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Measuring a Nation's Income

PRINCIPLES OF

ECONOMICS

FOURTH EDITION

N. GREGORY MANKIW

**PowerPoint® Slides
by Ron Cronovich**

In this chapter, look for the answers to these questions:

- What is Gross Domestic Product (GDP)?

- How is GDP related to a nation's total income and spending?

- What are the components of GDP?

- How is GDP corrected for inflation?

- Does GDP measure society's well-being?

Micro vs. Macro

- ***Microeconomics***:
  The study of how individual households and firms make decisions, interact with one another in markets.

- ***Macroeconomics***:
  The study of the economy as a whole.

- We begin our study of macroeconomics with the country's total income and expenditure.

Income and Expenditure

- **Gross Domestic Product (GDP)** measures total income of everyone in the economy.

- GDP also measures total expenditure on the economy's output of g&s.

For the economy as a whole,

income equals expenditure, because

every dollar of expenditure by a buyer

is a dollar of income for the seller.

The Circular-Flow Diagram

- is a simple depiction of the macroeconomy.

- illustrates GDP as spending, revenue, factor payments, and income.

- First, some preliminaries:
  - **Factors of production** are inputs like labor, land, capital, and natural resources.
  - **Factor payments** are payments to the factors of production. (*e.g.*, wages, rent)

FIGURE 1: The Circular-Flow Diagram

Households:
- own the factors of production, sell/rent them to firms for income
- buy and consume g&s
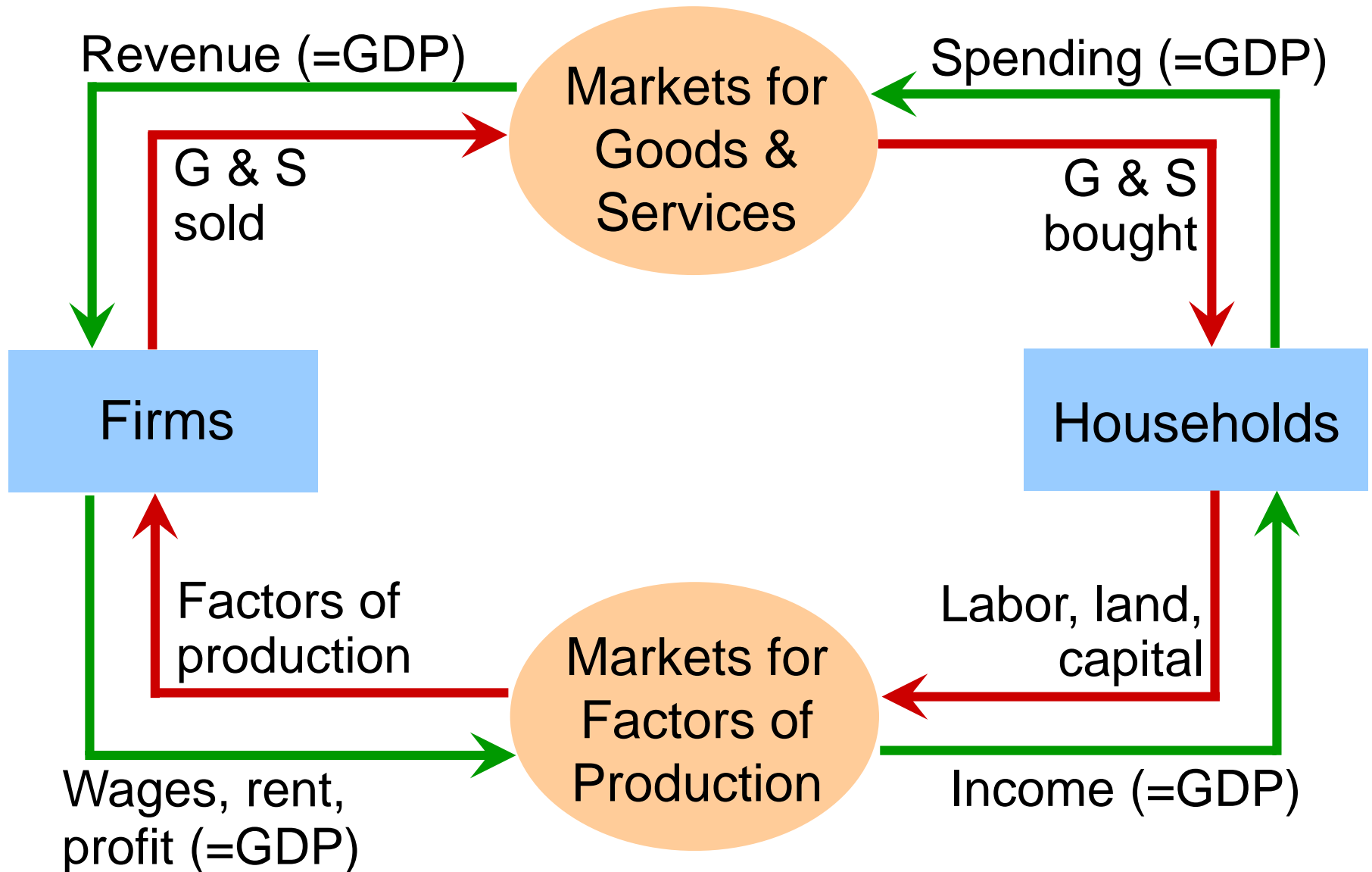
Firms

Households

FIGURE 1:   The Circular-Flow Diagram

Firms

Households

Firms:
- buy/hire factors of production, use them to produce g&s
- sell g&s

FIGURE 1: The Circular-Flow Diagram

What This Diagram Omits

- The government
  - collects taxes
  - purchases g&s

- The financial system
  - matches savers' supply of funds with borrowers' demand for loans

- The foreign sector
  - trades g&s, financial assets, and currencies with the country's residents

Gross Domestic Product (GDP) Is…

…the market value of all final goods & services produced within a country in a given period of time.

Goods are valued at their market prices, so:

- *GDP measures all goods using the same units (e.g., dollars in the U.S.), rather than "adding apples to oranges."*

- *Things that don't have a market value are excluded, e.g., housework you do for yourself.*

Gross Domestic Product (GDP) Is…

…the market value of all final goods & services produced within a country in a given period of time.

Final goods are intended for the end user.

Intermediate goods are used as components or ingredients in the production of other goods.

GDP only includes final goods, as they already embody the value of the intermediate goods used in their production.

Gross Domestic Product (GDP) Is…

…the market value of all final goods & services produced within a country in a given period of time.

GDP includes tangible goods
(like DVDs, mountain bikes, beer)

and intangible services
(dry cleaning, concerts, cell phone service).

Gross Domestic Product (GDP) Is…

…the market value of all final goods & services produced within a country in a given period of time.

GDP includes currently produced goods, not goods produced in the past.

Gross Domestic Product (GDP) Is…

…the market value of all final goods & services produced within a country in a given period of time.

GDP measures the value of production that occurs within a country's borders, whether done by its own citizens or by foreigners located there.

Gross Domestic Product (GDP) Is…

…the market value of all final goods & services produced within a country in a given period of time.

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usually a year or a quarter (3 months).

The Components of GDP

- Recall: GDP is total spending.

- Four components:
  - Consumption (**C**)
  - Investment (**I**)
  - Government Purchases (**G**)
  - Net Exports (**NX**)

- These components add up to GDP (denoted **Y**):

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

Consumption (C)

- is total spending by households on g&s.

- Note on housing costs:
  - For renters, consumption includes rent payments.
  - For homeowners, consumption includes the imputed rental value of the house, but not the purchase price or mortgage payments.

Investment (I)

- is total spending on goods that will be used in the future to produce more goods.

- includes spending on
  - capital equipment (*e.g.*, machines, tools)
  - structures (factories, office buildings, houses)
  - inventories (goods produced but not yet sold)

Note: "Investment" does not mean the purchase of financial assets like stocks and bonds.

Government Purchases (G)

- is all spending on the g&s purchased by govt at the federal, state, and local levels.

- **G** excludes **transfer payments**, such as Social Security or unemployment insurance benefits.

  These payments represent transfers of income, not purchases of g&s.

Net Exports (NX)

- **NX** = exports – imports

- Exports represent foreign spending on the economy's g&s.

- Imports are the portions of **C**, **I**, and **G** that are spent on g&s produced abroad.

- Adding up all the components of GDP gives:

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

U.S. GDP and Its Components, 2005

	billions	% of GDP	per capita
Y	$12,480	100.0	$42,035
C	8,746	70.1	29,460
I	2,100	16.8	7,072
G	2,360	18.9	7,950
NX	–726	–5.8	–2,444

GDP and its components

In each of the following cases, determine how much GDP and each of its components is affected (if at all).

A. Debbie spends $200 to buy her husband dinner at the finest restaurant in Boston.

B. Sarah spends $1800 on a new laptop to use in her publishing business. The laptop was built in China.

C. Jane spends $1200 on a computer to use in her editing business. She got last year's model on sale for a great price from a local manufacturer.

D. General Motors builds $500 million worth of cars, but consumers only buy $470 million worth of them.

ACTIVE LEARNING 1: Answers

A. Debbie spends $200 to buy her husband dinner at the finest restaurant in Boston.

Consumption and GDP rise by $200.

B. Sarah spends $1800 on a new laptop to use in her publishing business. The laptop was built in China.

Investment rises by $1800, net exports fall by $1800, GDP is unchanged.

Answers

C. Jane spends $1200 on a computer to use in her editing business. She got last year's model on sale for a great price from a local manufacturer.

Current GDP and investment do not change, because the computer was built last year.

D. General Motors builds $500 million worth of cars, but consumers only buy $470 million of them.

Consumption rises by $470 million, inventory investment rises by $30 million, and GDP rises by $500 million.

Real versus Nominal GDP

- Inflation can distort economic variables like GDP, so we have two versions of GDP:
One is corrected for inflation, the other is not.

- **Nominal GDP** values output using current prices. It is not corrected for inflation.

- **Real GDP** values output using the prices of a *base year*. Real GDP is corrected for inflation.

EXAMPLE:

	Pizza		Latte	
year	**P**	**Q**	**P**	**Q**
2002	$10	400	$2.00	1000
2003	$11	500	$2.50	1100
2004	$12	600	$3.00	1200

Compute nominal GDP in each year:

Increase:

2002: $10 x 400 + $2 x 1000 = $6,000

37.5%

2003: $11 x 500 + $2.50 x 1100 = $8,250

30.9%

2004: $12 x 600 + $3 x 1200 = $10,800

EXAMPLE:

	Pizza		Latte	
year	**P**	**Q**	**P**	**Q**
→ 2002	$10	400	$2.00	1000
2003	$11	500	$2.50	1100
2004	$12	600	$3.00	1200

Compute real GDP in each year,
using 2002 as the base year:

Increase:

2002: $10 x 400 + $2 x 1000 = $6,000

20.0%

2003: $10 x 500 + $2 x 1100 = $7,200

16.7%

2004: $10 x 600 + $2 x 1200 = $8,400

EXAMPLE:

year	Nominal GDP	Real GDP
2002	$6000	$6000
2003	$8250	$7200
2004	$10,800	$8400

In each year,

- nominal GDP is measured using the (then) current prices.

- real GDP is measured using constant prices from the base year (2002 in this example).

EXAMPLE:

year	Nominal GDP			Real GDP		
2002	$6000			$6000		
		37.5%			20.0%	
2003	$8250			$7200		
		30.9%			16.7%	
2004	$10,800			$8400		

- The change in nominal GDP reflects both prices and quantities.

- The change in real GDP is the amount that GDP would change if prices were constant (*i.e.,* if zero inflation).

   Hence, real GDP is corrected for inflation.

Nominal and Real GDP in the U.S., 1965-2005
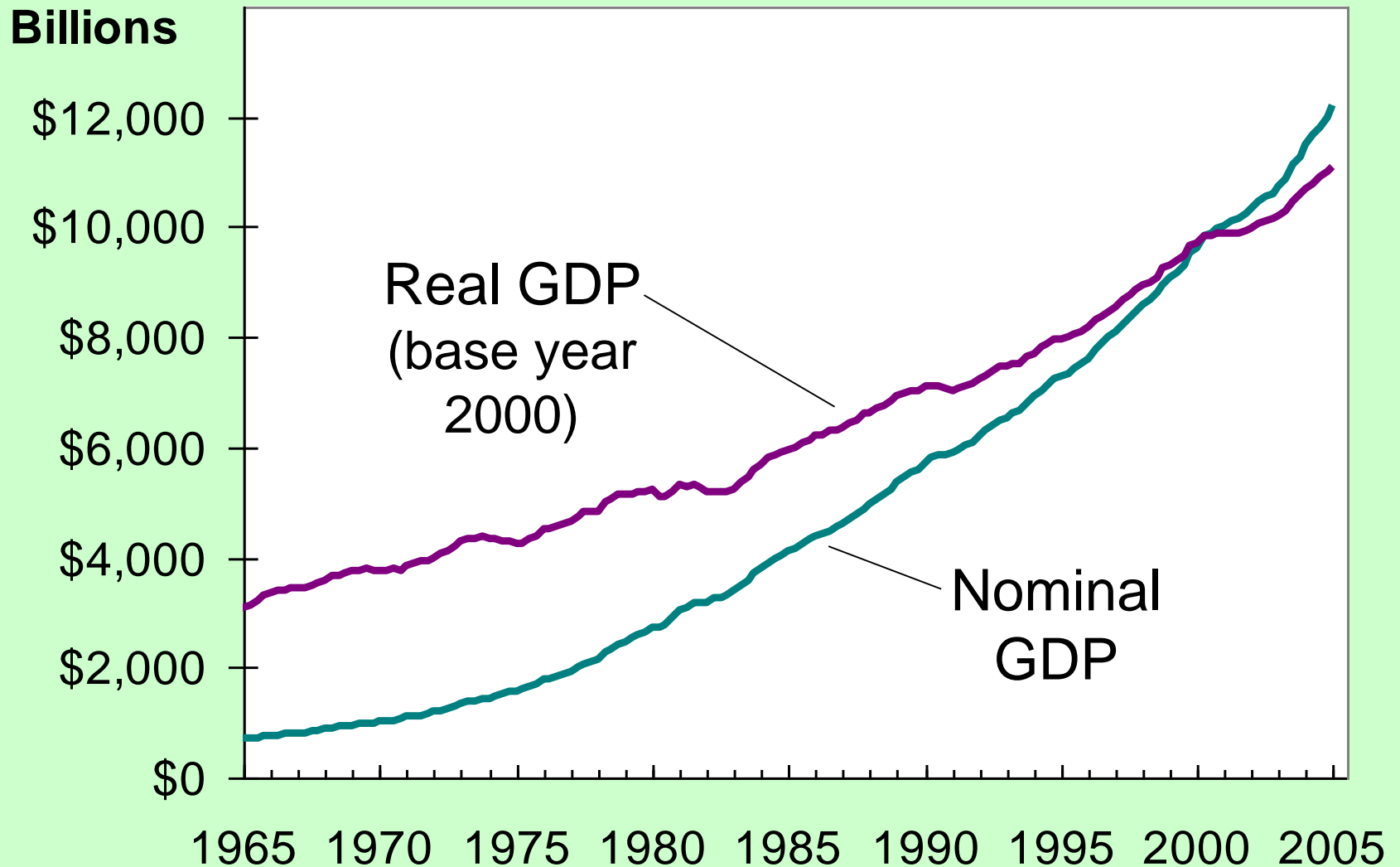
The GDP Deflator

- The GDP deflator is a measure of the overall level of prices.

- Definition:

$$\text{GDP deflator} = 100 \times \frac{\text{nominal GDP}}{\text{real GDP}}$$

- One way to measure the economy's **inflation rate** is to compute the percentage increase in the GDP deflator from one year to the next.

EXAMPLE:

year	Nominal GDP	Real GDP	GDP Deflator	
2002	$6000	$6000	100.0	
2003	$8250	$7200	114.6	14.6%
2004	$10,800	$8400	128.6	12.2%

Compute the GDP deflator in each year:

2002:   100 x (6000/6000) =   100.0

2003:   100 x (8250/7200) =   114.6

2004:   100 x (10,800/8400) =   128.6

Computing GDP

	2004 (base yr)		2005		2006	
	P	*Q*	*P*	*Q*	*P*	*Q*
good A	$30	900	$31	1,000	$36	1050
good B	$100	192	$102	200	$100	205

Use the above data to solve these problems:

A. Compute nominal GDP in 2004.

B. Compute real GDP in 2005.

C. Compute the GDP deflator in 2006.

	2004 (base yr)		2005		2006	
	P	*Q*	*P*	*Q*	*P*	*Q*
good A	$30	900	$31	1,000	$36	1050
good B	$100	192	$102	200	$100	205

A. Compute nominal GDP in 2004.

$30 x 900 + $100 x 192 = $46,200

B. Compute real GDP in 2005.

$30 x 1000 + $100 x 200 = $50,000

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	2004 (base yr)		2005		2006	
	P	*Q*	*P*	*Q*	*P*	*Q*
good A	$30	900	$31	1,000	$36	1050
good B	$100	192	$102	200	$100	205

C. Compute the GDP deflator in 2006.

Nom GDP = $36 x 1050 + $100 x 205 = $58,300

Real GDP = $30 x 1050 + $100 x 205 = $52,000

GDP deflator = 100 x (Nom GDP)/(Real GDP)

= 100 x ($58,300)/($52,000) = 112.1

GDP and Economic Well-Being

- *Real GDP per capita is the main indicator of the average person's standard of living.*

- But GDP is not a perfect measure of well-being.

- Robert Kennedy issued a very eloquent yet harsh criticism of GDP:

Gross Domestic Product…

"… does not allow for the health of our children, the quality of their education, or the joy of their play. It does not include the beauty of our poetry or the strength of our marriages, the intelligence of our public debate or the integrity of our public officials.

It measures neither our courage, nor our wisdom, nor our devotion to our country. It measures everything, in short, except that which makes life worthwhile, and it can tell us everything about America except why we are proud that we are Americans."
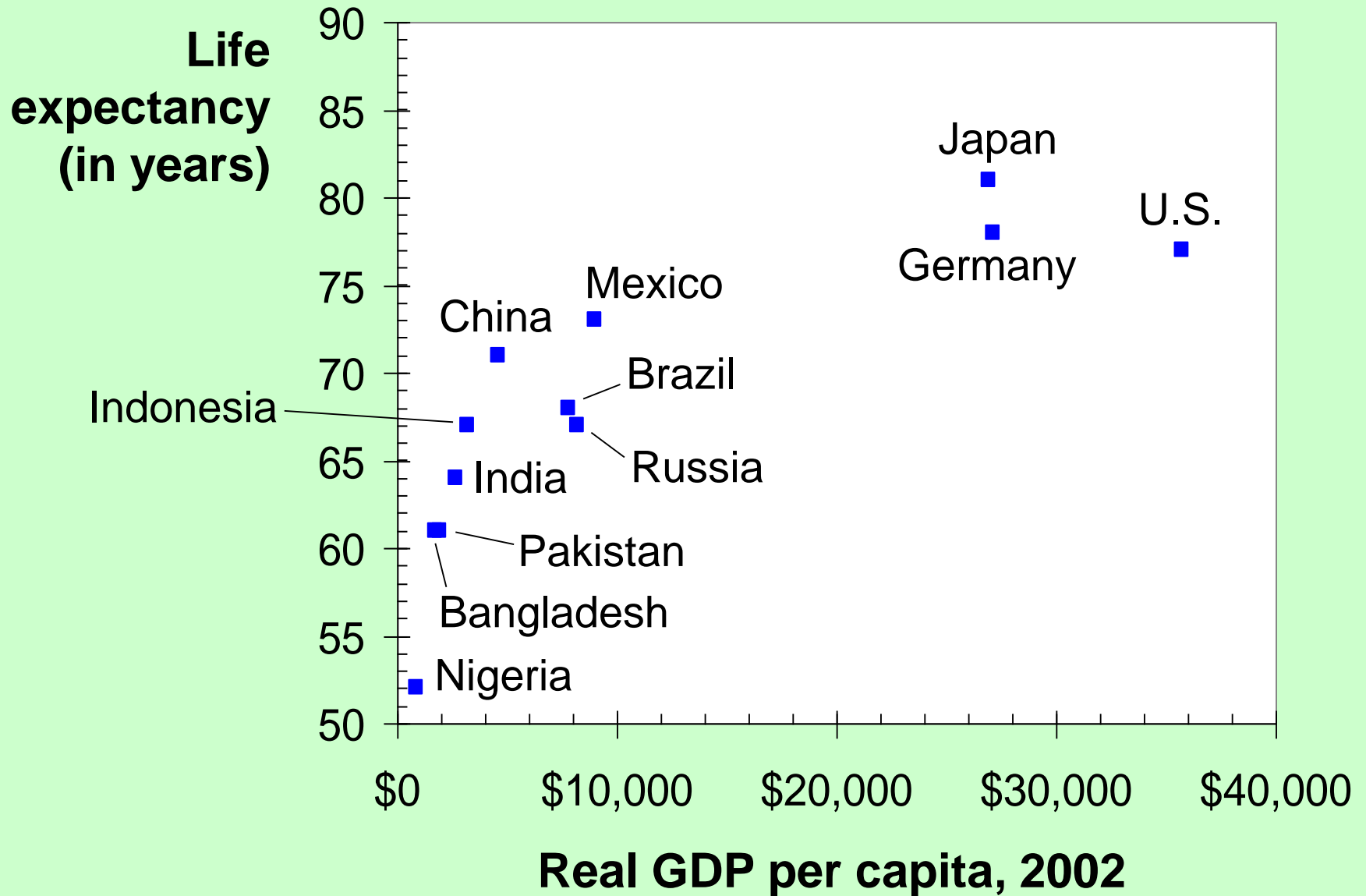
- Senator Robert Kennedy, 1968

GDP Does Not Value:

- the quality of the environment

- leisure time

- non-market activity, such as the child care a parent provides his or her child at home
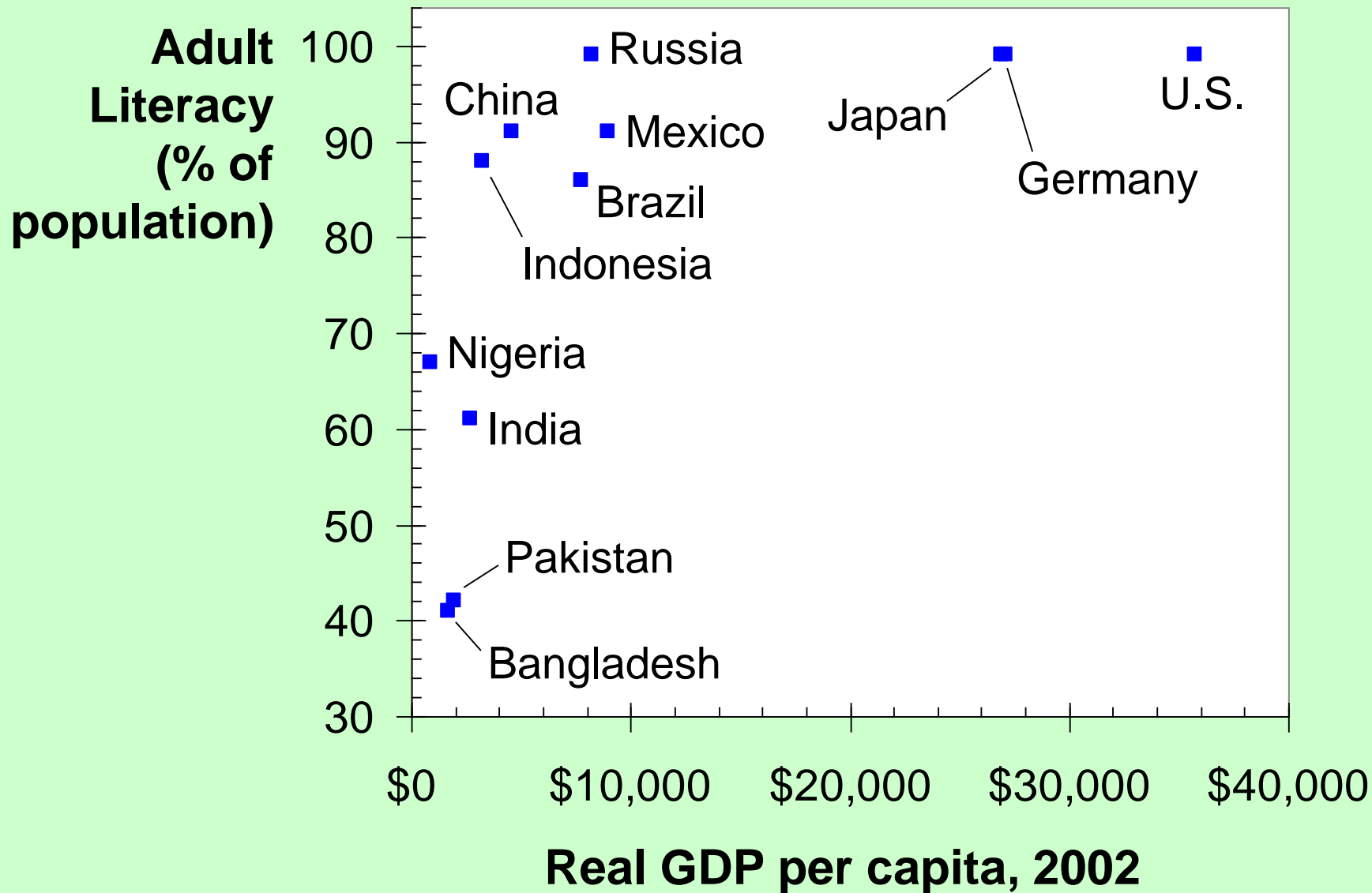
- an equitable distribution of income

Then Why Do We Care About GDP?

- Having a large GDP enables a country to afford better schools, a cleaner environment, health care, etc.

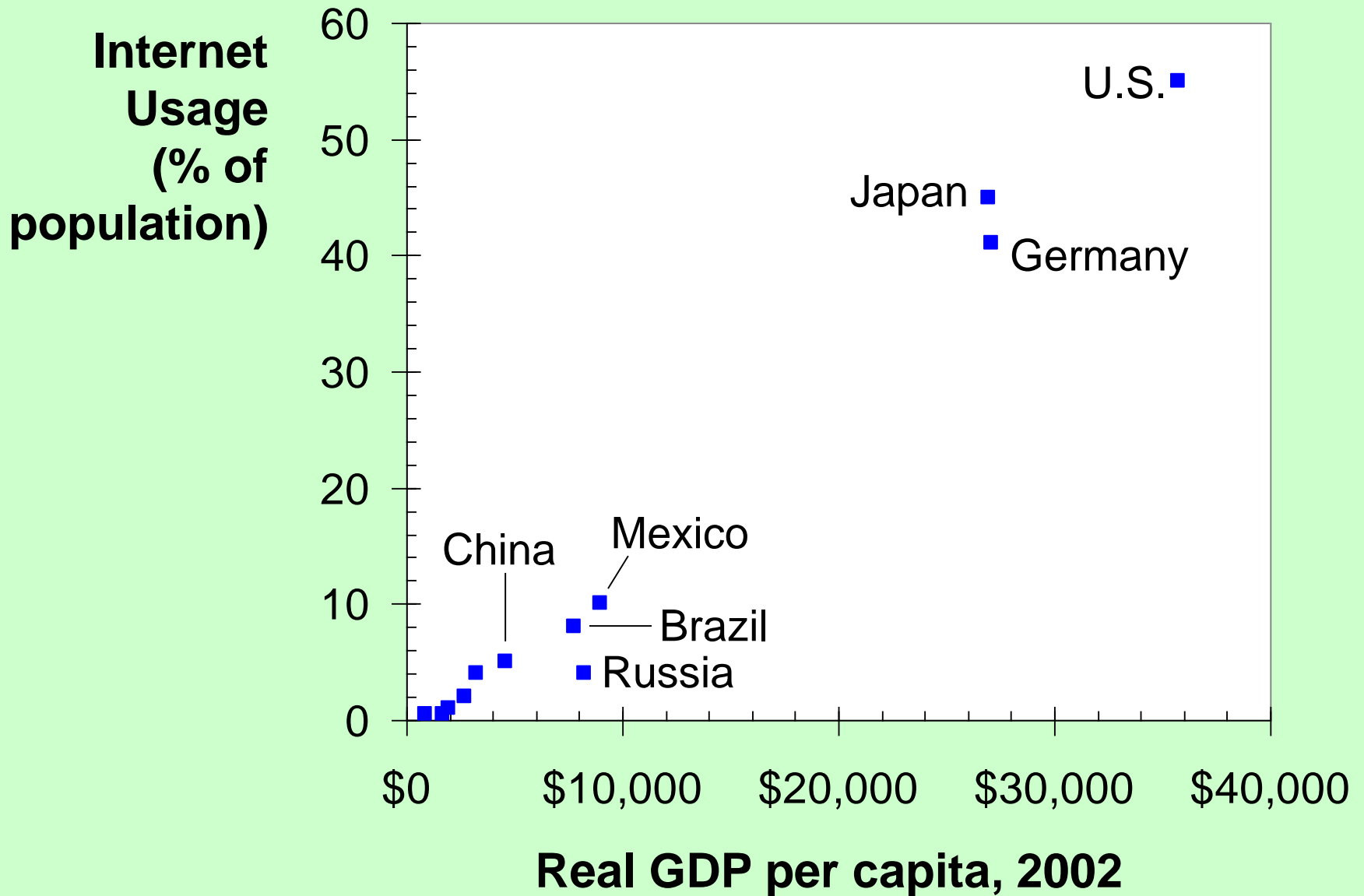- Many indicators of the quality of life are positively correlated with GDP. For example…

GDP and Adult Literacy in 12 Countries

Adult Literacy (% of population)

Real GDP per capita, 2002

GDP and Internet Usage in 12 Countries

Internet Usage (% of population)

Real GDP per capita, 2002

CHAPTER SUMMARY

- Gross Domestic Product (GDP) measures a country's total income and expenditure.

- The four spending components of GDP include: Consumption, Investment, Government Purchases, and Net Exports.

- Nominal GDP is measured using current prices. Real GDP is measured using the prices of a constant base year, and is corrected for inflation.

- GDP is the main indicator of a country's economic well-being, even though it is not perfect.

24 Measuring the Cost of Living

PRINCIPLES OF

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In this chapter, look for the answers to these questions:

- What is the Consumer Price Index (CPI)? How is it calculated? What's it used for?

- What are the problems with the CPI? How serious are they?

- How does the CPI differ from the GDP deflator?

- How can we use the CPI to compare dollar amounts from different years? Why would we want to do this, anyway?

- How can we correct interest rates for inflation?

The Consumer Price Index (CPI)

- Measures the typical consumer's cost of living.

- The basis of cost of living adjustments (COLAs) in many contracts and in Social Security.

How the CPI Is Calculated

1. ***Fix the "basket."***
   The Bureau of Labor Statistics (BLS) surveys consumers to determine what's in the typical consumer's "shopping basket."

2. ***Find the prices.***
   The BLS collects data on the prices of all the goods in the basket.

3. ***Compute the basket's cost.***
   Use the prices to compute the total cost of the basket.

How the CPI Is Calculated

4. ***Choose a base year and compute the index.***
The CPI in any year equals

$$100 \times \frac{\text{cost of basket in current year}}{\text{cost of basket in base year}}$$

5. ***Compute the inflation rate.***
The percentage change in the CPI from the preceding period.

$$\frac{\text{inflation}}{\text{rate}} = \frac{\text{CPI this year} - \text{CPI last year}}{\text{CPI last year}} \times 100\%$$

EXAMPLE

basket: {4 pizzas, 10 lattes}

year	price of pizza	price of latte	cost of basket
2003	$10	$2.00	$10 x 4 + $2 x 10 = $60
2004	$11	$2.50	$11 x 4 + $2.5 x 10 = $69
2005	$12	$3.00	$12 x 4 + $3 x 10 = $78

Compute CPI in each year:

Inflation rate:

2003:   100 x ($60/$60) = 100

15%

2004:   100 x ($69/$60) = 115

13%

2005:   100 x ($78/$60) = 130

Calculate the CPI

The basket contains 20 movie tickets and 10 textbooks.

The table shows their prices for 2004-2006.

The base year is 2004.

	movie tickets	text-books
2004	$10	$50
2005	$10	$60
2006	$12	$60

A. How much did the basket cost in 2004?

B. What is the CPI in 2005?

C. What is the inflation rate from 2005-2006?

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ACTIVE LEARNING 1:
Answers

The basket contains 20 movie tickets and 10 textbooks.

	movie tickets	text-books
2004	$10	$50
2005	$10	$60
2006	$12	$60

A. How much did the basket cost in 2004?

($10 x 20) + ($50 x 10) = $700

ACTIVE LEARNING 1: Answers

The basket contains 20 movie tickets and 10 textbooks.

	movie tickets	text-books
2004	$10	$50
2005	$10	$60
2006	$12	$60

B. What is the CPI in 2005?

cost of basket in 2005
= ($10 x 20) + ($60 x 10) = $800

CPI in 2005 = 100 x ($800/$700) = 114.3

ACTIVE LEARNING 1: Answers

The basket contains 20 movie tickets and 10 textbooks.

	movie tickets	text-books
2004	$10	$50
2005	$10	$60
2006	$12	$60

C. What is the inflation rate from 2005-2006?

cost of basket in 2006

= ($12 x 20) + ($60 x 10) = $840

CPI in 2006 = 100 x ($840/$700) = 120

Inflation rate = (120 – 114.3)/114.3 = 5%

What's in the CPI's Basket?

Legend:
- Housing — 42%
- Transportation — 17%
- Food & Beverages — 15%
- Medical care — 6%
- Recreation — 6%
- Education and communication — 6%
- Apparel — 4%
- Other — 4%
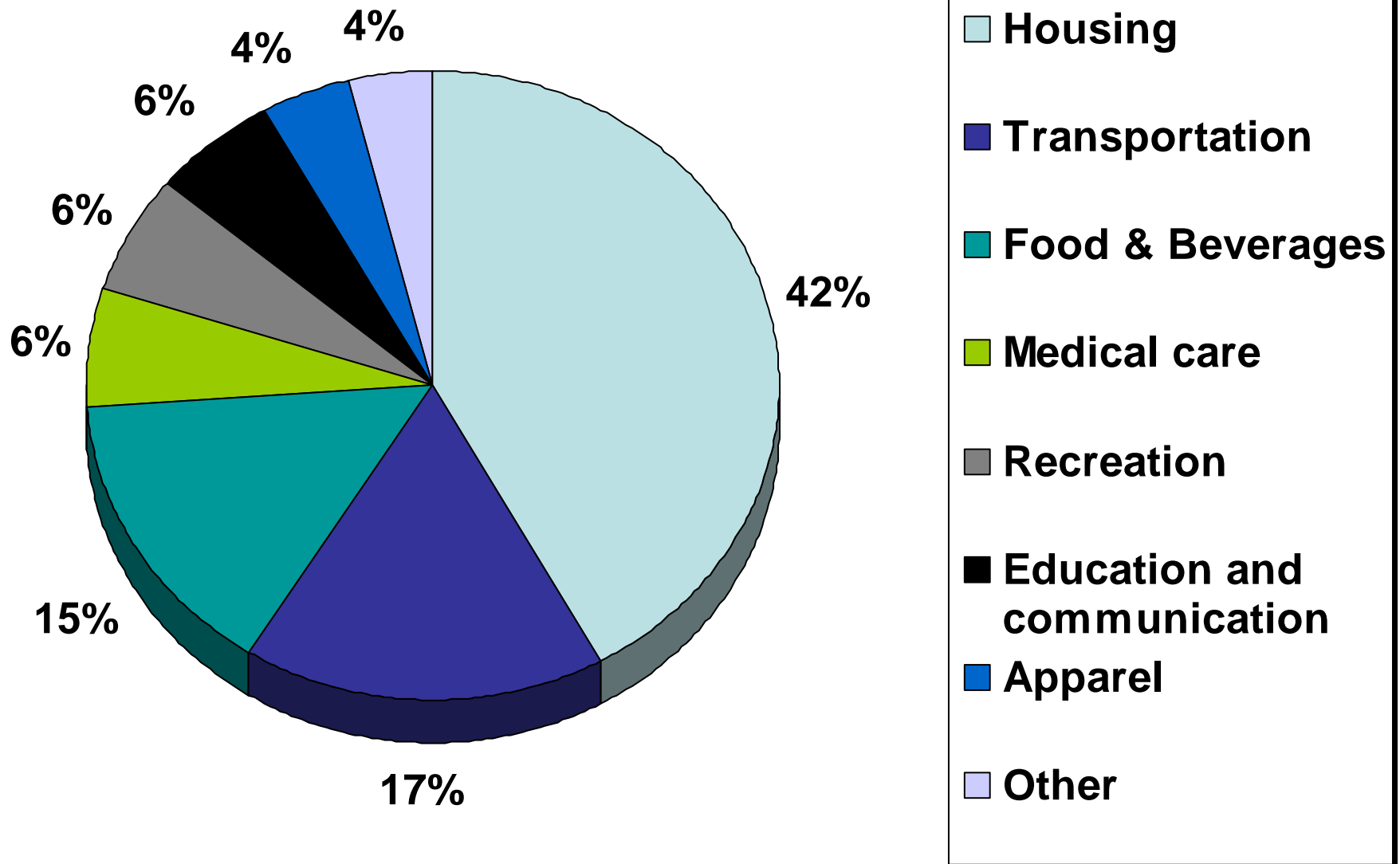
Problems With the CPI:
Substitution Bias

- Over time, some prices rise faster than others.

- Consumers substitute toward goods that become relatively cheaper.

- The CPI misses this substitution because it uses a fixed basket of goods.

- Thus, the CPI overstates increases in the cost of living.

Problems With the CPI:
Introduction of New Goods

- When new goods become available, variety increases,
  allowing consumers to find products that more closely meet their needs.

- This has the effect of making each dollar more valuable.

- The CPI misses this effect because it uses a fixed basket of goods.

- Thus, the CPI overstates increases in the cost of living.

Problems With the CPI:
Unmeasured Quality Change

- Improvements in the quality of goods in the basket increase the value of each dollar.

- The BLS tries to account for quality changes, but probably misses some quality improvements, as quality is hard to measure.

- Thus, the CPI overstates increases in the cost of living.

Problems With the CPI

- Each of these problems causes the CPI to overstate cost of living increases.

- The BLS has made technical adjustments, but the CPI probably still overstates inflation by about 0.5 percent per year.

- This is important, because Social Security payments and many contracts have COLAs tied to the CPI.

Two Measures of Inflation
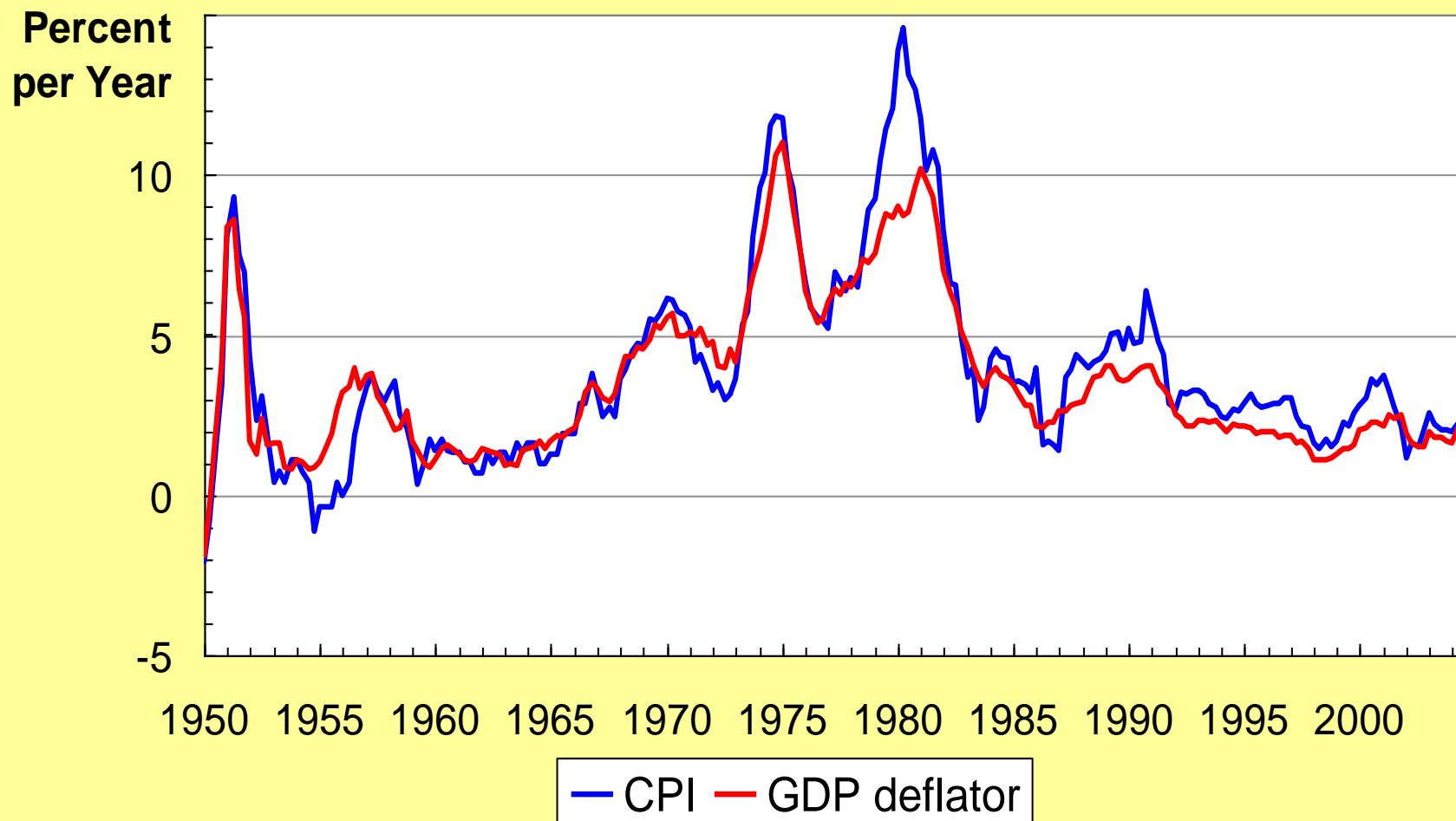
Contrasting the CPI and GDP Deflator

Imported consumer goods:
- included in CPI
- excluded from GDP deflator

Capital goods:
- excluded from CPI
- included in GDP deflator (if produced domestically)

The basket:
- CPI uses fixed basket
- GDP deflator uses basket of currently produced goods & services

This matters if different prices are changing by different amounts.

ACTIVE LEARNING 2:
CPI vs. GDP deflator

In each scenario, determine the effects on the CPI and the GDP deflator.

A. Starbucks raises the price of Frappuccinos.

B. Caterpillar raises the price of the industrial tractors it manufactures at its Illinois factory.

C. Armani raises the price of the Italian jeans it sells in the U.S.

ACTIVE LEARNING 2:
Answers

A. Starbucks raises the price of Frappuccinos.

The CPI and GDP deflator both rise.

B. Caterpillar raises the price of the industrial tractors it manufactures at its Illinois factory.

The GDP deflator rises, the CPI does not.

C. Armani raises the price of the Italian jeans it sells in the U.S.

The CPI rises, the GDP deflator does not.

Correcting Variables for Inflation:
Comparing Dollar Figures from Different Times

- Inflation makes it harder to compare dollar amounts from different times.

- We can use the CPI to adjust figures so that they can be compared.

EXAMPLE: The High Price of Gasoline

- Price of a gallon of regular unleaded gas:

  $1.42 in March 1981

  $2.50 in August 2005

- To compare these figures, we will use the CPI to express the 1981 gas price in "2005 dollars," what gas in 1981 would have cost if the cost of living were the same then as in 2005.

- Multiply the 1981 gas price by the ratio of the CPI in 2005 to the CPI in 1981.

EXAMPLE: The High Price of Gasoline

date	Price of gas	CPI	Gas price in 2005 dollars
3/1981	$1.42/gallon	88.5	$3.15/gallon
8/2005	$2.50/gallon	196.4	$2.50/gallon

- 1981 gas price in 2005 dollars

  = $1.42 x 196.4/88.5

  = $3.15

- After correcting for inflation, gas was more expensive in 1981.

Exercise

1980: CPI = 90,
    avg starting salary for econ majors = $24,000

Today: CPI = 180,
    avg starting salary for econ majors = $50,000

Are econ majors better off today or in 1980?

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Answers

1980: CPI = 90,
  avg starting salary for econ majors = $24,000

Today: CPI = 180,
  avg starting salary for econ majors = $50,000

Solution

Convert 1980 salary into "today's dollars"

$24,000 x (180/90) = $48,000.

After adjusting for inflation, salary is higher today than in 1980.

Correcting Variables for Inflation: Indexation

A dollar amount is **indexed** for inflation if it is automatically corrected for inflation by law or in a contract.

For example, the increase in the CPI automatically determines

- the COLA in many multi-year labor contracts
- the adjustments in Social Security payments and federal income tax brackets

Correcting Variables for Inflation:
Real vs. Nominal Interest Rates

The nominal interest rate:

- the interest rate <u>not</u> corrected for inflation
- the rate of growth in the dollar value of a deposit or debt

The real interest rate:

- corrected for inflation
- the rate of growth in the purchasing power of a deposit or debt

Real interest rate
   = (nominal interest rate) – (inflation rate)

Real and Nominal Interest Rates: EXAMPLE

- Deposit $1,000 for one year.

- Nominal interest rate is 9%.

- During that year, inflation is 3.5%.

- Real interest rate
    = Nominal interest rate – Inflation
    = 9.0% – 3.5%   = 5.5%

- The purchasing power of the $1000 deposit has grown 5.5%.

Real and Nominal Interest Rates in the U.S.
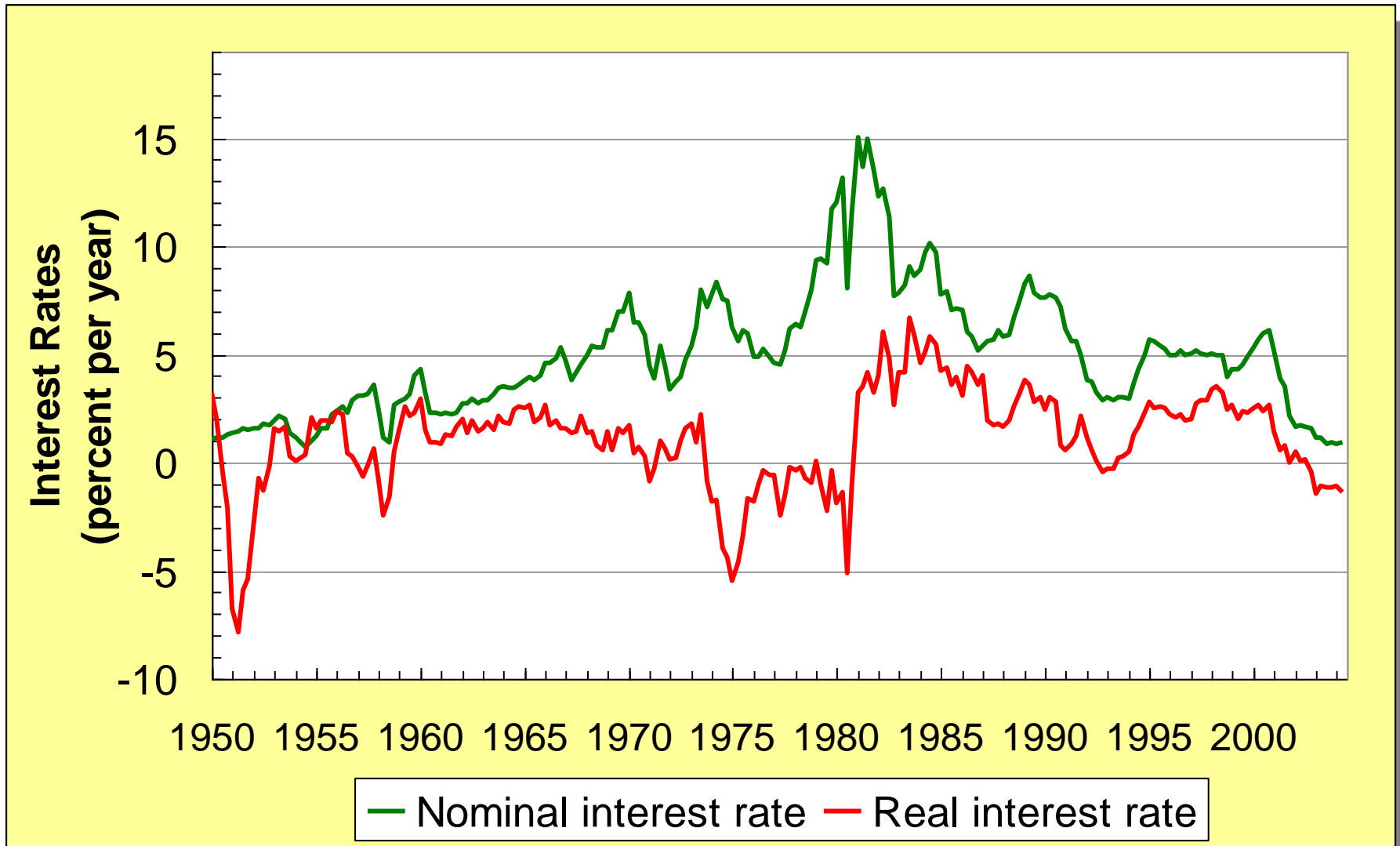
CHAPTER SUMMARY

- The Consumer Price Index is a measure of the cost of living. The CPI tracks the cost of the typical consumer's "basket" of goods & services.

- The CPI is used to make Cost of Living Adjustments, and to correct economic variables for the effects of inflation.

- The real interest rate is corrected for inflation, and is computed by subtracting the inflation rate from the nominal interest rate.

25 Production and Growth

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In this chapter, look for the answers to these questions:

- What are the facts about living standards and growth rates around the world?

- Why does productivity matter for living standards?

- What determines productivity and its growth rate?

- How can public policy affect growth and living standards?

A typical family with all their possessions in the U.K., an advanced economy
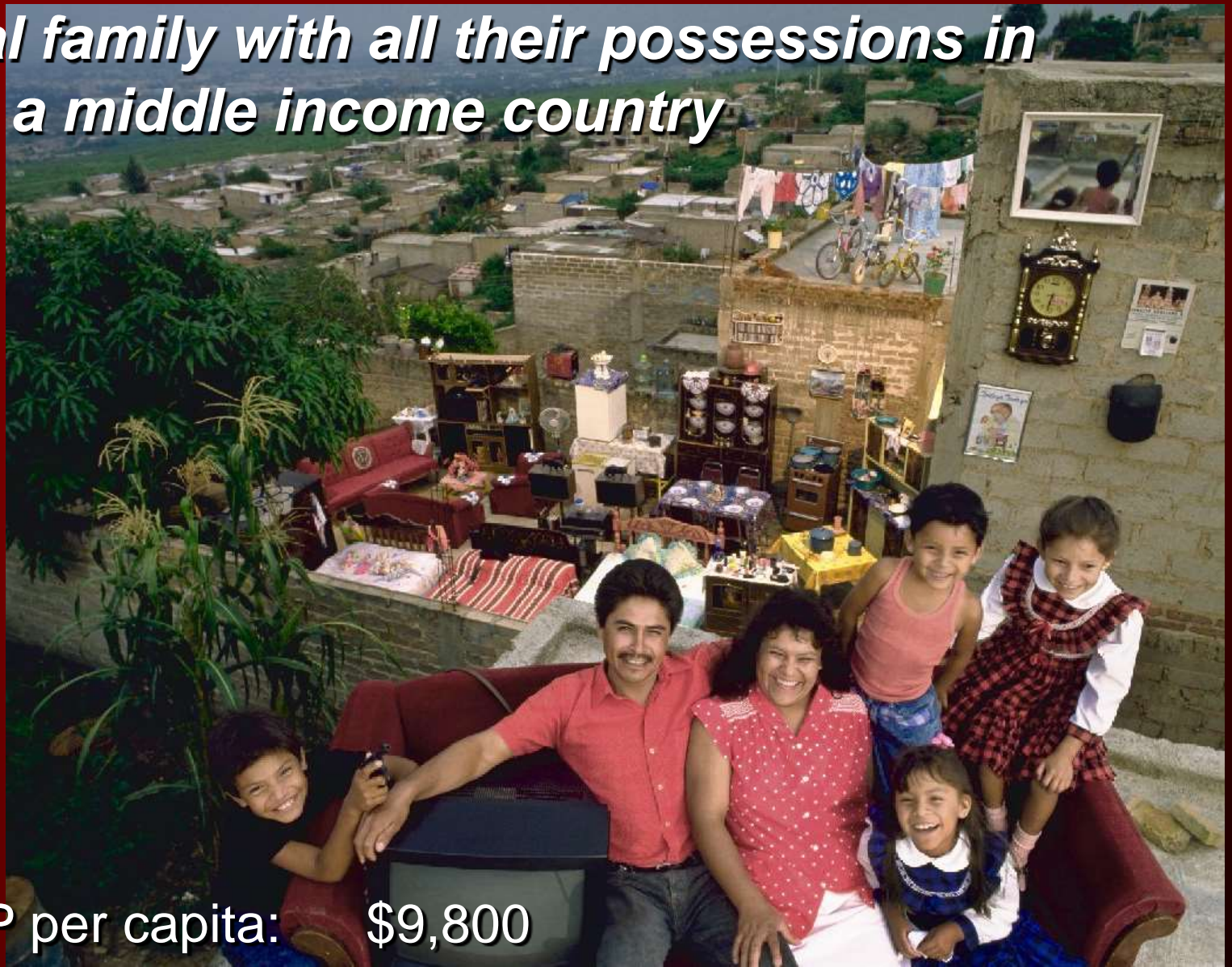
Real GDP per capita: $30,800
Life expectancy: 78 years
Adult literacy: 99%

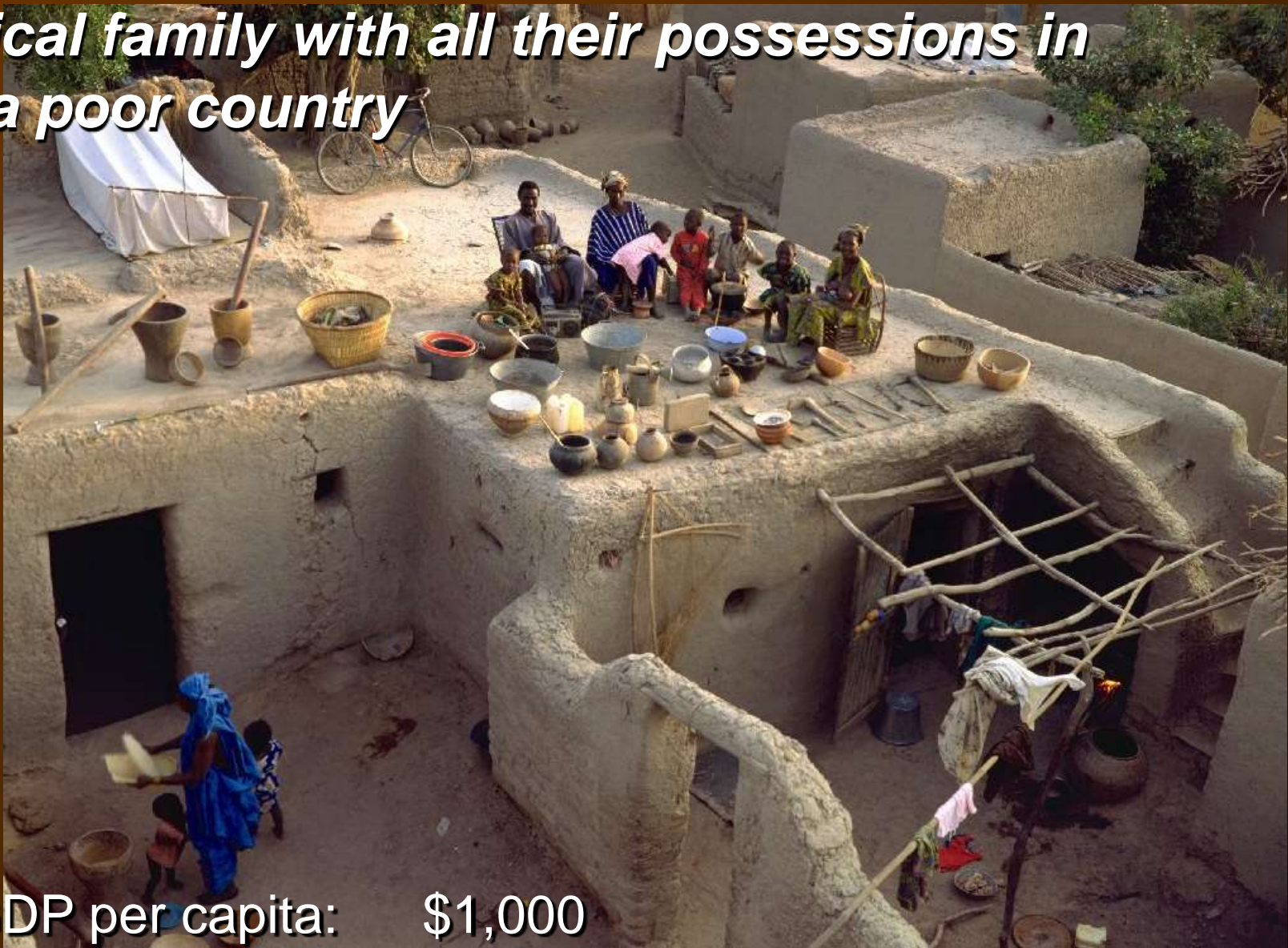A typical family with all their possessions in Mexico, a middle income country

Real GDP per capita: $9,800
Life expectancy: 74 years
Adult literacy: 92%

A typical family with all their possessions in Mali, a poor country

Real GDP per capita: $1,000
Life expectancy: 41 years
Adult literacy: 46%

Incomes and Growth Around the World

FACT 1:

There are vast differences in living standards around the world.

	GDP per capita, 2004		Growth rate, 1960-2004
China	$5,495		5.6%
Singapore	27,273		5.4%
Japan	29,539		3.9%
Spain	25,341		3.2%
Israel	24,082		2.6%
India	3,115		2.5%
United States	39,618		2.2%
Canada	31,129		2.1%
Colombia	7,121		1.8%
New Zealand	22,912		1.4%
Philippines	4,558		1.3%
Argentina	12,723		0.8%
Saudi Arabia	14,022		0.8%
Rwanda	1,326		0.2%
Haiti	1,685		–1.3%

Incomes and Growth Around the World

FACT 2:

There is also great variation in growth rates across countries.

	GDP per capita, 2004	Growth rate, 1960-2004
China	$5,495	5.6%
Singapore	27,273	5.4%
Japan	29,539	3.9%
Spain	25,341	3.2%
Israel	24,082	2.6%
India	3,115	2.5%
United States	39,618	2.2%
Canada	31,129	2.1%
Colombia	7,121	1.8%
New Zealand	22,912	1.4%
Philippines	4,558	1.3%
Argentina	12,723	0.8%
Saudi Arabia	14,022	0.8%
Rwanda	1,326	0.2%
Haiti	1,685	–1.3%

Incomes and Growth Around the World

Since growth rates vary, the country rankings can change over time:

- Poor countries are not necessarily doomed to poverty forever – *e.g.,* Singapore, incomes were low in 1960 and are quite high now.

- Rich countries can't take their status for granted: They may be overtaken by poorer but faster-growing countries.

Incomes and Growth Around the World

Questions:

- Why are some countries richer than others?

- Why do some countries grow quickly while others seem stuck in a poverty trap?

- What policies may help raise growth rates and long-run living standards?

Productivity

- Recall one of the Ten Principles from Chapter 1: *A country's standard of living depends on its ability to produce g & s.*

- This ability depends on **productivity**: the average quantity of g&s produced per unit of labor input.

- **Y** = real GDP = quantity of output produced
  L = quantity of labor
  so we can write productivity as
  Y/**L** (output per worker)

Why Productivity Is So Important

- When a nation's workers are very productive, real GDP is large and incomes are high.

- When productivity grows rapidly, so do living standards.

- What, then, determines productivity and its growth rate?

Physical Capital Per Worker

- Recall: The stock of equipment and structures used to produce g&s is called [**physical**] **capital**, denoted **K**.

- **K**/**L** = capital per worker.

- Productivity is higher when the average worker has more capital (machines, equipment, etc.).

- *i.e.*,
  an increase in **K**/**L** causes an increase in **Y**/**L**.

Human Capital Per Worker

- **Human capital** (**H**):
  the knowledge and skills workers acquire through education, training, and experience

- **H**/**L** = the average worker's human capital

- Productivity is higher when the average worker has more human capital (education, skills, etc.).

- *i.e.*,
  an increase in **H**/**L** causes an increase in **Y**/**L**.

Natural Resources Per Worker

- **Natural resources** (**N**): the inputs into production that nature provides, *e.g.,* land, mineral deposits

- Other things equal,
  more **N** allows a country to produce more **Y**.
  In per-worker terms,
  an increase in **N**/**L** causes an increase in **Y**/**L**.

- Some countries are rich because they have abundant natural resources
  (*e.g.,* Saudi Arabia has lots of oil)

- But countries need not have much **N** to be rich
  (*e.g.,* Japan imports the **N** it needs).

Technological Knowledge

- **Technological knowledge**: society's understanding of the best ways to produce g&s

- Technological progress does not only mean a faster computer, a higher-definition TV, or a smaller cell phone.

- It means any advance in knowledge that boosts productivity (allows society to get more output from its resources).
  - *e.g.*, Henry Ford and the assembly line.

Tech. Knowledge vs. Human Capital

- Technological knowledge refers to society's understanding of how to produce g&s.

- Human capital results from the effort people expend to acquire this knowledge.

- Both are important for productivity.

The Production Function

- The production function is a graph or equation showing the relation between output and inputs:

$$Y = A \, F(L, K, H, N)$$

  $F( )$ – a function that shows how inputs are combined to produce output

  "A" – the level of technology

- "A" multiplies the function $F( )$, so improvements in technology (increases in "A") allow more output (Y) to be produced from any given combination of inputs.

The Production Function

$$Y = A\ F(L, K, H, N)$$

- The production function has the property **constant returns to scale**: Changing all inputs by the same percentage causes output to change by that percentage. For example,

- Doubling all inputs (multiplying each by 2) causes output to double:

$$2Y = A\ F(2L, 2K, 2H, 2N)$$

- Increasing all inputs 10% (multiplying each by 1.1) causes output to increase by 10%:

$$1.1Y = A\ F(1.1L, 1.1K, 1.1H, 1.1N)$$

The Production Function

$$Y = A\ F(L, K, H, N)$$

- If we multiply each input by 1/**L**, then output is multiplied by 1/**L**:

$$Y/L = A\ F(1, K/L, H/L, N/L)$$

- This equation shows that productivity (output per worker) depends on:
  - the level of technology (**A**)
  - physical capital per worker
  - human capital per worker
  - natural resources per worker

Discussion question

Which of the following policies do you think would be most effective at boosting growth and living standards in a poor country over the long run?

a. offer tax incentives for investment by local firms

b. …by foreign firms

c. give cash payments for good school attendance

d. crack down on govt corruption

e. restrict imports to protect domestic industries

f. allow free trade

g. give away condoms

ECONOMIC GROWTH AND PUBLIC POLICY

Next, we look at the ways
public policy can affect
long-run growth in productivity
and living standards.

Saving and Investment

- We can boost productivity by increasing **K**, which requires investment.

- Since resources scarce, producing more capital requires producing fewer consumption goods.

- Reducing consumption = increasing saving. This extra saving funds the production of investment goods. *(More details in the next chapter.)*

- Hence, a tradeoff between current and future consumption.

Diminishing Returns and the Catch-Up Effect

- The govt can implement policies that raise saving and investment. *(Details in next chapter.)* Then **K** will rise, causing productivity and living standards to rise.

- But this faster growth is temporary, due to **diminishing returns to capital**: As **K** rises, the extra output from an additional unit of **K** falls….
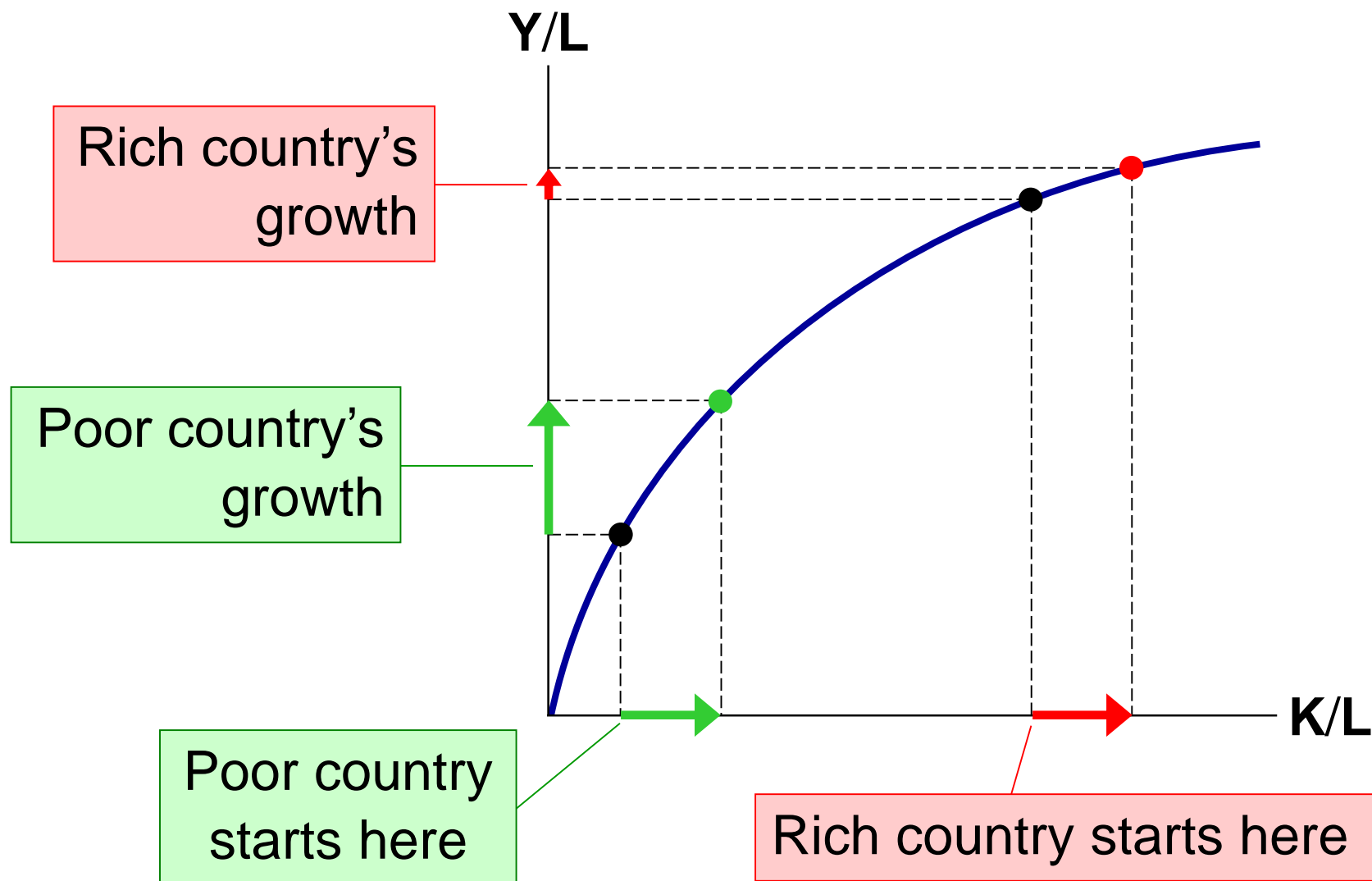
The Production Function & Diminishing Returns

If workers have little **K**, giving them more increases their productivity a lot.

If workers already have a lot of **K**, giving them more increases productivity fairly little.

Y/L

K/L

Capital per worker
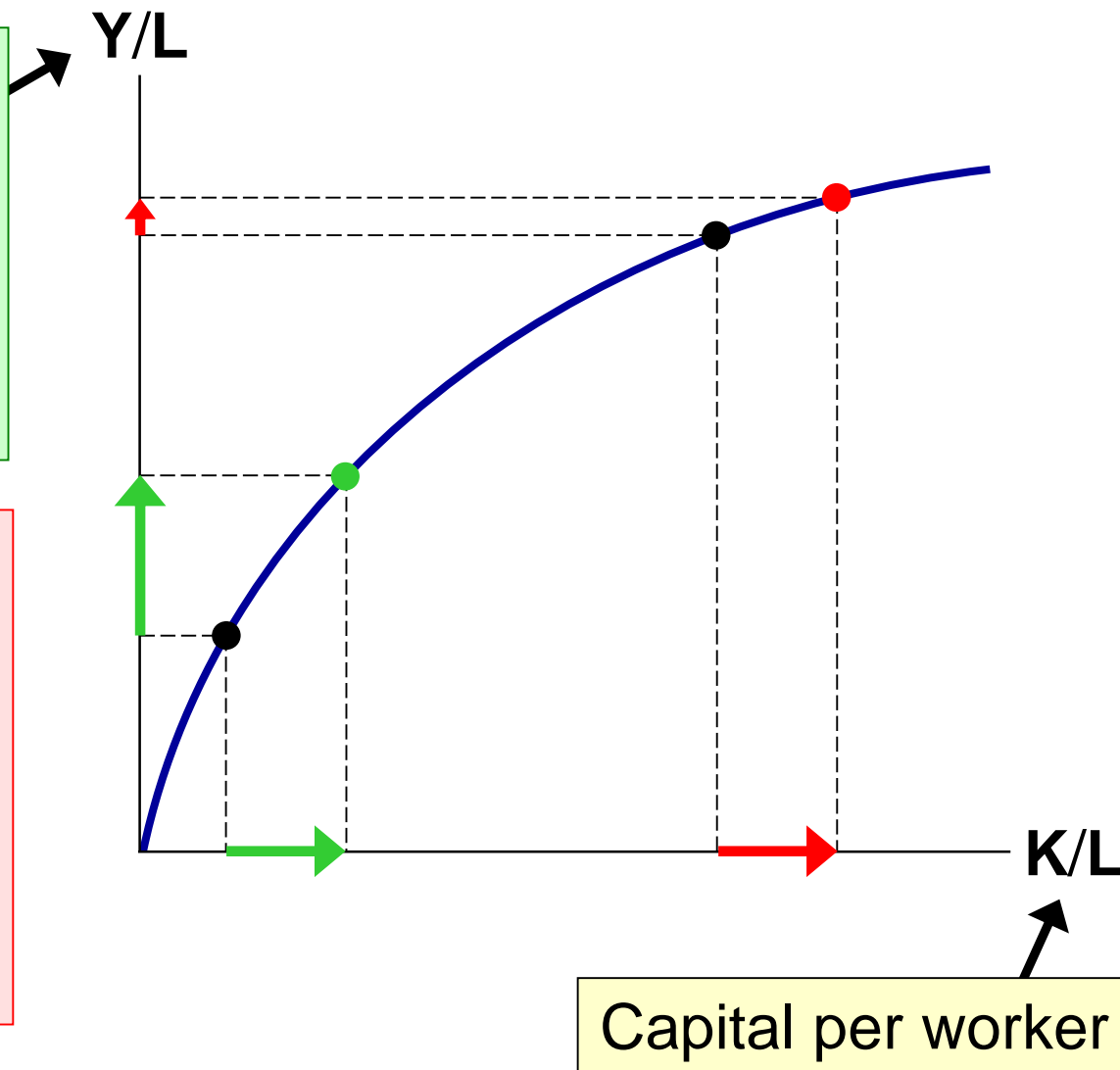
The catch-up effect: the property whereby poor countries tend to grow more rapidly than rich ones

Y/L

Rich country's growth

Poor country's growth

Poor country starts here

Rich country starts here

K/L

Example of the Catch-Up Effect

- Over 1960-1990, the U.S. and S. Korea devoted a similar share of GDP to investment, so you might expect they would have similar growth performance.

- But growth was >6% in Korea and only 2% in the U.S.

- Explanation: the catch-up effect. In 1960, **K**/**L** was far smaller in Korea than in the U.S., hence Korea grew faster.

Investment from Abroad

- To raise **K**/**L** and hence productivity, wages, and living standards, the govt can also encourage

    - **Foreign direct investment**:
      a capital investment (*e.g.*, factory) that is owned & operated by a foreign entity.

    - **Foreign portfolio investment**:
      a capital investment financed with foreign money but operated by domestic residents.

- Some of the returns from these investments flow back to the foreign countries that supplied the funds.

Investment from Abroad

- Especially beneficial in poor countries that cannot generate enough saving to fund investment projects themselves.

- Also helps poor countries learn state-of-the-art technologies developed in other countries.

Education

- Govt can increase productivity by promoting education–investment in human capital (**H**).
  - public schools, subsidized loans for college

- Education has significant effects: In the U.S., each year of schooling raises a worker's wage by 10%.

- But investing in **H** also involves a tradeoff between the present & future:
  Spending a year in school requires sacrificing a year's wages now to have higher wages later.

Health and Nutrition

- Health care expenditure is a type of investment in human capital – healthier workers are more productive.

- In countries with significant malnourishment, raising workers' caloric intake raises productivity:

  - Over 1962-95, caloric consumption rose 44% in S. Korea, and economic growth was spectacular.

  - Nobel winner Robert Fogel:
    30% of Great Britain's growth from 1790-1980 was due to improved nutrition.

Property Rights and Political Stability

- Recall: *Markets are usually a good way to organize economic activity.* The price system allocates resources to their most efficient uses.

- This requires respect for **property rights**, the ability of people to exercise authority over the resources they own.

Property Rights and Political Stability

- In many poor countries, the justice system doesn't work very well:

  - contracts aren't always enforced
  - fraud, corruption often go unpunished
  - in some, firms must bribe govt officials for permits

- Political instability (*e.g.,* frequent coups) creates uncertainty over whether property rights will be protected in the future.

Property Rights and Political Stability

- When people fear their capital may be stolen by criminals or confiscated by a corrupt govt, there is less investment, including from abroad, and the economy functions less efficiently. Result: lower living standards.

- Economic stability, efficiency, and healthy growth require law enforcement, effective courts, a stable constitution, and honest govt officials.

Free Trade

- **Inward-oriented policies** (*e.g.*, tariffs, limits on investment from abroad) aim to raise living standards by avoiding interaction with other countries.

- **Outward-oriented policies** (*e.g.*, the elimination of restrictions on trade or foreign investment) promote integration with the world economy.

Free Trade

- Recall: *Trade can make everyone better off.*

- Trade has similar effects as discovering new technologies – it improves productivity and living standards.

- Countries with inward-oriented policies have generally failed to create growth.
  - *e.g.,* Argentina during the 20th century.

- Countries with outward-oriented policies have often succeeded.
  - *e.g.,* South Korea, Singapore, Taiwan after 1960.

Research and Development

- Technological progress is the main reason why living standards rise over the long run.

- One reason is that knowledge is a **public good**: Ideas can be shared freely, increasing the productivity of many.

- Policies to promote tech. progress:
  - patent laws
  - tax incentives or direct support for private sector R&D
  - grants for basic research at universities

Population Growth

…may affect living standards in 3 different ways:

1. Stretching natural resources

- 200 years ago, Malthus argued that pop. growth would strain society's ability to provide for itself.

- Since then, the world population has increased sixfold. If Malthus was right, living standards would have fallen. Instead, they've risen.

- Malthus failed to account for technological progress and productivity growth.

Population Growth

2. Diluting the capital stock

- more population = higher **L** = lower **K**/**L** = lower productivity & living standards.

- This applies to **H** as well as **K**: fast pop. growth = more children = greater strain on educational system.

- Countries with fast pop. growth tend to have lower educational attainment.

Population Growth

2. Diluting the capital stock

To combat this, many developing countries use policy to control population growth.

- China's one child per family laws

- contraception education & availability

- promote female literacy to raise opportunity cost of having babies

Population Growth

3. Promoting tech. progress

- More people

    = more scientists, inventors, engineers

    = more frequent discoveries

    = faster tech. progress & economic growth

- Evidence from Michael Kremer:
  Over the course of human history,

  - growth rates increased as the world's population increased

  - more populated regions grew faster than less populated ones

ACTIVE LEARNING 2: Productivity

- List the determinants of productivity.

- List three policies that attempt to raise living standards by increasing one of the determinants of productivity.

Answers

Determinants of productivity:

physical capital per worker (**K**/**L**)

human capital per worker (**H**/**L**)

natural resources per worker (**N**/**L**)

technological knowledge (**A**)

Policies to boost productivity:

- Encourage saving and investment, to raise **K**/**L**

- Encourage investment from abroad, to raise **K**/**L**

- Provide public education, to raise **H**/**L**

ACTIVE LEARNING 2:
Answers

Determinants of productivity:

physical capital per worker (**K**/**L**)

human capital per worker (**H**/**L**)

natural resources per worker (**N**/**L**)

technological knowledge (**A**)

Policies to boost productivity:

- Patent laws or grants, to increase **A**

- Control population growth, to increase **K**/**L**

Are Natural Resources a Limit to Growth?

- Some argue that population growth is depleting the Earth's non-renewable resources, and thus will limit growth in living standards.

- But technological progress often yields ways to avoid these limits:

  - Hybrid cars use less gas.
  - Better insulation in homes reduces the energy required to heat or cool them.

- As a resource becomes scarcer, its market price rises, which increases the incentive to conserve it and develop alternatives.

CONCLUSION

- In the long run, living standards are determined by productivity.

- Policies that affect the determinants of productivity will therefore affect the next generation's living standards.

- One of these determinants is saving and investment.

- In the next chapter, we will learn how saving and investment are determined, and how policies can affect them.

CHAPTER SUMMARY

- There are great differences across countries in living standards and growth rates.

- Productivity (output per unit of labor) is the main determinant of living standards in the long run.

- Productivity depends on physical and human capital per worker, natural resources per worker, and technological knowledge.

- Growth in these factors – especially technological progress – causes growth in living standards over the long run.

CHAPTER SUMMARY

- Policies can affect the following, each of which has important effects on growth:
  - saving and investment
  - international trade
  - education, health & nutrition
  - property rights and political stability
  - research and development
  - population growth
- Because of diminishing returns to capital, growth from investment eventually slows down, and poor countries may "catch up" to rich ones.

26

Saving, Investment, and the Financial System

PRINCIPLES OF

ECONOMICS

FOURTH EDITION

N. GREGORY MANKIW

**PowerPoint® Slides
by Ron Cronovich**

In this chapter, look for the answers to these questions:

- What are the main types of financial institutions in the U.S. economy, and what is their function?

- What are the three kinds of saving?

- What's the difference between saving and investment?

- How does the financial system coordinate saving and investment?

- How do govt policies affect saving, investment, and the interest rate?

Financial Institutions

- The **financial system**: the group of institutions that helps match the saving of one person with the investment of another.

- **Financial markets**: institutions through which savers can <u>directly</u> provide funds to borrowers.
Examples:

  - The Bond Market.
    A **bond** is a certificate of indebtedness.

  - The Stock Market.
    A **stock** is a claim to partial ownership in a firm.

Financial Institutions

■ **Financial intermediaries**: institutions through which savers can <u>indirectly</u> provide funds to borrowers. Examples:

- Banks

- **Mutual funds** – institutions that sell shares to the public and use the proceeds to buy portfolios of stocks and bonds

Different Kinds of Saving

Private saving

= The portion of households' income that is not used for consumption or paying taxes

= **Y − T − C**

Public saving

= Tax revenue less government spending

= **T − G**

National Saving

National saving

= private saving + public saving

= $(Y - T - C) + (T - G)$

= $Y - C - G$

= the portion of national income that is not used for consumption or government purchases

Saving and Investment

Recall the national income accounting identity:

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

For the rest of this chapter, focus on the closed economy case:

$$Y = C + I + G$$

Solve for I:

national saving

$$I = Y - C - G = (Y - T - C) + (T - G)$$

Saving = investment in a closed economy

Budget Deficits and Surpluses

Budget surplus

= an excess of tax revenue over govt spending

= **T − G**

= public saving

Budget deficit

= a shortfall of tax revenue from govt spending

= **G − T**

= − (public saving)

Exercise

- Suppose GDP equals $10 trillion, consumption equals $6.5 trillion, the government spends $2 trillion and has a budget deficit of $300 billion.

- Find public saving, taxes, private saving, national saving, and investment.

ACTIVE LEARNING 1:
Answers

Given:
   $Y = 10.0$, $C = 6.5$, $G = 2.0$, $G - T = 0.3$

Public saving   = $T - G$ = $- 0.3$

Taxes: $T = G - 0.3 = 1.7$

Private saving = $Y - T - C = 10 - 1.7 - 6.5 = 1.8$

National saving = $Y - C - G = 10 - 6.5 = 2 = 1.5$

Investment = national saving = 1.5

Exercise

- Now suppose the government cuts taxes by $200 billion.

- In each of the following two scenarios, determine what happens to public saving, private saving, national saving, and investment.

    1. Consumers save the full proceeds of the tax cut.

    2. Consumers save 1/4 of the tax cut and spend the other 3/4.

Answers

In both scenarios, public saving falls by $200 billion, and the budget deficit rises from $300 billion to $500 billion.

1. If consumers save the full $200 billion, national saving is unchanged, so investment is unchanged.

2. If consumers save $50 billion and spend $150 billion, then national saving and investment each fall by $150 billion.

ACTIVE LEARNING 1C:
Discussion questions

The two scenarios are:

1. Consumers save the full proceeds of the tax cut.

2. Consumers save 1/4 of the tax cut and spend the other 3/4.

- Which of these two scenarios do you think is the most realistic?

- Why is this question important?

The Meaning of Saving and Investment

- **Private saving** is the income remaining after households pay their taxes and pay for consumption.

- Examples of what households do with saving:
  - buy corporate bonds or equities
  - purchase a certificate of deposit at the bank
  - buy shares of a mutual fund
  - let accumulate in saving or checking accounts

The Meaning of Saving and Investment

- **Investment** is the purchase of new capital.

- Examples of investment:

  - General Motors spends $250 million to build a new factory in Flint, Michigan.

  - You buy $5000 worth of computer equipment for your business.

  - Your parents spend $300,000 to have a new house built.

Remember: In economics, investment is NOT the purchase of stocks and bonds!

The Market for Loanable Funds

- A supply-demand model of the financial system.

- Helps us understand
  - how the financial system coordinates saving & investment
  - how govt policies and other factors affect saving, investment, the interest rate

The Market for Loanable Funds

Assume: only one financial market.

- All savers deposit their saving in this market.

- All borrowers take out loans from this market.

- There is one interest rate, which is both the return to saving and the cost of borrowing.

The Market for Loanable Funds

The supply of loanable funds comes from saving:

- Households with extra income can loan it out and earn interest.

- Public saving, if positive, adds to national saving and the supply of loanable funds.

  If negative, it reduces national saving and the supply of loanable funds.

The Slope of the Supply Curve

Interest Rate

Supply

6%

3%

60   80   **Loanable Funds ($billions)**
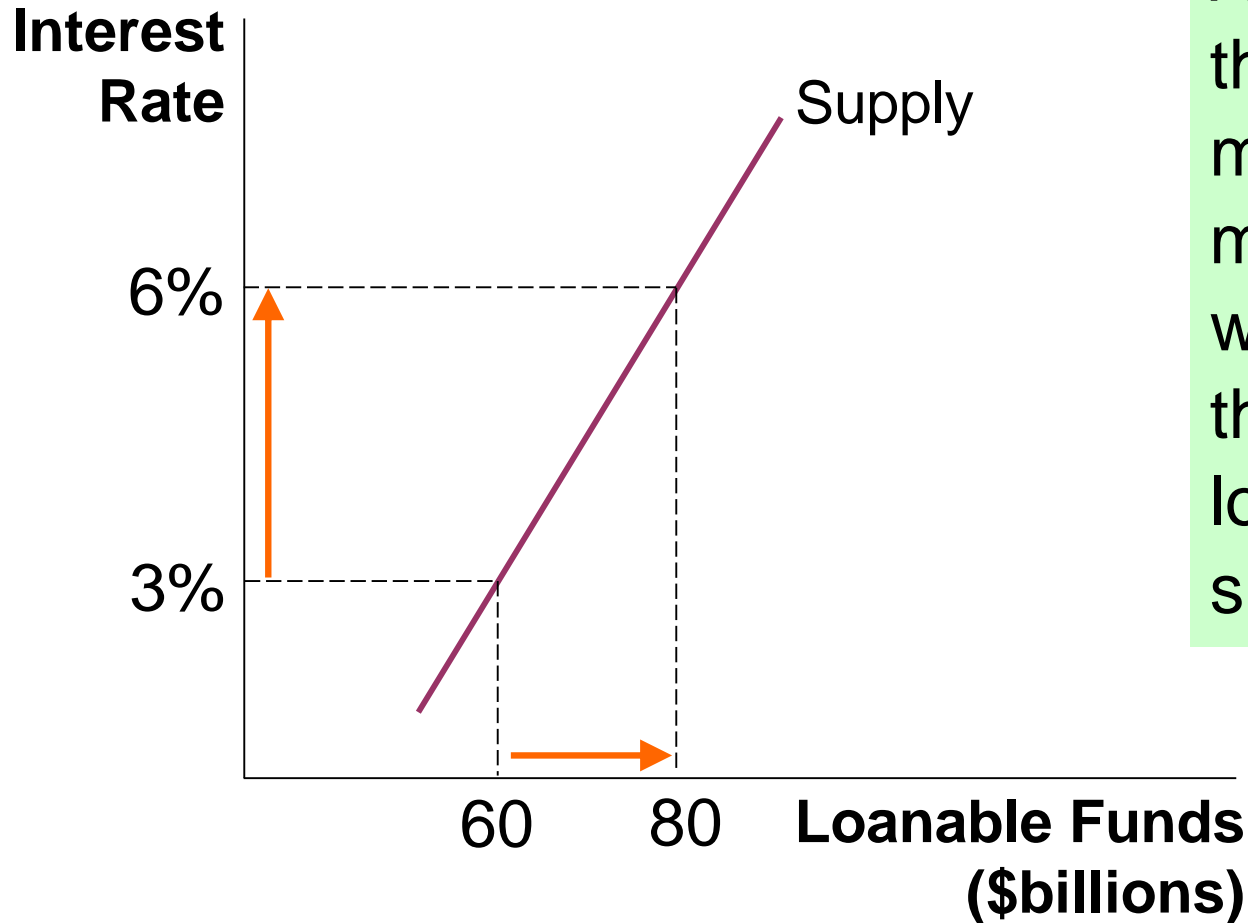
An increase in the interest rate makes saving more attractive, which increases the quantity of loanable funds supplied.

The Market for Loanable Funds
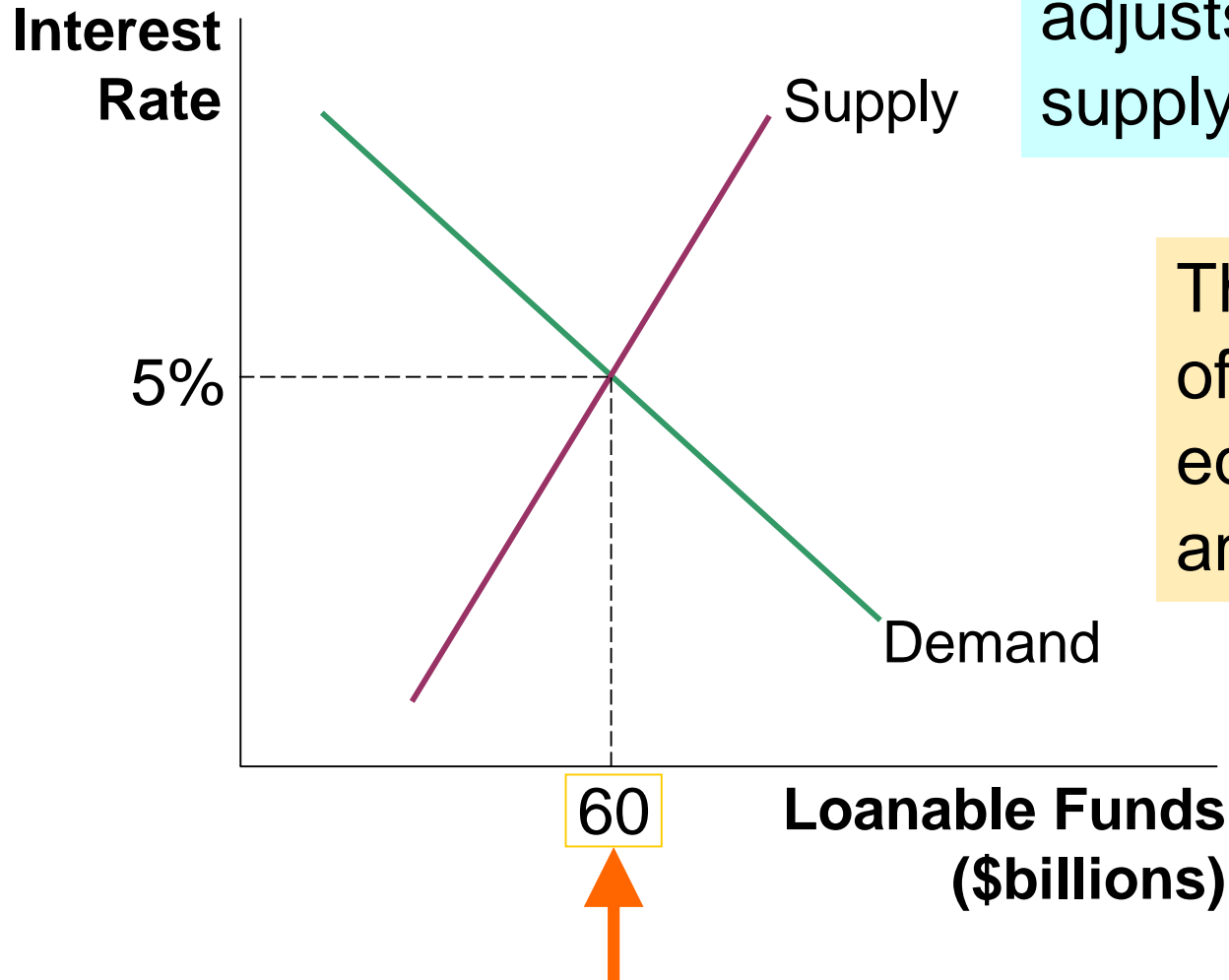
The demand for loanable funds comes from investment:

- Firms borrow the funds they need to pay for new equipment, factories, etc.
- Households borrow the funds they need to purchase new houses.

The Slope of the Demand Curve
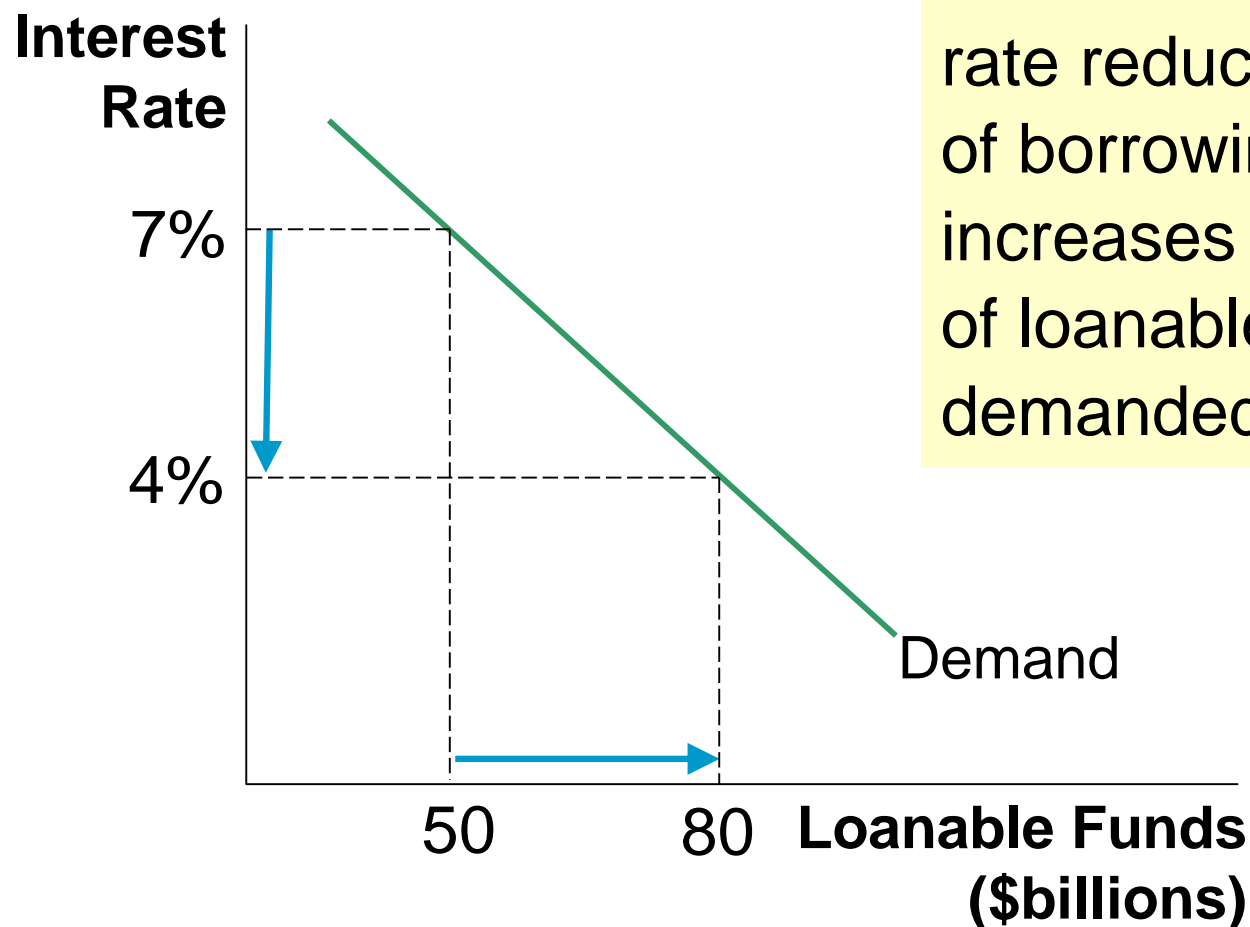
A fall in the interest rate reduces the cost of borrowing, which increases the quantity of loanable funds demanded.
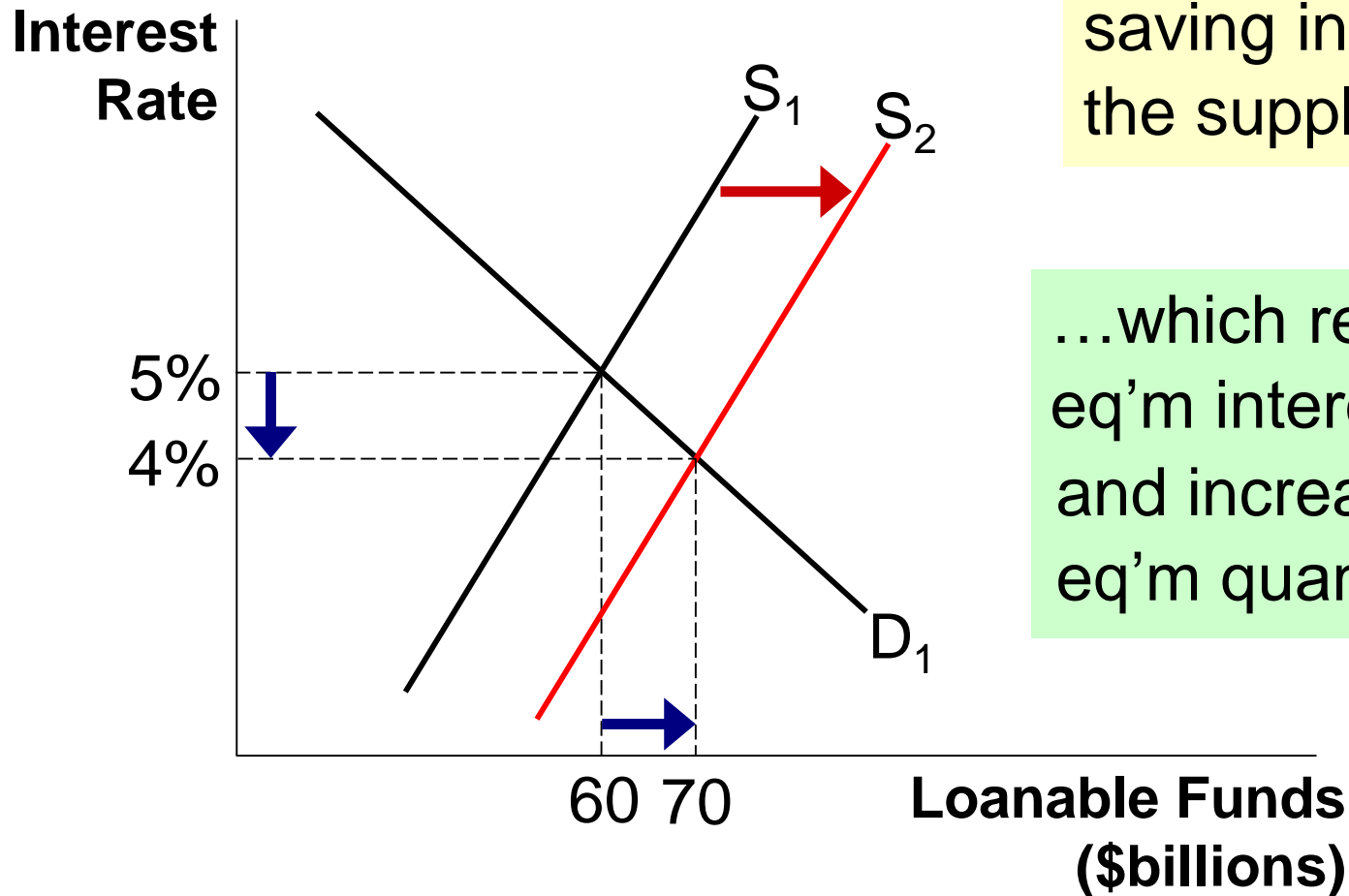
Equilibrium

Interest
Rate

Supply

The interest rate adjusts to equate supply and demand.

5%

The eq'm quantity of L.F. equals eq'm investment and eq'm saving.

Demand

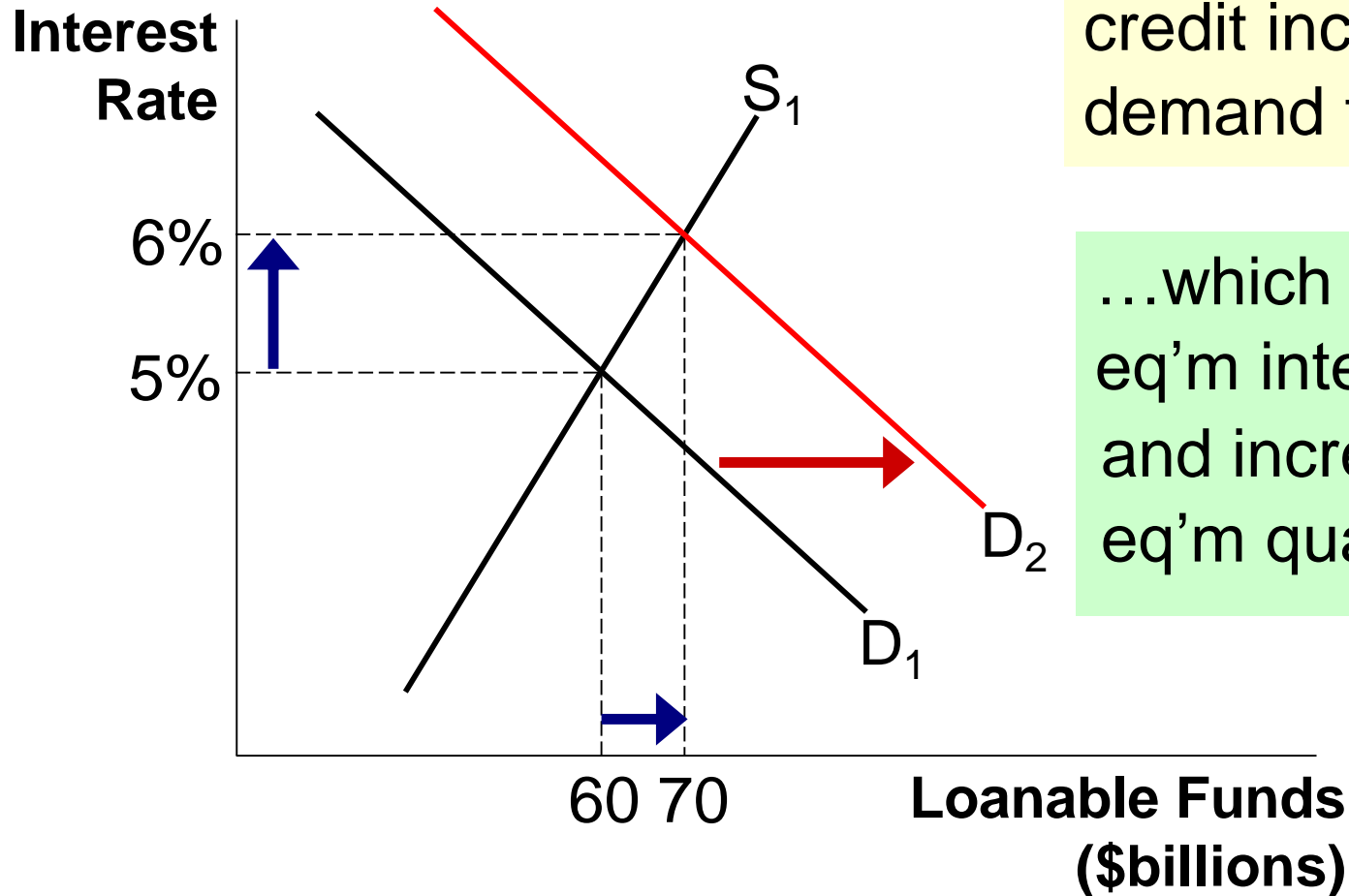60   Loanable Funds
      ($billions)

Policy 1: Saving Incentives

Tax incentives for saving increase the supply of L.F.

…which reduces the eq'm interest rate and increases the eq'm quantity of L.F.

Policy 2: Investment Incentives

An investment tax credit increases the demand for L.F.

…which raises the eq'm interest rate and increases the eq'm quantity of L.F.

Exercise

Use the loanable funds model to analyze the effects of a government budget deficit:

- Draw the diagram showing the initial equilibrium.

- Determine which curve shifts when the government runs a budget deficit.

- Draw the new curve on your diagram.

- What happens to the equilibrium values of the interest rate and investment?

ACTIVE LEARNING 2:
Answers

A budget deficit reduces national saving and the supply of L.F.

…which increases the eq'm interest rate and decreases the eq'm quantity of L.F. and investment.
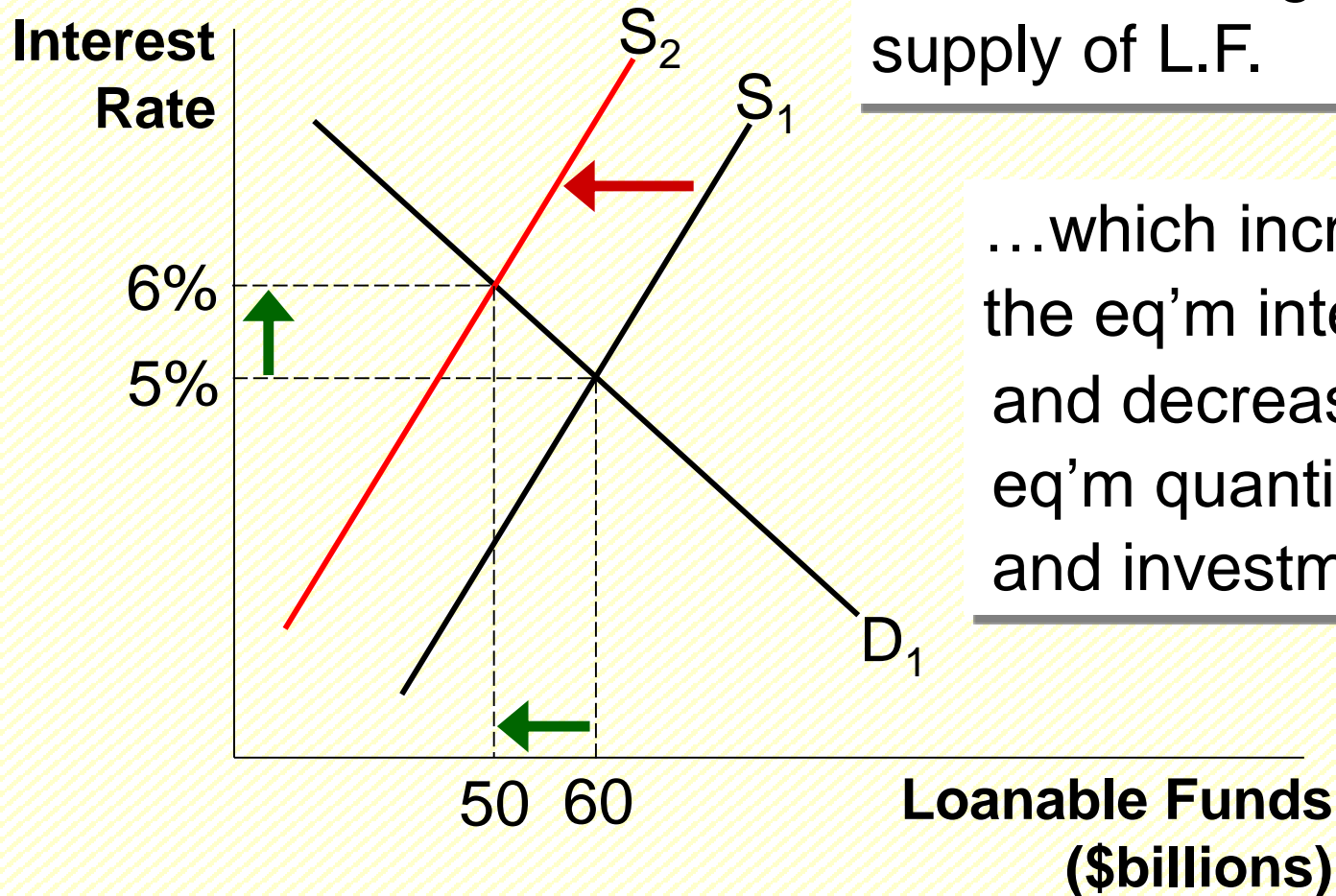
Budget Deficits, Crowding Out, and Long-Run Growth

- Our analysis: increase in budget deficit causes fall in investment.
  The govt borrows to finance its deficit, leaving less funds available for investment.

- This is called **crowding out**.

- Recall from the preceding chapter: Investment is important for long-run economic growth. Hence, budget deficits reduce the economy's growth rate and future standard of living.

The U.S. Government Debt

- The government finances deficits by borrowing (selling government bonds).

- Persistent deficits lead to a rising govt debt.

- The ratio of govt debt to GDP is a useful measure of the government's indebtedness relative to its ability to raise tax revenue.

- Historically, the debt-GDP ratio usually rises during wartime and falls during peacetime – until the early 1980s.

U.S. Government Debt
as a Percentage of GDP, 1970-2005
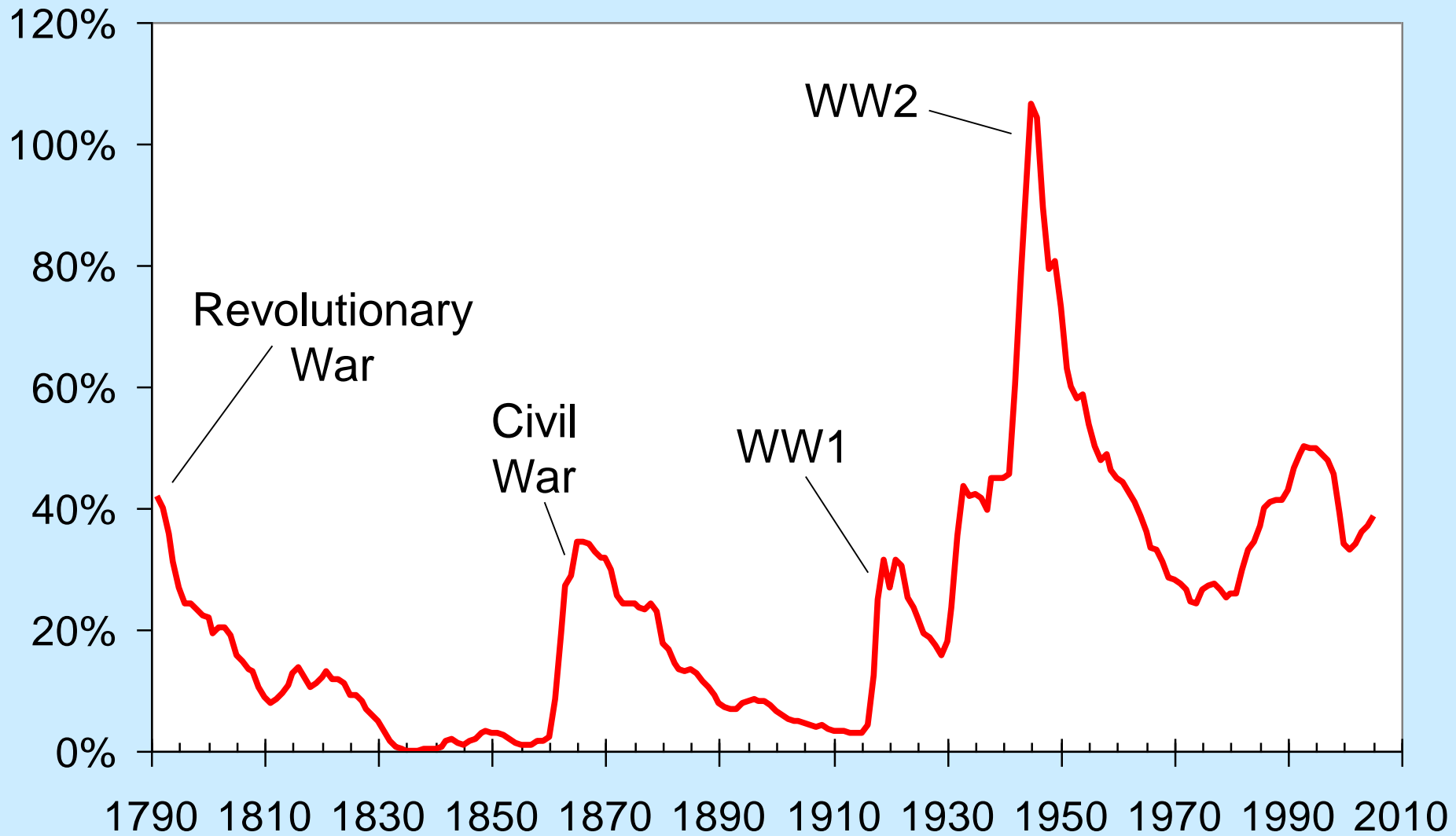
CONCLUSION

- Like many other markets, financial markets are governed by the forces of supply and demand.

- One of the Ten Principles from Chapter 1:
  *Markets are usually a good way
  to organize economic activity.*
  Financial markets help allocate the economy's scarce resources to their most efficient uses.

- Financial markets also link the present to the future: They enable savers to convert current income into future purchasing power, and borrowers to acquire capital to produce goods and services in the future.

CHAPTER SUMMARY

- The U.S. financial system is made up of many types of financial institutions, like the stock and bond markets, banks, and mutual funds.

- National saving equals private saving plus public saving.

- In a closed economy, national saving equals investment. The financial system makes this happen.

CHAPTER SUMMARY

- The supply of loanable funds comes from saving. The demand for funds comes from investment. The interest rate adjusts to balance supply and demand in the loanable funds market.

- A government budget deficit is negative public saving, so it reduces national saving, the supply of funds available to finance investment.

- When a budget deficit crowds out investment, it reduces the growth of productivity and GDP.