantity Demanded
55	5
20	25
5	50

Fig. 3.1: The Demand Curve for Oil

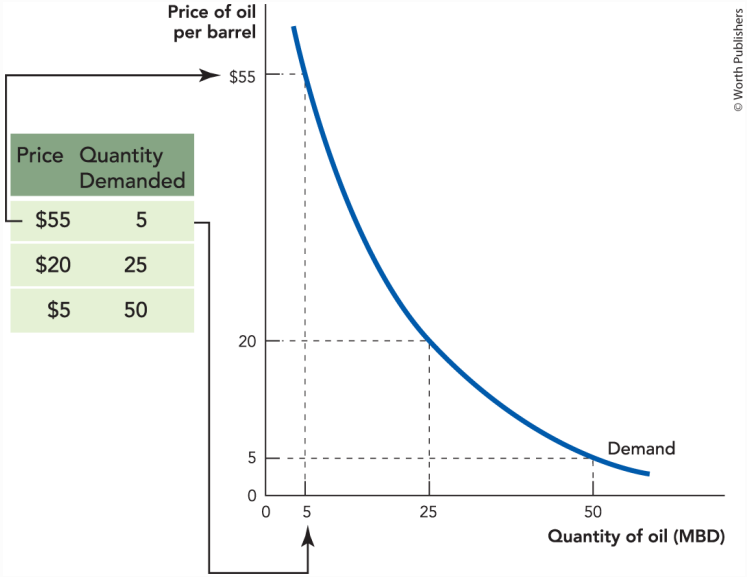


Fig. 3.2: Reading a Demand Curve in Two Different Ways

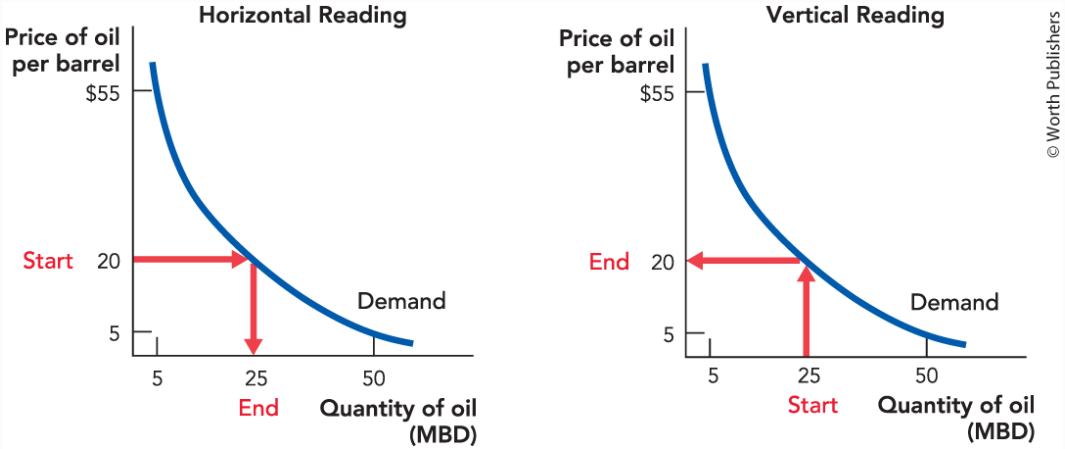
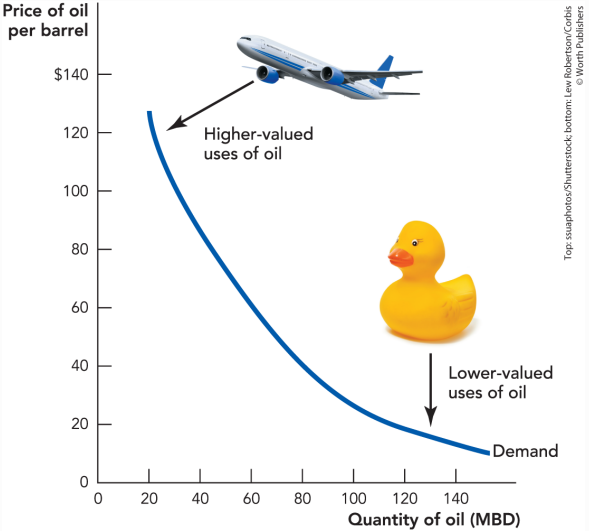


Fig. 3.3: The Demand for Oil Depends on the Value of Oil in Different Uses



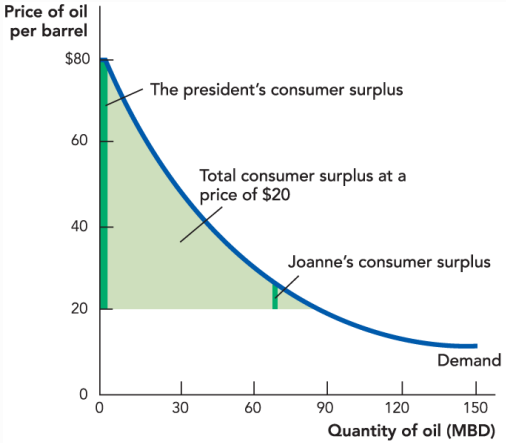
Consumer Surplus

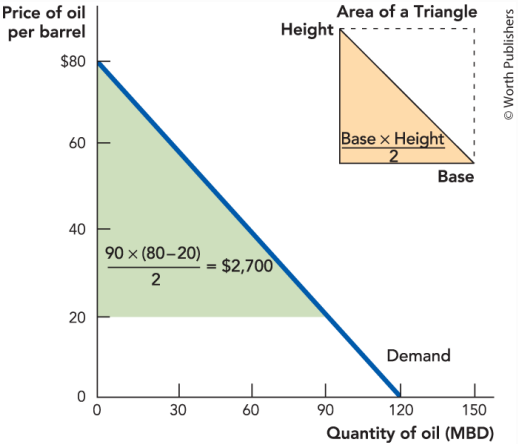
- Consumer’s gain from exchange
- Measured as the area beneath the demand curve and above the price

Calculating Consumer Surplus

- Use linear demand curve and simple geometry
- Area of a triangle = $\frac{1}{2} \times$ base $\times$ height
- Consumer surplus = $\frac{1}{2} \times$ quantity $\times$ (maximum price $-$ market price)

Fig. 3.4: Consumer Surplus





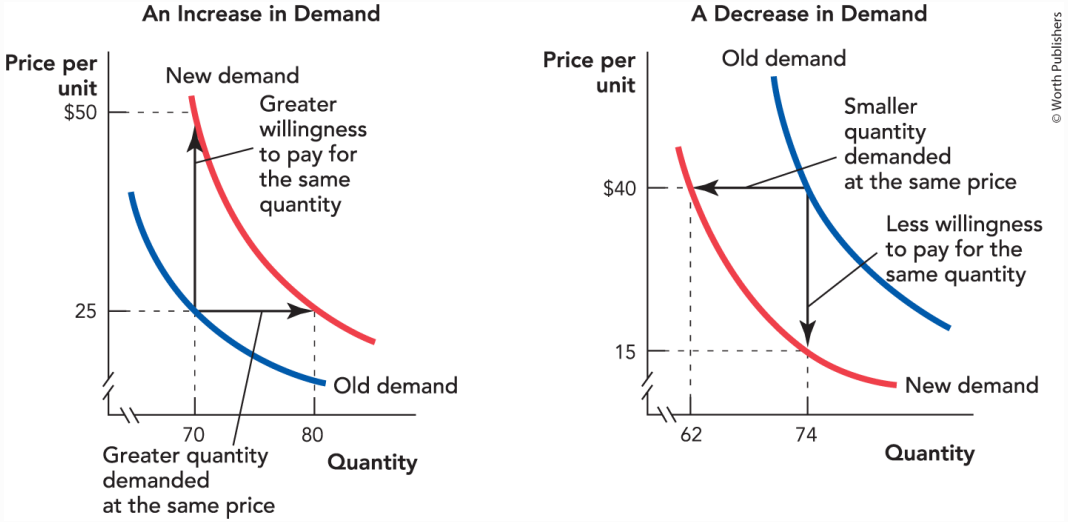
Example of Consumer Surplus

- Market price of oil is \$20 per barrel
- Maximum price for 10 barrels is \$25 per barrel
- Consumer surplus per barrel = \$25 − \$20 = \$5
- Total consumer surplus for 10 barrels = $\frac{1}{2} \times 10 \times \$5 = \$25$

What Shifts the Demand Curve?

- Changes in factors affecting demand shift demand curve
- Shift is rightward for increase in demand, leftward for decrease
- Key demand shifters:
  - Income
  - Population
  - Prices of substitutes and complements
  - Expectations
  - Tastes

Fig. 3.5: Shifting the Demand Curve



Change in Demand vs. Change in Quantity Demanded

- Change in demand: Shift of entire demand curve caused by factor other than price
- Change in quantity demanded: Movement along existing demand curve caused by change in price

Income Effect on Demand

- Normal goods: demand increases with income
  - ↑ income → ↑ demand
- Inferior goods: demand decreases with income
  - ↑ income → ↓ demand
- Example: As incomes rise in China → demand for cars ____

Income Effect on Demand

- Normal goods: demand increases with income
  - ↑ income → ↑ demand
- Inferior goods: demand decreases with income
  - ↑ income → ↓ demand
- Example: As incomes rise in China → demand for cars ↑

Population Effect on Demand

- More people → greater demand
- Can also consider demographic changes
- Example: Aging population increases demand for healthcare

Prices of Substitutes and Demand

- Substitutes can serve same purpose (Coke & Pepsi)
- If price of substitute falls, demand decreases
- Example: Lower natural gas price reduces demand for heating oil

Prices of Complements and Demand

- Complements used together (chips & salsa)
- If price of complement falls, demand increases
- Example: Lower burger price raises demand for buns

Expectations and Demand

- Expected future shortages → demand increases today
  - People stock up in advance
  - Example: Impending hurricane → demand spikes for batteries
- Expected future price decrease → demand decrease today
- Expectations can become a self-fulfilling prophecy

Tastes and Demand

- Changes in preferences or fads shift demand
- Example: Low-carb diets increased demand for meat

The Supply Curve

- Shows quantity supplied at each price
- Positively sloped due to the law of supply: higher price → greater quantity supplied
- Can read supply curve horizontally or vertically
  - Horizontally: quantity supplied at a given price
  - Vertically: minimum price needed for firms to supply a given quantity

The Supply Schedule

- Shows the quantity supplied at each price
- Same information as Supply Curve, but presented in a table

Price ($)	Quantity Supplied
55	50
20	30
5	10

Fig. 3.7: The Supply Curve for Oil

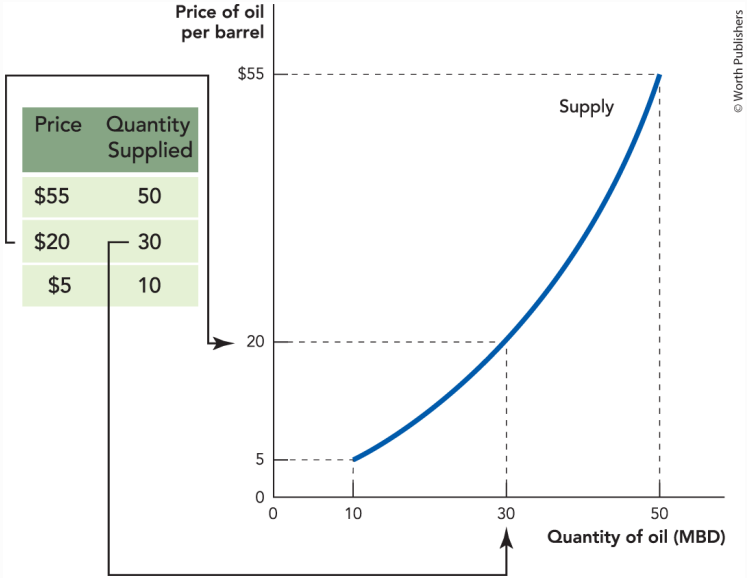


Fig. 3.8: Reading the Supply Curve Two Different Ways

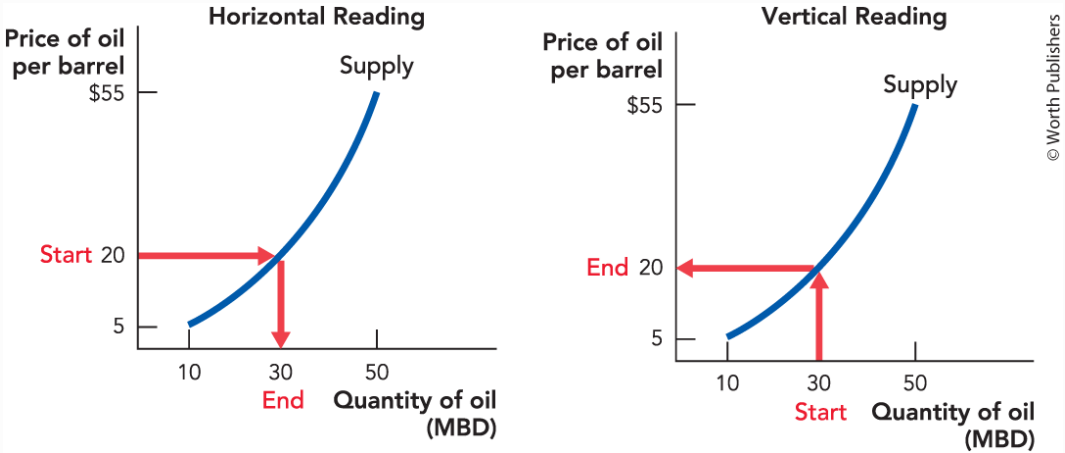
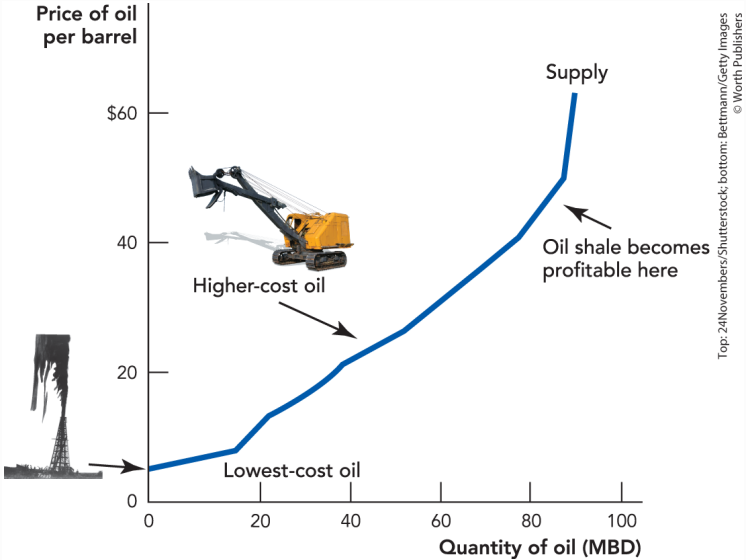


Fig. 3.9: The Supply Curve for Oil Depends on the Price of Oil in Different Uses



Producer Surplus

- Producer's gain from exchange
- Measured as the area above supply curve and below price

Calculating Producer Surplus

- Use linear supply curve and simple geometry
- Producer surplus = $\frac{1}{2} \times$ quantity $\times$ (market price $-$ minimum price)
- Producer's gain from exchange
- Measured as the area above supply curve and below price

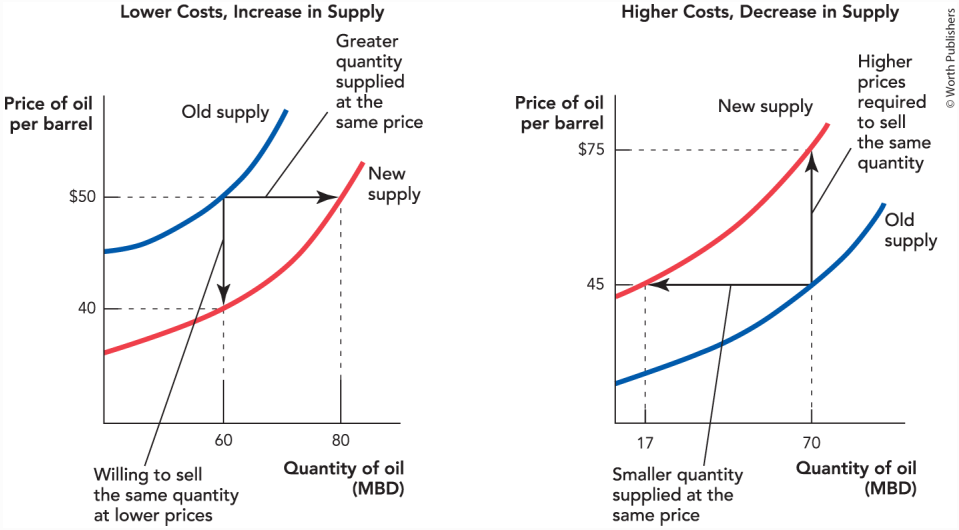
Example of Producer Surplus

- Market price for oil is \$40 per barrel
- Minimum price to produce 20 barrels is \$30 per barrel
- Producer surplus per barrel = \$40 − \$30 = \$10
- Total producer surplus on 20 barrels = $\frac{1}{2} \times 20 \times \$10 = \$100$

What Shifts the Supply Curve?

- Changes in factors affecting supply shift supply curve
- Shift is rightward for increase in supply, leftward for decrease
- Key supply shifters:
  - Technological innovation and changes in price of inputs
  - Taxes/subsidies
  - Expectations
  - Entry or exit of producers
  - Changes in opportunity cost

Fig. 3.11: Shifting the Supply Curve



Change in Supply vs. Change in Quantity Supplied

- Change in supply: Shift of entire supply curve caused by factor other than price
- Change in quantity supplied: Movement along existing supply curve caused by change in price

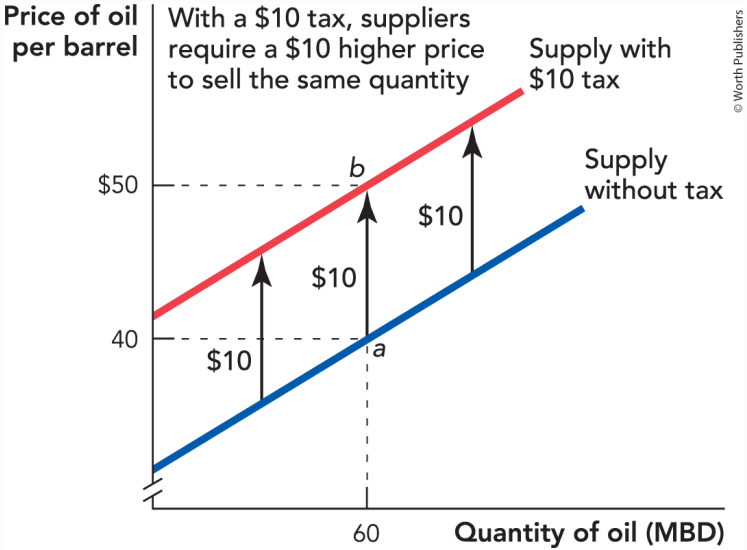
Technological innovation and changes in price of inputs

- Lower price of inputs → increase in supply
  - Improved technology → cheaper inputs
- Higher price of inputs → decrease in supply

Taxes/Subsidies and Supply

- Tax on production is equivalent to higher cost
- Subsidy is equivalent to lower cost
- Tax shifts supply curve up; subsidy shifts curve down

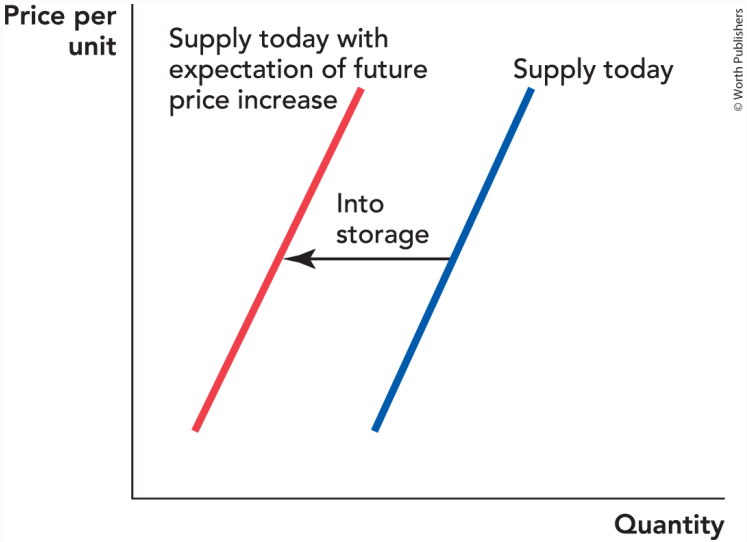
Fig. 3.12: A Tax on Oil



Expectations and Supply

- Producer expectations about the future impact supply today
  - Expect future lower prices → increase supply today
  - Expect future higher prices → decrease supply today

Fig. 3.13: A Change in Expectations



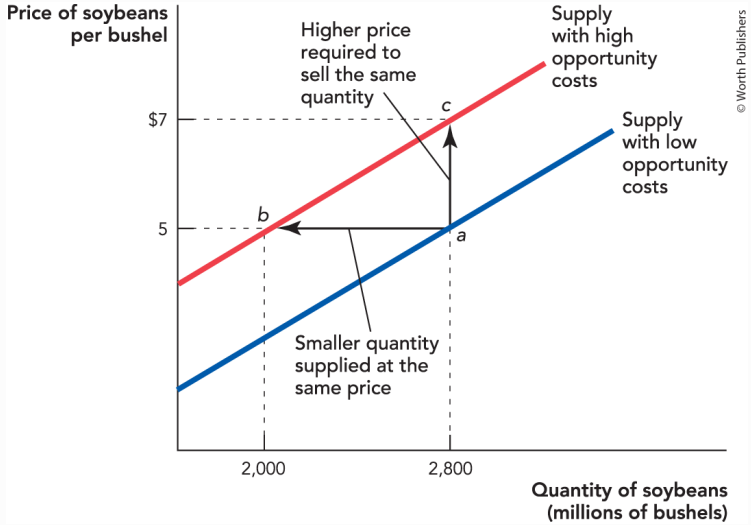
Number of Sellers and Supply

- More sellers (new entrants) → increase in supply
- Fewer sellers (exits) → decrease in supply

Changes in Opportunity Cost

- The most important cost in economics is opportunity cost
  - Opportunity cost of producing one good is the value of the next best alternative use of resources
- Opportunity cost of production increases → decrease in supply
- Opportunity cost of production decreases → increase in supply

Fig. 3.15: Higher (Oppertunity) Cost Reduce Supply



Takeaways

- Supply and Demand is fundamental to economic analysis
  - Most of the world can be explained with supply and demand
- A change in the price move you along a given curve
- A change in a non-price factor shifts a given curve
  - Demand shifters: Income; Population; Prices of substitutes and complements; Expectations; Tastes
  - Supply shifters: Technological innovation and changes in price of inputs; Taxes/subsidies; Expectations; Entry or exit of producers; Changes in opportunity cost

Navigation Links

EQUILIBRIUM

The Market for Oil

- Oil has many uses from transportation to plastics to energy.
  - It is not equally valuable in all uses.
- At high prices, oil is only used for the most valuable purposes like gasoline and jet fuel.
- As price falls, oil is used for less valuable purposes too.
- Demand for oil comes largely from rich countries and is affected by income, population, substitutes like solar, and expectations.
- Supply comes from places like Saudi Arabia and Texas where geology allows low-cost extraction. Costs set supply.
- Equilibrium price and quantity for oil are determined by global supply and demand.
- Changes in factors affecting supply and demand lead to price fluctuations.

Understanding the Price of Oil

- Major events in the Middle East reduced supply and raised prices in the 1970s.
  - Higher prices increased supply from new sources.
- Economic growth in China and India has increased demand for oil, pushing up price.
- Recession reduces demand and prices.
- New discoveries and fracking techniques have increased supply recently.
  - This puts downward pressure on prices.
  - These methods are only profitable given the high prices

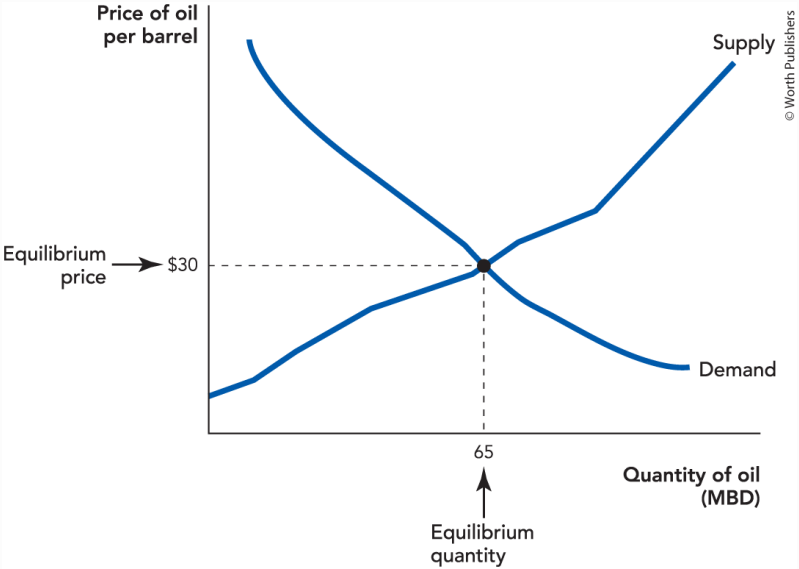
Equilibrium

- Equilibrium price and quantity occur where supply and demand curves intersect
- Equilibrium quantity is where quantity supplied = quantity demanded
- Equilibrium price is stable because no shortages or surpluses exist

Finding Equilibrium

- To identify equilibrium price and quantity:
  - Plot supply and demand curves on single graph
  - Equilibrium price is where the curves intersect
  - Equilibrium quantity can be found by:
    - Tracing down to x-axis from intersection point
    - Or tracing over to y-axis from intersection point

Fig. 4.1: Price is Determined by Supply and Demand



More on Finding Equilibrium

- Equilibrium occurs at only one price/quantity combination
- To practice finding equilibrium:
  - Draw supply and demand curves
  - Identify intersection point
  - Confirm it is the only point where $Q_d = Q_s$
  - Trace to axes to find P_e and Q_e
- With practice, equilibrium can be identified quickly from graph

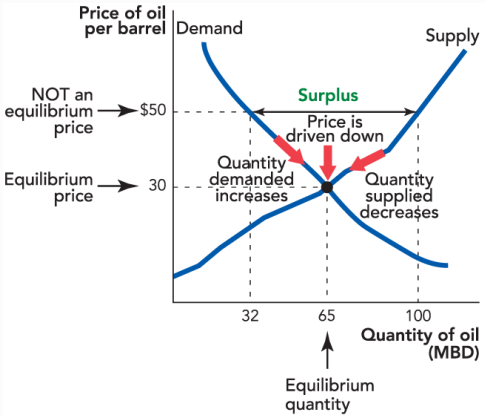
Adjustment to Equilibrium from Above

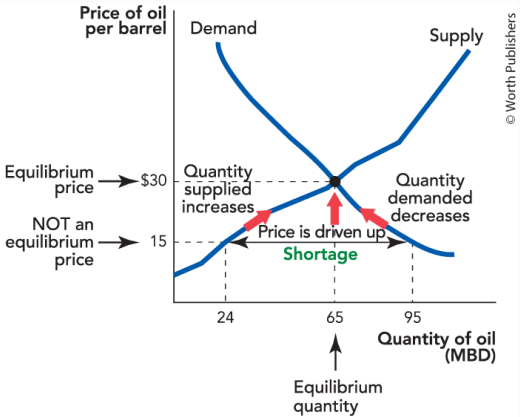
- If price above equilibrium:
  - Surplus exists
  - Competition among sellers pushes price down
  - Quantity demanded rises and quantity supplied falls
  - Price falls until equilibrium reached

Adjustment to Equilibrium from Below

- If price below equilibrium:
  - Shortage exists
  - Competition among buyers pushes price up
  - Quantity demanded falls and quantity supplied rises
  - Price rises until equilibrium reached

Fig. 4.2: Surpluses and Shortages

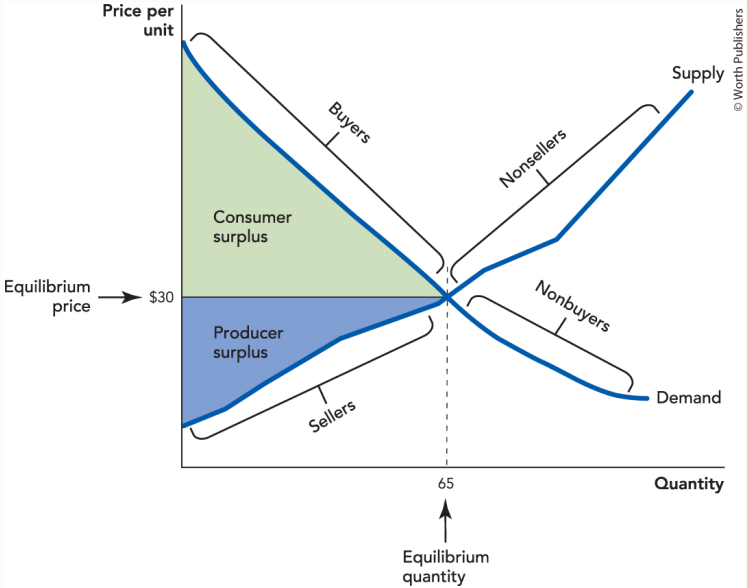




Equilibrium Maximizes Gains from Trade

- Gains from trade = consumer surplus + producer surplus
- At equilibrium:
  - No missed opportunities for mutually beneficial trades
  - No trades where costs exceed willingness to pay
  - Consumer surplus + producer surplus maximized

Fig. 4.4: Maximizing Gains from Trade



Experimental Validation

- Vernon Smith's experiments showed equilibrium emerges in experimental markets
- Buyers and sellers converge on equilibrium price and quantity
- Gains from trade also quickly maximize
- Validates predictive power of model

Changes in Equilibrium

- Changes that shift supply or demand curves affect equilibrium price and quantity
- To analyze effect:
  - Identify which curve shifts and direction of shift
  - Note resulting shortage/surplus at original equilibrium price
  - Determine how price will adjust to reach new equilibrium

Understanding Oil Prices

- Oil prices fluctuate based on supply and demand shifts
- Examples:
  - Oil embargoes and wars = leftward supply shifts → higher prices
  - New drilling technologies = rightward supply shifts → lower prices
  - Economic growth in China/India = rightward demand shifts → higher prices
  - Recessions = leftward demand shifts → lower prices

Fig. 4.6: An Increase in Supply Reduces Price and Increases Quantity

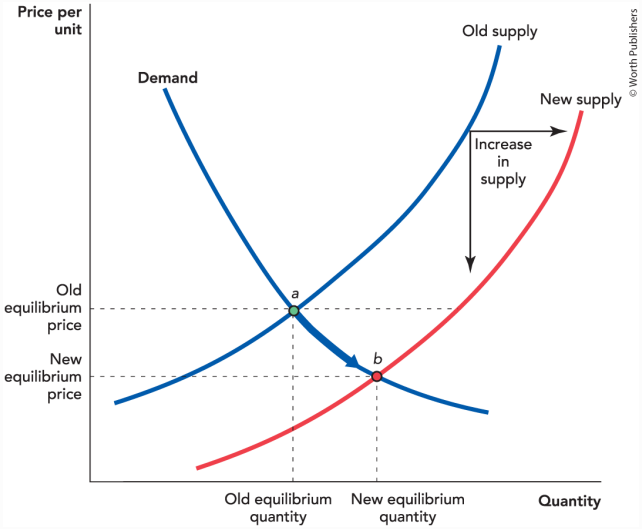
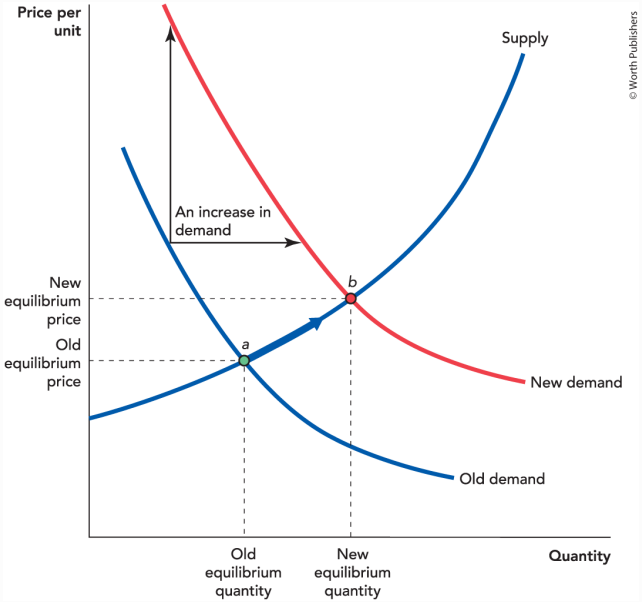


Fig. 4.7: An Increase in Demand Increases Price and Quantity



Changes in Supply vs. Quantity Supplied

- Shift of supply curve = change in supply
  - Caused by change in non-price factors
- Movement along supply curve = change in quantity supplied
  - Caused by change in price after demand shifts

Changes in Demand vs. Quantity Demanded

- Shift of demand curve = change in demand
  - Caused by change in non-price factors
- Movement along demand curve = change in quantity demanded
  - Caused by change in price after supply shifts

Fig. 4.8: Shifting Curves

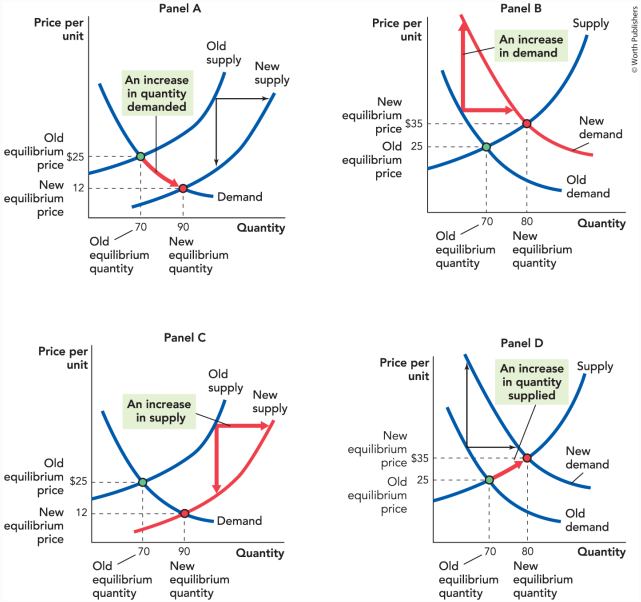
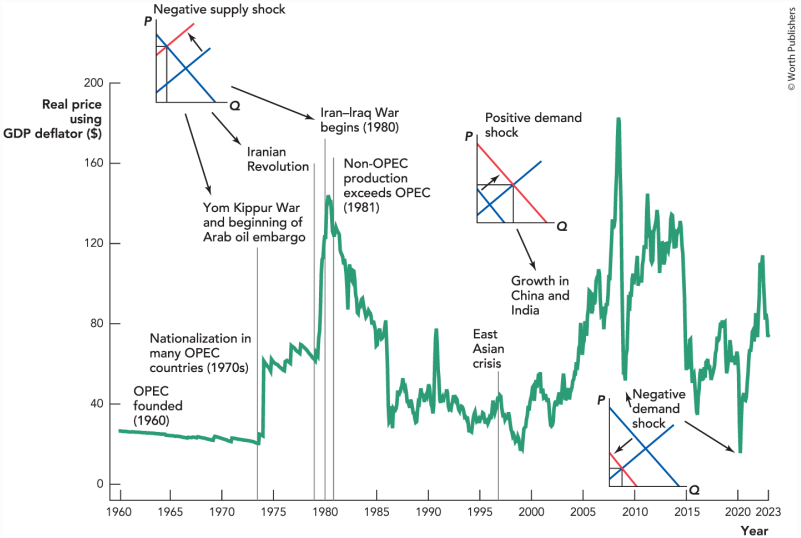


Fig. 4.9: The Real Price of Oil (1960–2023)



Takeaways

- Equilibrium exists where quantity supplied equals quantity demanded.
- Market forces drive price toward equilibrium.
- Equilibrium maximizes the sum of consumer and producer surplus - the gains from trade.
- Shifts in supply and demand curves lead to changes in equilibrium price and quantity in predictable ways.
- “Change in demand” means shifting the demand curve. “Change in quantity demanded” means moving along a fixed demand curve.
- Using supply and demand analysis lets you understand almost everything

Navigation Links

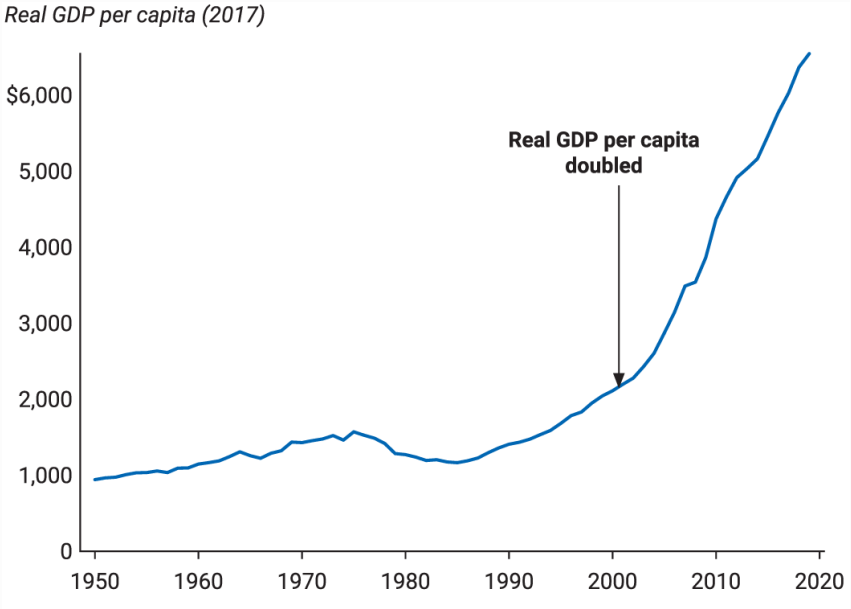
UNIT 2: ECONOMIC GROWTH

GDP AND THE MEASUREMENT OF PROGRESS

What is GDP?

- ***GDP***: The market value of all final goods and services produced within a country in a year
  - Measures a nation's total
    - output and production
    - spending
    - income
  - Allows quantification of economic growth and fluctuations
  - Uses market prices to determine value of different goods/services

Fig. 6.1: Real GDP Per Capita in India (1950–2019)



GDP is. . . the Market Value

- Uses market prices to value goods and services
- Market prices give greater weight to more valued goods
- Alternative to just adding quantities produced

Table 6.2

Finished Good	Price	×	Quantity	=	Market Value
Cars	$28,000	×	12 million	=	$336 billion
Chickens	$5	×	8.6 billion	=	$43 billion
					$379 billion (Added to GDP)

. . . of All Final. . .

- Sums market value of all ***final*** goods and services
  - ***Intermediate goods***: Used in production of other goods (e.g. Intel chip in Dell computer)
  - ***Final goods***: Sold to final users and consumed (e.g. Dell computer)
- Only final goods counted to avoid double counting

. . . Goods and Services. . .

- Includes both ***goods*** and ***services***
  - Goods are tangible items like food, clothing, cars
  - Services are activities like education, healthcare, transportation

. . . Produced . . . within a Country . . .

- Final Goods and Services produced by labor & capital within the country
  - Citizen of Mexico working in U.S. adds to U.S. GDP
  - American working in Mexico adds to Mexican GDP
- Note: Production is creation of utility/value, not just manufacturing

. . . in a Year

- Annual measure of production
- Like wages measure income for a year, not total wealth
- Although reported quarterly, figures are annualized

GDP Growth Rates

- The GDP ***Growth rate*** measures the percentage change in GDP over time
  - $\%\Delta GDP = \frac{GDP_{current} - GDP_{previous}}{GDP_{previous}} \times 100$
  - Growth of GDP $= \overrightarrow{GDP} = \%\Delta GDP$
- Tells if production is increasing/decreasing overall
  - Positive growth indicates a GDP increase
  - Negative growth indicates a GDP decline
- More generally, $\overrightarrow{x} = \frac{x_{current} - x_{previous}}{x_{previous}} \times 100$

Example Growth Rate Calculation

- If GDP in 1990 was \$5,803 billion
- And GDP in 1991 was \$5,995 billion
- What was the GDP Growth Rate?

$$\begin{aligned}\text{GDP Growth Rate} &= \frac{GDP_{current} - GDP_{previous}}{GDP_{previous}} \times 100 \\ &= \frac{5,995 - 5,803}{5,803} \times 100 \\ &= 0.0331 \times 100 \\ &= 3.31\%\end{aligned}$$

Fig. 6.2: US Real GDP Growth Rate (1948–2021)

Percentage change from preceding period

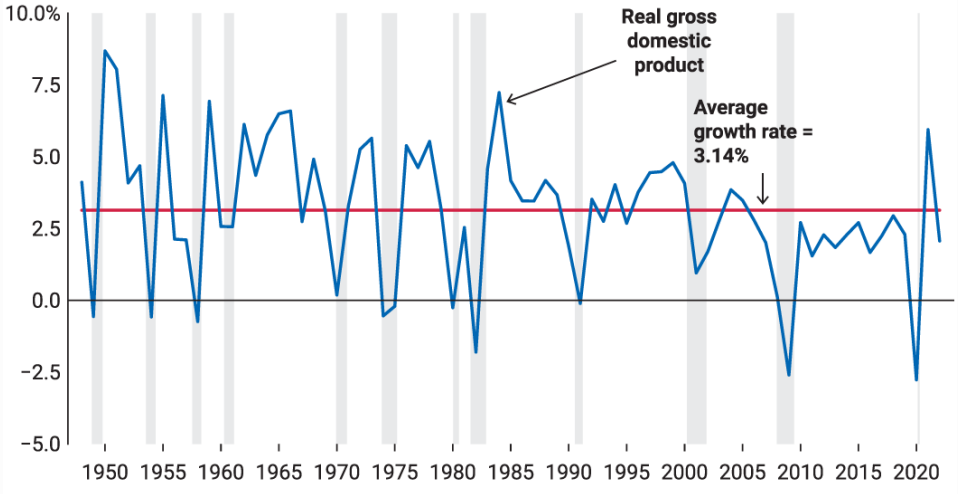


Chart: © Worth Publishers • Data from: Bureau of Economic Analysis, https://fred.stlouisfed.org/graph/?g=q6ZE

Nominal vs. Real GDP

- ***Nominal GDP***: Uses current-year prices

$$\text{Nominal GDP}_t = \sum_{i=1}^{n} \left(P_{i,t} \times Q_{i,t} \right)$$

- ***Real GDP***: Uses constant base-year prices
- Real GDP removes price effects to isolate quantity changes
  - Allows comparison of production over time

$$\text{Real GDP}_t = \sum_{i=1}^{n} \left(P_{i,base} \times Q_{i,t} \right)$$

GDP Deflator

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

- Captures inflation between base year and current year
- Always equals 100 in base year
- If GDP deflator$_t > 100$, prices rose faster than real GDP
- If GDP deflator$_t < 100$, prices rose slower than real GDP

GDP Deflator, cont

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

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

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

Example GDP Deflator Calculation

Year	Nominal GDP	Real GDP (base year 2012)	GDP Deflator
2022	26.14 trillion	20.18 trillion	?

$$
\begin{aligned}
\text{GDP deflator} &= \frac{\text{Nominal GDP}}{\text{Real GDP}} \times 100 \\
&= \frac{26.14 \text{ trillion}}{20.18 \text{ trillion}} \times 100 \\
&= 1.2953 \times 100 \\
&= 129.53
\end{aligned}
$$

GDP Deflator Interpretation

- What does a GDP deflator of 129.53 mean?
  - GDP deflator is a measure of inflation
  - Prices rose 29.53% since from 2012 to 2022
    - $\frac{129.53-100}{100} \times 100 = 29.53\%$
  - Or, prices rose 2.6% per year.

Year	Nominal GDP	Real $GDP_{\text{base year 2012}}$	GDP Deflator	Inflation Rate
2012	16.42 trillion	16.42 trillion	100.00	0.00%
2022	26.14 trillion	20.18 trillion	129.53	29.53%

Calculate GDP: Pizza, Beer, and Cigars

Good	Output_{2007}	Price_{2007}
Pizza (pies)	500	$8
Beer (cases)	1,000	$4
Cigars (packs)	200	$10
2007 Nominal GDP		

Good	Output_{2008}	Price_{2008}
Pizza (pies)	400	$12
Beer (cases)	800	$5
Cigars (packs)	200	$11
2008 Nominal GDP		

Calculate GDP: Pizza, Beer, and Cigars

Good	Output_{2007}	Price_{2007}	Market Value
Pizza (pies)	500	$8	$4,000
Beer (cases)	1,000	$4	$4,000
Cigars (packs)	200	$10	$2,000
2007 Nominal GDP			$10,000

Good	Output_{2008}	Price_{2008}	Market Value
Pizza (pies)	400	$12	$4,800
Beer (cases)	800	$5	$4,000
Cigars (packs)	200	$11	$2,200
2008 Nominal GDP			$11,000

Real vs. Nominal GDP

- Nominal GDP figures can be misleading over time due to price changes
- Real GDP removes price effects to isolate quantity changes
- Allows accurate comparison of production over time
- In example, real GDP shows production declined from 2007 to 2008

Pizza, Beer, and Cigars Revisited

Good	Output_{2008}	Price_{2008}	Market Value
Pizza (pies)	400	\$12	\$4,800
Beer (cases)	800	\$5	\$4,000
Cigars (packs)	200	\$11	\$2,200
2008 Nominal GDP_{2008}			\$11,000

Good	Output_{2008}	Price_{2007}	Market Value
Pizza (pies)	400	\$8	\$3,200
Beer (cases)	800	\$4	\$3,200
Cigars (packs)	200	\$10	\$2,000
2008 Real $\text{GDP}_{\text{BY=2007}}$			\$8,400

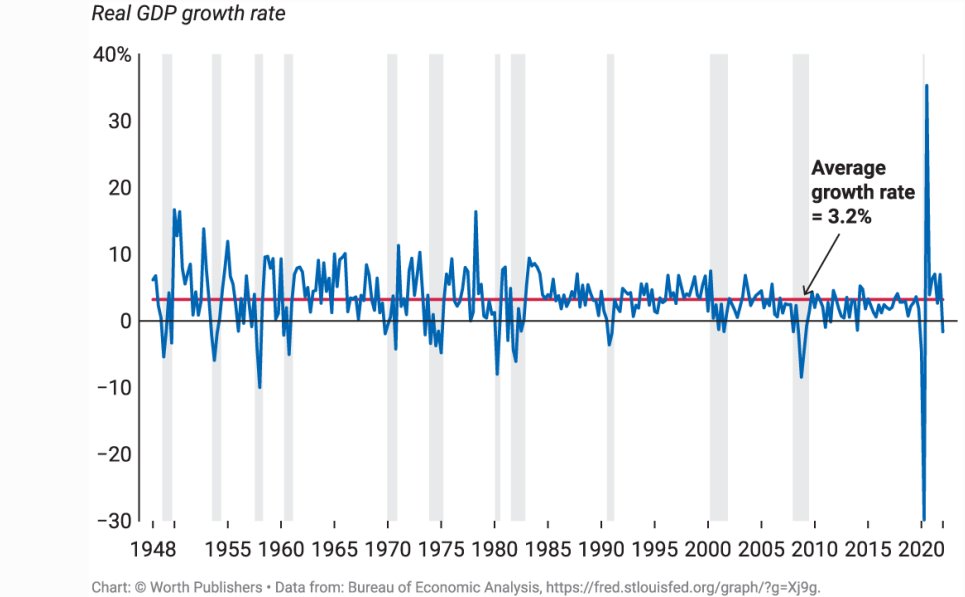
Importance of Real GDP Growth

- Real GDP growth is one of the best indicators of economic performance
  - Specifically, ***Real GDP per capita***: Real GDP divided by population
    - Approximates a nation's standard of living
    - Growth measures changes in living standards
- Measures increase in production/income, not just higher prices
- Positive real GDP growth signals expanding economic activity
- Higher real GDP growth indicates faster expansion and economic progress
- Negative real GDP growth indicates recession and falling incomes
- Real GDP growth is tracked closely by policymakers, firms, and households

Business Cycles

- ***Business cycles***: Short-run fluctuations in real GDP
- ***Recession***: Significant, widespread decline in economic activity
  - approximated by a decline in real GDP and employment
- ***Expansion***: Widespread increase in economic activity

Fig. 6.3: US Recessions (1948–2020)



Measuring Business Cycles

- Official recession dates from NBER Business Cycle Dating Committee
- Rule of thumb: 2+ consecutive quarters of negative GDP growth
- Difficult to identify recessions in real time due to data revisions

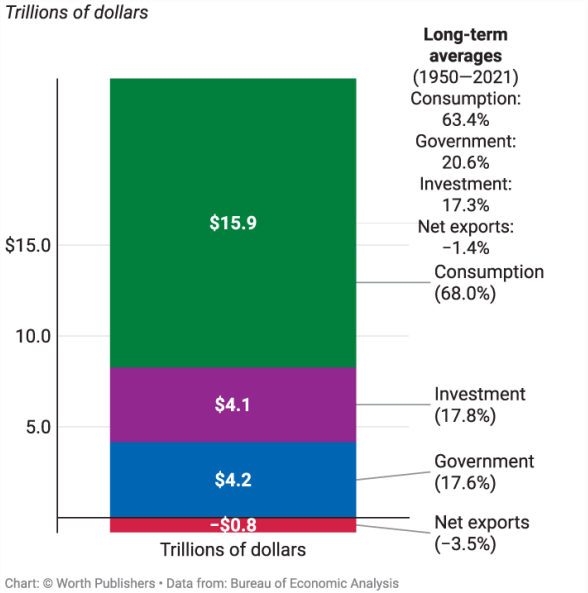
GDP as Production, Expenditure, and Income

- GDP measures total:
  - Production in the economy
    - Sum value of all production
  - Spending to purchase that production
    - Sum all spending
  - Income generated by that production
    - Sum all incomes received
- These 3 concepts are equivalent at the aggregate level
- All 3 approaches should yield same GDP figure

National Spending Approach

- $Y = C + I + G + NX$
  - C: Consumer spending on goods/services
  - I: Business Investment spending
  - G: Government Spending on goods/services
  - NX: Exports - Imports

Fig. 6.4: Components of US GDP



Consumption

- Consumption is private spending on finished goods and services
  - Includes household spending and transfer spending
  - Does not include direct government spending
  - BEA includes education spending though some view as investment
- Key component of GDP calculated through national spending approach

Investment

- Investment is private spending on capital goods
  - Tools, machines, factories, equipment
  - Also includes new home construction
- Not financial transactions like stocks which are asset transfers
- Key component of GDP in national spending approach

Government Purchases

- Government purchases include:
  - Federal, state, and local government spending
  - Government consumption (office equipment)
  - Government investment (infrastructure)
- Does not include transfer payments (Social Security)
- Important component in measuring GDP

Net Exports

- Net exports = exports - imports
- Avoids double counting domestic production
- Captures overseas production and spending
- Key component of GDP in national spending approach

Factor Income Approach

- Y = Employee compensation + Interest + Rent + Profit
- Measures GDP by incomes received
  - Employee compensation: income of labor
  - interest: income of capital
  - rent: income of land
  - profit: income of entrepreneurship

Why So Many Ways To Measure?

- GDP components behave differently over business cycles
- Income approach shows division of GDP to factors which helps clarify what is happening
- Provides multiple perspectives on the economy

Limitations of GDP

- Excludes underground/illegal production
- Excludes zero priced goods/services
  - free apps
  - unpaid work
  - liesure
- Does not account for Bads (pollution, crime, etc.)
- Does not count health of nations
- Does not measure the distribution of income

Conclusion

- GDP is an imperfect but essential measure of output, growth, and business cycles
- Economists constantly work to refine GDP measurement
- Multiple calculation methods provide cross-checks on accuracy

Navigation Links

Economic growth

- Increases societal well-being over long periods of time
  - Raises incomes
  - Improves health
  - Reduces poverty
- Economic growth is the most important economic topic
  - Economic growth is one of the least well understood topics

GROWTH, CAPITAL ACCUMULATION, AND THE ECONOMICS OF IDEAS

Why Economic Growth Matters

- Higher GDP per capita means:
  - Improved standards of living
  - Higher incomes
  - Lower poverty rates
  - Better health outcomes
  - Increased educational attainment
  - Longer life expectancy
  - More equitable gender norms
  - And many other broadly desirable outcomes
- Understanding the sources of growth helps identify policies to promote growth and development

Fig. 7.1: Wealthier Counties Have Higher Infant Survival Rates

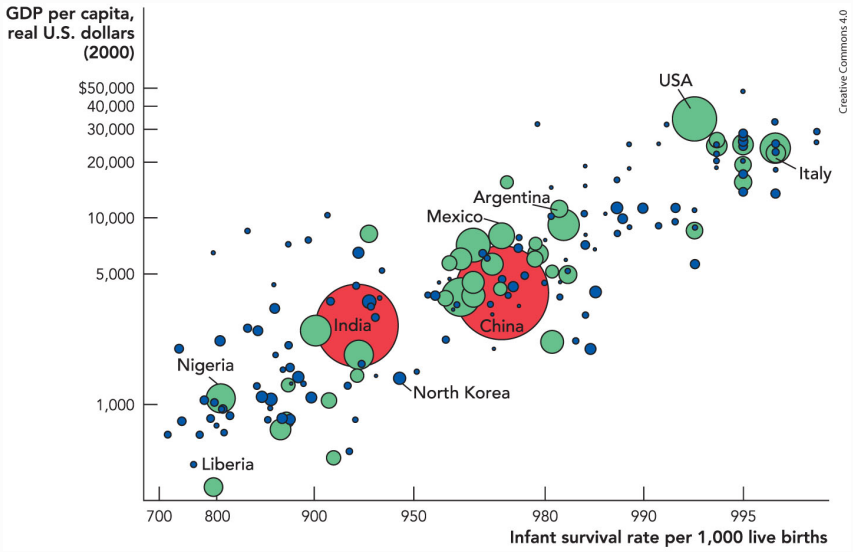


Fig. 7.2: The Distribution of World Income (2019)

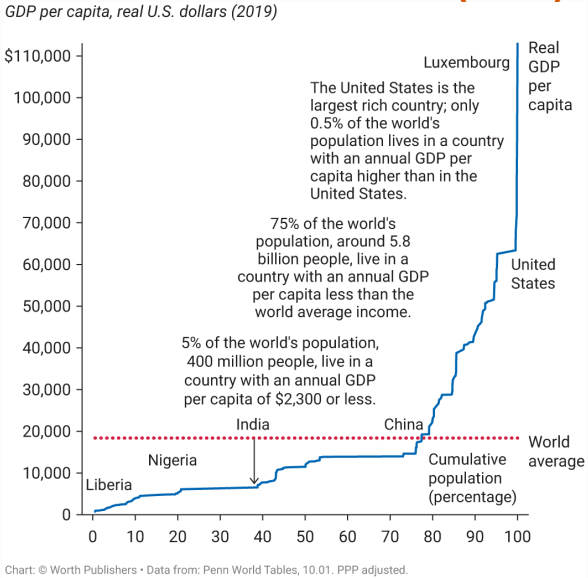
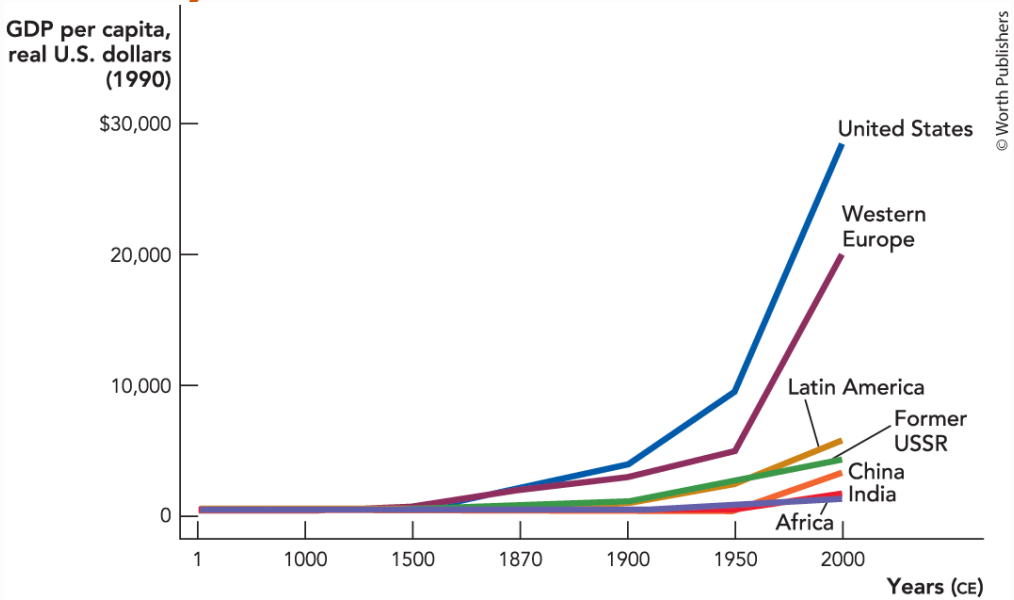


Fig. 7.3: History of Economic Growth



Consider Growth in China and the U.S.

- Over last 100 years
  - How you would you explain growth in China?
  - How would you explain growth in the U.S.?
- What features of growth differ between the two nations?

Growth in China

- China
  - Started with very little capital, so MPK very high
  - Increased investment rate with market reforms
  - Opened to beneficial trade and investment
- China's rapid growth will slow as capital accumulates and MPK declines
- Example of ***Catching-up growth***

U.S. Growth

- Consistant growth for 200+ years from continuous new ideas
- Not explained by capital accumulation, since U.S. already has much capital
- Example of ***Cutting-edge growth***

The Solow Model and Catching-up Growth

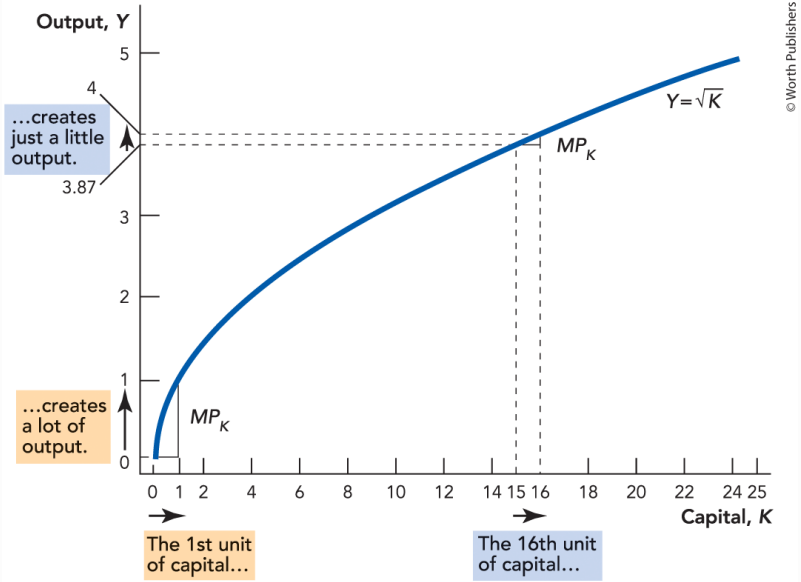
- Relates output (Y) to factor inputs
- Production function: $Y = A \times F(K, eL)$
  - Y = real GDP
  - A = technology/ideas
  - K = physical capital
  - eL = human capital (education x labor force)

$$Y = A \times \left(K^{1/3} \times eL^{2/3}\right)$$

Simplified Model

- Assume A, e, and L constant to simplify analysis
- Only analyze impact of capital on output (***ceteris paribus***)
- Simplified production function: $Y = F(K)$
  - assume $F(K) = \sqrt{K}$
- More capital K increases output Y but at a diminishing rate

Fig. 8.1: Diminishing Returns



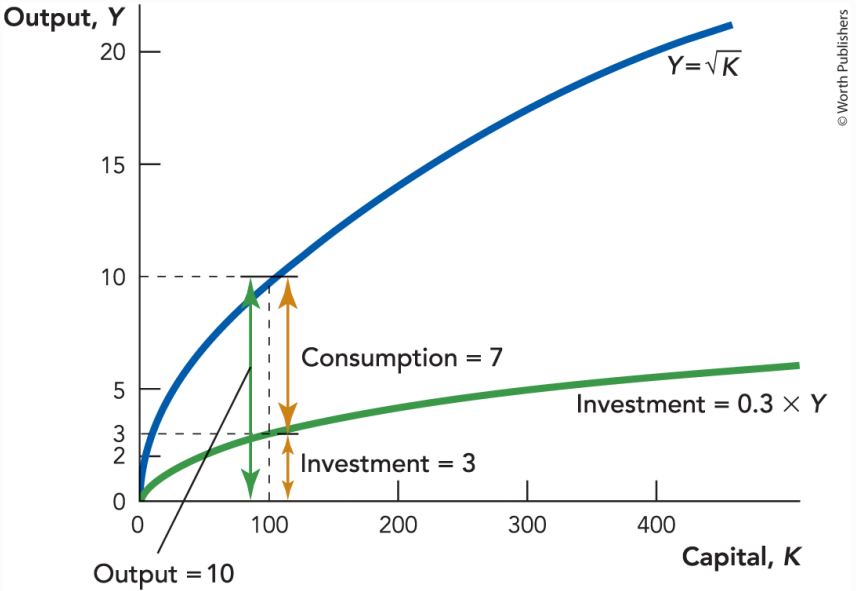
Diminishing Returns

- Marginal product of capital (MPK) diminishes as more capital added
  - MPK is the extra output from an additional unit of capital
  - Is the slope of $Y = F(K)$.
- MPK decreases as K increases due to diminishing returns
- First unit of capital more productive than the second; the fifteenth unit is more productive than the sixteenth

Investment and Capital

- Investment adds to capital stock
- Depreciation subtracts from capital stock
- γ = fraction of output Y that is invested ($I = \gamma Y$)
- Capital accumulates if Investment is greater than Depreciation
- Or, more generally: $\Delta K = I - D$
  - $\Delta K > 0 \mid I > D$
  - $\Delta K = 0 \mid I = D$
  - $\Delta K < 0 \mid I < D$

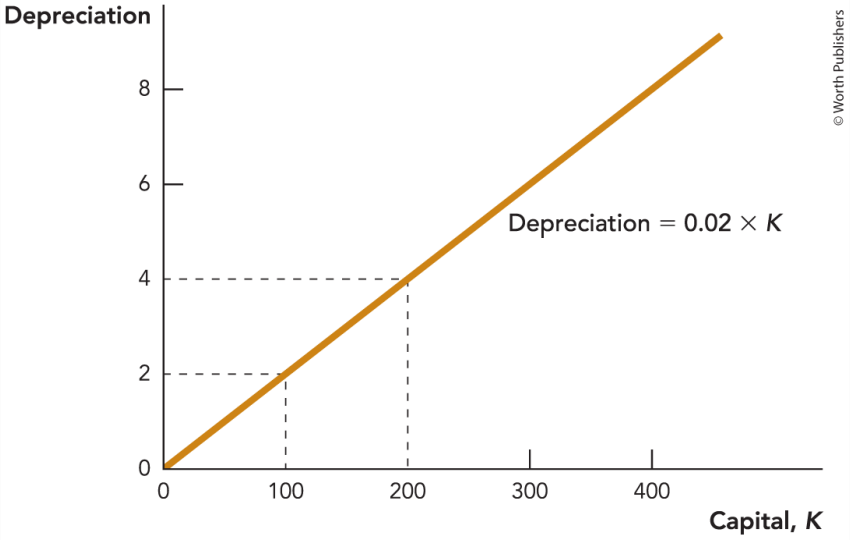
Fig. 8.2: Capital Growth Equals Investment Minus Depreciation



Depreciation

- Overtime, capital falls apart
- δ = fraction of capital (K) that depreciates each period
- More capital means greater depreciation
- Depreciation is a constant fraction of K
  - $D = \delta K$

Fig. 8.3: More Capital means More Captial Depreciation



Steady State Capital

- At steady state:
  - Investment = Depreciation
  - No new net investment
  - K and Y remain constant over time

Fig. 8.4: Capital Adjust Until Investment Equals Depreciation

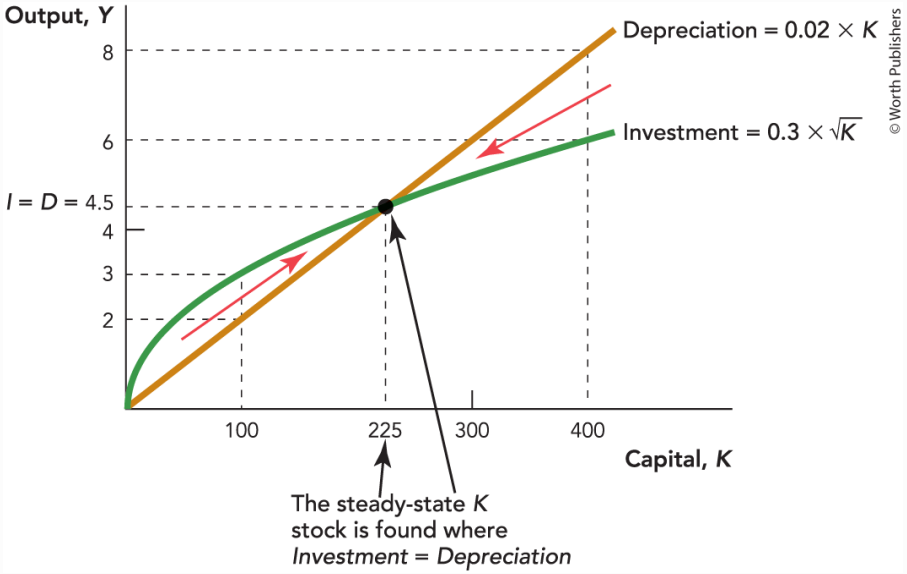
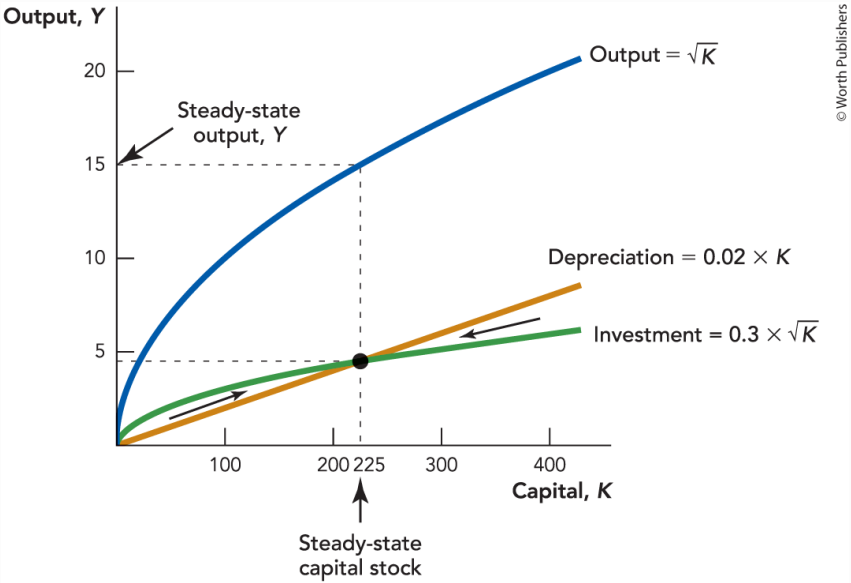


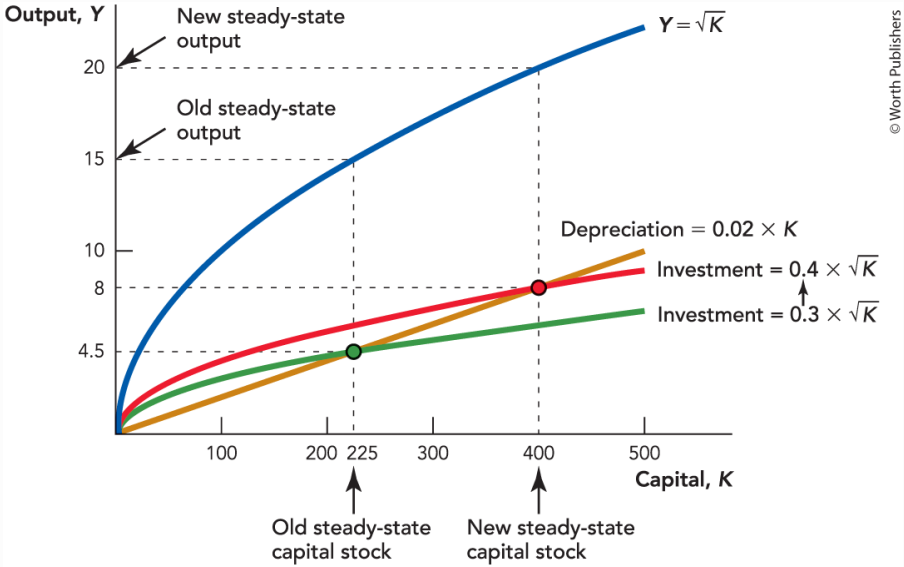
Fig. 8.6: Steady State Capital Produces Steady State Output



Investment Rate (γ)

- Higher investment (γY) increases steady-state capital (K) and output (Y)
- Empirical evidence shows higher investment leads to higher GDP
- Also seen in National Income Accounting
  - $\uparrow Y = C + \uparrow I + G + NX$

Fig. 8.7: An Increase in Investment



Investment, Depreciation, and Output

- When Investment > Depreciation:
  - Capital stock grows
  - Output grows
- When Investment = Depreciation:
  - Capital stock is constant
  - Output is constant (steady state)
- When Investment < Depreciation:
  - Capital stock shrinks
  - Output shrinks

Why Bombing a Country Can Raise Its Growth Rate

- Destroyed capital means high marginal product for new investment
- Post-WWII, Germany and Japan rebuilt devastated capital stocks
- High marginal product drove rapid catching-up growth
- Growth slowed as capital rebuilt and marginal product diminished

Catching-Up Growth (aka Convergance)

- Occurs as economy accumulates capital and moves toward steady state
- Diminishing returns means catching-up growth fizzles out at steady state
- Conditional Convergence
  - Among similar countries, poorer ones grow faster and converge
  - Evidence shows convergence in GDP for OECD countries

Cutting-Edge Growth

- Growth driven by new ideas that increase productivity
- Ideas increase productivity (A), and shift production function up
  - This enables greater long-run growth
- Unlike capital, ideas don’t diminish or depreciate

Solow Model with Ideas

- Better ideas increase Y directly through higher productivity
- Also increase capital accumulation indirectly by increasing investment
- Relax assumption that A is fixed, leading to a new simplified model:

$$Y = A \times F(K)$$

- $Y = A \times \sqrt{K} \mid F(K) = \sqrt{K}$
- Ideas increase output: $\uparrow Y = \uparrow A \times \sqrt{K}$
- Ideas increase investment: $\uparrow I = \gamma \times \uparrow Y$

Fig. 8.10: An Increase in Technology

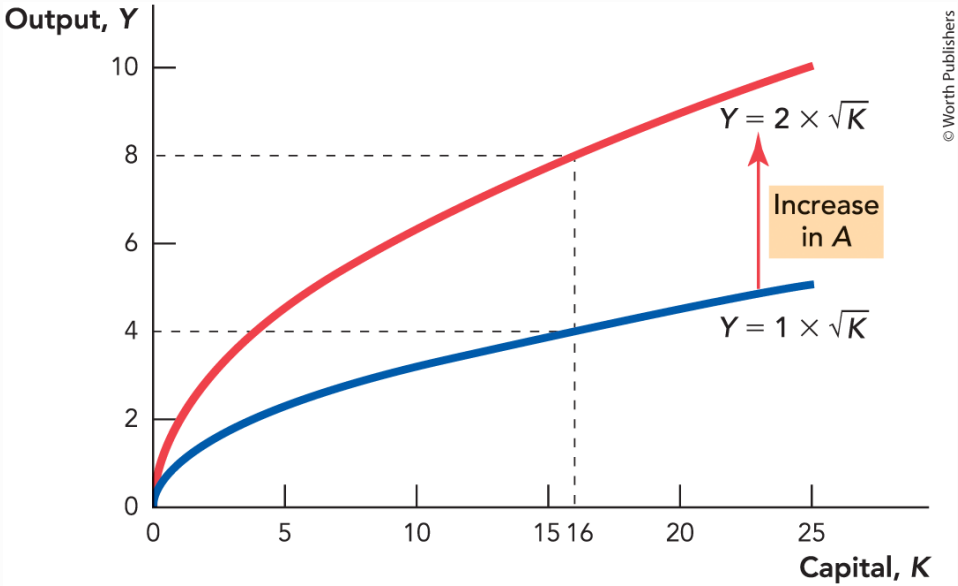
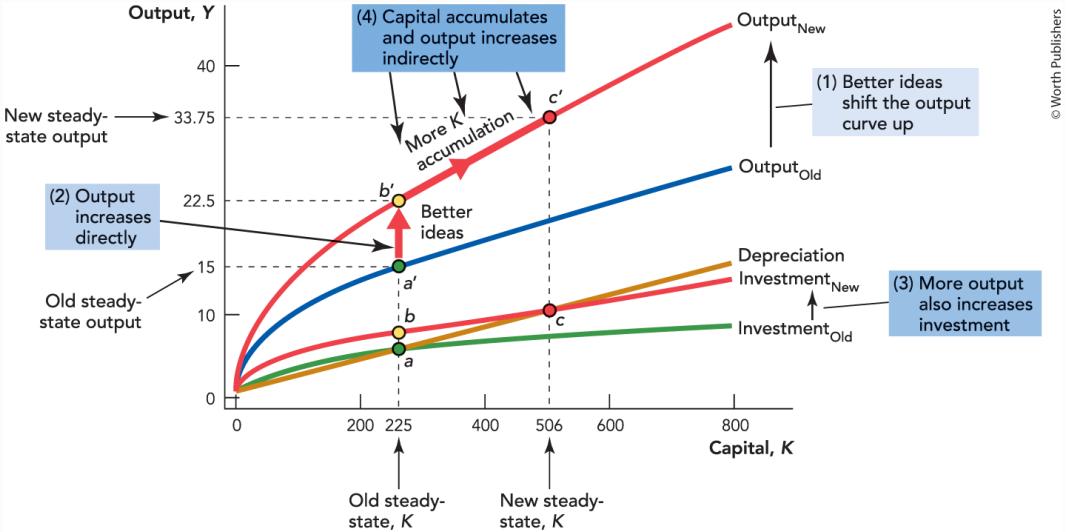


Fig. 8.11: Better Ideas Lead to More Output



Research and Development (R&D)

- Ideas need incentives like other goods
- But, ideas can be easily shared (unlike most other goods)
- More R&D leads to more ideas and higher growth
- But what leads to more R&D?

Spillovers

- Ideas are public goods
  - Public goods: Goods that are non-excludable and non-rivalrous
    - Non-excludable: Individuals cannot be excluded from use
    - Non-rivalrous: One person's use does not reduce availability to others
  - Classic Examples: National defense, basic research, air quality
- Spillovers (positive expernalities) mean ideas are underprovided

Government's Role

- Can encourage ideas through:
  - Patents – may provide incentives (although this is debated) but grants monopoly power
  - ***Prizes*** – avoid monopoly power while transferring some of the public benefit to the private actors
  - Subsidies – may provide incentives (although this is debated) but requires gov't to pick winners and losers

The Future of Economic Growth

- Global population is growing
  - More people → more ideas (remember in the model we held *e* and *L* constant, but if we relax this, increasing *e* or *L* also increases growth)
- Number of people doing R&D is increasing
- Incentives to innovate are improving worldwide
- Growth in ideas per hour may accelerate due to:
  - Ideas building on previous ideas
  - Vast number of potential new ideas
- Economic growth could be faster than in the past

Conclusion

- Capital accumulation is important for catching-up growth
- But new ideas, not capital, drive long-run growth
- Institutions are critical for new idea generation

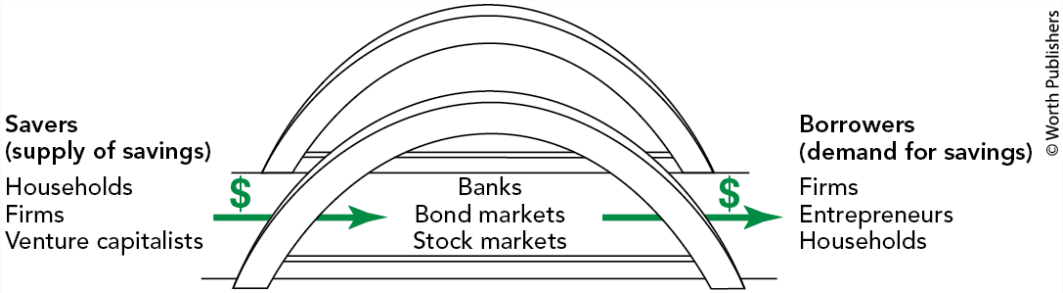
Navigation Links

SAVING, INVESTMENT, AND THE FINANCIAL SYSTEM

Introduction

- Savings needed for capital accumulation and growth
  - More capital investment enabled by more savings
  - Higher capital stock raises labor productivity and GDP per capita
- Connecting savers and borrowers increases gains from trade
  - Specialization allows each party to focus on own comparative advantage
  - Exchange guided by prices moves resources to higher valued uses
- Financial institutions bridge gap between savers and borrowers
  - Reduce transaction costs of bringing parties together
  - Enable large-scale, sophisticated transactions

Fig. 9.1: Financial Institutions Bridge the Gap Between Savers and Borrowers



Definitions

- ***Saving***
  - Refers to national saving: Income not spent on consumption goods
  - Not same as household saving
- ***Investment***
  - Refers to business investment
    - Spending by businesses to create products or offer services
    - Buying stuff to help you make more stuff
  - Not same as individual financial investments such as buying stocks or bonds
- Macro saving $\neq$ household saving
- Macro investment $\neq$ individual buying stocks/bonds

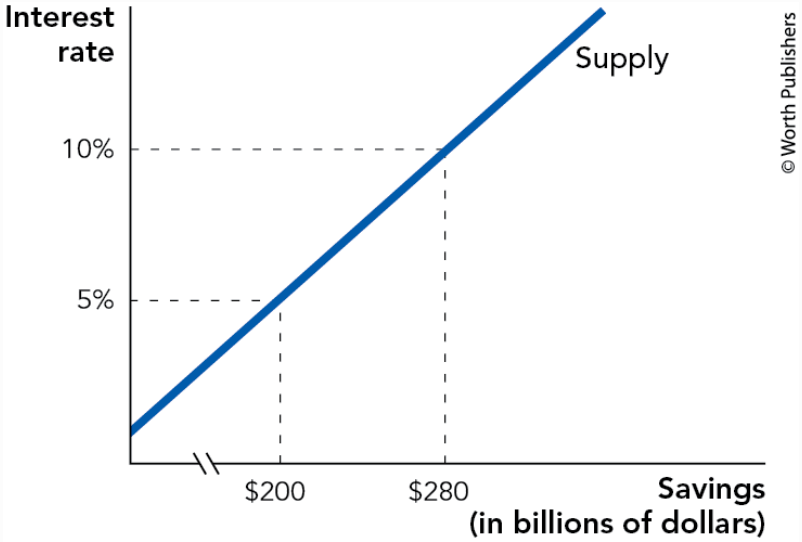
Market for Loanable Funds

- Savers (supply) trade with borrowers (demand)
  - Exchange reconciles desires to save and invest
- Trading determines equilibrium interest rate
  - Market-clearing rate balances saving/borrowing

The Supply of Loanable Funds

- Determined by:
  - Interest rates
  - Consumption Smoothing
  - Time preference
  - Tax Incentives
  - Economic Conditions

Fig. 9.3: The Supply of Loadable Funds



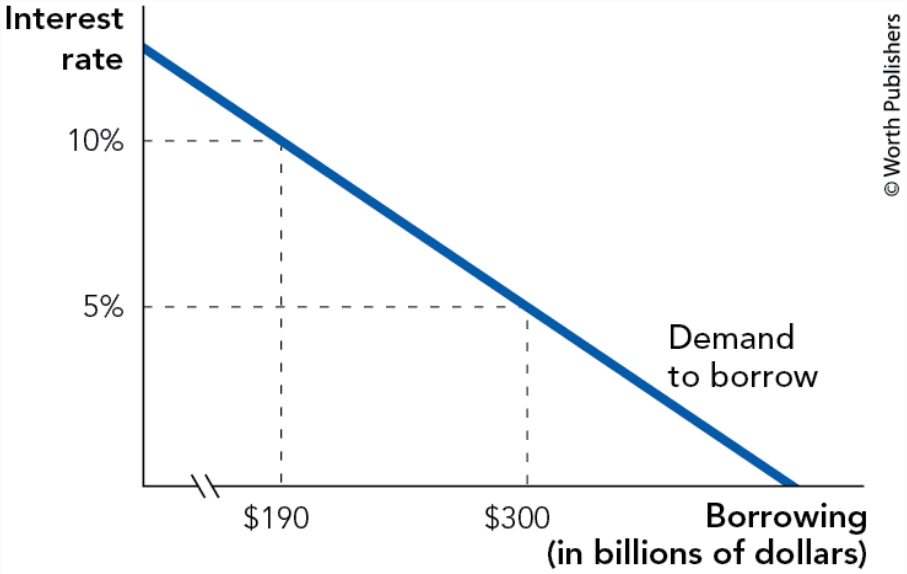
Changes in Loanable Funds Supply

- Decreased impatience → supply increases
  - More future-oriented time preference
- Expected income fluctuations → supply increases
  - Save more to smooth volatile income
- Higher interest rates → movement along supply curve
  - Draw forth more saving at given rate

The Demand for Loanable Funds

- Determined by:
  - Interest Rates
  - Consumption Smoothing
  - Large Investments
  - Tax Incentives
  - Business Cycles
  - Government Borrowing

Fig. 9.5: The Demand for Loanable Funds



Changes in Loanable Funds Demand

- Increased investment opportunities → demand increases
  - Profitable ventures require financing
- Lower interest rates → movement along demand curve
  - More projects worth borrowing at lower rates

Equilibrium in Loanable Funds Market

- Equilibrium where supply equals demand
  - Same quantity supplied and demanded
- Interest rate adjusts to balance saving and borrowing
  - Market mechanism matches plans
- Shortage → rate increases
  - Borrowers bid up rate to secure limited funds
- Surplus → rate decreases
  - Savers lower required return to induce lending
- Price (interest rate) adjusts to resolve excess demand/supply

Deriving the Savings Identity

- Remember: $Y = C + I + G + NX$
- Assume closed economy: $NX = 0$
- Rearrange to get: $I = Y - C - G$
- Investment equals national saving
  - $I = S$
  - $S = Y - C - G$

Private and Government Savings

- Given the savings identity: $S = Y - C - G$
- Add and subtract taxes: $S = Y - C - G + T - T$
- Rearrange to get:

$$\underbrace{S}_{\text{Savings}} = \underbrace{(Y - T - C)}_{\text{Private Savings}} + \underbrace{(T - G)}_{\text{Gov't Savings}}$$

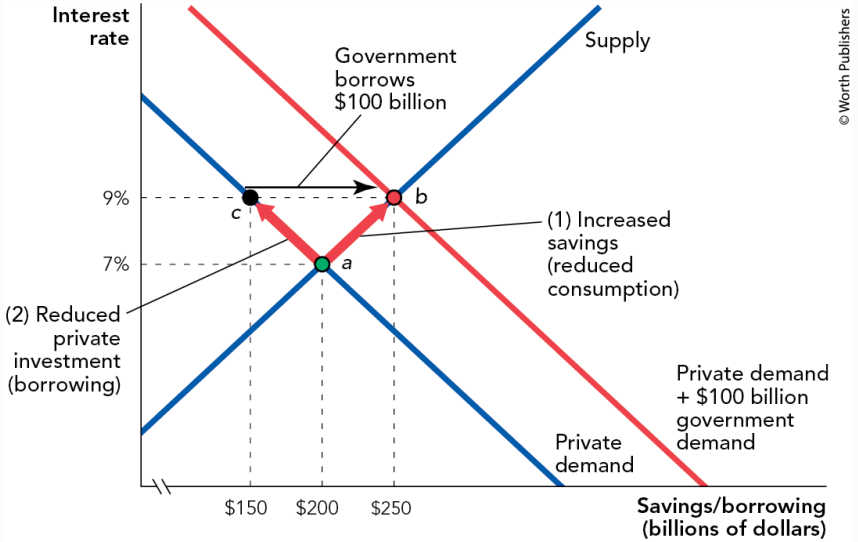
Financial Intermediaries

- ***Financial intermediaries*** reduce the cost of moving savings from savers to borrowers.
  - Connect savers and borrowers
  - Reduce transaction costs of bringing parties together
  - Enable large-scale, sophisticated transactions
- Three Key Intermediaries:
  1. Banks
  2. Bond Markets
  3. Stock Markets

U.S. Government Bonds

- Low default risk makes government debt popular
  - “Risk-free” asset for investors
- Treasuries are an important tool in monetary policy
  - Fed implements policy in this market
- Bills, Bonds, and Notes
  - T-Bonds are IOUs with 20 to 30 year maturities
  - T-Notes are IOUs with 2 to 10 year maturities
  - T-Bills are IOUs with up to 1 year maturity

Fig. 9.10An Increase in Government Borrowing Crowds Out Private Consumption and Investment



Bond Prices and Interest Rates

- Bond prices and interest rates move in opposite directions
- When interest rates rise, bond prices fall to offer competitive returns
- When interest rates fall, bond prices rise
- Changes in interest rates create risk for bond investors
- For a One Year, Zero-Coupon Bond:

$$\text{Rate of Return} = \frac{\text{Face value} - \text{Price}}{\text{Price}}$$

Bond Price Equations

- Given:

$$\text{Rate of Return} = \frac{\text{Face value} - \text{Price}}{\text{Price}}$$

- We also know:

$$\text{Price} = \frac{\text{Face Value}}{(1 + \text{Rate of Return})}$$

- and:

$$\text{Face Value} = (1 + \text{Rate of Return}) \times \text{Price}$$

Breakdown of Intermediation

- Insecure property rights discourage saving
  - Fear of confiscation deters depositing
- Interest rate controls cause credit shortages
  - Artificially low ceilings reduce lending
- Politicized lending reduces efficiency
  - Resources misallocated toward cronies
- Bank failures and panics freeze credit
  - Loss of depositor confidence

Takeaways

- Saving/borrowing smooth lifetime consumption
  - Align income with differing needs over life
- Financial intermediaries crucial for growth
  - Transform saving into productive investment
- Intermediation breakdown show importance of institutions
  - Rules shape incentives and stability

Navigation Links

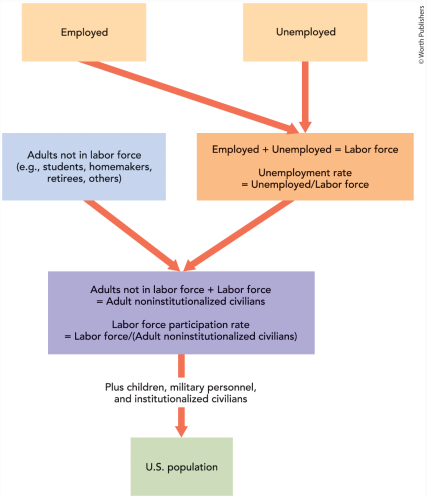
UNIT 3: BUSINESS FLUCTUATIONS

UNEMPLOYMENT AND LABOR FORCE PARTICIPATION

Defining Unemployment

- ***Unemployed workers***: Non-institutionalized adult (16+) civilians who do not have a job and are actively looking for work
- ***Unemployment rate***: The percentage of the labor force without a job
  - Unemployment rate $= \frac{\text{Unemployed}}{\text{Labor force}} \times 100$

Fig. 11.1: Employment, Unemployment, and Labor Force Participation in the US



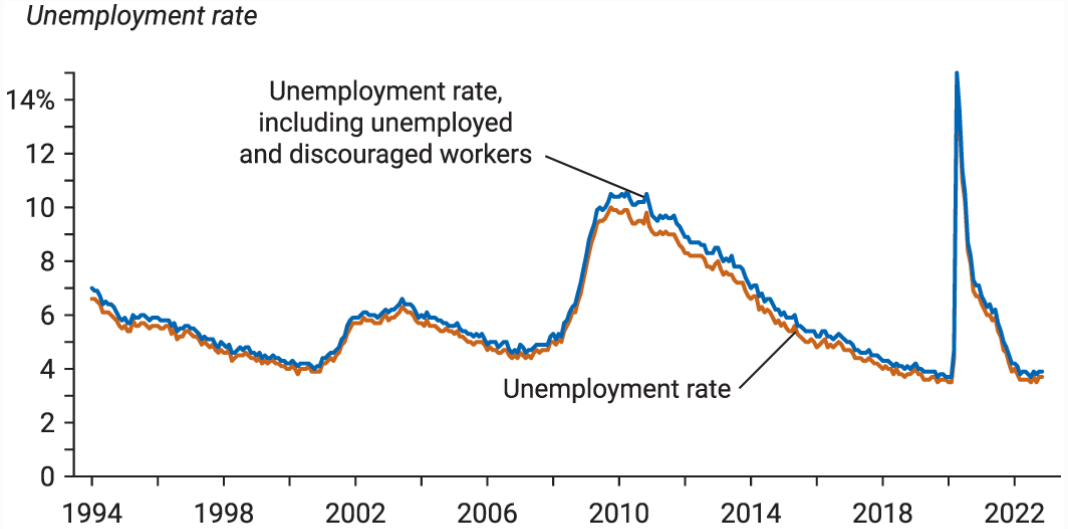
Unemployment Rate Example

- Consider an economy with:
  - 7 million people unemployed
  - 153.2 million people employed
- What is the unemployment rate?
  - Unemployment rate $= \frac{\text{Unemployed}}{\text{Labor force}} \times 100$
  - Unemployment rate $= \frac{7}{7+153.2} \times 100 = 4.4\%$

How Good an Indicator is the Unemployment Rate?

- The unemployment rate does not count:
  - Discouraged workers
    - Workers who have given up looking for work but would still like a job
  - Underemployed workers
- The unemployment rate counts part-time workers as employed
  - Even if they would prefer full-time work
- But unemployment rate still correlates well with economic conditions

Fig. 11.2: The Unemployment Rate with and without Discouraged Workers



Other Labor Market Indicators

- ***Employment to Population Ratio***: The portion of the population that is employed.
- ***Vacancies*** (aka Job Openings): The number of job openings per month.
- ***Quits***: The number of people who quit their jobs per month.
- ***Hires***: The number of new employees hired by a firm per month.

Unemployment Calculation

Group	Size (in millions)
Adult Population	160
Labor Force	155
Employed Persons	148
Adults without Jobs	12

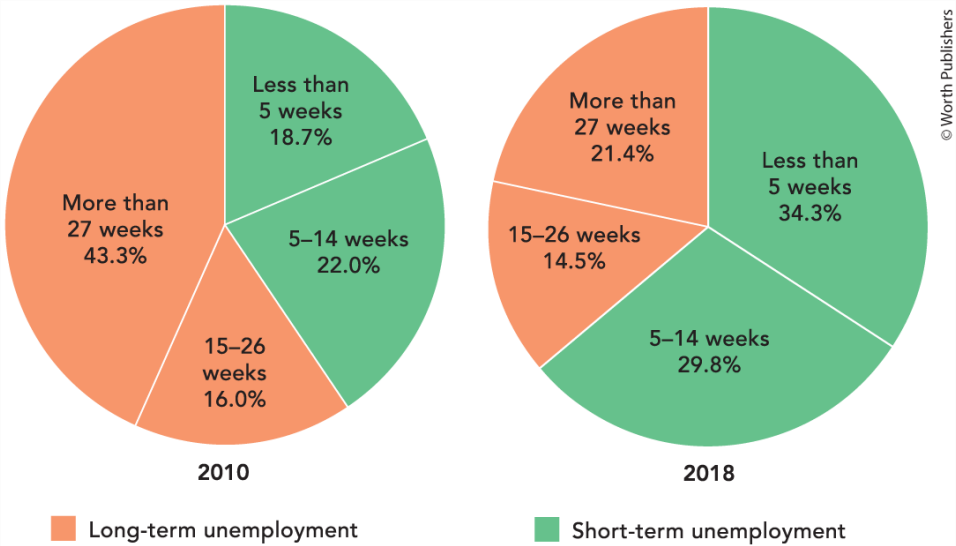
- What is the unemployment rate?

$$4.5\% = \frac{155 - 148}{155} \times 100$$

Frictional Unemployment

- ***Frictional unemployment***: Short-term unemployment caused by difficulties matching employees and employers
- Due to information scarcity and time needed to find right job match
- Significant portion of unemployment in normal times

Fig. 11.3: Duration of Unemployment



Which person(s) is(are) frictionally unemployed?

1. Dolly, a recent graduate without a job who is looking for the job that best suits her qualifications
2. Mona, who recently went on medical leave from her work
3. Melia, who is has been looking for work since the start of a recent recession

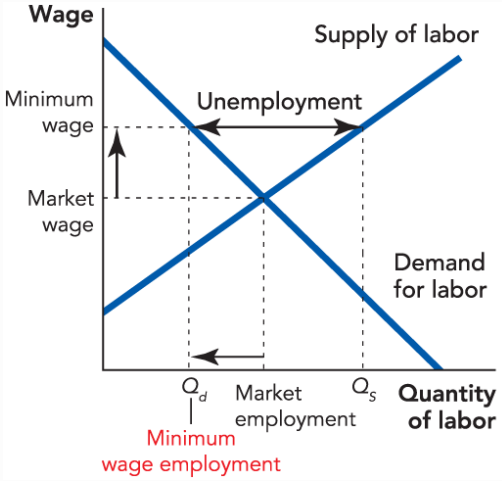
Structural Unemployment

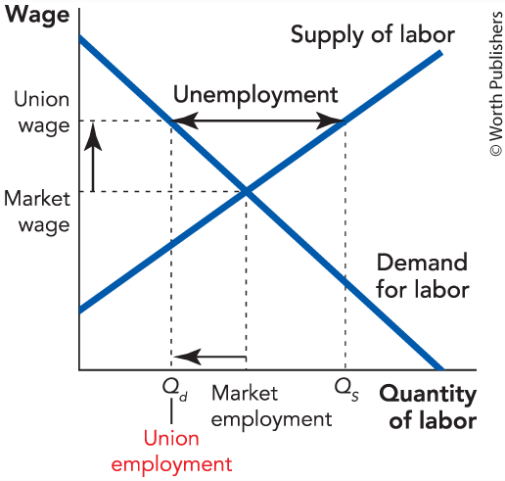
- ***Structural unemployment***: Unemployment caused by:
  - Economy-wide shocks requiring restructuring
  - Labor regulations making it difficult to find jobs
- More significant in Europe due to regulations like:
  - Generous unemployment benefits
  - High minimum wage
  - Powerful unions
  - Strict employment protection laws
    - e.g. Riots in France over employment protection laws

Factors Affecting Structural Unemployment

- Increase:
  - Economy-wide shocks requiring restructuring
  - Unemployment benefits
  - Minimum wage
  - Powerful unions
  - Employment protection laws
- Decrease:
  - Job retraining programs
  - Job search assistance
  - Work tests
  - Early employment bonuses

Fig. 11.5: Minimum and Union Wages Increasing Structural Unemployment





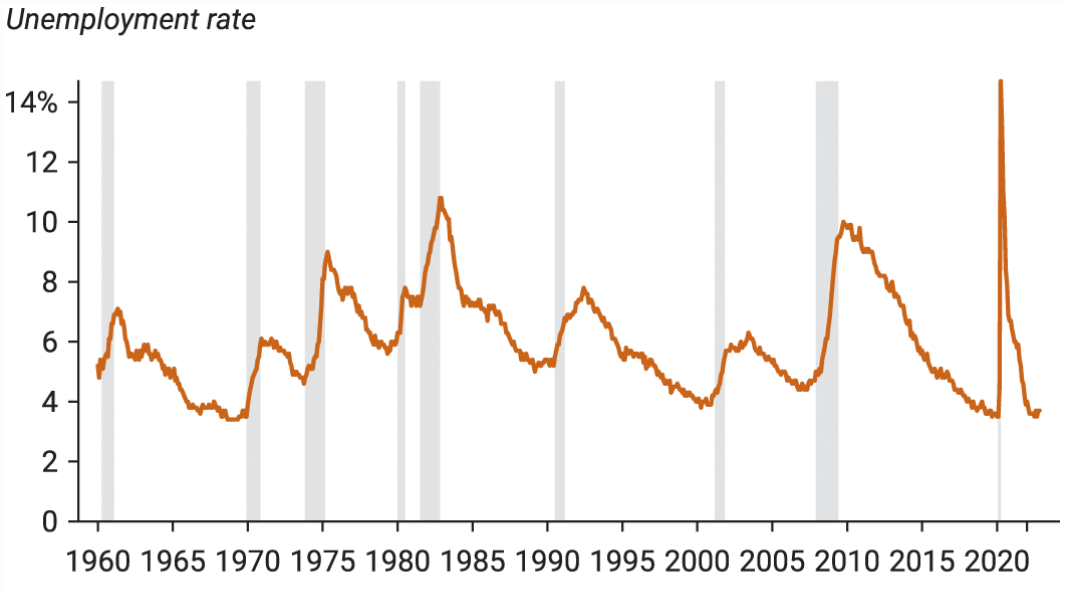
Which person(s) is(are) structurally unemployed?

1. Juanita lost her job as a paint department manager. She has several applications out, but is still waiting for an opening in another paint department.
2. Mary lost her job as a bank teller because of increased ATM usage for routine banking transactions. She is applying for other work.
3. Raquel was working at the local mill, but soon after it closed during a recession, she got discouraged and quit looking for a job.

Cyclical Unemployment

- ***Cyclical unemployment***: Unemployment correlated with the business cycle
- Rises during recessions when:
  - Firms lay off workers
  - Idle resources hurt job creation
- Falls when economy grows faster

Fig. 11.7: The Cyclical Nature of Unemployment



Which person(s) is(are) cyclically unemployed?

1. Tex, who has returned to a full-time MBA program so that he can improve his earning potential
2. Cyrus, who is finding it difficult to get a job in his field because businesses are not hiring due to high unionized wages.
3. Jack was working at Zillow, but soon after the start of a recession, he was let go and is now looking for work.

The Natural Unemployment Rate

- ***Natural unemployment rate***: Rate of frictional + structural unemployment
- Changes slowly over time
- Actual unemployment rate fluctuates around natural rate
  - Cyclical unemployment causes fluctuations

Fig. 11.9: Natural Rate of Unemployment

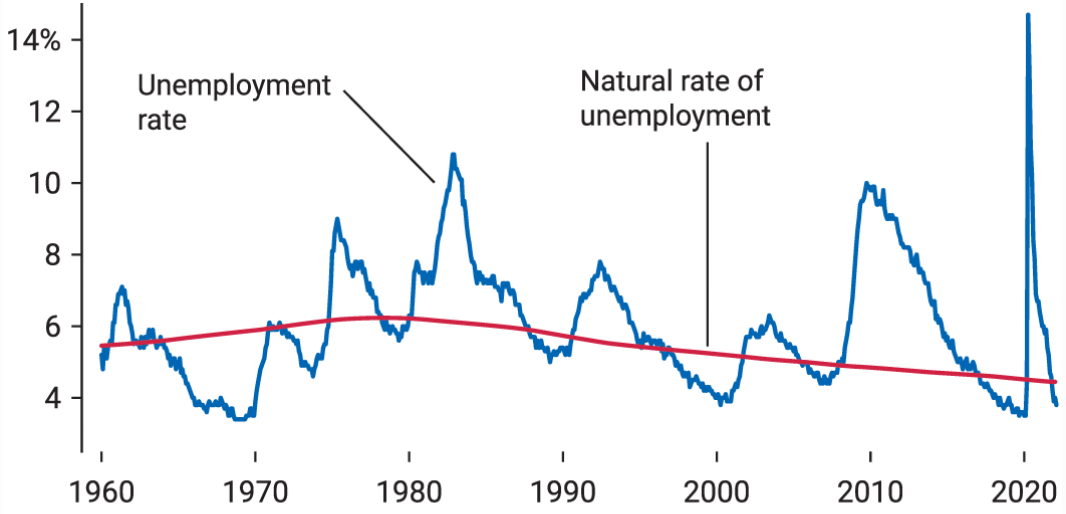


Chart: © Worth Publishers • Data from: Bureau of Labor Statistics and author calculations, https://fred.stlouisfed.org/graph/?g=Mrfe.

Defining Labor Force

- ***Labor force***: The total number of workers, including the employed and unemployed
  - Labor force = Employed + Unemployed
- ***Labor force participation rate***: The percentage of adults in the labor force
  - Labor force participation rate = $\frac{\text{Labor force}}{\text{Adult population}} \times 100$
- Affected by:
  - Lifecycle effects and demographics
    - e.g. aging population lowering participation
  - Incentives
    - e.g. taxes discourage work

Labor Force Participation Example

- Consider an economy with:
  - 7 million people unemployed
  - 153.2 million people employed
  - 255 million non-institutionalized civilian adults
- The Labor force participation rate is:

$$\begin{aligned} \text{LFPR} &= \frac{\text{Unemployed} + \text{Employed}}{\text{All Non-institutionalized Civilian Adults}} \times 100 \\ &= \frac{7 + 153.2}{255} \times 100 \\ &= 62.9\% \end{aligned}$$

Fig. 11.12: Increasing Female Labor Force Participation

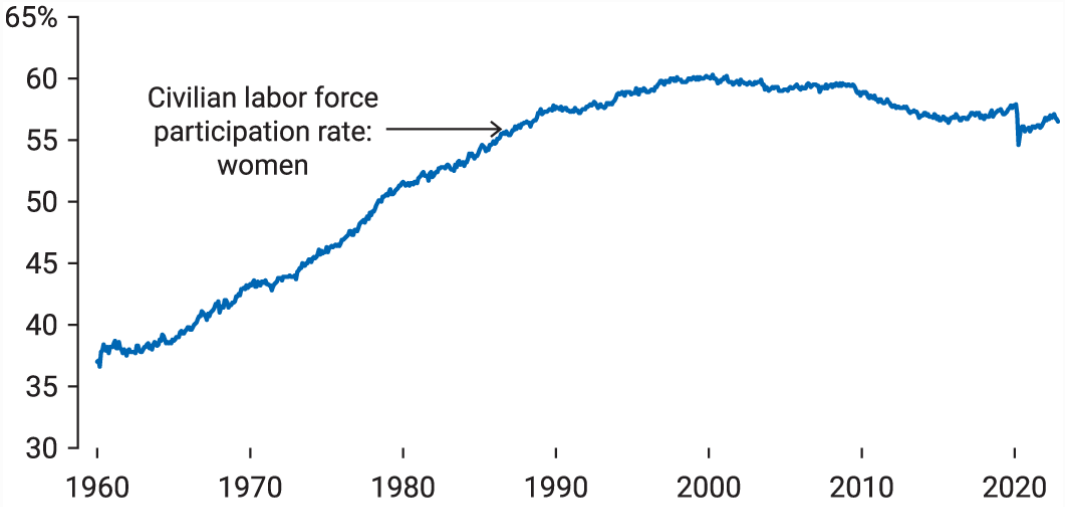


Chart: © Worth Publishers • Data from: Bureau of Labor Statistics, https://fred.stlouisfed.org/graph/?g=Mrfo.

Incentives and Female Labor Force Participation

- Rose dramatically since 1950s
- Due to:
  - Cultural factors like feminism
  - Economic factors like rise of service professions
  - Increased certainty about fertility from birth control pill

Fig. 11.14: Declining Male Labor Force Participation

Chart: © Worth Publishers • Data from: OECD, https://fred.stlouisfed.org/graph/?g=p5vm.

The Decline in Male Labor Force Participation

- Primarily less educated, unmarried males exiting labor force
- Likely explanations:
  - Decrease in demand for less skilled workers
    - Decline of manufacturing jobs
    - Wage gap between skilled and unskilled growing
  - Growth in incarceration rates
  - Increase in value of leasure (aka the “video game effect”)
    - From a 2016 survey that compared men in the labor force and out of the labor force found (1) both cared for household members the same, (2) those out of the labor force performed slightly more household activities, and (3) those out of the labor force spent 2x time on socializing, relating, and leisure

Takeaway

- Understand definitions and measurement of unemployment rate and labor force participation rate
- Three subsets of unemployment: frictional, structural, cyclical
- Understand factors affecting labor force participation
- Unemployment exists even in best of times due to economic change and growth
- The Labor Market is complex, and to understand it we must use a series of indicators rather than just one.

Navigation Links

INFLATION AND THE QUANTITY THEORY OF MONEY

What Causes Inflation: Money Growth!

- Inflation is a sustained increase in the average price level
- The quantity theory of money says:
  - Money growth drives inflation in the long run
  - When money supply (M) grows faster, inflation (π) increases
- Empirical evidence confirms the close relationship between money growth and inflation

Defining Inflation

- ***Inflation***: Increase in average price level
  - Historically, inflation was defined as an increase in the quantity of money
  - Today, inflation references an increase in the price level
- ***Inflation rate (π)***: % change in price index

$$\pi = \frac{PI_2 - PI_1}{PI_1} \times 100$$

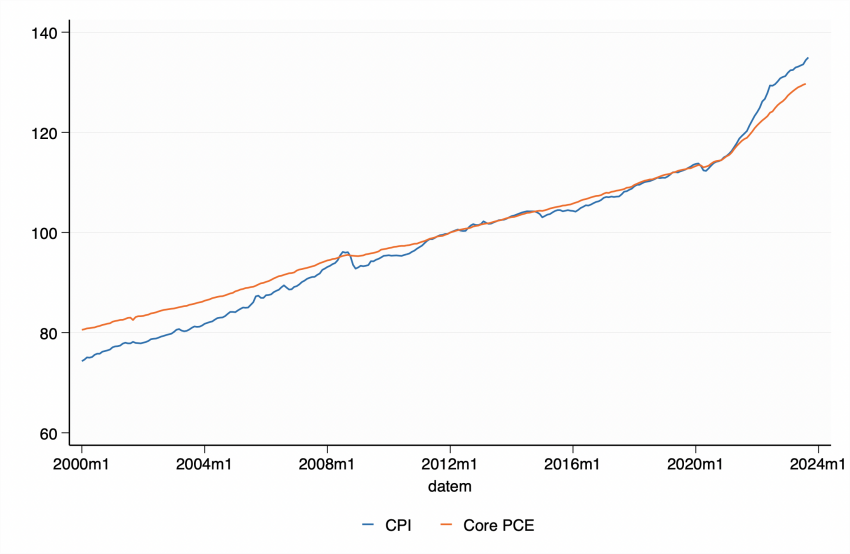
Inflation vs. Relative Price Changes

- Inflation: Average price level
- Relative price changes: Prices of individual goods
- Increase in price of one good $\neq$ inflation

Measuring Inflation with Price Indecies

- ***Price index***: Measures average price level of a basket of goods
  - E.g. CPI, PCE, GDP deflator, PPI
- Shows price level relative to base year
  - Calculate cost of a basket of goods in base year:
    $BP_{base} = \sum_{i=1}^{n} \left(P_{i,base} \times Q_i \right)$
  - Calculates cost of same basket in current year:
    $BP_{current} = \sum_{i=1}^{n} \left(P_{i,current} \times Q_i \right)$
  - Compares current year to base year: $\frac{BP_{current}}{BP_{base}} \times 100$
    - Price Index equal 100 in base year by construction
- CPI most relevant for consumers
- (Core) PCE used by the Federal Reserve

CPI and Core PCE 2000m1–2023m9



Computing a Price Index, Base Year = 2016

Calculating a Simple Price Index

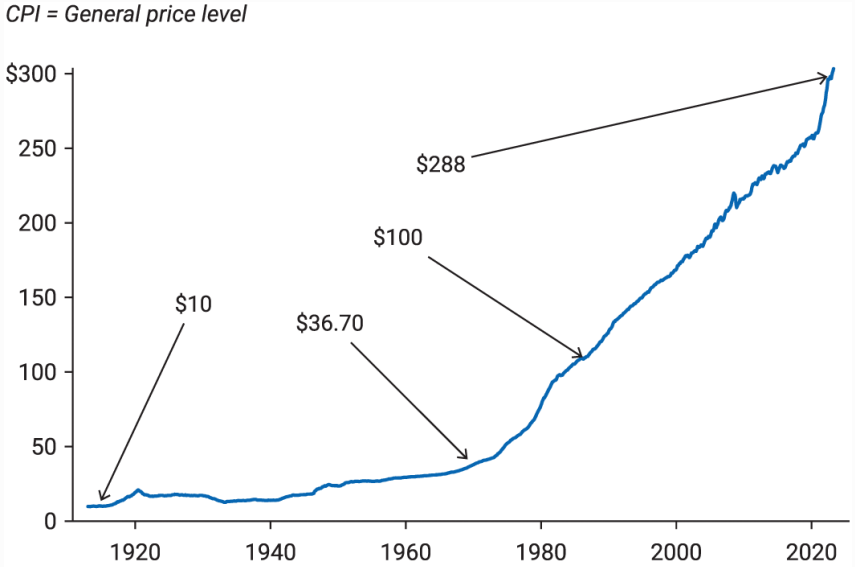
	Good	Quantity	2016 Unit price	2016 Total cost	2020 Unit price	2020 Total cost
	Popcorn	1	$6	$6	$8	$8
	Coke	2	$5	$10	$5	$10
	Movie ticket	2	$12	$24	$13	$26

Computing a Price Index, Base Year = 2016

Calculating a Simple Price Index

	Good	Quantity	2016 Unit price	2016 Total cost	2020 Unit price	2020 Total cost
	Popcorn	1	$6	$6	$8	$8
	Coke	2	$5	$10	$5	$10
	Movie ticket	2	$12	$24	$13	$26
	Basket price			**$40**		**$44**
	Index (EPI)		$\frac{\$40}{\$40} \times 100 = \mathbf{100}$		$\frac{\$44}{\$40} \times 100 = \mathbf{110}$	

Fig. 12.3: The Effects of Inflation on the Price of a Basket of Goods



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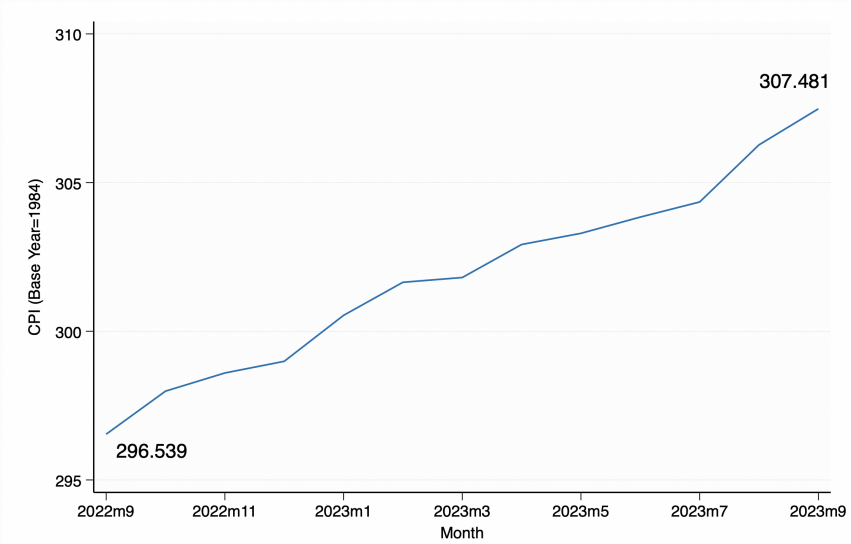
Calculating Inflation Rate



Converting Nominal to Real Prices

- ***Real price***: Adjusted for inflation
- Convert using Price Index data (e.g. CPI)

$$\text{price}_{\text{today's \$}} = \text{price}_{\text{earleir \$}} \times \frac{\text{price level today}}{\text{price level in earlier time}}$$

- Makes dollar values comparable over time
- Example: in 1924, you could purchase a Sears home for \$1,969, $CPI_{1924} = 17$, and $CPI_{2021} = 280$.
  - The House Price in 2021 Dollars is:

$$\begin{aligned}\text{Home Price}_{2021} &= \$1,969 \times \frac{280}{17} \\ &= \$32,430.59\end{aligned}$$

Quantity Theory of Money

- Relates money supply to prices
- ***Equation of exchange***: $M \times v = P \times Y_R$
  - M: Money supply
  - v: Velocity of money
  - P: Price level
  - Y_R: Real GDP (also denoted "y")
- ***Equation of exchange in Growth Rates*** (following three are equivalent)
  - $\overrightarrow{M} + \overrightarrow{v} \approx \overrightarrow{P} + \overrightarrow{Y_R}$
  - $gM + gv \approx gP + gy$
  - $\%\Delta M + \%\Delta v \approx \%\Delta P + \%\Delta y$

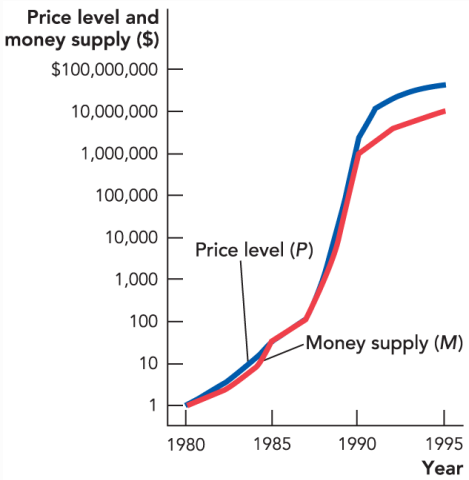
The Cause of Inflation

- The Quantity of Money Theory of Inflation:
  - Y_R is fixed by real factors of production
  - v is fairly stable over time
  - So… increase in money supply → increase in prices
    - $\overrightarrow{M} \approx \pi$
  - This implies that money is neutral in the long run

The Long Run Neutrality of Money

- Changes in the money supply do not affect real variables in the economy in the long run
  - such as real GDP or unemployment
- Changes in the money supply only influence nominal variables,
  - such as the price level or nominal wages
- More dollar bills does not mean more real resources for production
- Note that the neutrality of money is a long-run concept.

Fig. 12.4: Inflation Is a Monetary Phenomenon in Peru



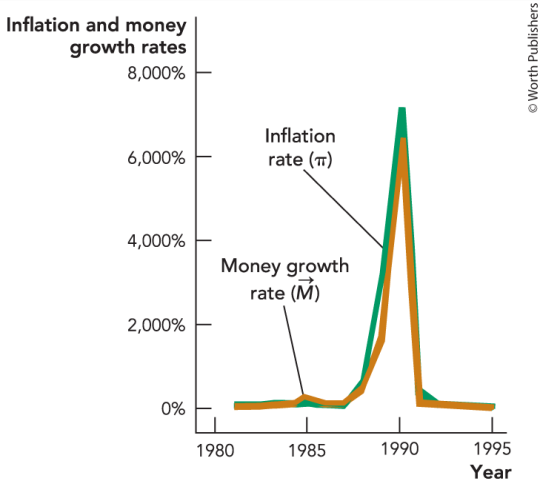
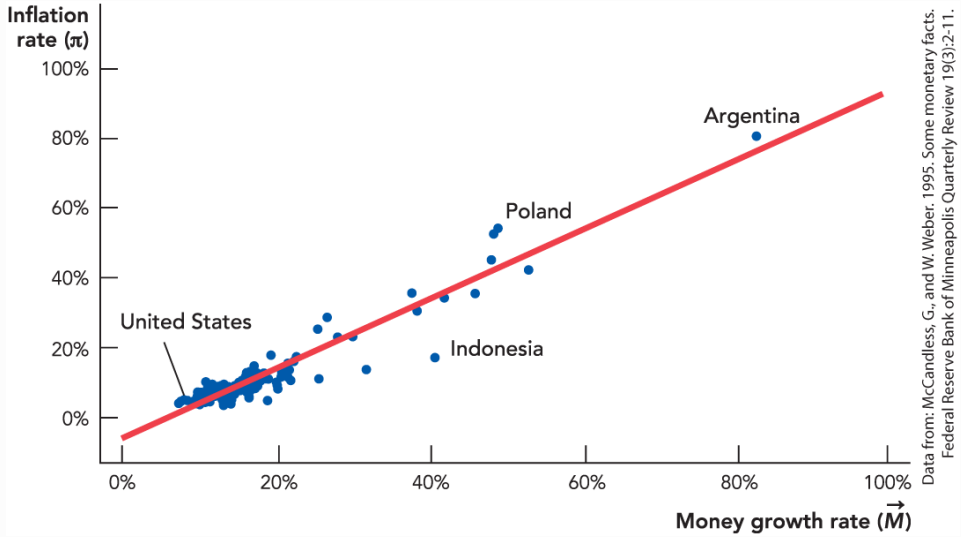


Fig. 12.5: Inflation Is Always and Everywhere a Monetary Phenomenon



An Inflation Parable

- Imagine a small economy with a baker, a tailor, and a carpenter
- Government starts pays soldiers with newly printed money (free money for the gov't)
- Soldiers go and spend money on bread, clothes, and furniture
  - At first, baker works more to meet higher demand and raises prices
  - But soon tailor and carpenter have also raised prices
  - Real wages fall for baker, tailor, and carpenter as they realize prices rose economy-wide
- Next time government prints money, baker knows prices will rise so doesn't work more
- Conclusion: Unexpected inflation can temporarily increase output, but not once anticipated

The Fisher Equation

- ***Real interest rate*** (r): Interest rate adjusted for inflation
- ***Nominal interest rate*** (i): Interest rate including inflation
- ***Inflation*** (π): Change in the average price level
- Fisher equation:

$$i = r + \pi$$

- Implication: the nominal interest rate will rise with inflation

The Fisher Effect

- If $\mathbb{E}(\pi) < \pi$, then real rate of return will be less than the equilibrium rate
  - Wealth is redistributed from lenders to borrowers
- If $\mathbb{E}(\pi) > \pi$, then real rate of return will be greater than the equilibrium rate
  - Wealth is redistributed from borrowers to lenders

Fig. 12.6: Nominal Interest Rates Tend to Increase with Inflation

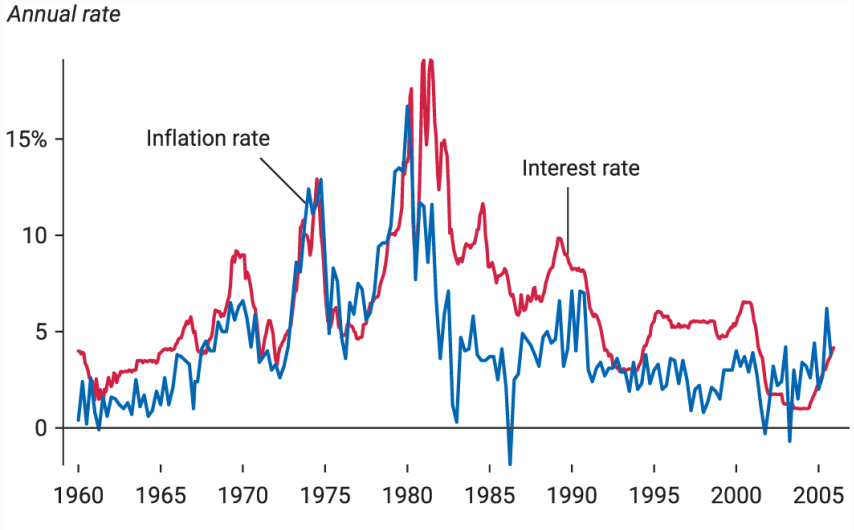


Chart: © Worth Publishers • Data from: U.S. Bureau of Labor Statistics and Board of Governors of the Federal Reserve System; https://fred.stlouisfed.org/graph/?g=12HHW.

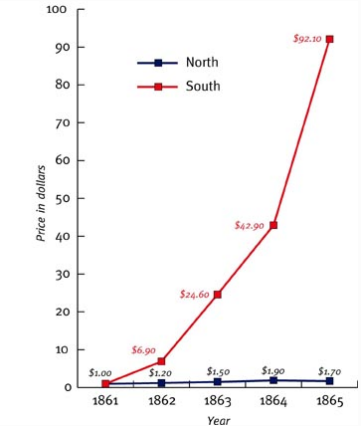
Monetizing the Debt

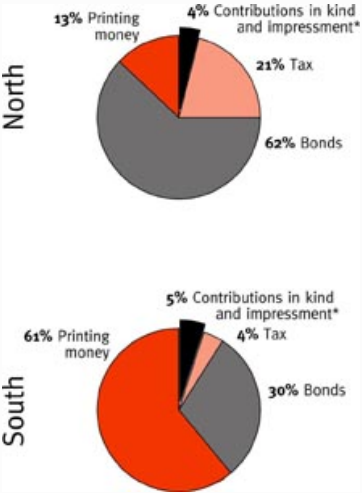
- Governments are often borrows and thus can benefit from unexpected inflation
- ***Monetizing the debt***: Printing money to pay off debt
  - Tempting for indebted gov't
  - Leads to inflation (known as the inflation tax)
- If abused, lenders will anticipate with higher nominal rates
  - Increases cost of gov't borrowing

Hyperinflation

- ***Hyperinflation***: Extremely high inflation ($\pi > 50\%$ per month)
- Usually caused by:
  - Excessive money growth
  - Loss of confidence in currency
- Can lead to:
  - Severe economic contraction
  - Social unrest
  - Political instability

Hyperinflation: US Civil War





Hyperinflation: Weimar Republic

- October 1923, prices rose by 29,500 percent (21%/day)
- Patrons payed for meals out at the start of the meal to avoid intra-meal inflation

Hyperinflation: Zimbabwe

- November 2008, prices rose by 79 billion percent (98%/day)

Deflation and Disinflation

- ***Deflation***: Decrease in average price level
  - Deflation is fairly rare in US and usually caused by real shocks
- ***Disinflation***: Decrease in inflation rate
  - Disinflation is more common and usually caused by tight monetary policy

Costs of Inflation

- Price signal confusion
- Menu Costs
- Redistribution of wealth
- Breakdown of financial intermediation
- Hard to stop

Price Confusion and Money Illusion

- Inflation obscures price signals
- Money illusion: Mistake nominal for real prices
- Leads to inefficient allocation of resources

Menu Costs

- Inflation increases menu costs
- Firms must change prices more often
- Costs of changing prices
  - Printing new menus
  - Updating websites
  - Repricing inventory
- Reduces efficiency of price system

Redistributing Wealth (If unexpected)

Unexpected inflation ($\mathbb{E}(\pi) < \pi$)	Unexpected disinflation ($\mathbb{E}(\pi) > \pi$)	Expected inflation = Actual inflation ($\mathbb{E}(\pi) = \pi$)
Real rate less than equilibrium rate	Real rate greater than equilibrium rate	Real rate equal to equilibrium rate
Harms lenders Benefits borrowers	Benefits lenders Harms borrowers	No redistribution of wealth

Breakdown of Financial Intermediation

- Uncertainty → fewer long-term contracts
- Less borrowing → lower interest rates
  - Saving, investment ↓
  - Growth ↓

Hard to Stop Inflation

- Lower money growth → recession
- Takes time to adjust expectations
- Unemployment until adjustment

Inflation Post COVID-19 Pandemic

- Large stimulative monetary and fiscal policy
- Rapid economic recovery
- Pent-up demand unleashed
- Potential supply bottlenecks
- Has made stopping inflation difficult

Navigation Links

BUSINESS FLUCTUATIONS: AGGREGATE DEMAND AND SUPPLY

Introduction

- Economic growth is not a smooth process.
- Real GDP in the United States has grown at an average rate of 3.2% per year over the past 65 years.
- The economy rarely grew at an average rate.
- Growth fluctuated from -5% to more than 8%.
- Recessions are of special concern to policymakers and the public because unemployment typically increases during them.

Fig. 13.1: Economic Growth is Not Always Smooth (US Real GDP Growth Rate 1960–2022

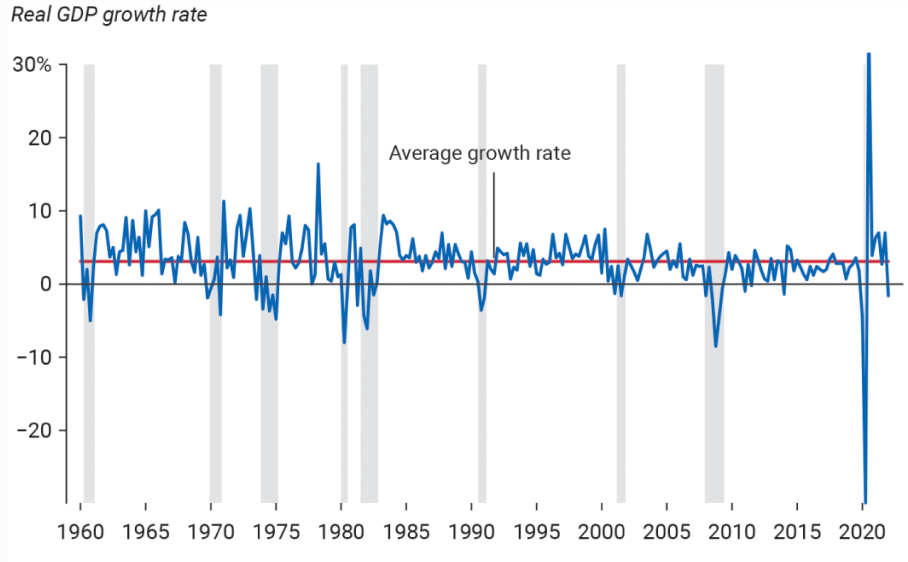
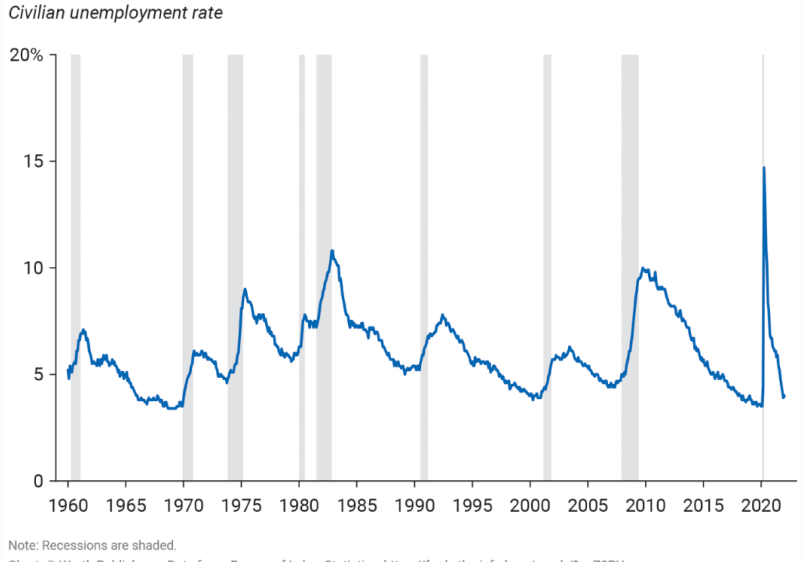


Fig. 13.2: The Unemployment Rate Increases During a Recession (US Unemployment Rate 1960–2022)



The Aggregate Demand-Aggregate Supply Model

- Used to analyze business cycles and growth fluctuations
- Combines 3 curves:
  - Aggregate Demand (AD)
  - Long-Run Aggregate Supply (LRAS)
  - Short-Run Aggregate Supply (SRAS)

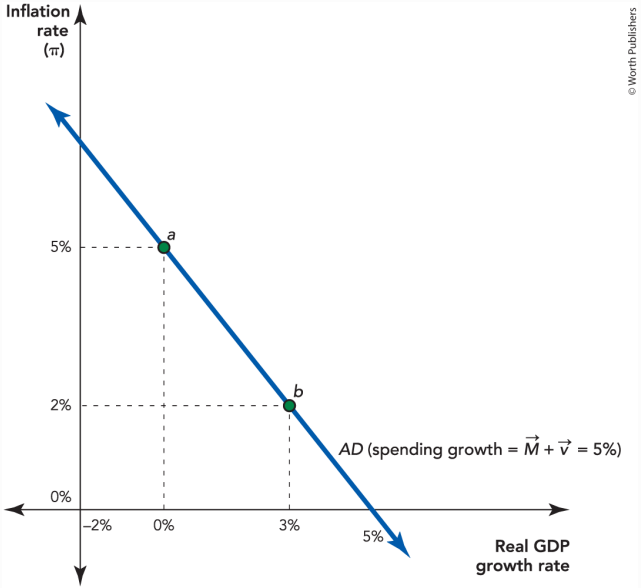
The Aggregate Demand Curve

- Shows combinations of inflation (π) and real growth ($\overrightarrow{Y_R}$) for a given rate of spending growth ($\overrightarrow{M} + \overrightarrow{v}$)
  - Holds money growth ($\overrightarrow{M}$) and velocity growth ($\overrightarrow{v}$) constant ($\overrightarrow{M} + \overrightarrow{v}$)
  - Shows combinations of inflation (π) and real growth ($\overrightarrow{Y_R}$) consistent with that constant
- Derived from quantity theory:

$$\overrightarrow{M} + \overrightarrow{v} = \overrightarrow{P} + \overrightarrow{Y_R}$$

- AD curve slopes downward in ($\overrightarrow{Y_R}, \pi$) space

Fig. 13.3: The Aggregate Demand Curve



Why the AD Curve Slopes Downward

- From the quantity equation:

$$\overrightarrow{M} + \overrightarrow{v} = \overrightarrow{P} + \overrightarrow{Y_R}$$

- For a given rate of spending growth ($\overrightarrow{\overrightarrow{M} + \overrightarrow{v}}$), $\overrightarrow{P}$ and $\overrightarrow{Y_R}$ must move in opposite directions
- The AD Curve represents a given nominal income (or spending): $\overrightarrow{\overrightarrow{M} + \overrightarrow{v}}$
- For a given nominal income, intuitively:
  - If real growth increases ($\uparrow \overrightarrow{Y_R}$) inflation must decrease ($\downarrow \overrightarrow{P}$)
    - Same amount of money chasing more goods
  - This implies a downward-sloping AD curve in ($\overrightarrow{Y_R}$, $\overrightarrow{P}$) space

Shifts in the Aggregate Demand Curve

- Changes in nominal spending growth ($\overrightarrow{M} + \overrightarrow{V}$) shift the AD Curve
- Rightward shift of AD = increase in spending growth
  - Caused by increase in money growth ($\uparrow \overrightarrow{M}$) or velocity growth ($\uparrow \overrightarrow{V}$)
- Leftward shift of AD = decrease in spending growth
  - Caused by decrease in money growth ($\downarrow \overrightarrow{M}$) or velocity growth ($\downarrow \overrightarrow{V}$)

Changes in Money Growth

- $\Delta\overrightarrow{M}$ occurs when the Fed changes the money supply
  - More on this in Chapters 15 and 16
- For now:
  - The Fed can increase the money supply
  - The Fed can decrease the money supply

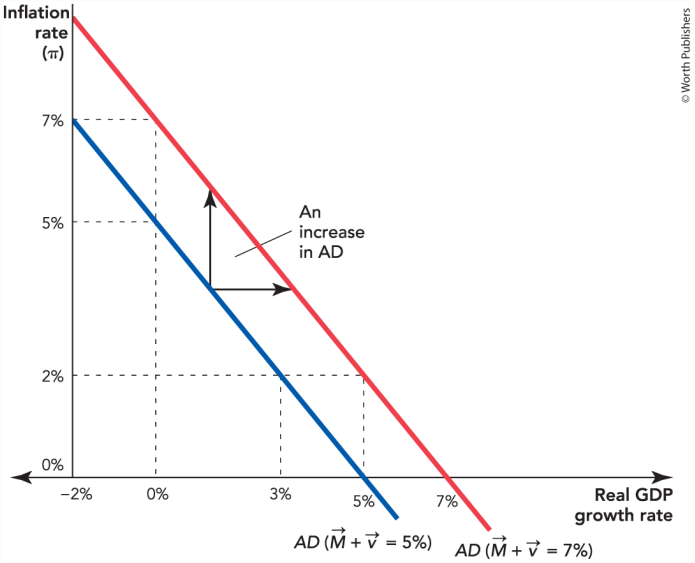
Changes in Velocity Growth

- $\Delta \overrightarrow{v}$ occurs when the public changes how quickly they spend money
- $\Delta \overrightarrow{v}$ results from changes in one or more of the components of total spending:
  - Consumption growth ($\overrightarrow{C}$)
  - Investment growth ($\overrightarrow{I}$)
  - Government spending growth ($\overrightarrow{G}$)
  - Net exports growth ($\overrightarrow{NX}$)

Factors that Shift the AD Curve

- Changes in money growth rate
- Changes in consumer or business confidence
- Changes in wealth
- Changes in taxes
- Changes in government spending
- Changes in export growth
- Changes in import growth
- Animal Spirits

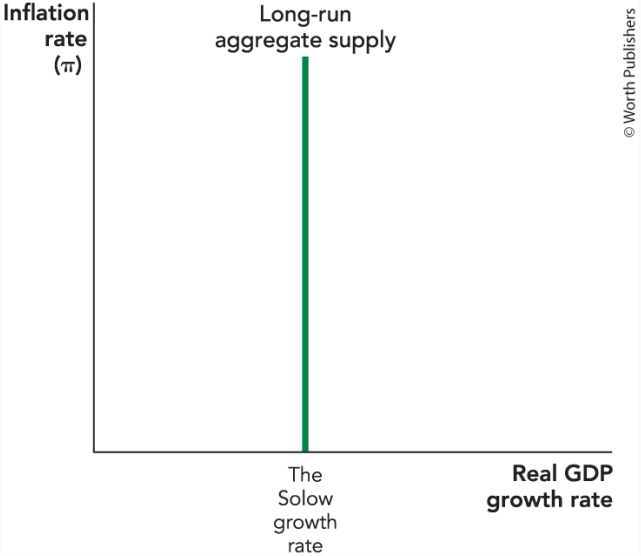
Fig. 13.4: An Increase in Spending Growth Shifts the AD Curve Out



The Long-Run Aggregate Supply Curve

- Shows the economy's potential growth rate given available resources and technology
- Determinted by:
  - Physcial Capital
  - Human Capital
  - Labor Force
  - Technology
- LRAS is vertical at the "Solow" growth rate
  - Growth is independent of inflation in the long run
  - Implies monetary neutrality in the long run

Fig. 13.5: The Long-Run Aggregate Supply Curve



Shifts in the Long-Run Aggregate Supply Curve

- Shifted by real shocks that affect productivity and potential output:
  - Resources
    - Land
    - Labor
    - Capital
  - Technology
    - The productivity of resources
  - Institutions
- Rightward shift = positive productivity shock
- Leftward shift = negative productivity shock

Negative Real Shocks

- Drought reduces agricultural output (negative shock in agricultural economy)
- Oil shock reduces productivity across oil-dependent industries
- Financial crisis disrupts financial intermediation
- Policy changes like tax hikes reduce incentives to supply output

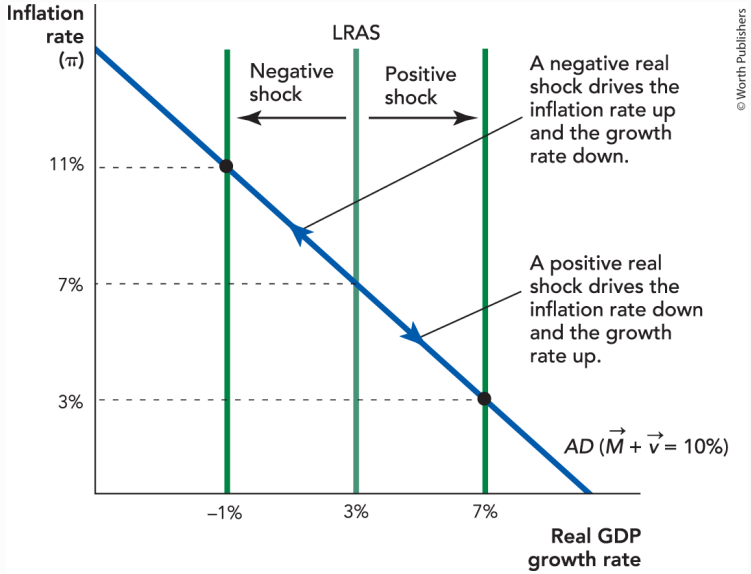
Fluctuations Caused by Real Shocks

- Real shocks shift LRAS curve
- Fluctuations are accompanied by changes in inflation rate

Other Real Shocks

- Natural disasters
- Wars
- Major new technologies (e.g. Internet)
- Financial market developments
- Changes in labor skills/education
- Public infrastructure investments

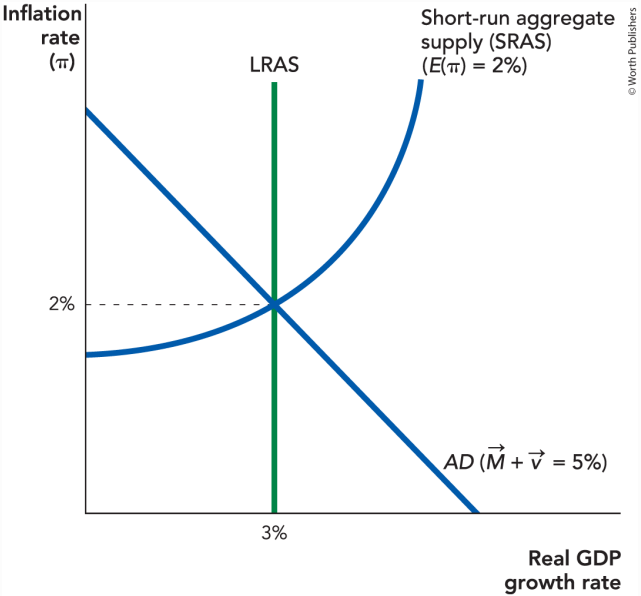
Fig. 13.7: Real Business Cycle Theory



The Short-Run Aggregate Supply Curve

- Considers the time before prices fully adjust
  - The short run
- In this time, prices are sticky
  - Wages and prices do not adjust immediately
- SRAS slopes upward due to
  - sticky wages and prices
  - price signal distortion
- Position anchored by expected inflation ($\mathbb{E}(\pi)$)
  - Intersects LRAS at expected inflation

Fig. 13.11: The Short-Run Aggregate Supply Curve



Sticky Wages and Prices

- Wage are not fully flexible in the short run
  - Nominal contracts set wages for a period of time
  - Workers resist nominal wage cuts
  - Employers resist nominal wage increases
- Other prices are sticky
  - Nominal rent contracts set rent for a period of time
  - Menu cost increase stickiness
  - Price signal distortions cause delay in changing prices

Sticky Wages and Prices → Upward Sloping SRAS

- When $\pi > \mathbb{E}(\pi)$ real growth is faster than the long-run potential
  - Wages grow more slowly than non-wage inflation
  - Firms' profits rise as prices rise faster than wage costs
  - Firms expand production to take advantage of higher profits
- When $\pi < \mathbb{E}(\pi)$ real growth is less than the long-run potential
  - Firms cut production as profits shrink as cost rise faster than revenue
- When $\pi = \mathbb{E}(\pi)$ real growth is equal to the long-run potential

Shifts in the Short-Run Aggregate Supply Curve

- Does not shift due to demand shocks
- Shifts up and left as inflation expectations ($\mathbb{E}(\pi)$) rise
- Shifts down and right as inflation expectations ($\mathbb{E}(\pi)$) fall
- Shifts occur only as expectations adjust over time
- Also shifts when the LRAS shifts

The Shape of the SRAS Curve

- SRAS is flatter at low growth rates
  - Wages and other prices are particularly sticky downward
  - Downward wage adjustment have particularly large effect on output
- SRAS is steeper at higher growth rates
  - Wages and other prices are much less sticky upward
  - At high growth rates, economy approaches its physical limits on growth
  - Upward wage adjustments have smaller effects on output

Aggregate Demand Shocks and SRAS

- AD shocks shift AD curve, move economy along given SRAS curve
  - inflation and output adjust
- Cause business fluctuations as economy moves between short-run equilibria
- In Short Run
  - Inflation and Output impacted
- In Long Run
  - Only inflation is impacted
  - Output returns to potential output

Shocks to Components of Aggregate Demand

- $\Delta \overrightarrow{v}$ shifts AD through changes in underlying components: C, I, G, NX growth
- For example:
  - Negative wealth shocks can reduce $\overrightarrow{C}$
  - Negative confidence shocks can reduce $\overrightarrow{I}$
  - Fiscal policy changes can affect $\overrightarrow{C}$ or $\overrightarrow{I}$ via taxes, and $\overrightarrow{G}$ via spending
  - Trade and exchange rate conditions affect $\overrightarrow{NX}$

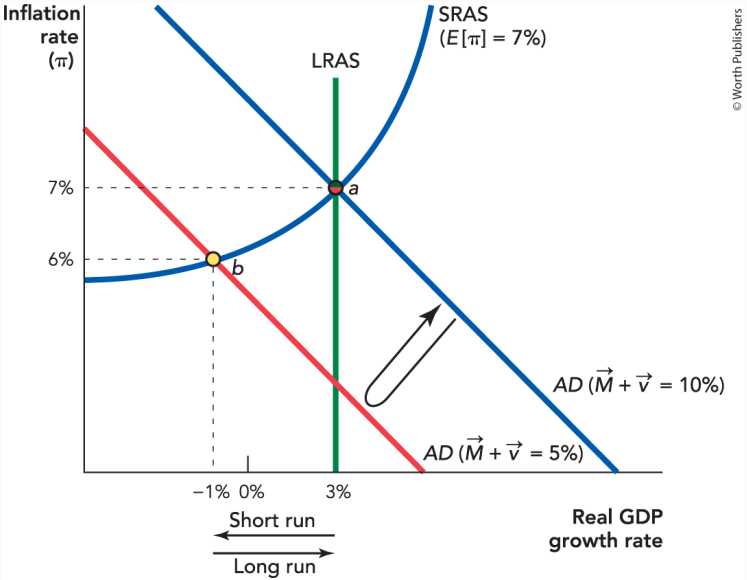
Temporary Changes in Velocity

- $\Delta \overrightarrow{v}$ shifts AD through $\overrightarrow{C}$, $\overrightarrow{I}$, $\overrightarrow{G}$, or $\overrightarrow{NX}$
- These AD shifts tend to be temporary
- Spending shares are stable as a share of GDP long-term

Example Temporary Negative Shock to Consumer Confidence

- Decreased C growth ($\overrightarrow{C}$) from less confidence reduces AD
  - Shifts AD curve to the left
  - Moves equilibrium south-west along the SRAS curve
  - New SR equilibrium: $\downarrow \pi, \downarrow \overrightarrow{Y_R}$
- Creates recession in short run as growth falls

Fig. 13.15: A Temporary Decrease in Consumer Confidence



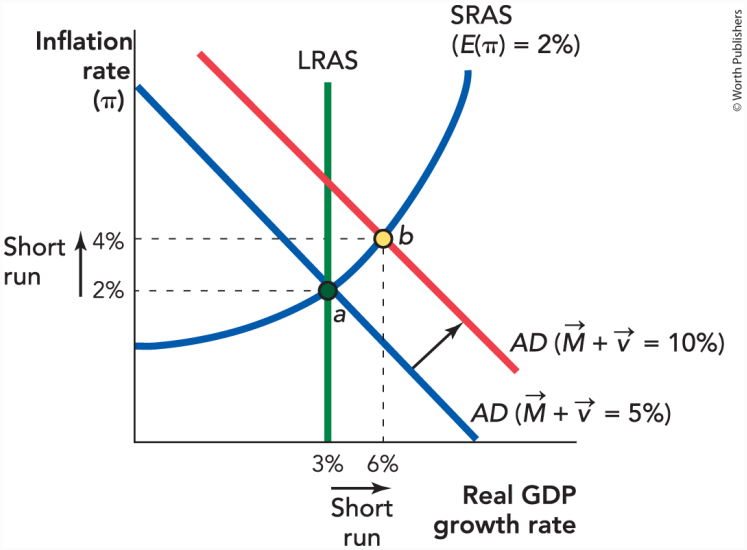
Other AD Shocks

- Investment: driven by profit expectations and confidence
- Government spending: can stimulate AD in short run
- Net exports: depend on foreign and domestic economic conditions

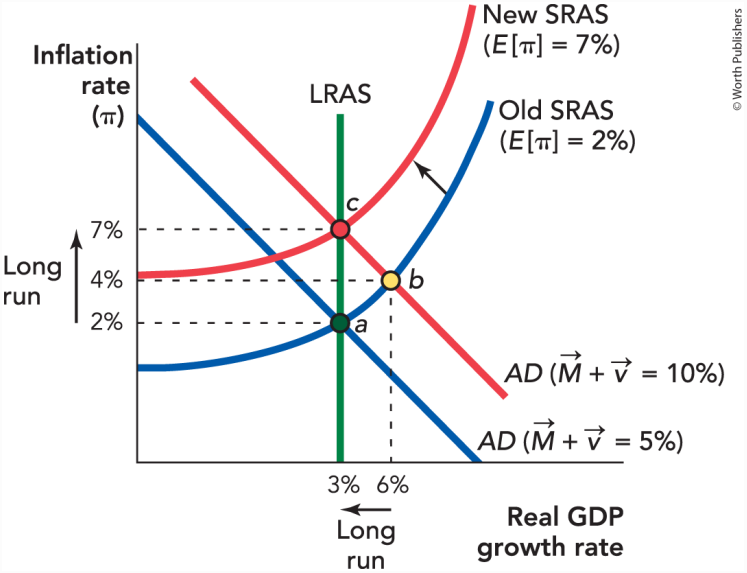
An increase in Money Growth

- $\uparrow \overrightarrow{M}$ shifts AD curve to the right
  - Moves equilibrium north-east along the SRAS curve
  - New SR equilibrium: $\uparrow \pi, \uparrow \overrightarrow{Y_R}$
- Creates boom in short run as growth increases
- New SR equilibrium is not sustainable in long run
  - Inflation expectations rise
  - SRAS shifts up
  - Moves equilibirum north-east along the AD curve
  - New LR equilibrium: $\uparrow \pi, \downarrow \overrightarrow{Y_R}$
- Only inflation is higher in long run

An Increase in the Growth Rate of the Money Supply – SR



An Increase in the Growth Rate of the Money Supply – LR



Shifts in the LRAS

- Negative Shocks
  (LRAS Curve Moves Left)
  - Bad weather (important in agricultural economy)
  - Higher price of oil or other important input
  - Productivity slump/technology slump
  - Higher taxes or regulation
  - Disruption of production by war, earthquake, pandemic
- Positive Shocks
  (LRAS Curve Moves Right)
  - Good weather (important in agricultural economy)
  - Lower price of oil or other important input
  - Productivity boom/technology boom
  - Lower taxes or regulation
  - Smooth production without disruption

Shifts in the AD

- Negative Shocks (Decrease AD) (Lower Growth Rate of Spending)
  - A slower money growth rate
  - Fear
  - Reduced wealth
  - Higher taxes
  - Lower growth of government spending
  - Decreased export growth
  - Increased import growth
- Positive Shocks (Increase AD) (Higher Growth Rate of Spending)
  - A faster money growth rate
  - Confidence
  - Increased wealth
  - Lower taxes
  - Greater growth of government spending
  - Increased export growth
  - Decreased import growth

Shifts in the SRAS

- SRAS shifts up and to the left
  - Increase in Inflation Expectations
    - $\uparrow \mathbb{E}(\pi)$
  - Decrease in LRAS
- SRAS shifts down and to the right
  - Decrease in Inflation Expectations
    - $\downarrow \mathbb{E}(\pi)$
  - Increase in LRAS

Takeaways

- AD-AS model explains growth fluctuations from demand and supply shocks
- AD shocks move economy along SRAS curve
- Real shocks shift LRAS curve
- SRAS shows output fluctuating around potential output
- Demand shocks have temporary real effects; only affect inflation in long run

Navigation Links

UNIT 4: MACROECONOMIC POLICY

MONEY AND THE FEDERAL RESERVE SYSTEM

Money

- ***Money***: ***C***ommonly ***A***ccpected ***M***edium ***O***f ***E***xchange (***CAMOE***)
  - From book: “a widely accepted means of payment”
- Functions as
  - unit of account: a common measure of value/prices in an economy (tied to CAMEO by default)
  - store of value: an asset that retains value over time (not unique to money)

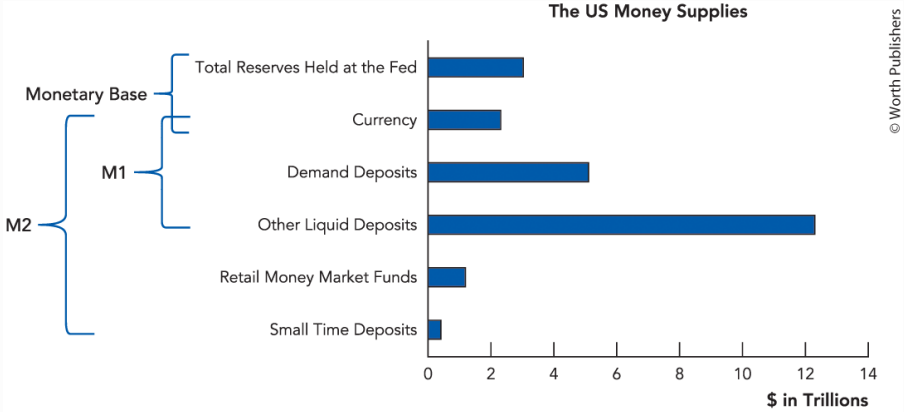
Commonly Accepted

- For something to serve as money, it must be widely accepted in exchange for goods and services.
- It does not have to be declared legal tender by the government to function as money.
- Commonly accepted monies arise through custom and practice over time. For example:
  - Cigarettes were used as money in prison systems.
  - Cryptocurrencies like Bitcoin are becoming more widely accepted.
- The dollar is accepted for transactions in the U.S. because people know it will be accepted by others.

Medium of Exchange

- A key function of money is to serve as a medium of exchange.
  - An asset acquired to be traded away later
- This makes transactions easier by eliminating the double coincidence of wants problem in a barter system.
  - With barter, you need to find someone who has what you want and also wants what you have.
  - With money, you only need to find someone who has what you want and will accept money in return.
- Money facilitates exchanges between buyers and sellers who want different things.

Fig. 15.1: US Money Supplies



Data from: Board of Governors of the Federal Reserve System, Money Stock Measures—H.6 Release January 2023.
Note: Currency is defined slightly differently for the monetary base and for M1. For the monetary base it is technically called "currency in circulation" and includes notes and coin in bank vaults while currency in circulation does not. The differences are minor. Neither definition includes currency held by the Treasury or by the Federal Reserve.

The Fed

- Established in 1913 by the Federal Reserve Act to regulate and ensure health of U.S. banking system
- Later took on additional role of conducting monetary policy - deliberate changes in money supply to influence economy
- The Fed consists of:
  - The Board of Governors in Washington, D.C.
    - The Board has 7 governors appointed by president for 14-year terms
  - 12 regional Federal Reserve banks in major cities
    - Each regional bank has a 9-member board of directors
- The FOMC sets policy
  - consists of the Board plus 5 rotating regional bank presidents, sets policy

Who Controls the Fed?

- Independent government agency
- 7 governors appointed by president
- 12 regional banks add geographic diversity
- Power theoretically dispersed to preserve independence
- Mostly run by troika: Chair of the Board of Governors, the Vice Chair of the Board of Governors, and the President of the New York Fed

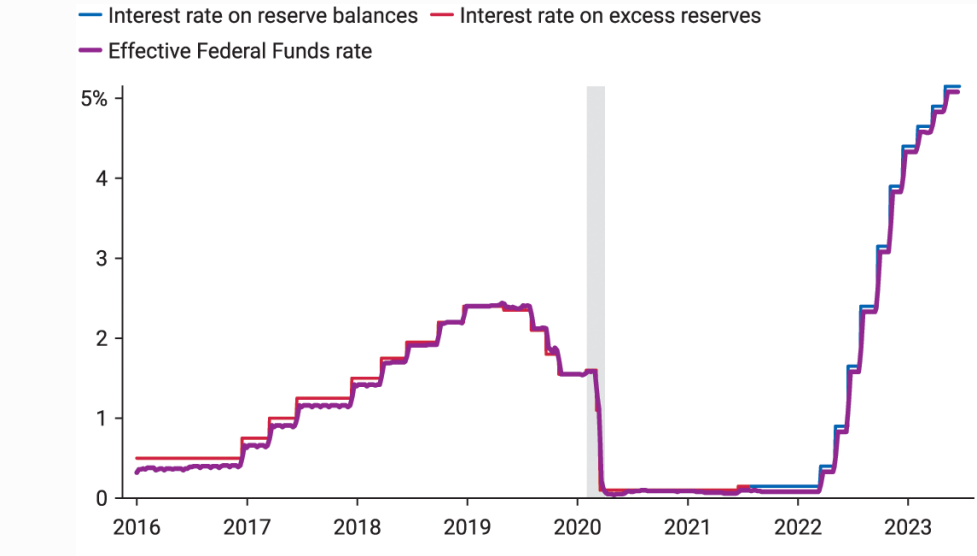
Goals of the Federal Reserve

- The "Dual Mandate"

"maintain long run growth of the monetary and credit aggregates commensurate with the economy's long run potential to increase production, so as to promote effectively the goals of maximum employment, stable prices and moderate long-term interest rates"

  - Maximum Employment
    - $u = u^*$
  - Stable Prices
    - $\pi = 2\%$

Target of the Federal Reserve: The Federal Funds Rate



Tools of the Federal Reserve

- Administered Rates
  - Interest on Reserves
  - Repos (and Reserve Repos)
  - Discount Rate
- Lender of Last Resort
- Open Market Operations
- QE/QT
- Coordinating Expectations

Federal Funds Market

- Overview
  - Interbank lending/borrowing of reserves
  - Participants: Commercial banks, depository institutions
  - Federal Reserve's primary monetary policy target
- The Fed Funds Rate
  - Interest rate for overnight interbank lending
  - Set by supply/demand of federal funds (aka reserves)
  - Influenced by Federal Reserve policy
  - Affects bank lending rates, mortgages, consumer spending

The Floor System

- In 2008, the Fed began the Switch from a Corridor to a Floor System
  - Also known as an Abundant Reserve System
  - Divorced FFR from Balance Sheet

The Supply of Reserves

- The Fed Determines the Supply of Reserves
  - Vertical Supply
  - Increase via Open Market Purchase or QE
  - Decrease via Open Market Sales or QT
- The Fed offers Unlimited Reserves at the Discount Window
  - Horizontal Supply at Discount Rate (i_D)

The Demand for Reserves

- The Market Determines the Demand for Reserves
- Reserves Lent Overnight Between Banks
  - Downward Sloping Demand
- The Fed offers Unlimited Reserves at the Discount Window
  - Horizontal Demand at Discount Rate (i_D)
- The Fed pays interest on reserve balances (i_{IORB}) kept at the Fed
  - Horizontal Demand at i_{IORB}

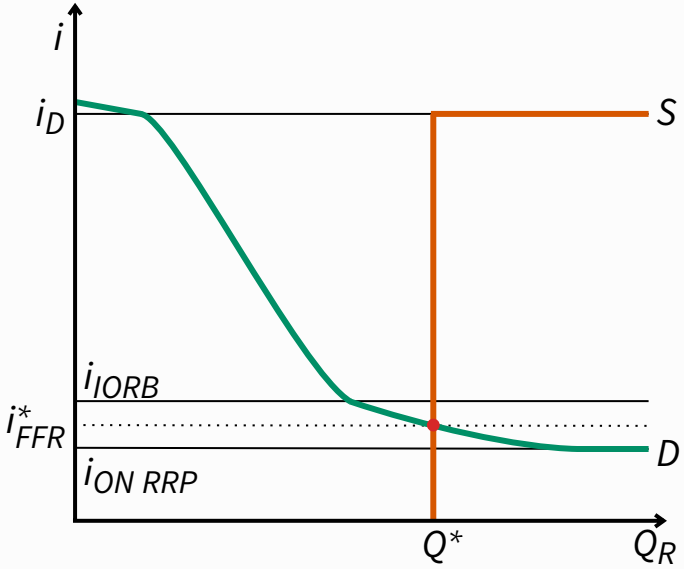
Changes Post-08

- The Fed has Increased the Supply of Reserves to Intersect the Flat Portion of the Demand Curve
  - Equilibrium in the Federal Funds Market Determines i_{FFR}
    - Supply is Abundant
    - Demand is Flat
    - Intersection at “Floor”
- Changes in Balance Sheet $\neq$ Changes in i_{FFR}
- Changes in i^*_{FFR} are Driven by Changes in the Floor (i_{IORB})

Equilibrium FFR

- Equilibrium (i^*_{FFR}) Occurs where $S = D$ on the Flat Part of the Demand Curve
- Shifts in Supply
  - Changes in Reserves by Fed
- Shifts in Demand
  - Changes in Reserve Requirements
  - Changes in Market Conditions

Floor (Abundant Reserve) System



The Federal Funds Rate and the Money Supply

- The Central Bank issues base money (Reserves + Currency in Circulation) and sets the minimum reserve requirement.
- The Public decides how much currency to hold outside banks.
- Banks decide actual reserve ratio by the amount of deposits/loans created on top of given reserves.
  - Higher i_{IORB} increases opportunity cost of creating loans
  - Lower i_{IORB} increases opportunity cost of creating loans

$$M^S = \text{Monetary Base} \times \text{Money Multiplier}$$

$$\Delta M^S = \Delta\text{Monetary Base} \times \text{Money Multiplier}$$

Tools of the Federal Reserve

- Administered Rates
  - Interest on Reserves
  - Repos (and Reserve Repos)
  - Discount Rate
- Lender of Last Resort
- Open Market Operations
- QE/QT
- Coordinating Expectations

Transmission Mechanism

- Lending Channel
- Interest Rate Channel
- Asset Price and Wealth Effect Channel

Takeaways

Raising or lowering the interest rate paid on reserves. The Fed lowers the rate paid on reserves to decrease reserve demand and expand bank lending, and raises the rate to increase reserve demand and reduce bank lending.

Coordinating expectations—using announcements and actions to coordinate firms and workers toward mutually consistent expectations about economic variables.

Open market operations—the buying and selling of short-term U.S. government bonds. The Fed buys bonds to lower interest rates and expand the money supply, and sells bonds to raise interest rates and contract the money supply.

Transmission mechanisms or channels of monetary policy:
- Lending channel
- Interest rate channel
- Asset price and wealth effect channel

Quantitative easing and tightening—the buying and selling of longer-term U.S. government bonds or other securities. Used to influence longer-term rates directly or to support borrowing and lending in especially distressed markets in a crisis.

Repos and reverse repos—buying or selling T-bills on a short-term, usually overnight basis.

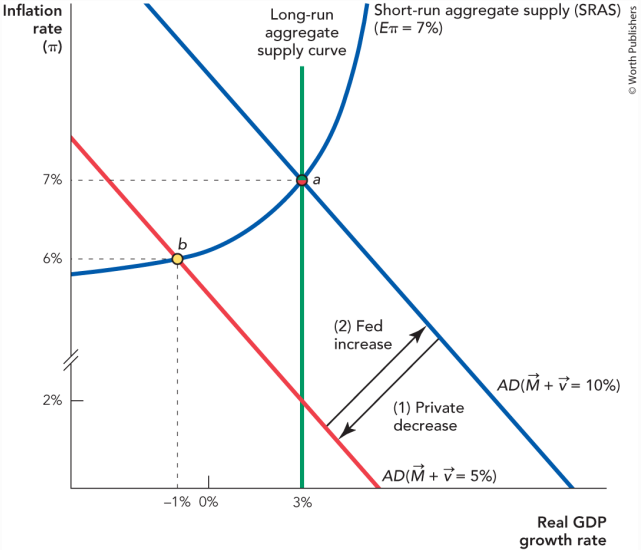
Lender of last resort—lending to banks and other financial intermediaries in a crisis to maintain borrowing and lending.

MONETARY POLICY

Monetary Policy: The Best Case

- In the best case, the Fed can offset a negative AD shock with ↑ money supply
- Speed of recovery is the advantage, not recovery itself
- Prerequisite: recession caused by demand shock, not supply shock
- Example:
  - Negative AD shock from decreased consumer and business spending
  - Fed increases money supply growth, reducing interest rates
  - Shifts AD curve back, faster recovery from recession

Fig. 16.1: The Best Case Scenario



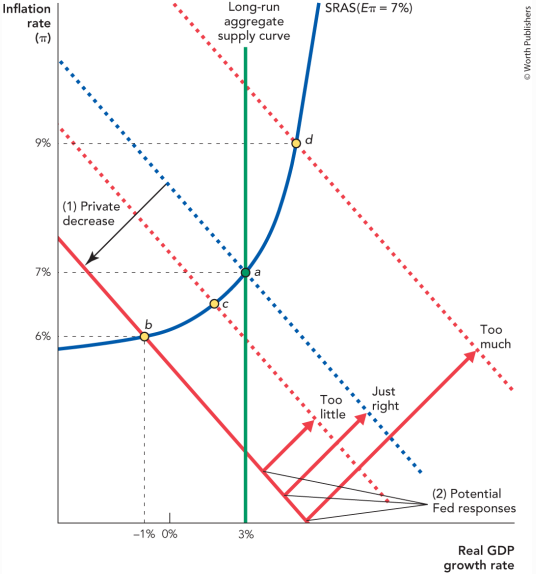
Problems Using Monetary Policy

- No real-time economic data
  - Policy is guesswork without accurate data
- Incomplete control of money supply
  - Time lag between policy and effect
    - Hard to time policy right
    - Hard to calibrate policy precisely
- Results: policy increases volatility

Getting Policy “Just Right” Is Hard

- Too little stimulus → sluggish recovery
- Too much stimulus → overheats economy, ↑ inflation
- Lags and uncertainty → policy increases volatility
- Need “Goldilocks” amount of stimulus

Fig. 16.2: Getting Policy "Just Right" Is Hard



Engineering a Decrease in AD

- If Fed overstimulates, must later contract money supply to reduce inflation
- Disinflation is painful and risks causing a recession
- Disinflation works best when policy is ***credible***
  - Expected that Fed will stick to policy
- 1980s disinflation: reduced inflation from 13.5% to 3% but caused recession

Fed as Confidence Manager

- Powerful tool is influencing expectations and psychology
- Countersignaling (e.g. lending after 9/11) stabilizes expectations
- Can offset ↓ velocity growth from uncertainty

The Negative Real Shock Dilemma

- With real shock, Fed must accept
  - Low growth and high unemployment or
  - High inflation
- Stimulus ineffective due to reduced productivity
- 1970s example: Fed responses to oil shocks increased inflation without restoring growth

Fig. 16.3: The Fed's Dilemma When Responding to a Real Shock 1

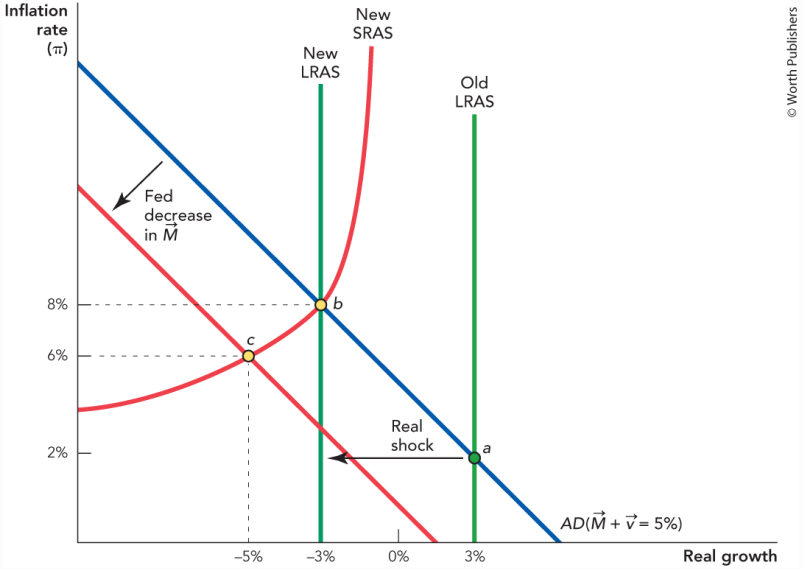
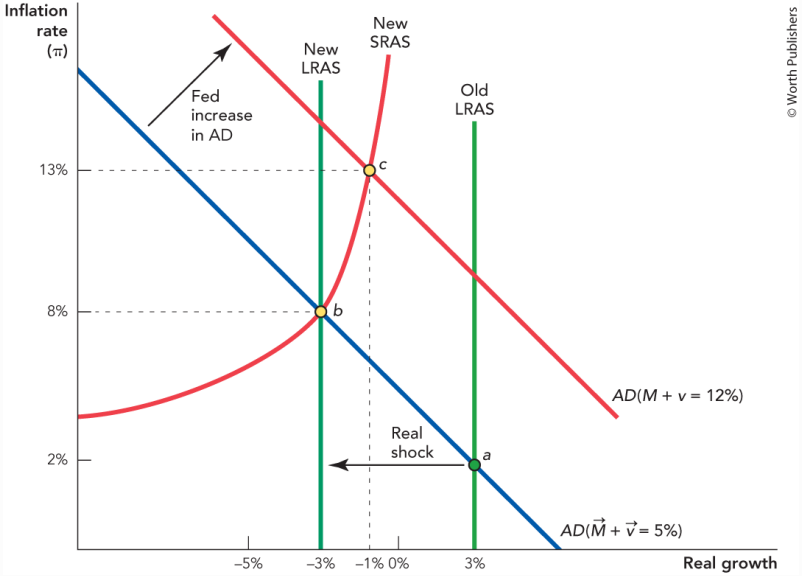


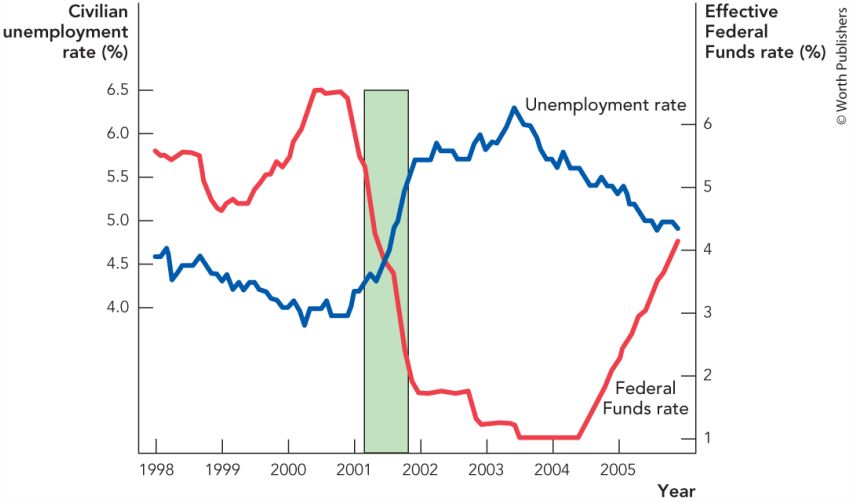
Fig. 16.4: The Fed's Dilemma When Responding to a Real Shock 2



When Fed Policy Goes Too Far

- Fed kept rates very low 2003–2004, fueling housing bubble
- Easy credit encourages speculation and bubbles
- Hard to identify bubbles and use policy to “pop” them
- Housing prices peaked 2006, crashed 2007

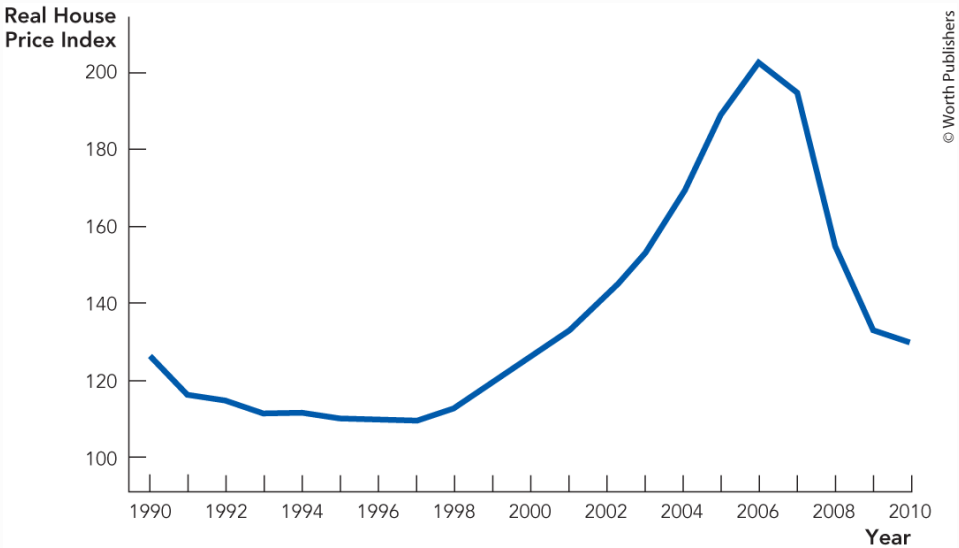
Fig. 16.5: US Unemployment and the Federal Funds Rate (1998–2005)



Dealing with Asset Price Bubbles

- Uncertainty about damage from bubbles bursting
- Difficulty identifying bubbles
- Policy affects whole economy, not just asset prices
- Regulation of risky mortgages would have been better

Fig. 16.6: The US Housing Boom and Bust



Rules vs. Discretion

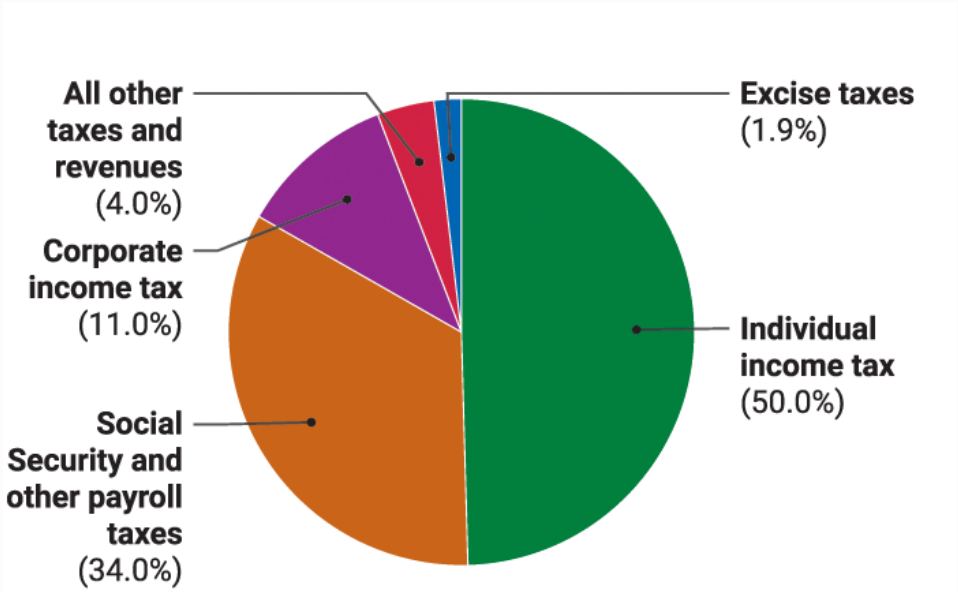
- Rules limit Fed discretion over business cycle
- Likely increase stability
- Examples
  - Gold standard
  - Friedman’s constant 3% money growth
  - Nominal GDP targeting

THE FEDERAL BUDGET - TAXES AND SPENDING

The Budget Process

- President proposes budget each January
- Congress passes budget bill before Oct 1
- Tax and spending changes require legislation
- Applies to each fiscal year (Oct 1-Sept 30)

Fig. 17.1: US Tax Revenues 2023



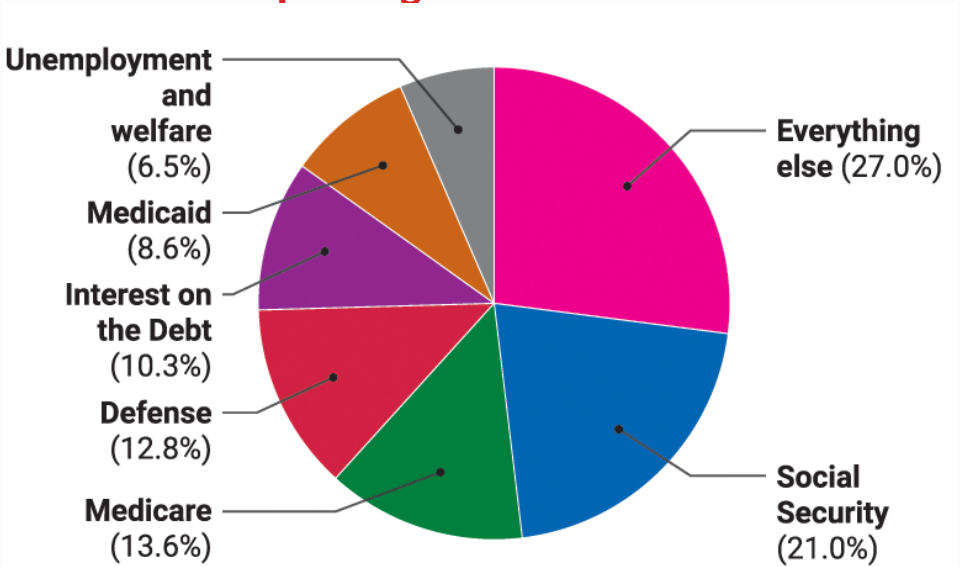
Social Security and Medicare Taxes

- FICA tax funds Social Security: 12.4% of earnings (split between employee and employer)
- Medicare tax: 2.9% of earnings (split between employee and employer)
- Burden falls on workers via lower wages
- Payroll taxes deducted from paychecks

Corporate Income Tax

- Statutory rate is 21%
- Paid by shareholders (lower returns) and consumers (higher prices)
- Reducing corporate tax leads to an increase in investment

Fig 17.4: US Federal Spending 2023

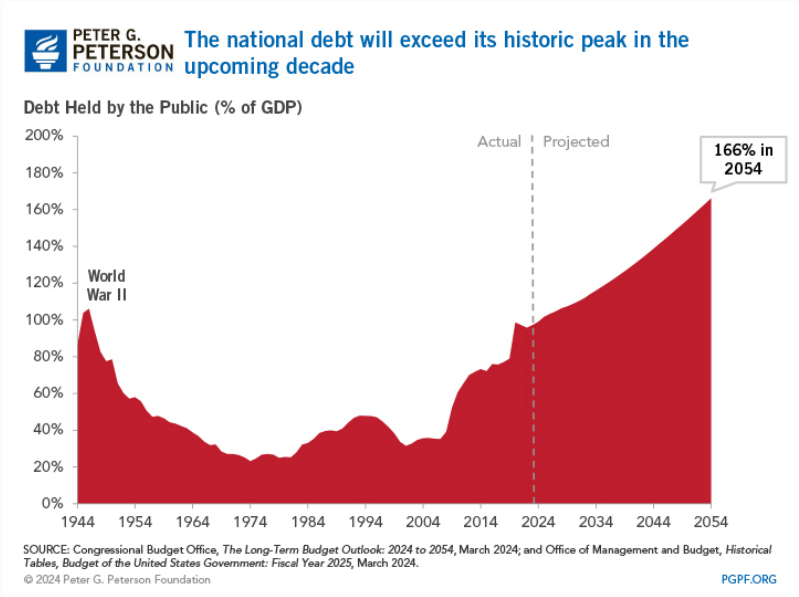


Note: Percentages are subject to rounding error.

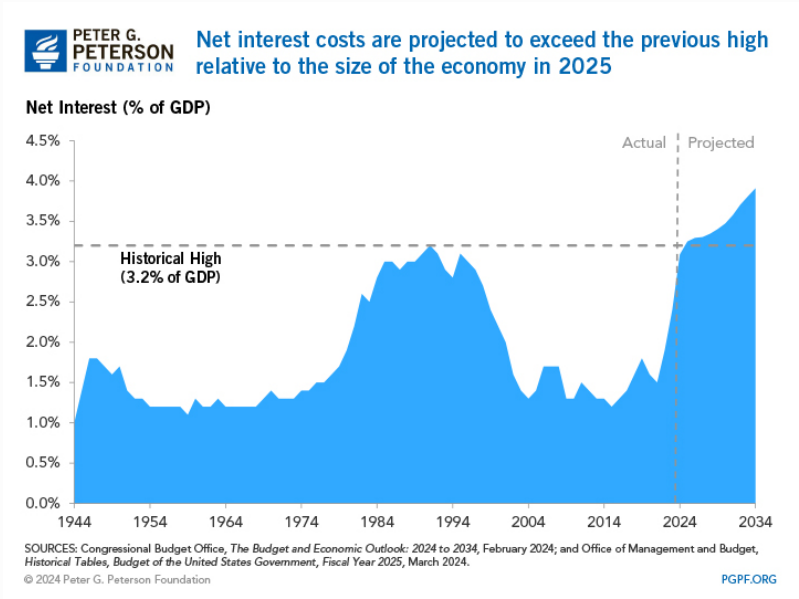
The National Debt and Interest

- US Debt Clock Link
- Debt held by public: $27 trillion
- Total Federal Debt: $34.5 trillion
- Debt-to-GDP ratio: 95%
- Interest payments around $650 billion/year

US Debt to GDP



Interest on US Debt

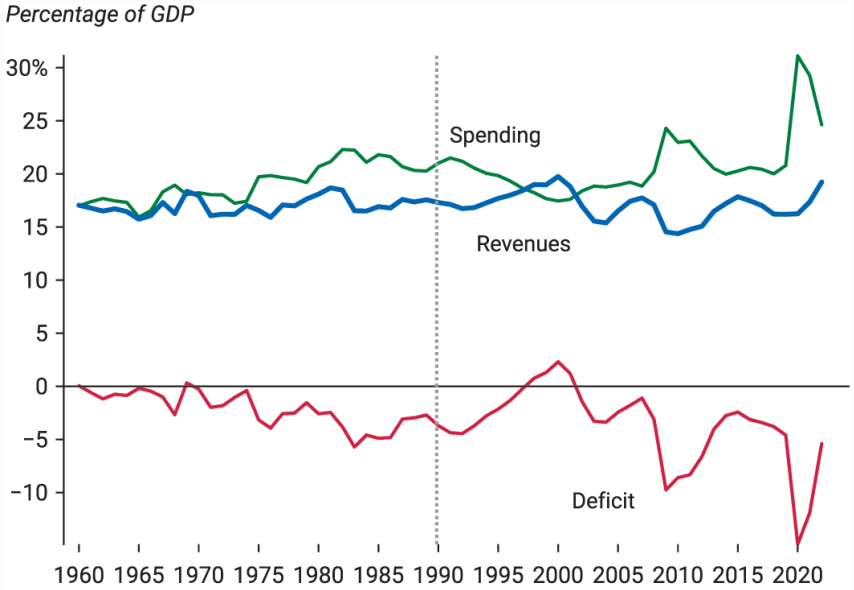


Budget Deficit and Budget Surplus

- ***Budget deficit***:
  - Occurs when government outlays exceed revenue in a year.
  - Outlays > revenues.
  - More funds flowing out than in.

- ***Budget surplus***:
  - Occurs when government revenue exceeds outlays in a year.
  - Revenues > outlays.
  - More funds flowing in than out.

Fig. 17.6: Spending, Revenues, and Deficits as % of GDP



Predicted Spending and Revenues as % of GDP

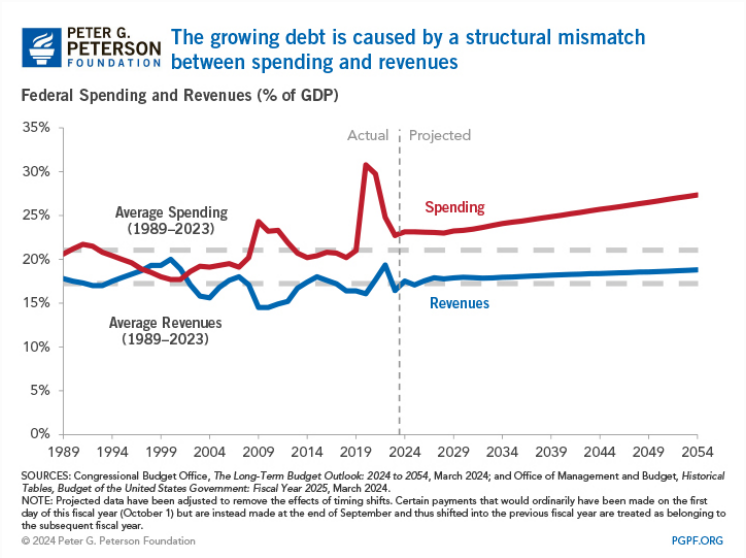
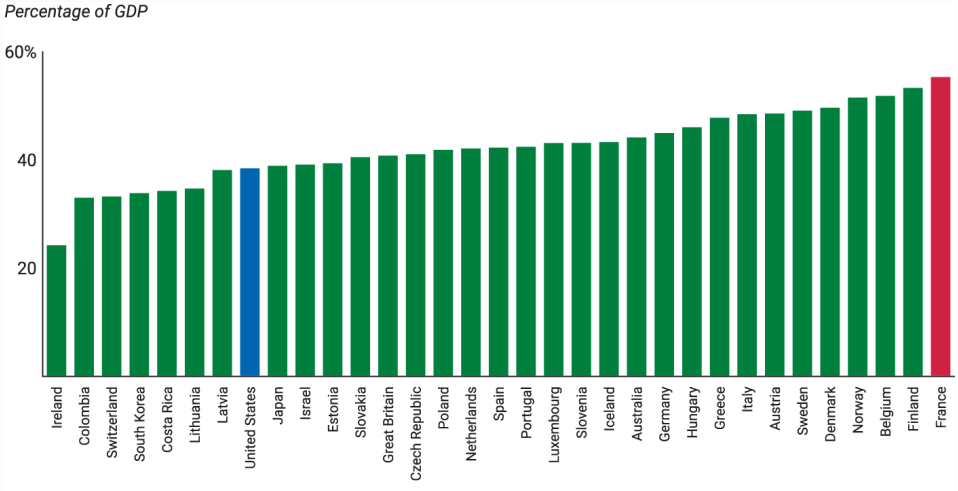


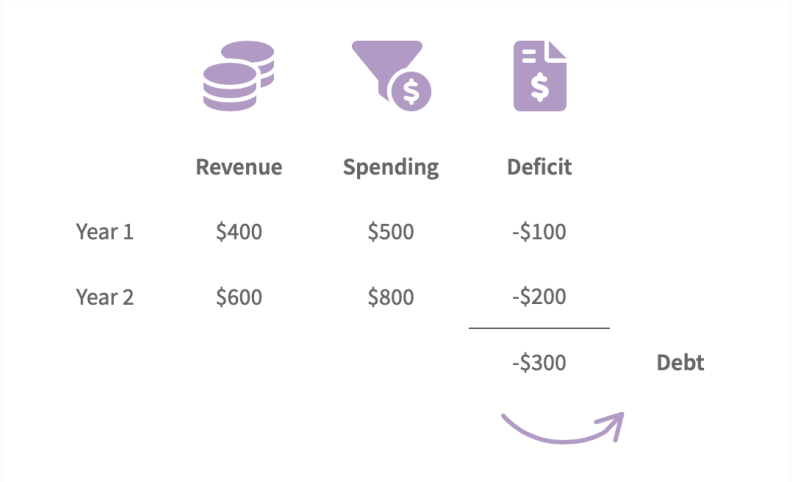
Fig. 17.7: Government Spending as % of GDP



General government spending includes spending by federal, state, and local governments.

Chart: © Worth Publishers • Data from: OECD (2019), General government spending (indicator). doi: 10.1787/a31cbf4d-en.

Deficits versus Debt, 1 of 2



Deficits versus Debt, 2 of 2

- Easy to confuse deficit and debt but the difference is important.
- ***Deficit***: A shortfall in revenue for a particular year's budget.
  - When there is a budget deficit, the government has to borrow money to cover the gap.
- ***Debt***: The total of all accumulated and unpaid budget deficits.
  - Owned partly by the government and partly by the public.

Future Outlook

- Aging population raises costs
- Healthcare costs rising rapidly
- Tax hikes, spending cuts, or more debt needed
- Hard choices on taxes and spending

Takeaways

- Taxes mainly from individuals
- Social Security, Medicare largest spending
- Deficits and debt rising rapidly
- Future commitments require tough choices

Navigation Links

FISCAL POLICY

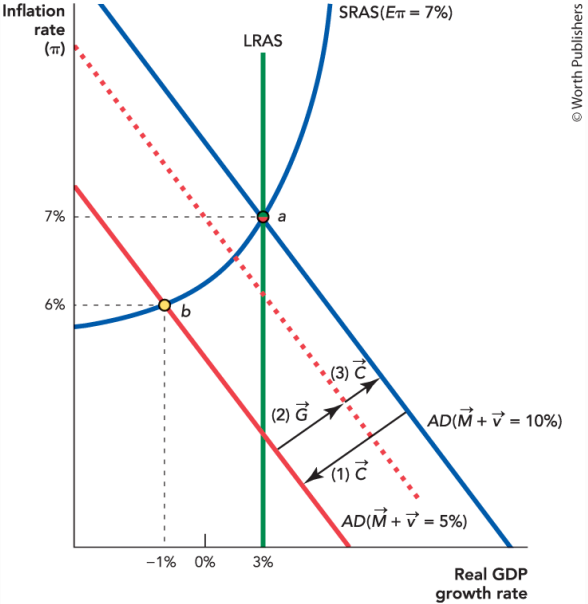
Introduction

- Fiscal policy refers to changes in taxes and government spending intended to influence the economy
- Examples:
  - 2008 tax rebates
  - 2021 infrastructure spending

Why Should Fiscal Policy Work?

- At full employment, increased government spending crowds out private spending
  - ***Crowding out***: decrease in private spending due to fiscal policy
- However, with unemployed resources, fiscal policy can increase GDP
  - The size of the impact depends on the multiplier.
    - ***Multiplier effect***: additional spending generated by initial increase in government spending
    - Each $1 of spending can add $1+ to GDP due to multiplier effect
- Fiscal policy can work because with underutilized resources, the economy is operating inefficiently
- There is a debate about when resources are underutilized

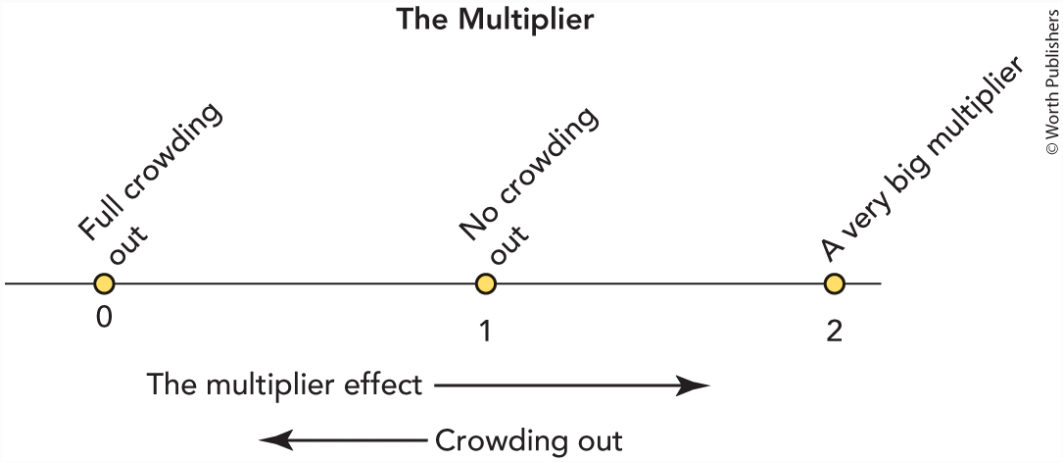
Fig 18.1 The Multiplier



The Multiplier Debate

- Concerns balance of crowding out versus multiplier effect
- With full crowding out, multiplier $m^S = 0$
- With no crowding out, $m^S = 1$
- With multiplier effect, $m^S > 1$:
  - More unemployed resources
  - Targeted spending

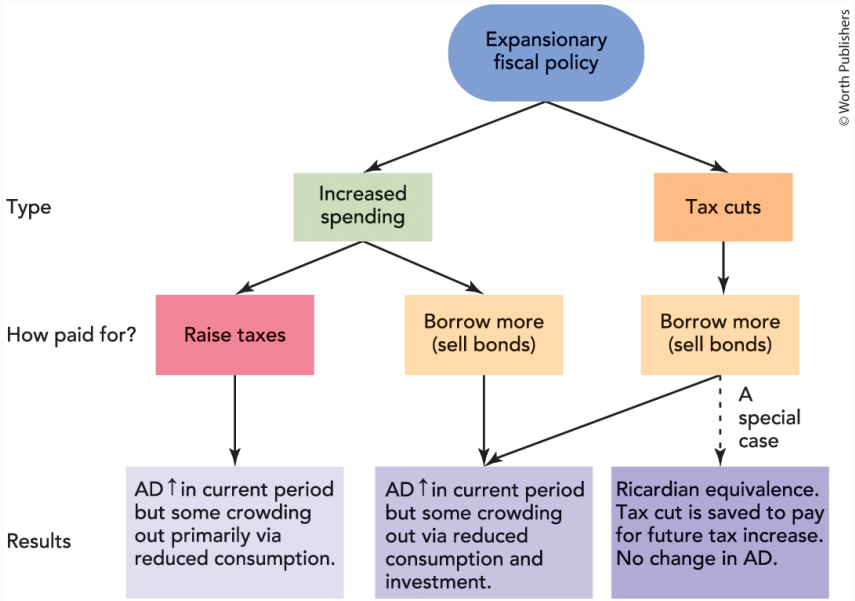
Fig. 18.2: Crowding Out vs. The Multiplier Effect



Estimating the Multiplier

- Multiplier size depends on economic conditions and type of policy
  - Larger during recessions
  - Larger when accommodated by monetary policy
  - Larger for productive spending
- General consensus is that
  - general spending multiplier: $0 < m^S < 1$
  - general tax multiplier: $m^T > 1$

Fig. 18.4: Types of Expansionary Fiscal Policy



Limits: Magnitude

- Much federal budget is pre-determined
  - Social Security, Medicare, Medicaid, interest on debt
- Stimuli are small relative to total GDP
- Hard to spend enough quickly
  - 2009 stimulus was largest since World War II but still only 1.6% of GDP
  - 2021 stimulus was unprecedented at 26% of GDP
  - Usually, its difficult politically and practically to spend enough

Limits: Timing Issues

1. Recognition lag: Problem must be recognized
2. Legislative lag: Congress must propose and pass plan
3. Implementation lag: Bureaucracies implement plan
4. Effectiveness lag: Time for plan to work
5. Evaluation/adjustment lag: Evaluate and adjust plan

Automatic Stabilizers

- Automatic stabilizers stimulate AD during recessions without explicit policy action
- Examples:
  - Unemployment insurance spending increases automatically as unemployment rises
  - Tax revenue falls automatically during recessions as income and profits decline
- Key advantage: Avoid lags in recognizing problems and passing legislation
- More automatic stabilizers could be created, like triggers for payroll tax cuts or even automatic stimulus checks

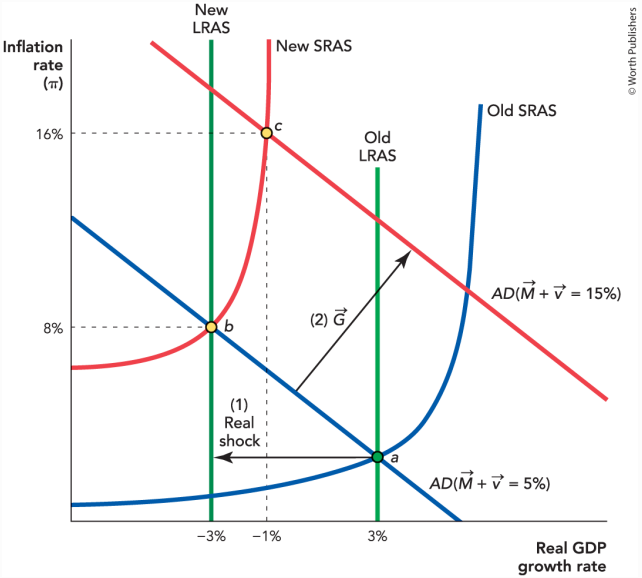
Ricardian Equivalence

- Savers realize, *ceteris paribus*,
  - tax cuts today mean higher taxes later
  - spending increases today mean higher taxes later
- Reduces effectiveness of tax cuts and spending increase in stimulating AD

Fiscal Policy and Real Shocks

- Fiscal policy acts through aggregate demand
- Not effective with real (supply) shocks
- Tends to increase inflation more than growth
- Real shocks require supply-side solutions

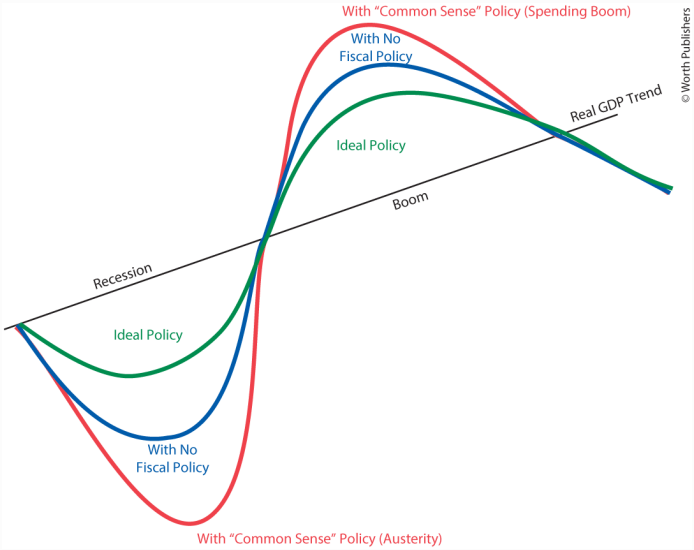
Fig. 18.5: Fiscal Policy Is Less Effective at Combatting a Real Shock



Danger of “Common Sense” Policy

- Ideal policy is countercyclical
  - ***Countercyclical fiscal policy***: expansionary in recessions, contractionary in booms
- But “common sense” suggests procyclical policy
  - Spending less in recessions
  - Spending more in booms
- Procyclical policy would increase volatility

Fig. 18.7: Ideal Policy vs “Common Sense” Fiscal Policy



When Is Fiscal Policy Effective?

- High unemployment
- Demand shocks
- Short-run focus
- Productive government spending
- Automatic stabilizers
- Targeted, timely spending increases and tax cuts

Political Differences

- Tax cuts give more power to private sector
- Spending increases give more power to government
- If productive investments, case for spending can be strong
- If non-productive investments, case for tax cuts is stronger

Takeaway

- Fiscal policy can be effective when:
  - Economy needs short-run boost
  - Recession caused by demand shock
  - Resources unemployed
  - Government spending productive
- Success depends on size of multiplier
  - Bigger with high unemployment, targeted policies, less crowding out
- Ideal policy countercyclical, but lags and debt are challenges
- Automatic stabilizers like unemployment insurance are important
- Fiscal policy limits booms and busts if timed well, targeted effectively

Navigation Links