

**chapter:**

**11**

**>> Income and Expenditure**

**Krugman/Wells**

# WHAT YOU WILL LEARN IN THIS CHAPTER

- The nature of the **multiplier**, which shows how initial changes in spending lead to further changes.
- The meaning of the **aggregate consumption function**, which shows how disposable income affects consumer spending
- How expected future income and aggregate wealth affect consumer spending
- The determinants of investment spending, and the distinction between **planned investment** and **unplanned inventory investment**

# WHAT YOU WILL LEARN IN THIS CHAPTER

- How the inventory adjustment process moves the economy to a new equilibrium after a change in demand
- Why investment spending is considered a leading indicator of the future state of the economy

# The Multiplier: An Informal Introduction

- The marginal propensity to consume, or MPC, is the increase in consumer spending when disposable income rises by \$1.
- The marginal propensity to save, or MPS, is the increase in household savings when disposable income rises by \$1.

$$MPC = \frac{\Delta \text{ Consumer spending}}{\Delta \text{ Disposable income}}$$

# The Multiplier: An Informal Introduction

- Increase in investment spending = \$100 billion
- + Second-round increase in consumer spending =  $MPC \times \$100$  billion
- + Third-round increase in consumer spending =  $MPC^2 \times \$100$  billion
- + Fourth-round increase in consumer spending =  $MPC^3 \times \$100$  billion
- • • • • • • • • •
- **Total increase in real GDP =  $(1 + MPC + MPC^2 + MPC^3 + \dots) \times \$100$  billion**

# The Multiplier: An Informal Introduction

- So the \$100 billion increase in investment spending sets off a chain reaction in the economy. The net result of this chain reaction is that a \$100 billion increase in investment spending leads to a change in real GDP that is a *multiple* of the size of that initial change in spending.
- How large is this multiple?

$$\begin{aligned} &\text{Total increase in real GDP from \$100 billion rise in } I \\ &= \frac{1}{1 - MPC} \times \$100 \text{ billion} \end{aligned}$$

# The Multiplier: Numerical Example

## Rounds of Increases of Real GDP When $MPC = 0.6$

	Increase in real GDP (\$ billions)	Total increase in real GDP (\$ billions)
First round	100	100
Second round	60	160
Third round	36	196
Fourth round	21.6	217.6
...	...	...
Final round	0	250

# The Multiplier: Numerical Example

- In the end, real GDP rises by \$250 billion as a consequence of the initial \$100 billion rise in investment spending:
- $1/(1 - 0.6) \times \$100 \text{ billion} = 2.5 \times \$100 \text{ billion} = \$250 \text{ billion}$

# The Multiplier: An Informal Introduction

- An autonomous change in aggregate spending is an initial change in the desired level of spending by firms, households, or government at a given level of real GDP.

$$\Delta Y = \frac{1}{1 - MPC} \times \Delta AAS$$

- The multiplier is the ratio of the total change in real GDP caused by an autonomous change in aggregate spending to the size of that autonomous change.

$$\text{Multiplier} = \frac{\Delta Y}{\Delta AAS} = \frac{1}{1 - MPC}$$

## **The Multiplier and the Great Depression**

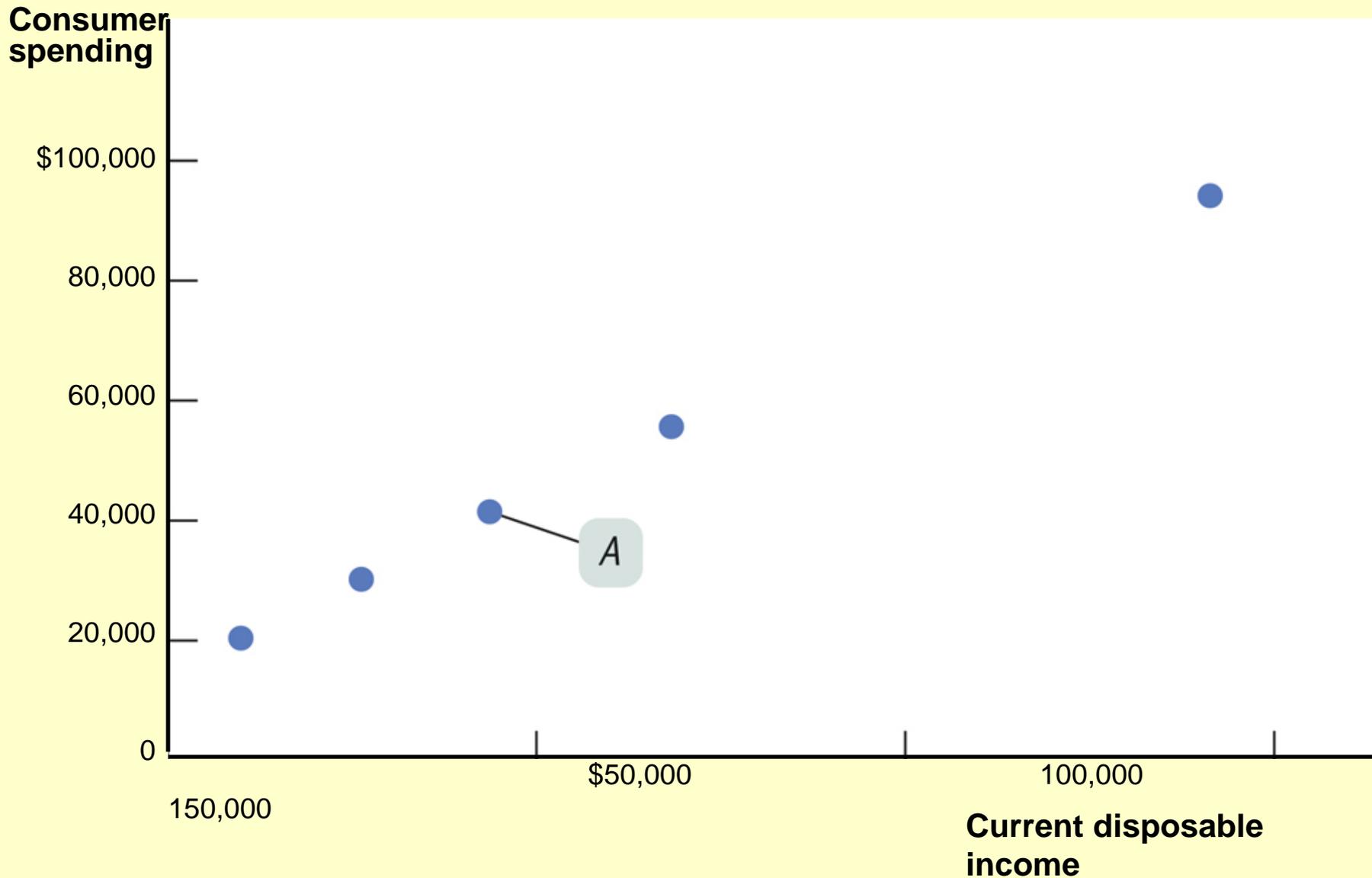
- The concept of the multiplier was originally devised by economists trying to understand the Great Depression. Most economists believe that the slump from 1929 to 1933 was driven by a collapse in investment spending. But as the economy shrank, consumer spending also fell sharply, multiplying the effect on real GDP.
- In 1929, government in the United States was very small by modern standards: taxes were low and major government programs like Social Security and Medicare had not yet come into being. In the modern U.S. economy, taxes are much higher, and so is government spending.
- Why does this matter? Because taxes and some government programs act as *automatic stabilizers*, reducing the size of the multiplier.

# Consumer Spending

- The **consumption function** is an equation showing how an individual household's consumer spending varies with the household's current disposable income.

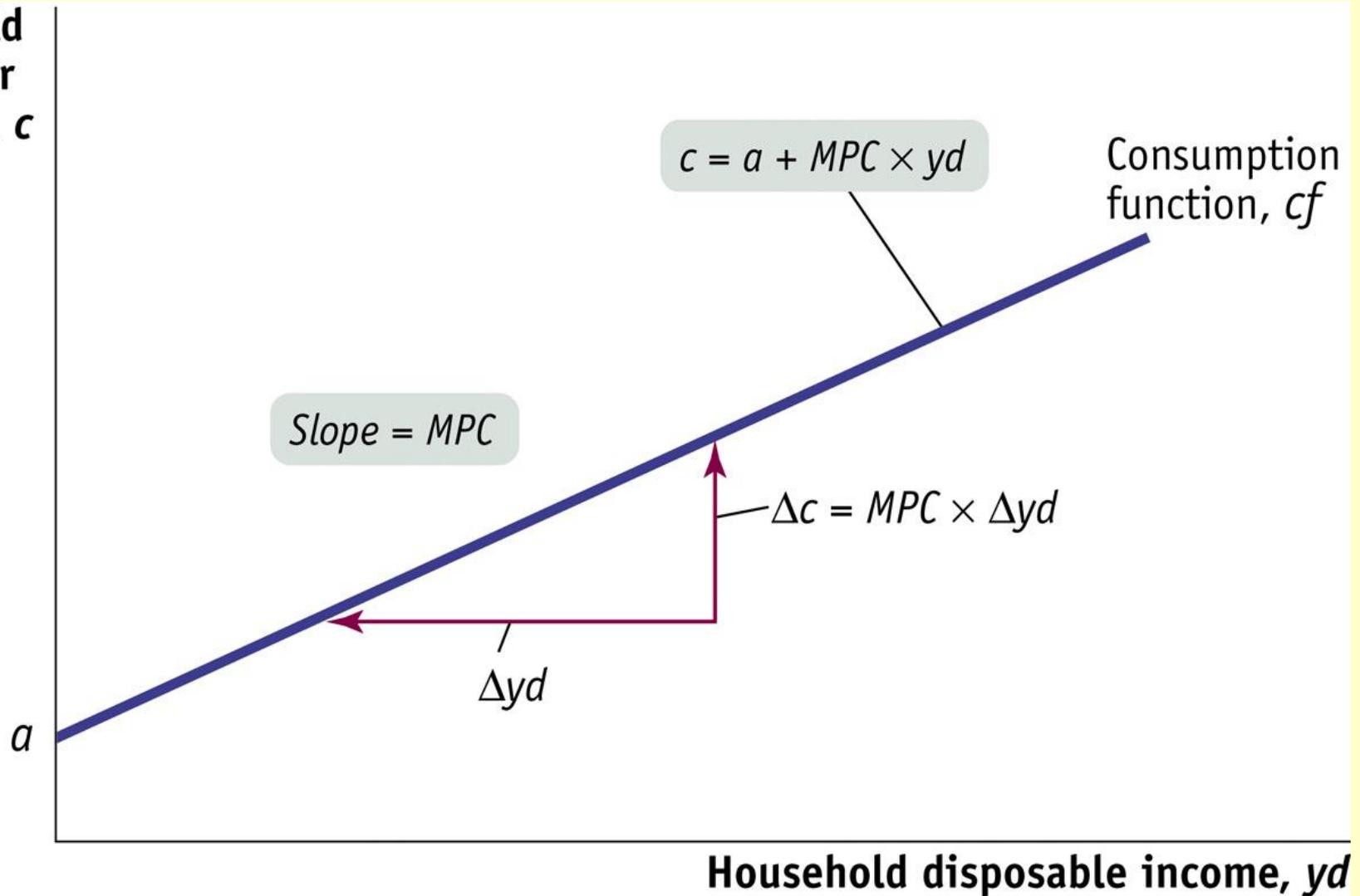
$$c = a + MPC \times yd$$

# Disposable Income and Consumer Spending



# The Consumption Function

Household  
consumer  
spending,  $c$



# The Consumption Function

- Deriving the Slope of the Consumption Function

Slope of consumption function

= Rise over run

=  $\Delta c / \Delta yd$

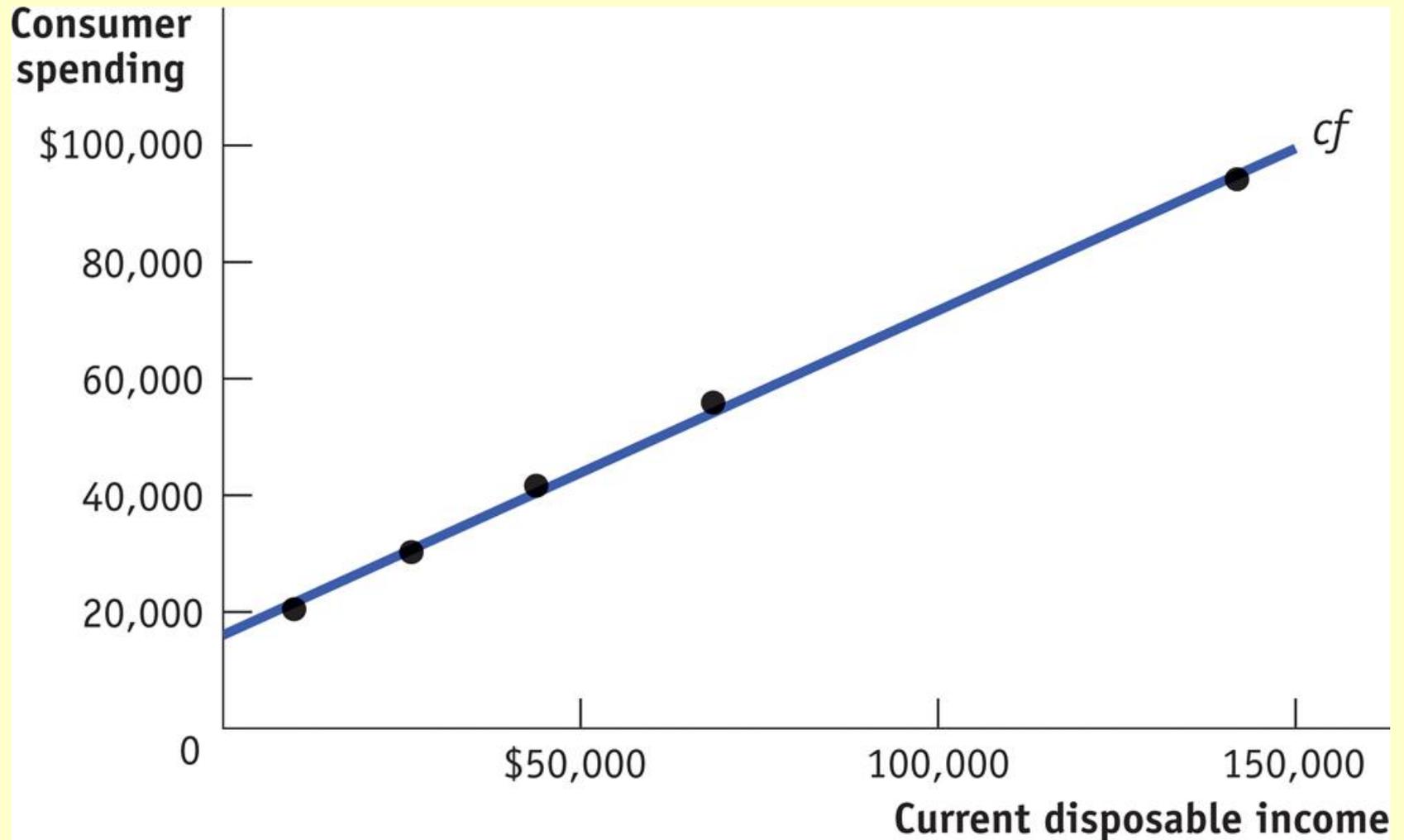
=  $\frac{MPC \cdot \Delta yd}{\Delta yd}$

=  $MPC$

# The Consumption Function

- For American households in 2006, the best estimate of the average household's autonomous consumer spending,  $a$ , is \$16,017 and the best estimate of  $0.557$ , or approximately  $0.56$ .

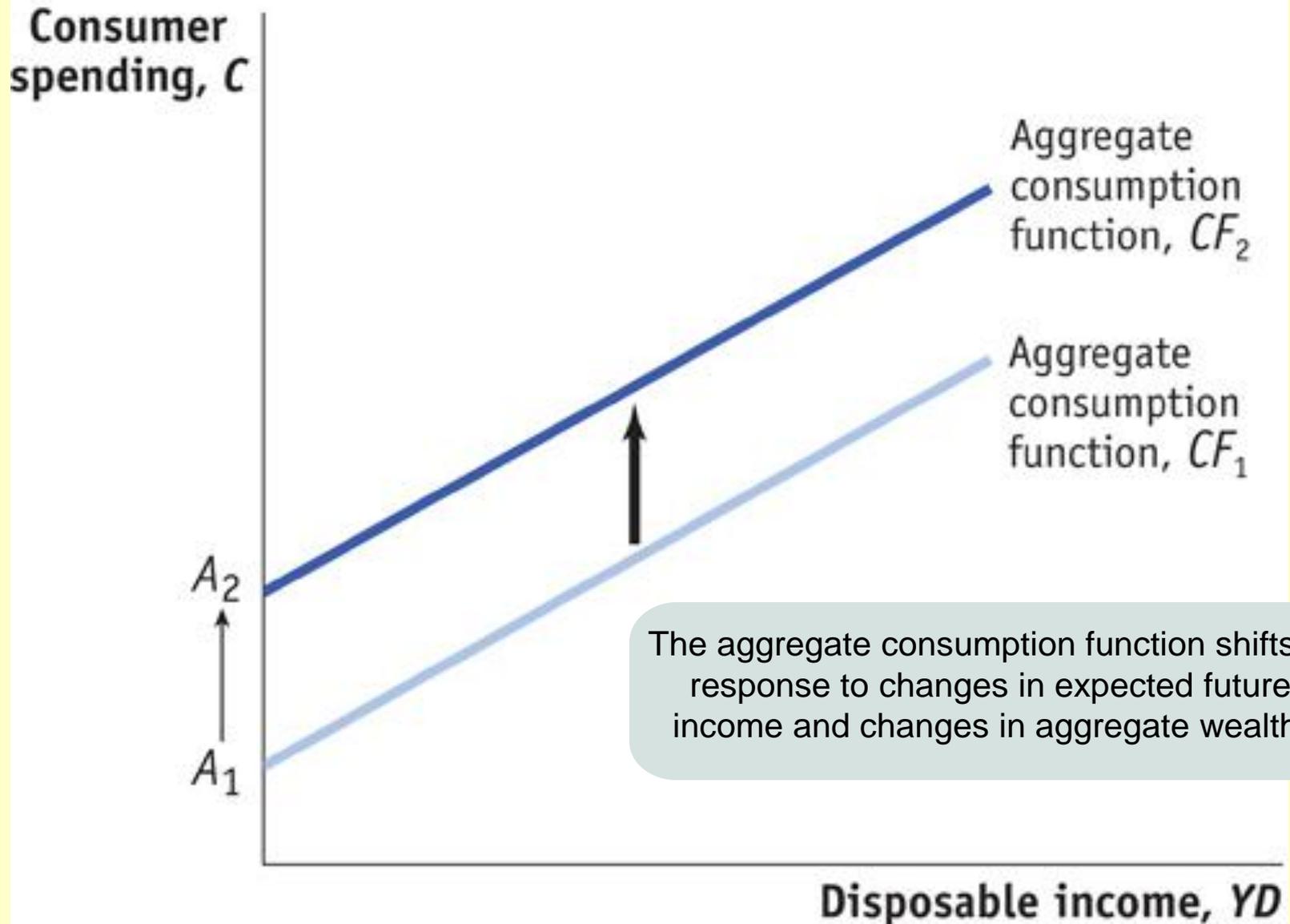
# The Consumption Function



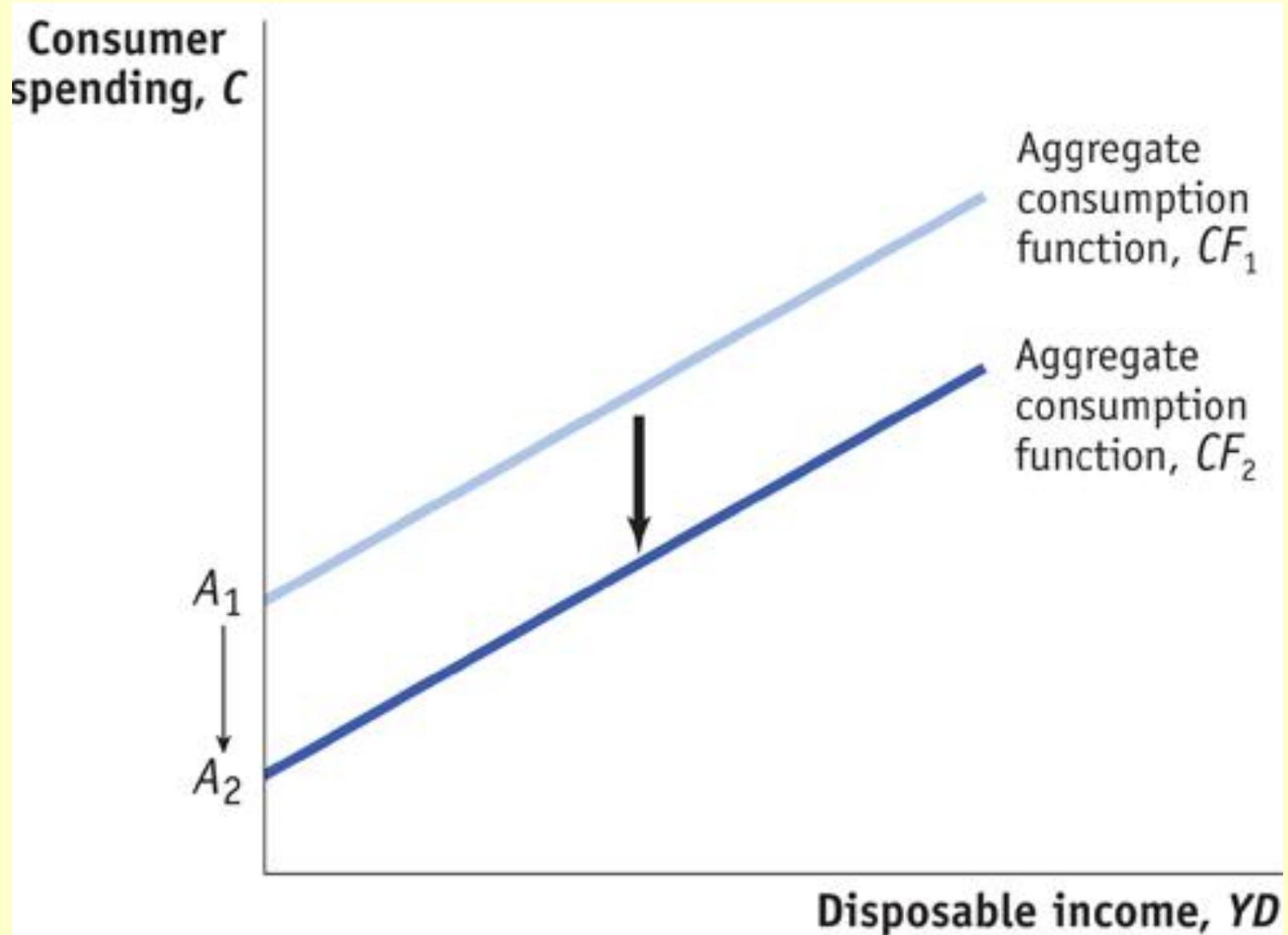
# Aggregate Consumption Function

- The **aggregate consumption function** is the relationship for the economy as a whole between aggregate current disposable income and aggregate consumer spending.

# Aggregate Consumption Function



# Aggregate Consumption Function



# Aggregate Consumption Function



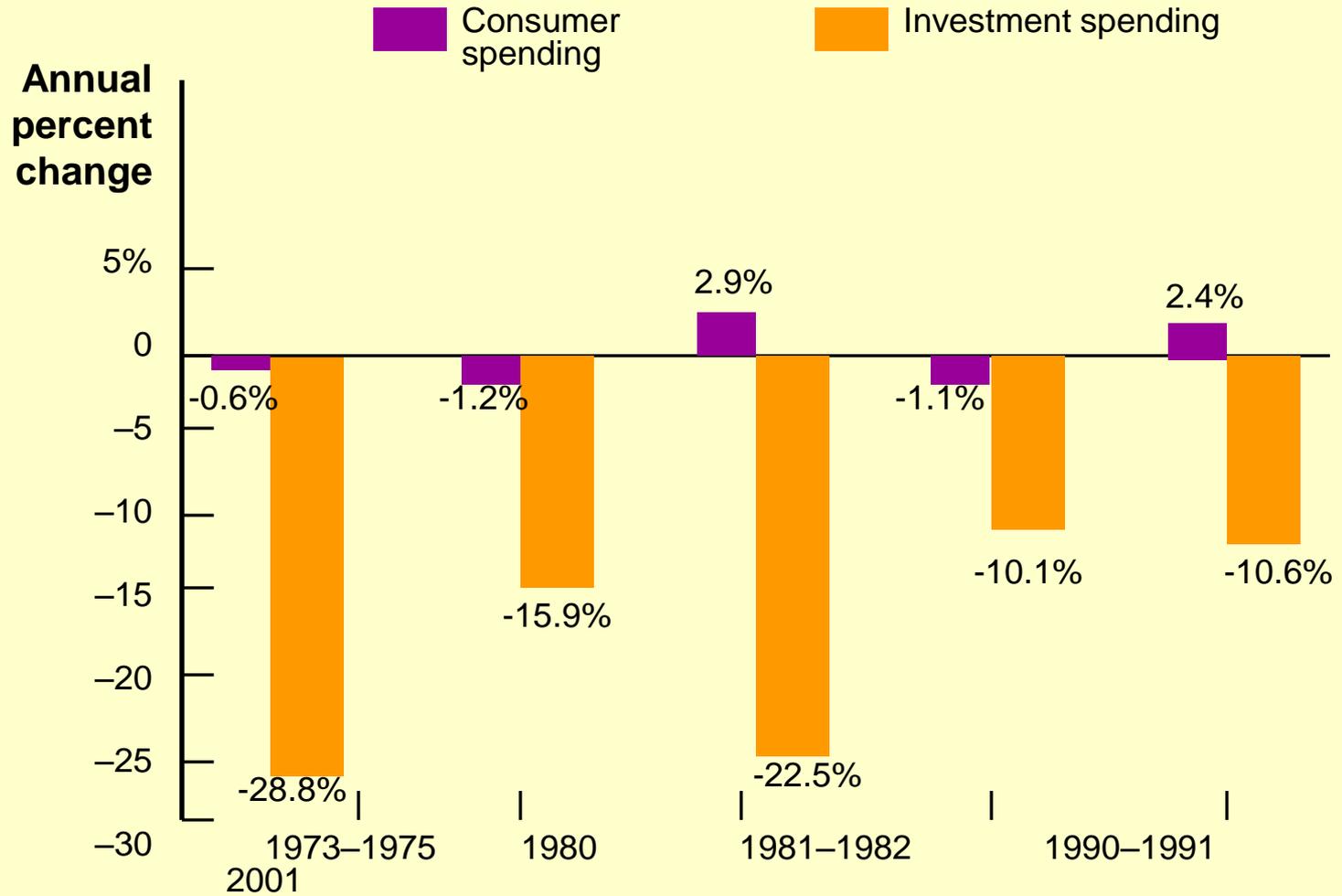
# Investment Spending

- **Planned investment spending** is the investment spending that businesses plan to undertake during a given period.
- It depends **negatively** on:
  - *interest rate*
  - *existing production capacity*
- and **positively** on:
  - *expected future real GDP.*

# Investment Spending

- According to the **accelerator principle**, a higher rate of growth in real GDP leads to higher planned investment spending.
- According to the **accelerator principle**, a lower growth rate of real GDP leads to lower planned investment spending.

# Investment Spending



# Inventories and Unplanned Investment Spending

- **Inventories** are stocks of goods held to satisfy future sales.
- **Inventory investment** is the value of the change in total inventories held in the economy during a given period.
- **Unplanned inventory investment** occurs when actual sales are more or less than businesses expected, leading to unplanned changes in inventories.

# Inventories and Unplanned Investment Spending

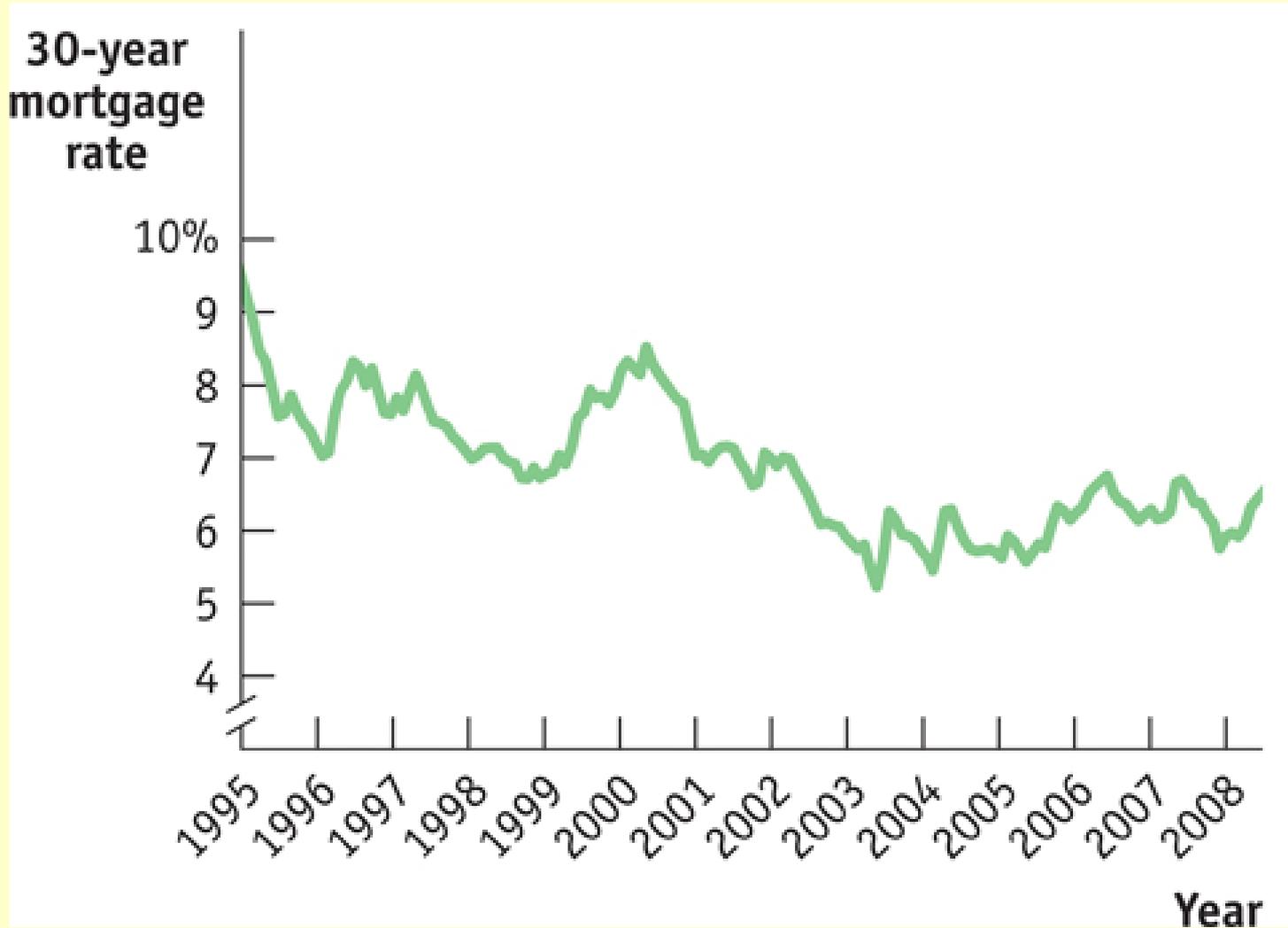
- **Actual investment spending** is the sum of planned investment spending and unplanned inventory investment.

$$I = I_{Unplanned} + I_{Planned}$$

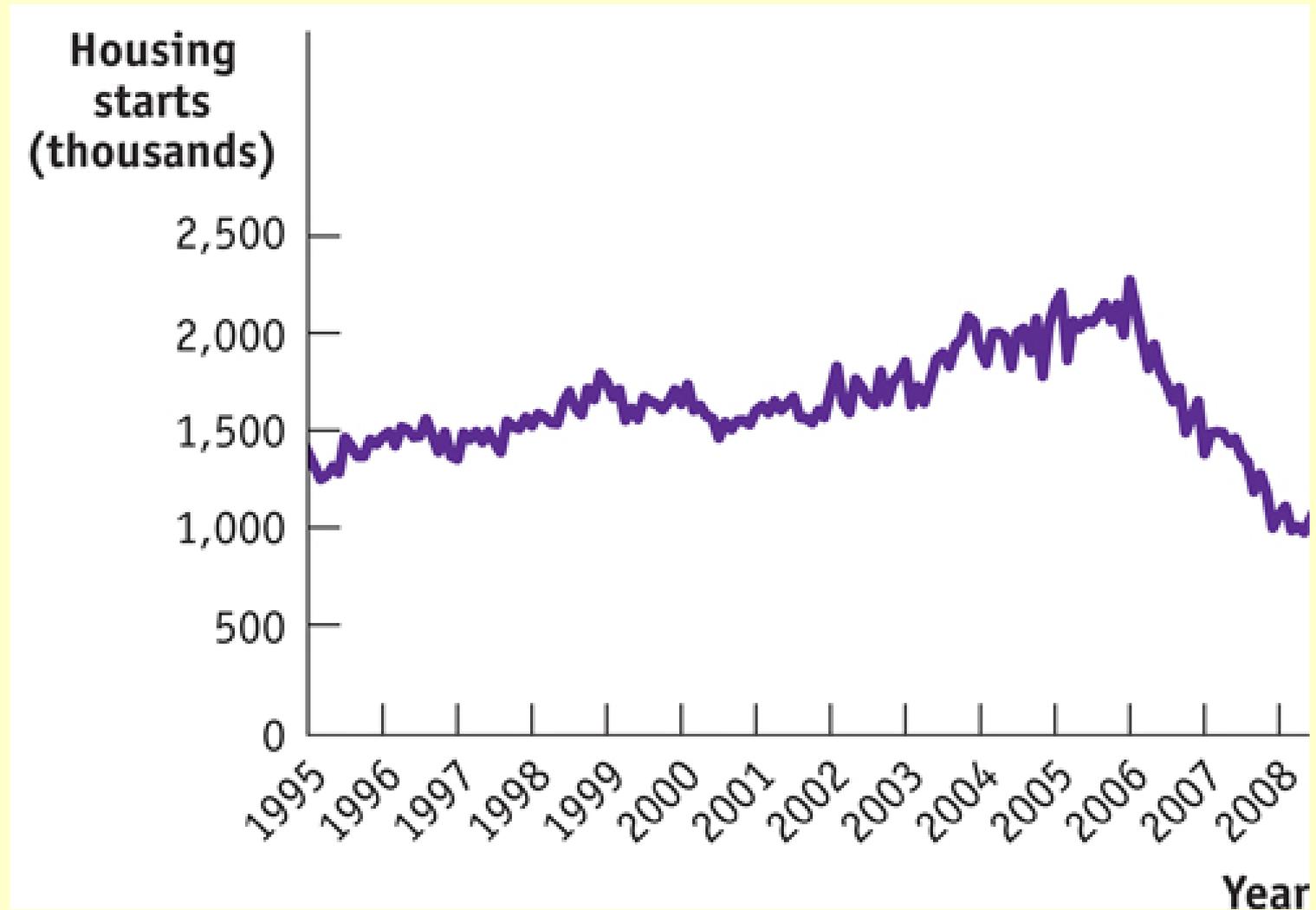
## **Interest Rates and the U.S. Housing Boom**

- The Fed cut mortgage rates in response to the 2001 recession and continued cutting them into 2003 out of concern that the economy's recovery was too weak to generate sustained job growth.
- The low interest rates led to a large increase in residential investment spending, reflected in a surge of housing starts.
- Unfortunately, the housing boom eventually turned into too much of a good thing.
- By 2006, it was clear that the U.S. housing market was experiencing a bubble: people were buying housing based on unrealistic expectations about future price increases. When the bubble burst, housing—and the U.S. economy—took a fall.

## Interest Rates and the U.S. Housing Boom



## Interest Rates and the U.S. Housing Boom



# Income-Expenditure Model

## Assumptions underlying the multiplier process:

1. Changes in overall spending lead to changes in aggregate output. The aggregate price level is fixed.
2. The interest rate is fixed.
3. Taxes, transfers, and government purchases are all zero.
4. Exports and imports are both zero. There is no foreign trade.

# Planned Aggregate Spending and GDP

$$GDP = C + I$$

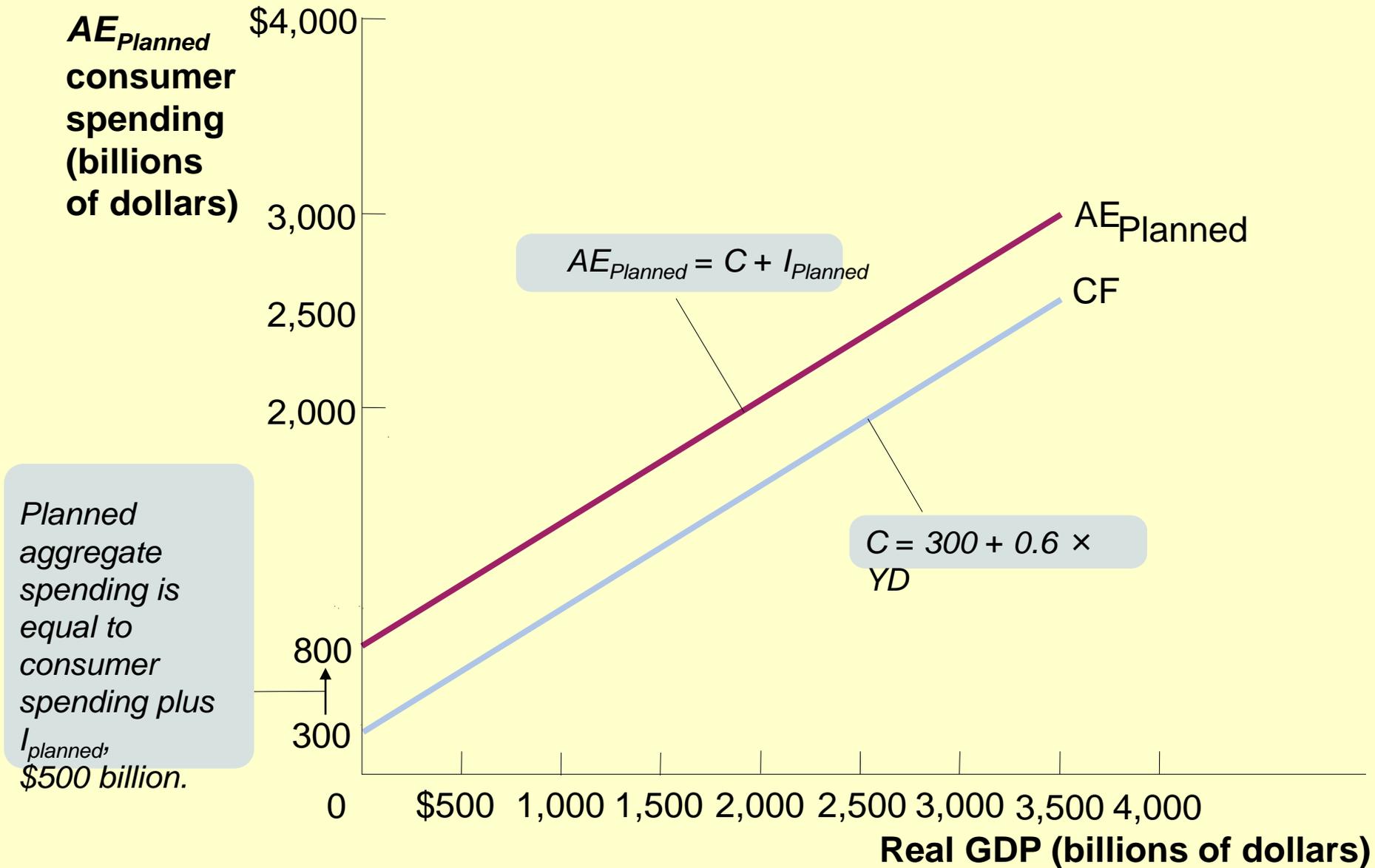
$$YD = GDP$$

$$C = A + MPC \times YD$$

- **Planned aggregate spending** is the total amount of planned spending in the economy.

$$AE_{\text{Planned}} = C + I_{\text{planned}}$$

# Planned Aggregate Spending and GDP



# Income-Expenditure Equilibrium

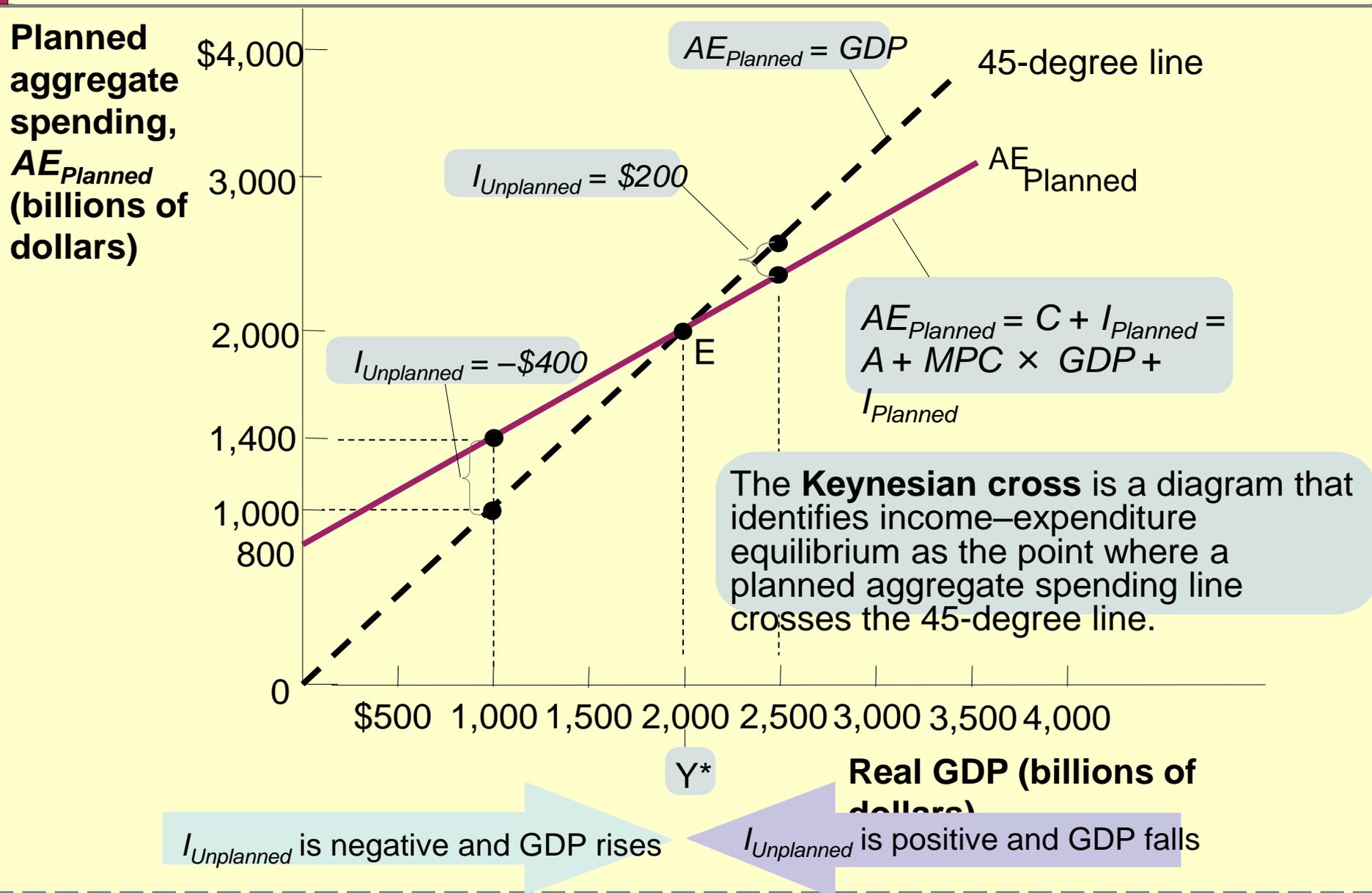
- The economy is in **income–expenditure equilibrium** when aggregate output, measured by real GDP, is equal to planned aggregate spending.
- **Income–expenditure equilibrium GDP** is the level of real GDP at which real GDP equals planned aggregate spending.

$$\begin{aligned} \text{GDP} &= C + I \\ &= C + I_{\text{Planned}} + I_{\text{Unplanned}} \\ &= AE_{\text{Planned}} + I_{\text{Unplanned}} \end{aligned}$$

# Income-Expenditure Equilibrium

- When planned aggregate spending is **larger than**  $Y^*$ , unplanned inventory investment is negative; there is an **unanticipated reduction** in inventories and firms increase production.
- When planned aggregate spending is **less than**  $Y^*$ , unplanned inventory investment is positive; there is an **unanticipated increase** in inventories and firms reduce production.

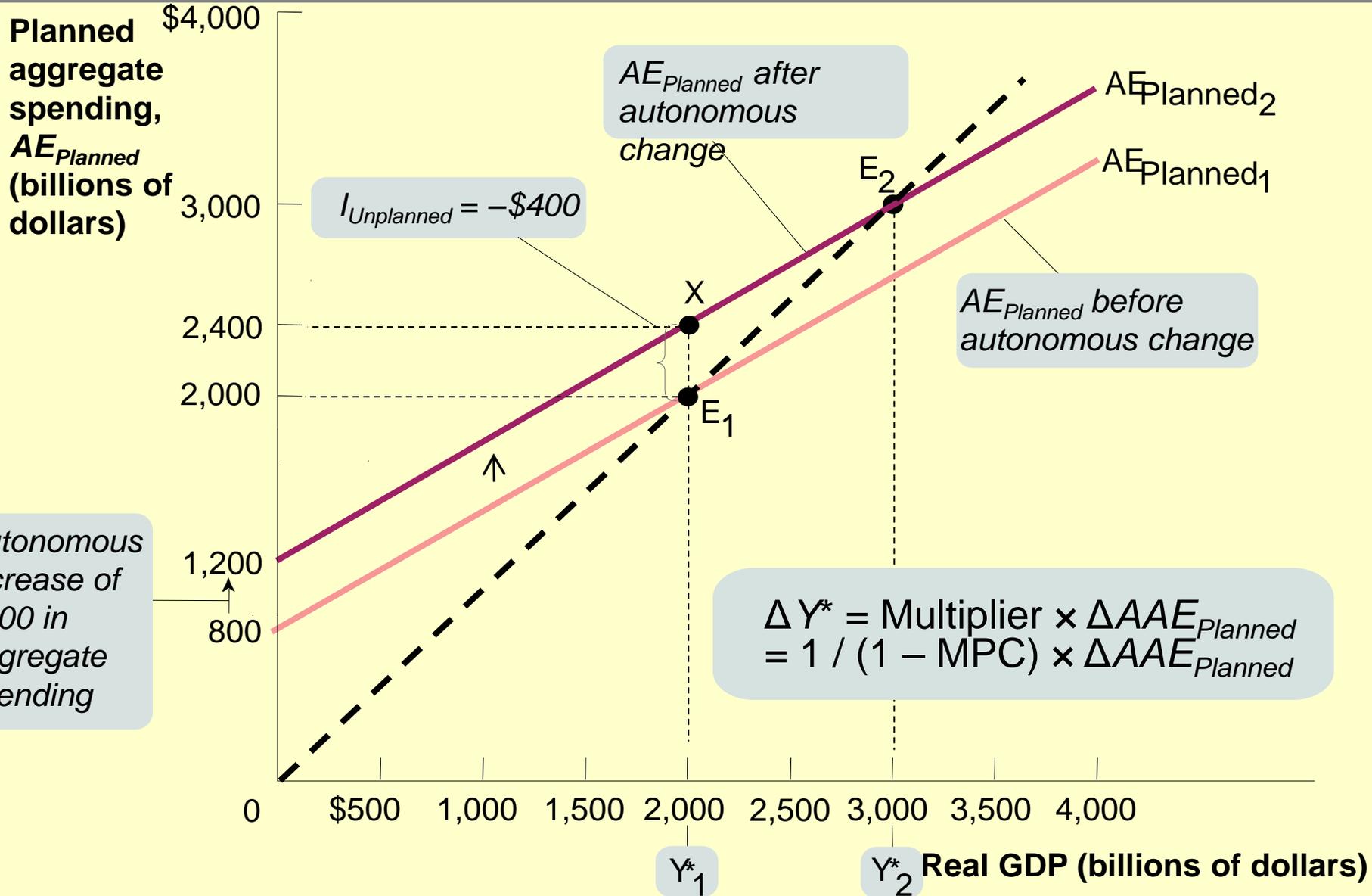
# Income-Expenditure Equilibrium



# The Multiplier Process and Inventory Adjustment

<b>GDP</b>	<b>AE<sub>Planned</sub> before autonomous change</b>	<b>AE<sub>Planned</sub> after autonomous change</b>
0	800	1,200
500	1,100	1,500
1,000	1,400	1,800
1,500	1,700	2,100
2,000	2,000	2,400
2,500	2,300	2,700
3,000	2,600	3,000
3,500	2,900	3,300
4,000	3,200	3,600

# The Multiplier



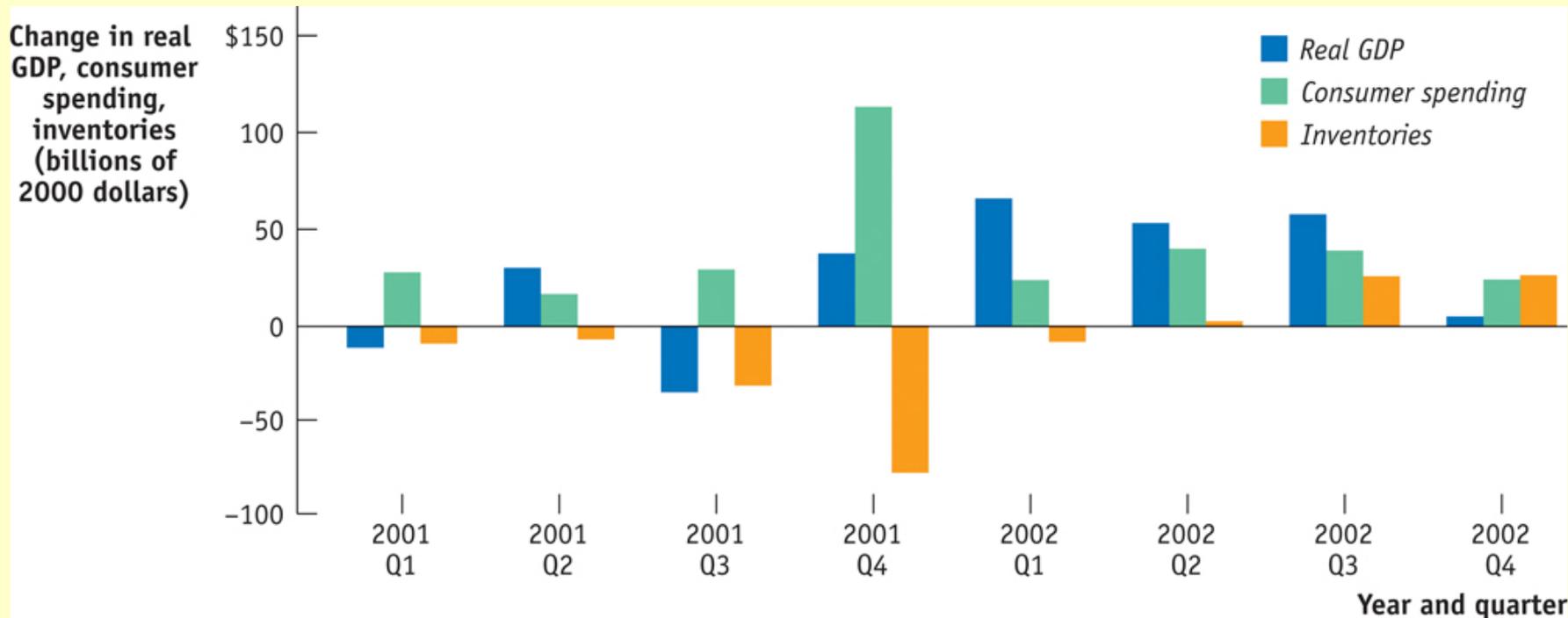
# The Paradox of Thrift

- In the **Paradox of Thrift**, households and producers cut their spending in anticipation of future tough economic times.
- These actions depress the economy, leaving households and producers worse off than if they hadn't acted virtuously to prepare for tough times.
- It is called a paradox because ***what's usually "good" (saving to provide for your family in hard times) is "bad" (because it can make everyone worse off).***

# The Paradox of Thrift



## ▪ Inventories and the End of a Recession



1. An **autonomous change in aggregate spending** leads to a chain reaction in which the total change in real GDP is equal to the **multiplier** times the initial change in aggregate spending. The size of the multiplier,  $1/(1 - MPC)$ , depends on the **marginal propensity to consume, *MPC***, the fraction of an additional dollar of disposable income spent on consumption.
2. The **consumption function** shows how an individual household's consumer spending is determined by its current disposable income. The **aggregate consumption function** shows the relationship for the entire economy.

- 3. Planned investment spending** depends negatively on the interest rate and on existing production capacity; it depends positively on expected future real GDP. The **accelerator principle** says that investment spending is greatly influenced by the expected growth rate of real GDP.
- 4. Firms hold inventories** of goods so that they can satisfy consumer demand quickly. **Inventory investment** is positive when firms add to their inventories, negative when they reduce them. Often, however, changes in inventories are not a deliberate decision but the result of mistakes in forecasts about sales. The result is **unplanned inventory investment**, which can be either positive or negative. **Actual investment spending** is the sum of planned investment spending and unplanned inventory investment.

5. In **income–expenditure equilibrium**, **planned aggregate spending**, which in a simplified model with no government and no trade is the sum of consumer spending and planned investment spending, is equal to real GDP. At the **income–expenditure equilibrium GDP**, or  $Y^*$ , unplanned inventory investment is zero. The **Keynesian cross** shows how the economy self-adjusts to income–expenditure equilibrium through inventory adjustments.
6. After an autonomous change in planned aggregate spending, the inventory adjustment process moves the economy to a new income–expenditure equilibrium. The change in income–expenditure equilibrium GDP arising from an autonomous change in spending is equal to  $(1/(1 - MPC)) \times \Delta AAE_{Planned}$ .

# The End of Chapter 11

coming attraction:  
**Chapter 12:**  
**Aggregate Demand and**  
**Aggregate Supply**