

# Finance-Interest Rates-Long-Run Economic Growth

- › Financial Markets: Bond and Interest Rates
- › Direct and Indirect Financing
- › Banking Regulation: From Glass-Steagall Act to Dodd-Frank Act
- › Long-run economic growth : Rule 70, and Compound Growth
- › Convergence hypothesis vs. Divergence hypothesis
- › Sustainability and the challenges to economic growth

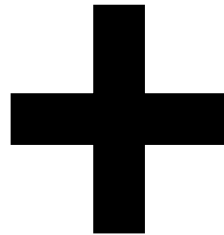
# The Necessity of Finance

Having a good idea isn't enough to build a business.

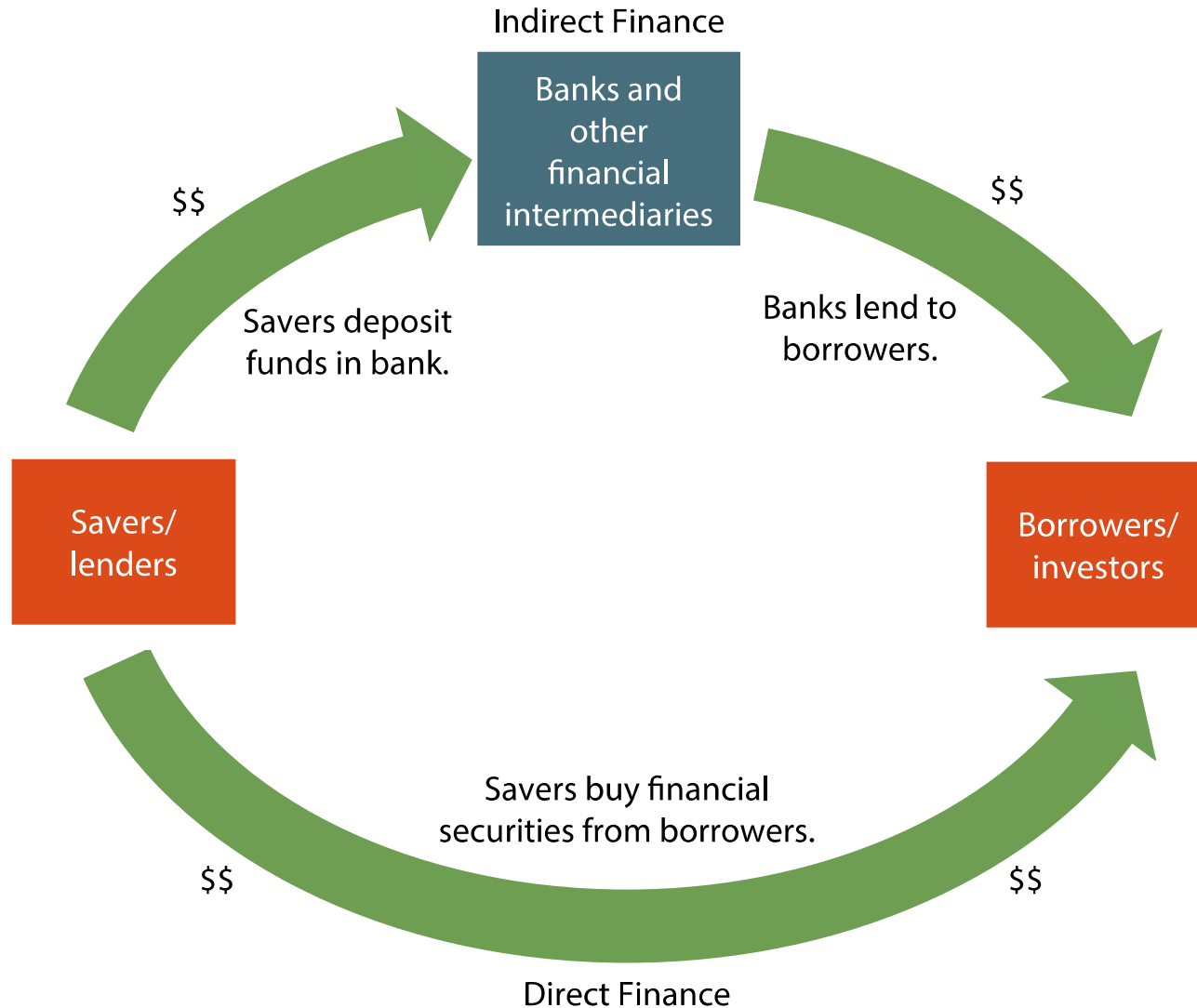
-Entrepreneurs need funds:

You have to spend money to make money.

- Indirect Finance (via Banks) v. Direct Financing (via stocks/bonds)



# Direct versus Indirect Finance



# How Do Financial Markets Help the Economy?



## Financial intermediaries

Banks (depository banks v. investment banks)

## Banks' Roles/Tasks:

- Reduce Transaction costs*

- Reduce Risk:* Uncertainty - financial losses or gains.

  - Diversification:* investing in several assets.

- Provide Liquidity*

  - accept deposits and extend loans

  - connect borrowers (demanders) with the savers (suppliers)



# The Evolution of the American Banking System

**1929 Great Depression: Property, Banking, Financial crisis**

**1932, the [Glass-Steagall Act](#)** separated banks into two categories:

**Commercial banks:** depository banks that accepted deposits and were covered by deposit insurance.

**Investment banks:** banks which engaged in creating and trading financial assets (stocks and corporate bonds) but were not covered by FDIC (Federal Deposit Insurance ) because their activities were considered riskier.

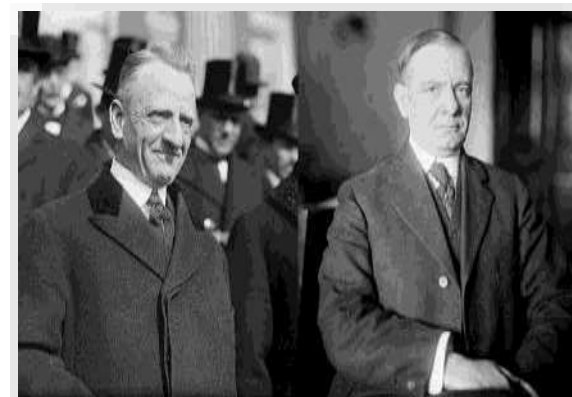
**1998: Gramm-Leach-Bliley Act:** eliminating the barriers between commercial banks, securities, investment banks, and insurance.

**-Repeal of Glass-Steagall Act**

**2008 Housing crisis – Lehman Brothers – Banking**

**2010: Dodd-Frank Act:**

**Wall Street Reform and Consumer Protection Act**



*Sen. Carter Glass (D-Va.) and Rep. Henry B. Steagall (D-Ala.)*

# Bond as a Formal IOU

Bonds are used by large established firms when they need an infusion of money

Bonds are issued and sold to the public

This is an example of direct finance

Funds generated are used for investment

## Information on Every Bond

**I, Kara Alexis, owe you \$10,000.**

**I will pay you on February 20, 2015.**

**Today's date: February 20, 2014.**

*Kara Alexis*

1. Name of borrower
2. Repayment date  
(Maturity date)
3. Amount due at  
repayment  
(Face value)

# Simple Interest Rate Formula

$$\text{Interest Rate} = \frac{\text{Face Value} - \text{Price at Inception}}{\text{Price at Inception}}$$

$$\text{Interest} = (F - P) / P$$

## Bond buyers (savers)

look for the highest interest rates.

They want the highest return on their money.

They want to pay the lowest price at inception.

## Bond sellers/issuers (lenders)

try to sell bonds at the lowest interest rate possible.

They want to sell the bonds at an inception price that is very close to the face value.

# Two Bond Price Principles

1. The dollar price of a bond determines its interest rate (and vice versa).
2. The dollar price and interest rate of a bond move opposite one another.

Consider the following table to the right. A **\$10,000 bond** is being offered. This means that bond will pay \$10,000 at maturity. If the bond is bought at a lower dollar price (at inception), it means the interest rate is higher.

Dollar Price	Interest Rate
\$9,000	11%
\$8,000	25%
\$7,500	33%
\$5,000	100%



# SIMPLE Interest

$$\text{Interest} = i = (F - P) / P$$

i.  $P = (F - P) \rightarrow$  in one year/period

i.P.n. =  $(F - P) \rightarrow$  in n number of years

$$\text{Total interest earned} = P \cdot i \cdot n$$

$$F = P + P \cdot i \cdot n$$

Where  $P$  = Principal

$i$  = Simple annual interest rate, in a year

$n$  = Number of years

Where  $F$  = Amount due at the end of n years

**Loan of \$5,000 for 5 yrs at simple interest rate of 8%**

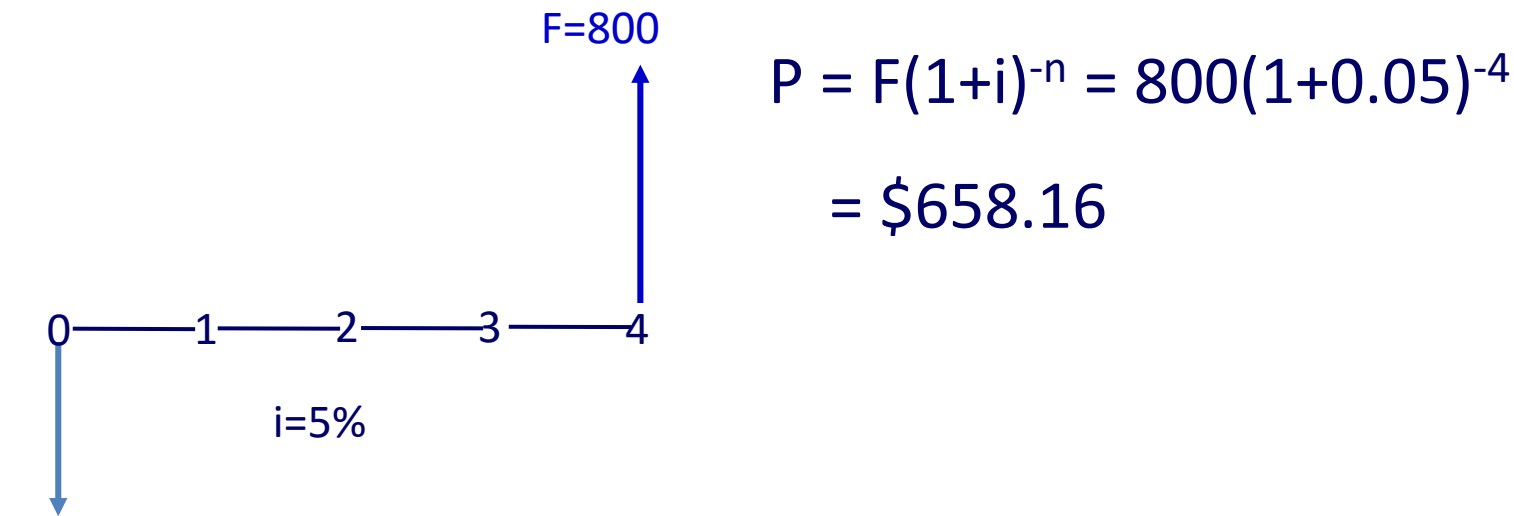
$$\text{Total interest earned} = \$5,000(8\%)(5) = \$2,000$$

But, most interests are calculated in COMPOUND formula.

# Single Payment COMPOUND Interest Formulas

$$F = P(1 + i)^n$$

Wish to have \$800 at the end of 4 years, how much should be deposited in an account that pays 5% annually?



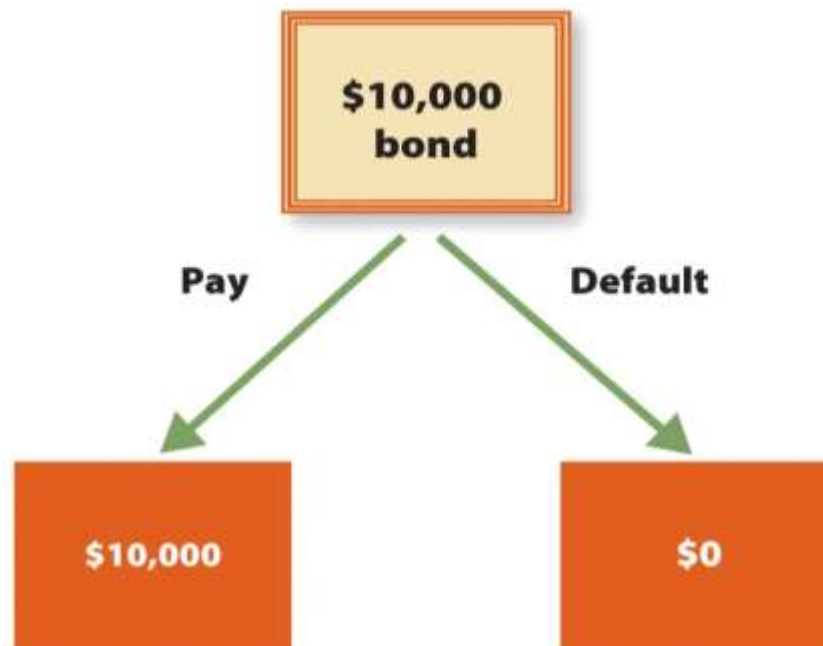
$$P = F(1+i)^{-n} = 800(1+0.05)^{-4} \\ = \$658.16$$

**Example:** A 15-year bond (matures in 15 years), with a face-value of \$10,000. If interest rate is 5% a year, use compound-interest to estimate the price at the inception.

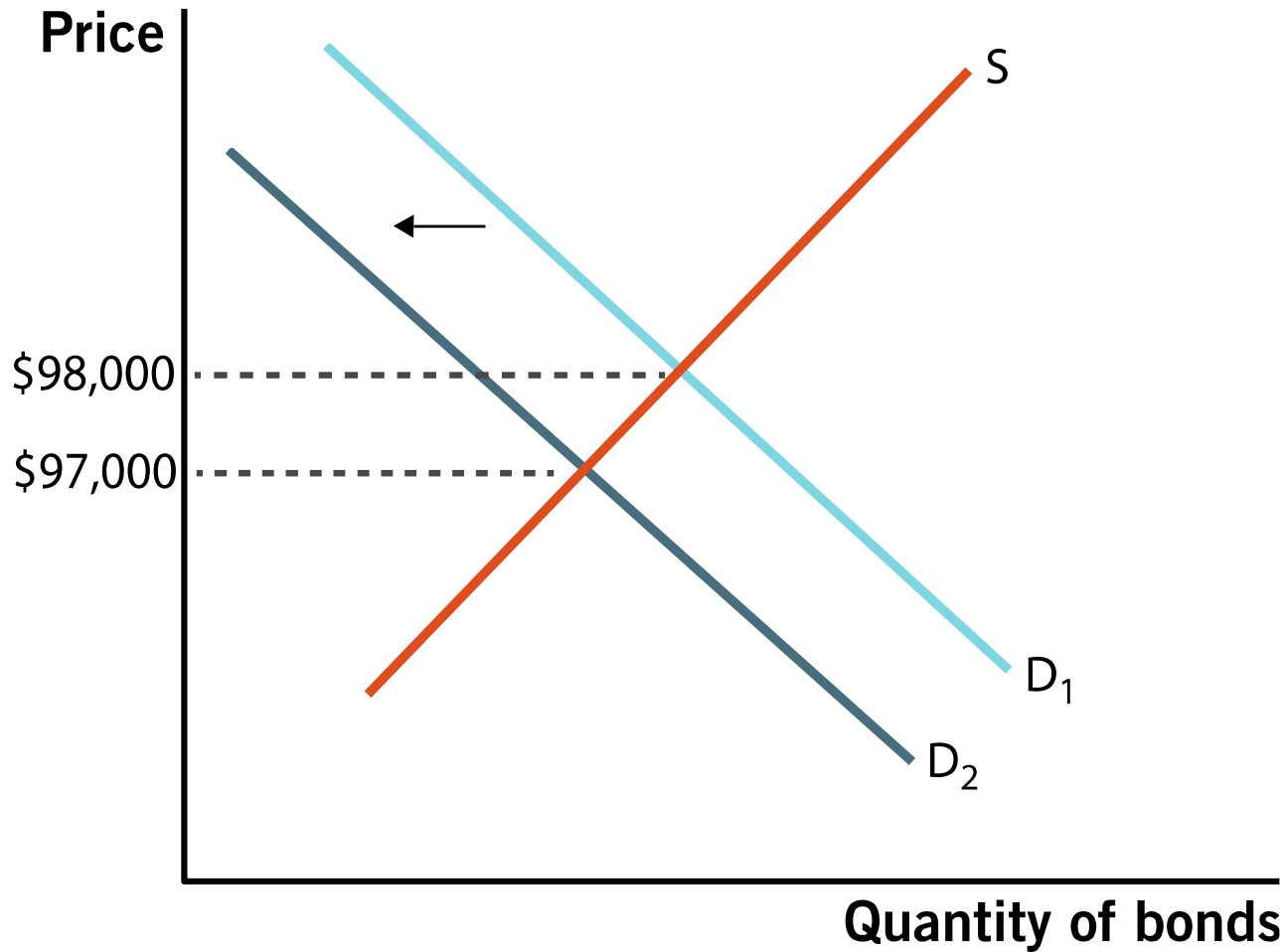
# Default Risk

## Two possible outcomes for the bond

- The borrower pays maturity value of the bond to lender
- The borrower defaults on the loan (lender gets \$0 back)



# Price Falls when Bonds Are Downgraded



# Bond Ratings and Default Risk

Moody' s	S&P	Description	Examples
Aaa	AAA	Prime	Microsoft, Johnson & Johnson, Bank of America, UVA, Harvard University
Aa	AA	High Grade	Berkshire Hathaway, Toyota, Walmart, Intel, Virginia Tech, UNC, Duke University
A	A	Upper Medium Grade	Coca-Cola, AT&T, McDonald' s, Target, Dell, <i>Washington Post</i> , Disney, Nike, HP
Baa	BBB	Lower Medium Grade	Home Depot, Anheuser-Busch, Time Warner, Nordstrom, Molson Coors, Nissan
Ba	BB	Noninvestment Grade or Speculative	Sprint Nextel, <i>NY Times</i> , Best Buy, Republic of Turkey
B	B	Highly Speculative	Dillard' s, Delta Airlines, <i>NY Times</i> , General Motors, Ford, Goodyear
Caa	CCC	Extremely Speculative	Eastman Kodak, JetBlue, E-Trade
	D	In Default	

# Stocks v. Bonds

## Stock shares

Ownership shares in the firm

Shareholders have some influence in the operations of the firm—if a shareholder owns more than 50% of the shares.

If Firms concern about the control of the firms, they choose to issue Bonds (when they need new capital).

Otherwise, Firms sell shares (rather than Bonds) and move forward without the burden of debt from having to pay back a bond in the future





# Secondary Markets

## Secondary markets

Where securities are traded after their first sale

Analogous to used car markets, via a broker

Enables firms to sell bonds at higher prices (lower interest rates) since demand for assets increases when they can be resold

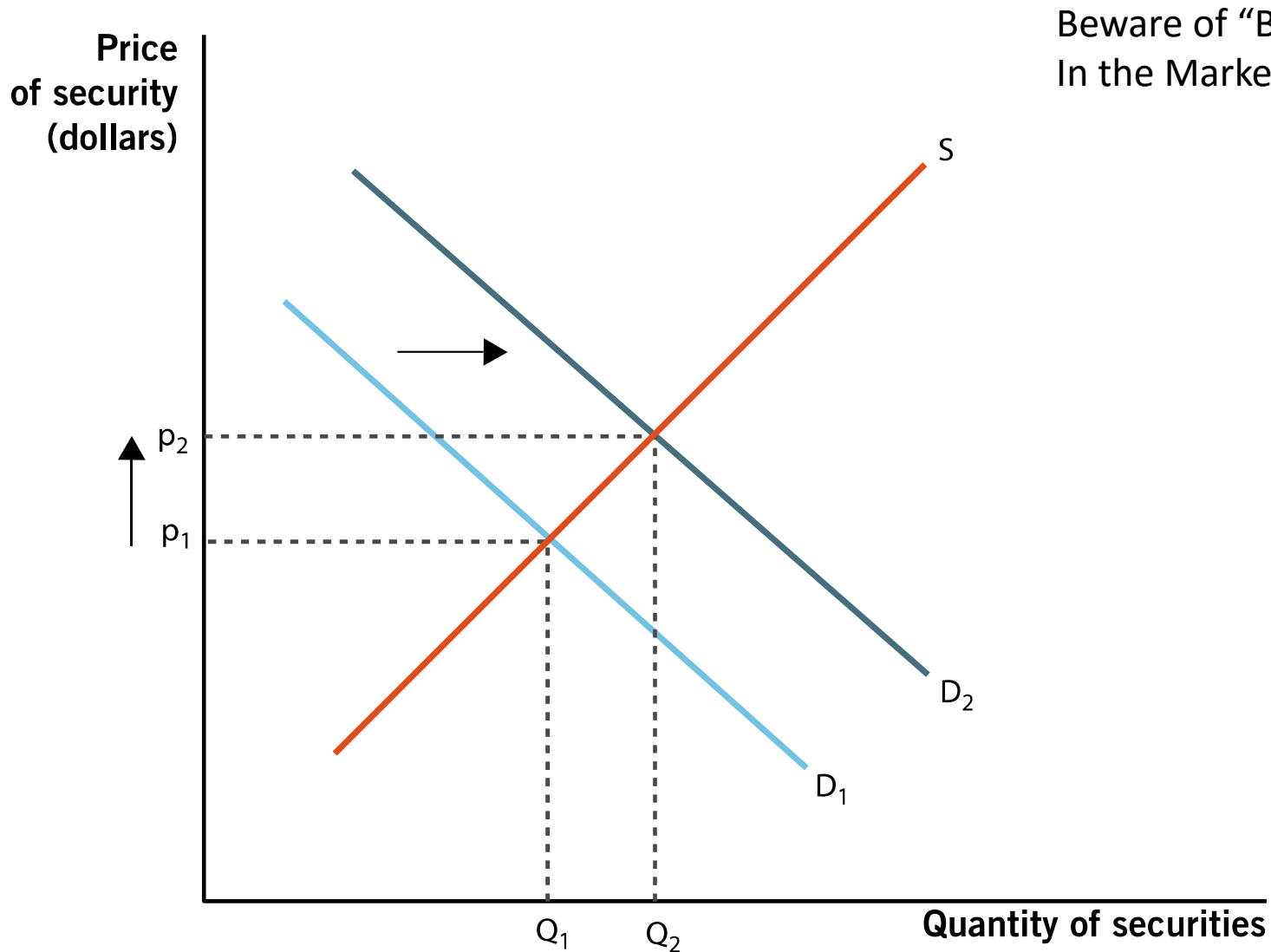
## Stock markets are secondary markets

### New York Stock Exchange (NYSE)

Dow Jones Industrial Average (DJIA – average of 30 companies of 30 industries), S&P 500, and NASDAQ are a kind of index, averages of a group of stocks.

-National Association of Securities Dealers Automated Quotations (NASDAQ)

# Secondary Markets Make Securities More Valuable





# Behavioral Finance

**Behavioral economics study how people make mistakes in their decisions.**

Investors depart from rationality in systematic ways:

**Overconfidence:** having misguided faith that they are able to spot a winning stock.

**Loss aversion:** being unwilling to sell an unprofitable asset and accept the loss.

**Herd mentality:** buying an asset when its price has already been driven high and selling it when its price has already been driven low.

# **Two Special (Financial/Debt) Instruments**

## **Treasury securities**

**U.S. government borrows by selling treasury securities (T-bills, T-notes, T-bonds)**

**Generally considered less risky than other bonds, since no one expects United States to default**

**Play a central role in monetary policy**

## **Home mortgage loan**

**Individuals use mortgages to pay for homes**

**MBS (Mortgage-Backed Securities)**

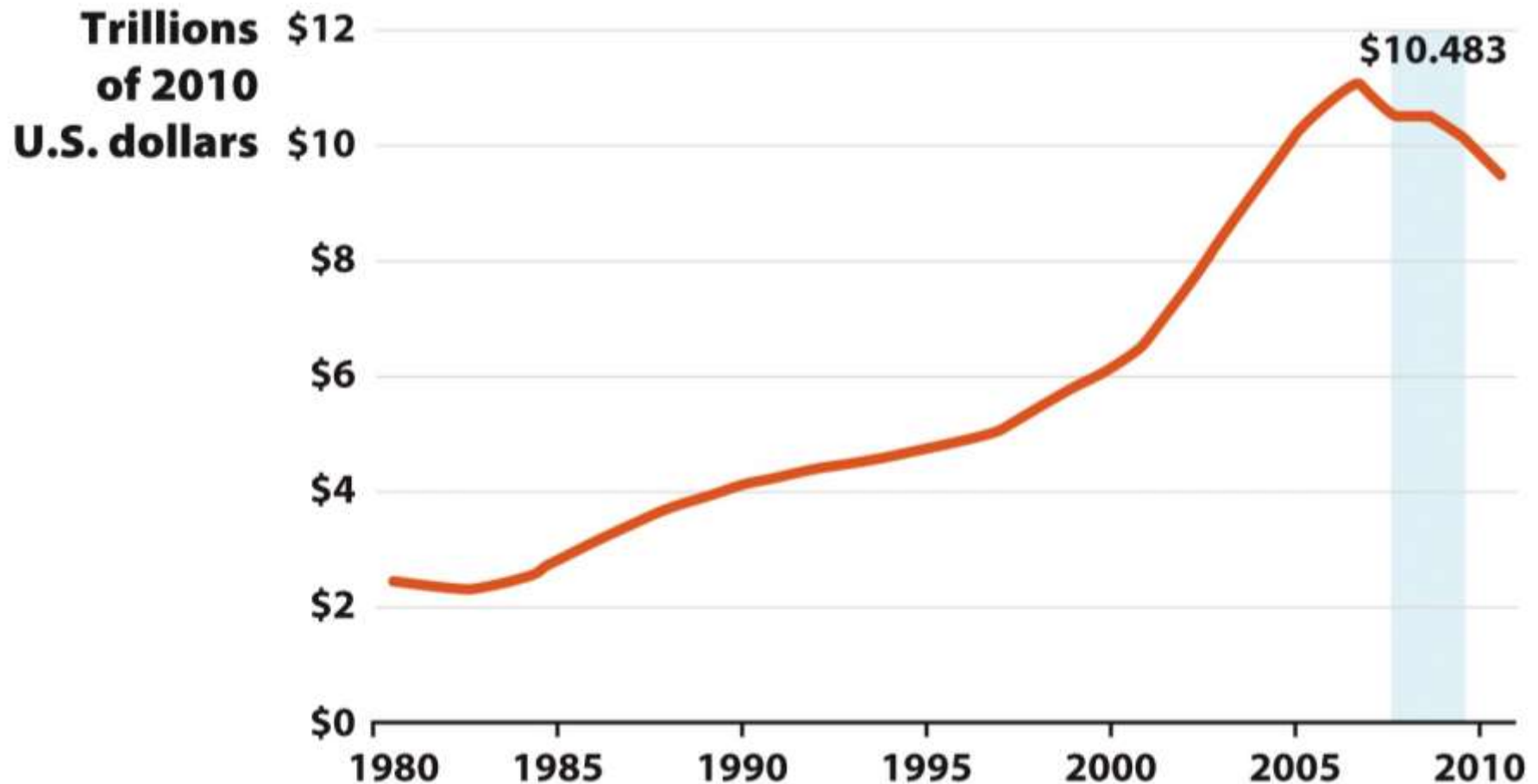
**Market expanded leading up to the 2008 recession**

# Major Foreign Holders of U.S. Treasury Securities

Major Foreign Holders of U.S. Treasury Securities, 2011 (in billions of dollars)

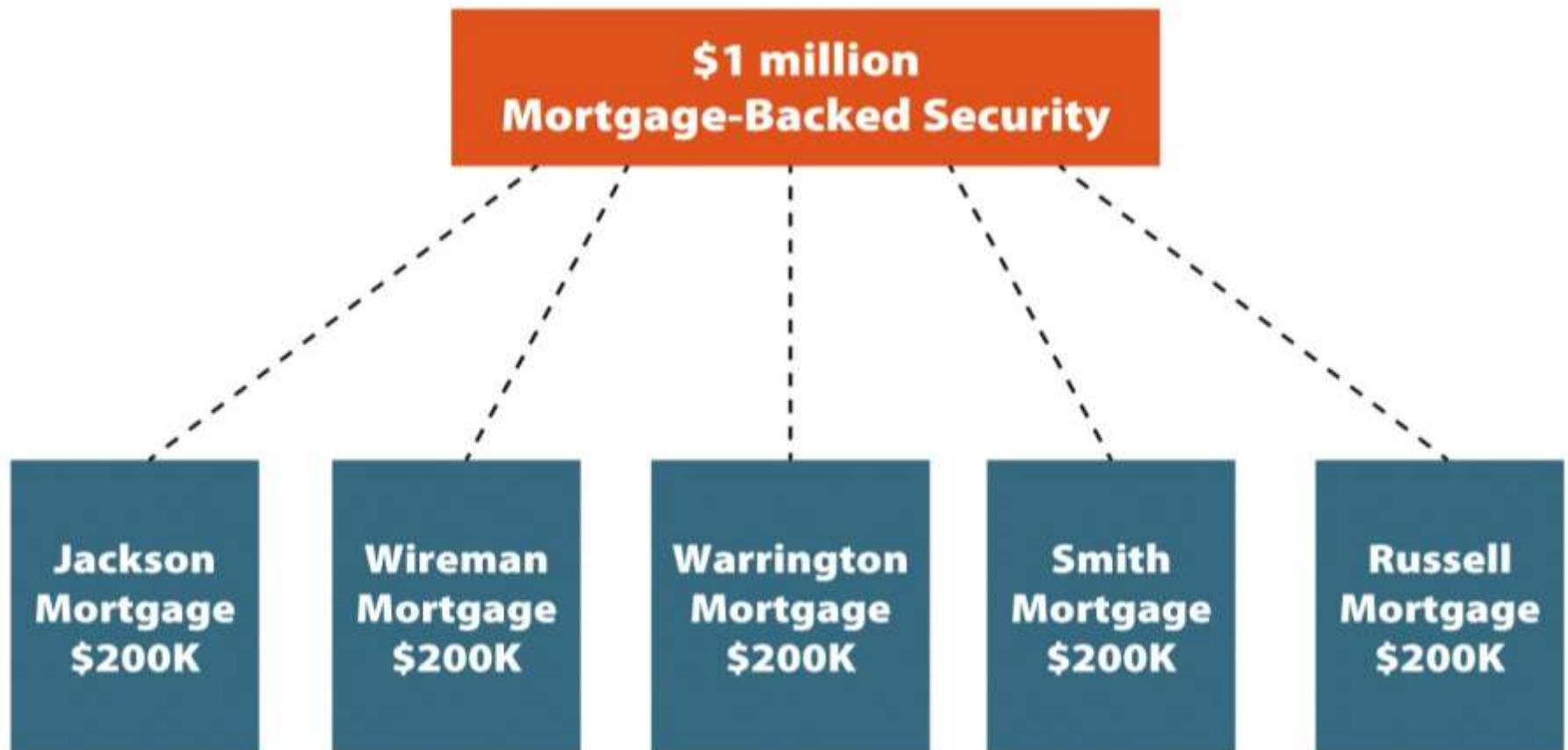


# The U.S. Mortgage Market Expanded Rapidly before 2008



# Bundling Loans: MBS

**Securitization:** The process of creation of a new security as a combination of other securities and loan agreements to diversify risk, lowers interest rates



# Practice What You Know

**What is an advantage of a firm selling stocks instead of selling bonds?**

- A. Bonds are usually sold by new companies, and stocks make a firm seem established**
- B. Stocks are only sold once at the initial public offering**
- C. Firms can manipulate stock prices easily**
- D. Stocks don't burden the firm with future debts that must be paid**

# Practice What You Know

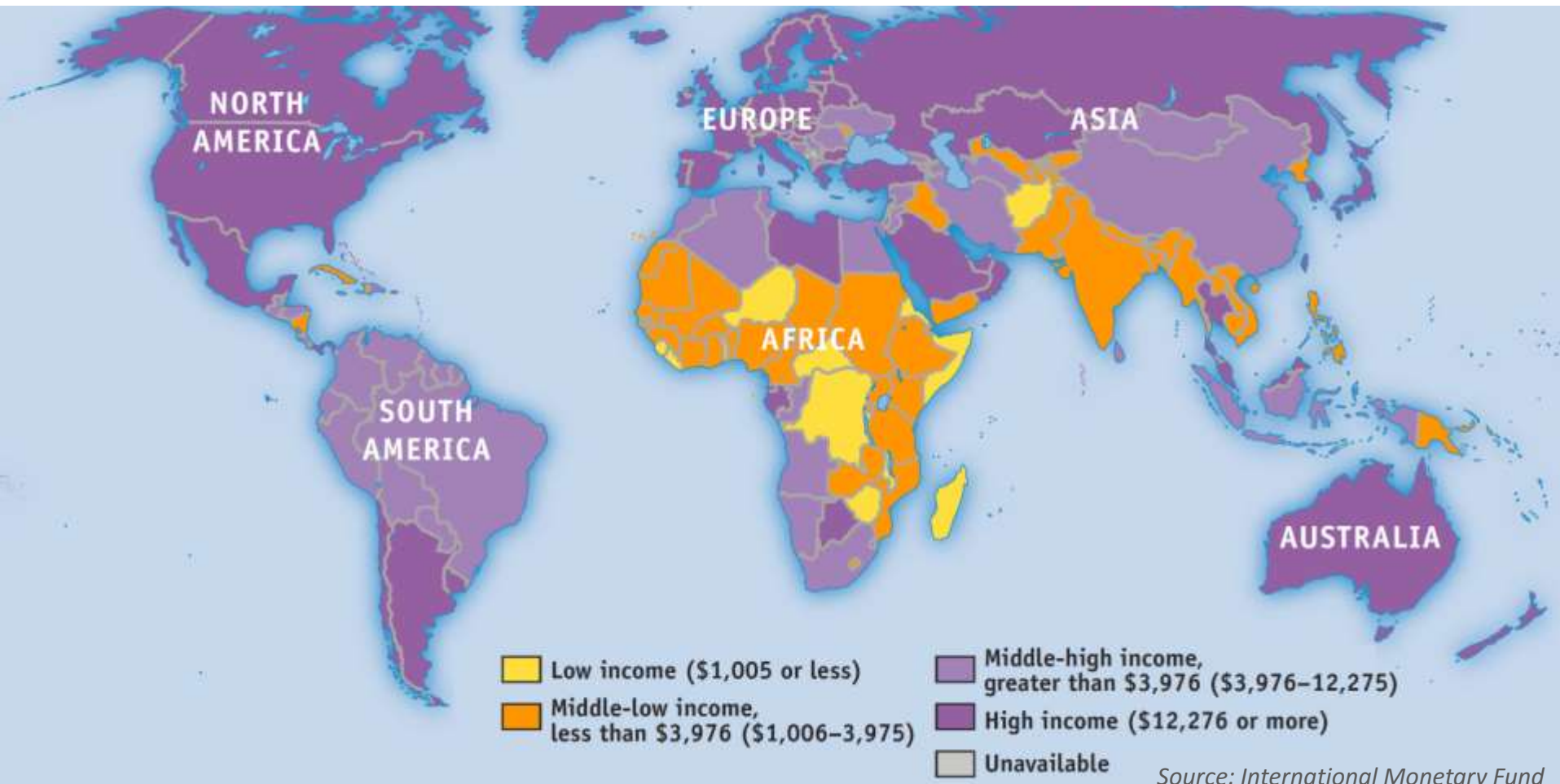
**Why is a secondary markets for securities important?**

- A. It increases the value of securities**
- B. It protects buyers from decreases in the value of the security**
- C. It decreases the incentive for people to sell and devalue securities**
- D. It encourages firms to only sell to the most responsible buyers**

# Incomes Around the World

The United States has grown quickly, while some nations have stalled.

Half the world's population lives in countries whose standard of living is lower than the United States' in 1900.





# U.S. Real GDP per Capita

The U.S. economy produces more than seven times as much per person today as in 1900.

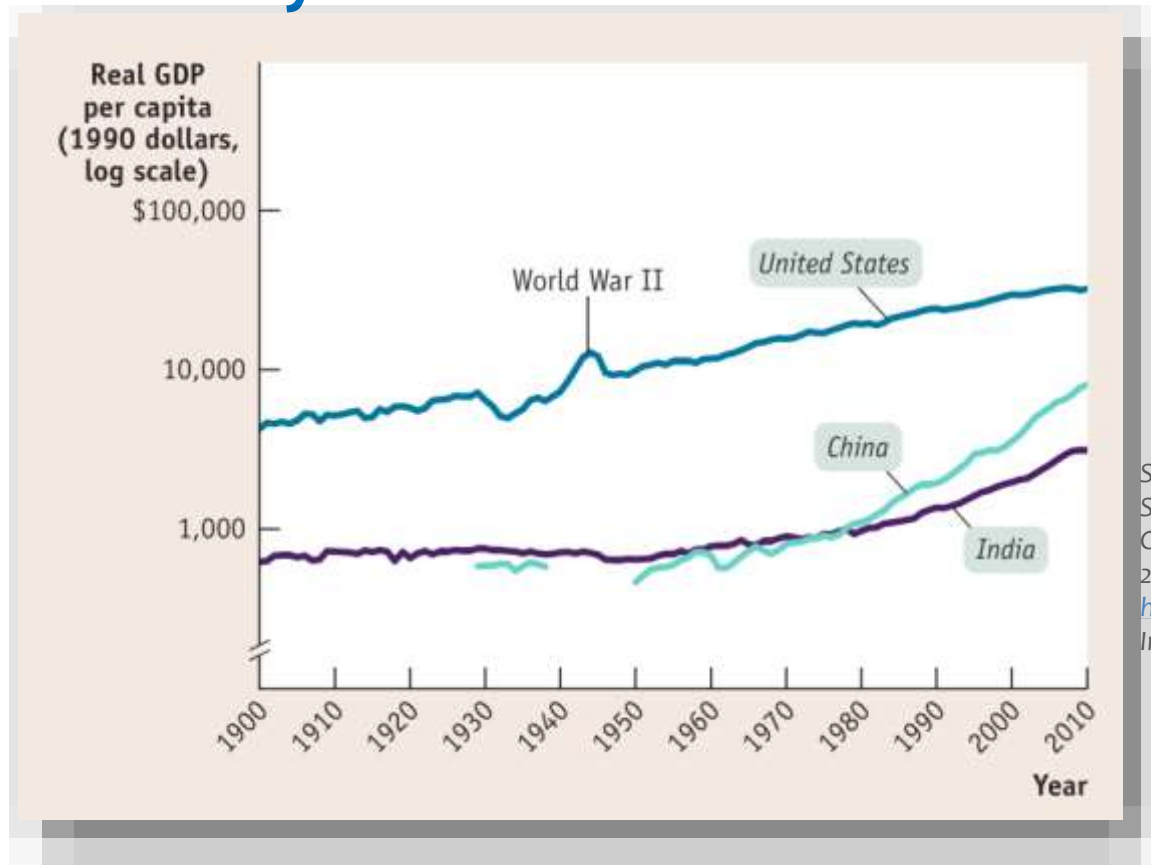
Year	Percentage of 1900 real GDP per capita	Percentage of 2010 real GDP per capita
1900	100%	13%
1920	136	18
1940	171	23
1980	454	60
2000	696	92
2010	758	100

Sources: Angus Maddison, *Statistics on World Population, GDP, and Per Capita GDP, 1–2008AD*, <http://www.ggdcd.net/maddison>; Bureau of Economic Analysis.

# Comparing Economies Across Time and Space

**Real GDP per capita** (real GDP divided by the population size) **is** the key statistic.

Economic growth in the United States, India, and China over the past century



Sources: Angus Maddison, Statistics on World Population, GDP, and Per Capita GDP, 1–2008AD, <http://www.ggdc.net/maddison>; International Monetary Fund.

# Compounding Growth

$$F = P(1 + i)^n$$



**Growth formula:  $\$P(1 + g)^n$**

**$g$  = growth (%) per year**

**$N$  = how many years it grows**

**Examples:**

**India:  $\$3,000 (1 + 0.04)^{20} = \$ 6,573$**

**China:  $\$6,500 (1 + 0.08)^{20} = \$30,296$**

**USA:  $\$47,000 (1 + 0.02)^{20} = \$62,409$**

# The Rule of 70: The Magic of Compounding

Even small differences in growth rates get magnified over time.

The *rule of 70*:

$$\text{Doubling time for a variable} = \frac{70}{\% \text{ growth rate}}$$

**Example:** If real GDP per capita is growing at an annual growth rate of 3.5%, it will double in:

$$\frac{70}{3.5} = 20 \text{ years.}$$

# Practice What You Know



**Suppose that real GDP per capita grows at 2% per year. How many years will it take for real GDP per capita to approximately double? It will take:**

- a) 70 years because of the rule of 70.**
- b) 140 years, because the rule of 70 states that a variable will double in 70 years if the variable has an annual growth rate of 1%; therefore, a variable growing at 2% will take twice as long to double.**
- c) 35 years, because the rule of 70 states that the number of years it takes for a variable to double is equal to 70 divided by the annual growth rate of the variable.**
- d) 50 years, since at 2% per year it takes 50 years to reach 100% more than the initial real GDP per capita.**

# Practice What You Know



Let's figure out how long it will take for the average Indian to be as wealthy as the average Western European is today. Note that *all numbers are adjusted for inflation*. India's GDP per capita is \$3,000, and let's assume real output per person grows at 5% per year. Using the rule of 70, how many years will it take for India to reach Italy's current level of GDP per capita, about \$24,000 per year?

- a) 42 years
- b) 14 years
- c) 28 years
- d) 12 years

# Comparing Recent Growth Rates

China, India and Ireland saw impressive growth.  
Zimbabwe, once the breadbasket of Africa, collapsed.

Average annual  
growth rate  
of real GDP  
per capita,  
1980–2010



# Accounting for Growth

How much does output change when we change inputs?

*For instance, China and India may have a production function like this (Brookings Institution estimates):*

$$\text{Productivity} = \text{GDP (Output) per worker} = Y/L = T \times (K/L)^{0.4} \times (H/L)^{0.6}$$

$Y/L = f\{\text{physical capital per worker } (=K/L) ; \text{ human capital per worker } (=H/L) ; \text{ and state of technology } (T=\text{TFP})\}$

**Total factor productivity, TFP=T:**

*Technology Progress can help elevate all the other factors, K/L and H/L, to produce more output (Y/L)*

(When TFP increases, the economy can produce **more output, even** with the **same quantity of physical capital, human capital, and labor.**)

**0.4** is the measure of how the physical capital per worker contributes to Econ Growth.

**0.6** is the measure of how the Human capital per worker contributes to the Econ Growth.

In general (in the US) an estimate of 1/3 of the growth of physical capital per worker contributes to the growth of output per worker), while in China and India, the number is 0.4.

*Since China had more physical capital than India, that would explain its quicker growth.*



# The Power of Log – for

## “Growth Accounting”



$$\text{Log}_{10} 1 = 0$$

$$\text{Log}_{10} 10 = 1$$

$$\text{Log}_{10} 100 = 2$$

$$\text{Log}_{10} 1000 = 3$$

$$\text{Log}_3 27 = 3$$

$$\text{Log}_5 125 = 3$$

$$\text{Log}_4 16 = 2$$

### Properties of Log:

$$\text{Log } A.B = \text{Log } A + \text{Log } B$$

$$\text{Log } A/B = \text{Log } A - \text{Log } B$$

$$\text{Log } A^B = B. \text{Log } A$$

Examples: take log of the following:

$$75 X^4 Y^3$$

$$A^4 / B^3$$

$$4 K^{0.7} L^{0.3}$$

# Log normal = Percent change



$\text{Log}_e = \text{Ln}$

( $e = 2.7182718\dots$ ) comes from:

$X$	$(1 + 1/X)^X$
1	2
10	2.593
100	2.704
1,000	2.7169
...	
1,000,000	2.7182718...

**Why “ln x” = “% of x” or Log = Percent change**

$Y = \ln x$

$dy/dx = 1/x$

$dy = dx/x = \Delta x/x = (x_2 - x_1)/x = \text{percent change!}$

We use this log to represent the % growth rate in the topic of Econ growth.

Ex: GDP grows by 5%, and population grows by 1%;

what is the growth of GDP per capita?

GDP per capita = GDP/population = 5% - 1% = 4%

since both are in %, we use the property of Log:

$\text{Log } A/B = \text{Log } A - \text{Log } B$

5% - 1% = 4%



# Example of Growth Accounting

Productivity : GDP per worker =  $Y/L = T \times (K/L)^{0.4} \times (H/L)^{0.6}$

Using the above equation that Bosworth-Collins of Brookings Institute formulated, let's figure out the following:

If the GDP (Y) grows by **8%**,  
Labor (L) grows by **1%**,  
physical capital (K) grows by **3%**,  
investment in human capital such as schools, training (H) grows by **2%**.

TFP that contributes to the growth in Output per worker (Y/L) can be counted from:

(remember that “**log**” = “**%**”)

$$Y/L = T \times (K/L)^{0.4} \times (H/L)^{0.6}$$

$$(8\% - 1\%) = \text{TFP} + 0.4 (3\% - 1\%) + 0.6 (2\% - 1\%)$$

What about TFP? TFP contribution =  $7\% - 0.8\% - 0.6\% = 5.6\%$

# Why Growth Rates Differ

A number of factors influence differences among countries in their growth rates.

- savings and investment spending
- foreign investment
- education
- infrastructure
- research and development (R&D - technology progress)
- political and economic stability



# The Role of Government In Promoting Economic Growth

## Government policies

### 1. Subsidies to INFRASTRUCTURE

**Infrastructure:** roads, power lines, ports, information networks, and other econ activities.

### 2. Subsidies to EDUCATION

### 3. Subsidies to R&D

### 4. Maintaining a well-functioning FINANCIAL SYSTEM

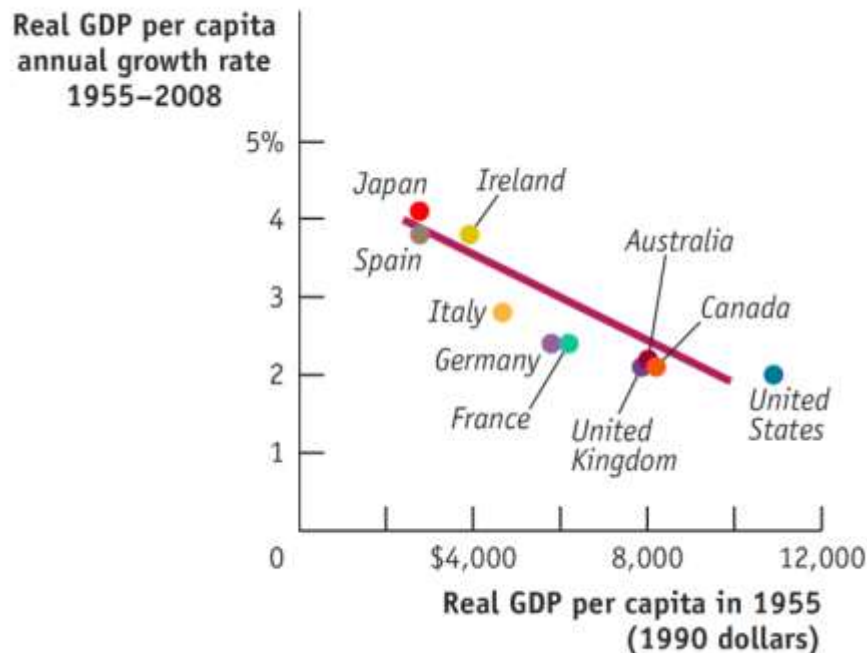
### 5. Protection of PROPERTY RIGHTS

### 6. GOOD GOVERNANCE: political stability, integrity

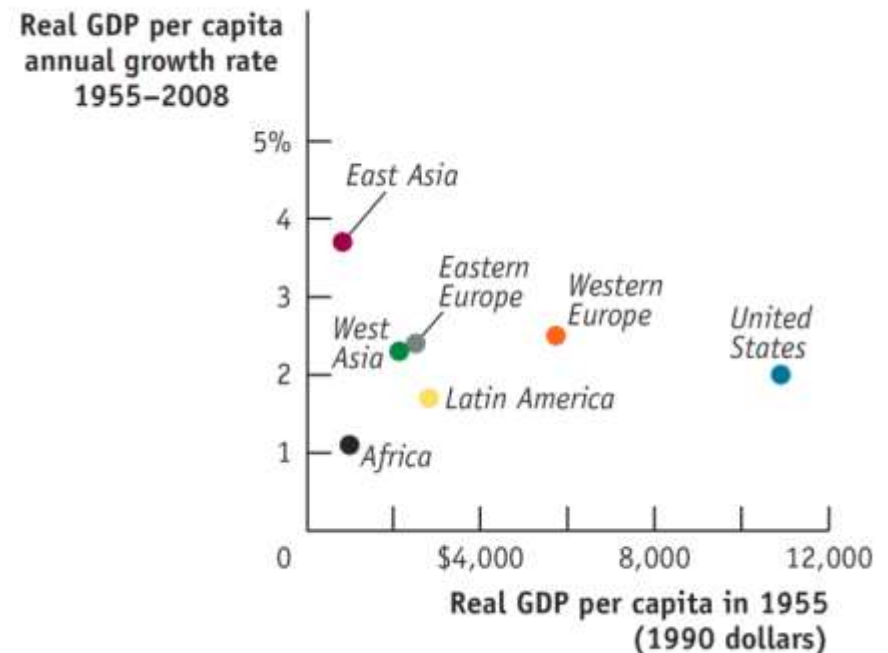
# Convergence Hypothesis v. Divergence

**Convergence hypothesis:** international differences in real GDP per capita tend to narrow over time.

(a) Convergence among Wealthy Countries...



(b) ... But Not for the World as a Whole

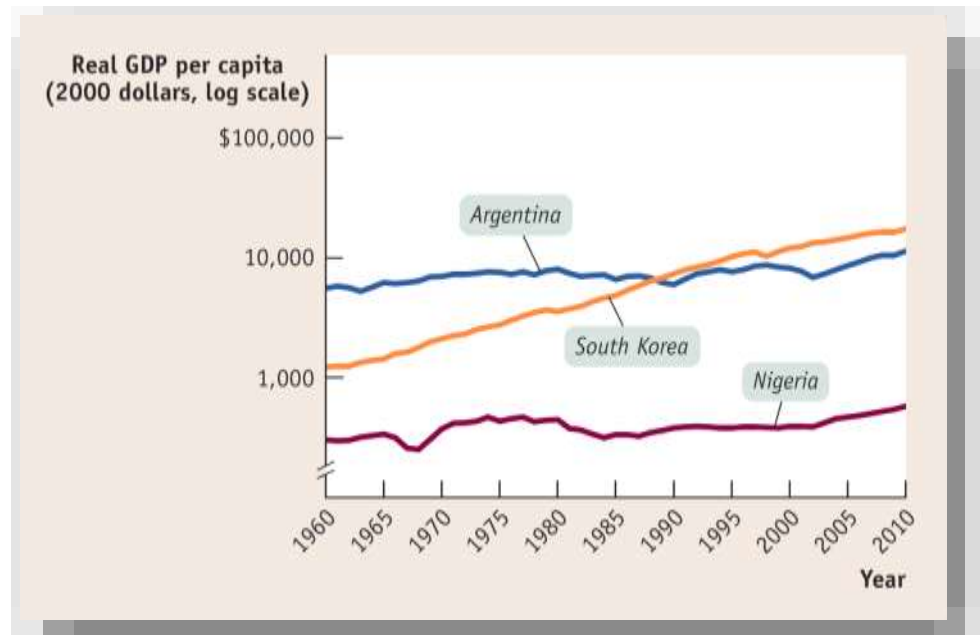


Source: Angus Maddison, *Statistics on World Population, GDP, and Per Capita GDP, 1-2008AD*, <http://www.ggdc.net/maddison>.

# Latin America's Disappointment

What's holding Argentina back?  
(and other Latin American nations)

- Irresponsible government action that eroded savings through high **inflation**
- Lack of emphasis on **education**
- Political **instability**



Source: World Bank.



# Africa's Troubles and Promise

What's holding much of Africa back?

- 】 Government corruption
- 】 Civil wars & political instability
- 】 Unfavorable geography

A big question: **Is Africa poor because its politics are unstable? Or vice versa?**

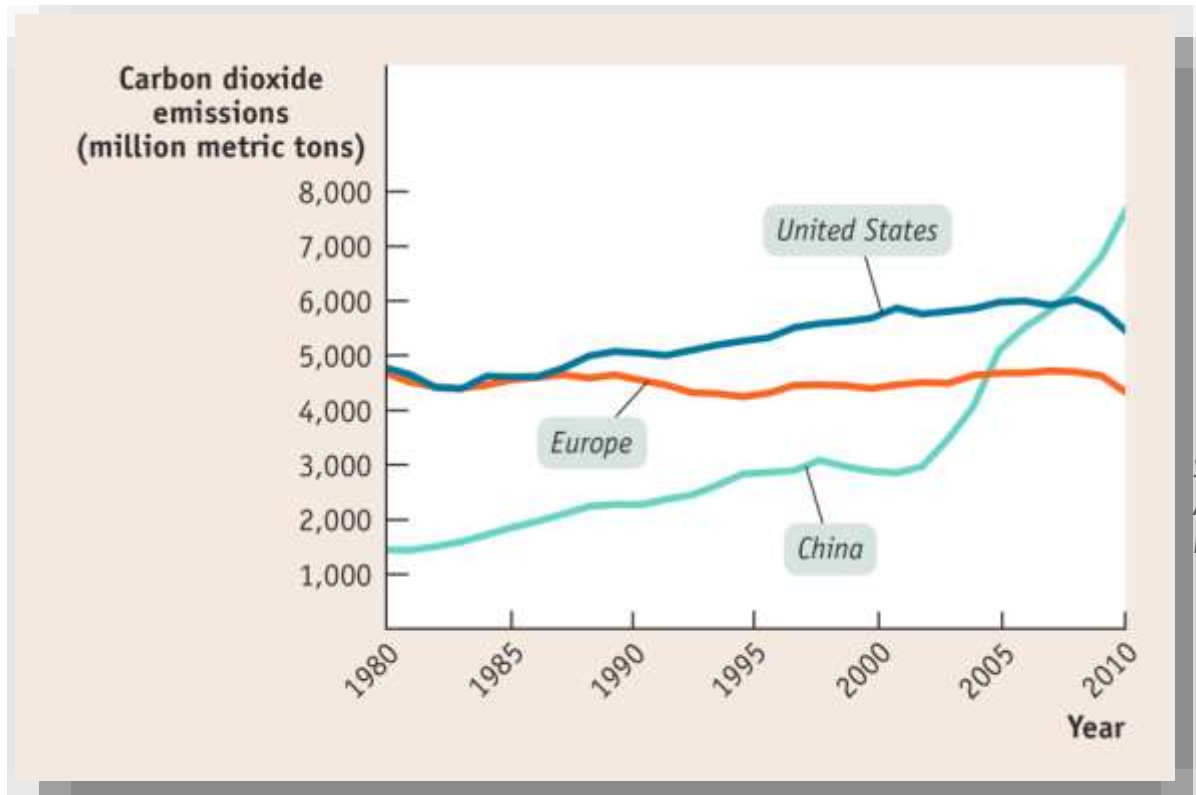
*Good news: Growth rates are up in sub-Saharan African nations since 2011.*





# Economic Growth and the Environment

**Economic growth tends to increase the human impact on the environment.**



Sources: Energy Information Administration; Bureau of Economic Analysis.

***Unlike resource scarcity, environmental problems don't automatically provide incentives for changed behavior.***