Chapter

21

# Aggregate Expenditure and Equilibrium Output

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# 21

## Chapter Outline



# AGGREGATE EXPENDITURE AND EQUILIBRIUM OUTPUT

The level of GDP, the overall price level, and the level of employment—three chief concerns of macroeconomists—are influenced by events in three broadly defined "markets":

- Goods-and-services markets
- Financial (money) markets
- Labor markets

# AGGREGATE EXPENDITURE AND EQUILIBRIUM OUTPUT

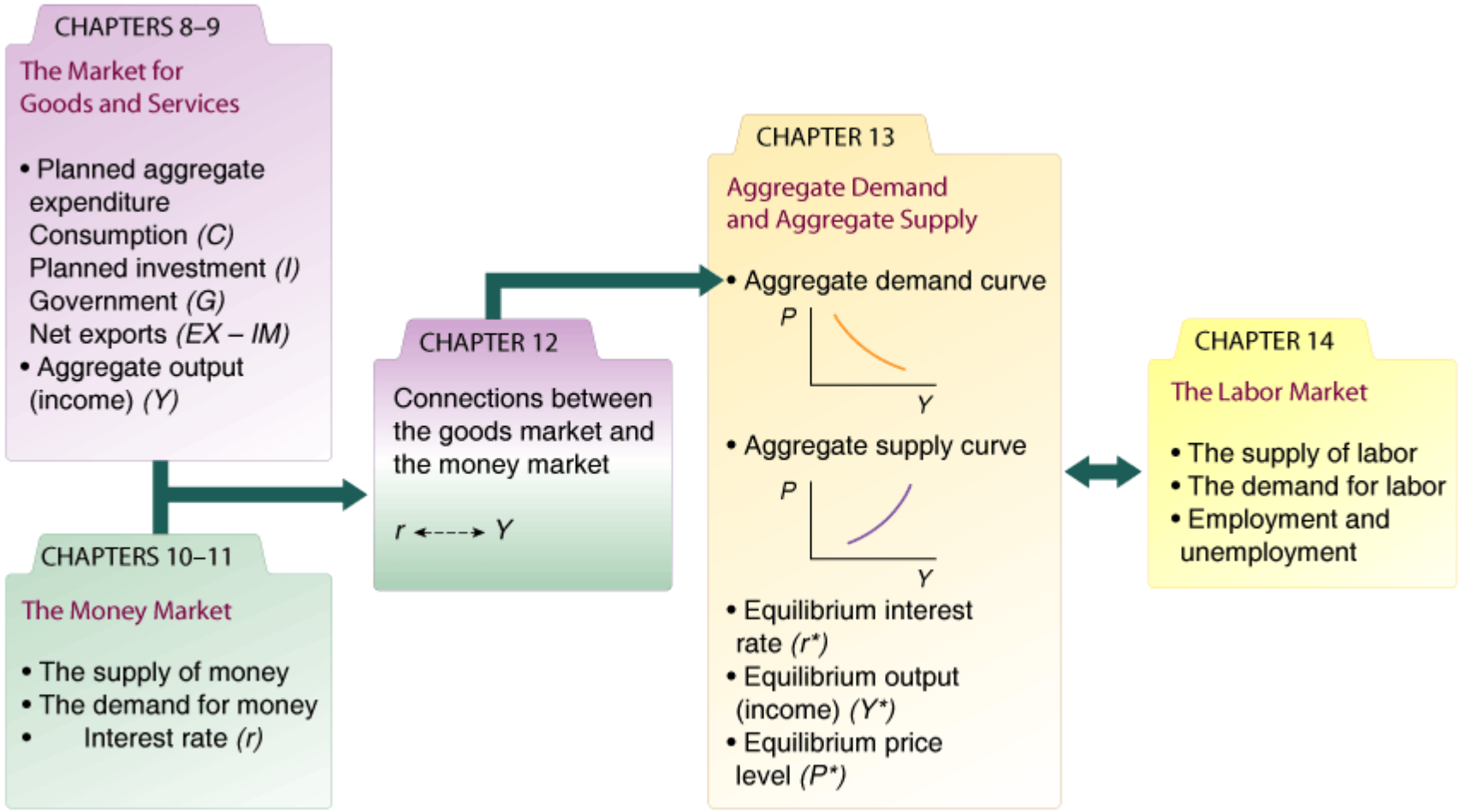



**FIGURE 8.1** The Core of Macroeconomic Theory

# AGGREGATE OUTPUT AND AGGREGATE INCOME (*Y*)

**aggregate output** The total quantity of goods and services produced (or supplied) in an economy in a given period.

**aggregate income** The total income received by all factors of production in a given period.

**aggregate output (income) (*Y*)** A combined term used to remind you of the exact equality between aggregate output and aggregate income.

**In any given period, there is an exact equality between aggregate output (production) and aggregate income. You should be reminded of this fact whenever you encounter the combined term aggregate output (income).**

# AGGREGATE OUTPUT AND AGGREGATE INCOME (*Y*)

## Think in Real Terms

When we talk about output (*Y*), we mean real output, not nominal output.

The main point is to think of *Y* as being in real terms—the quantities of goods and services produced, not the dollars circulating in the economy.

# AGGREGATE OUTPUT AND AGGREGATE INCOME (*Y*)

## INCOME, CONSUMPTION, AND SAVING (*Y*, *C*, AND *S*)

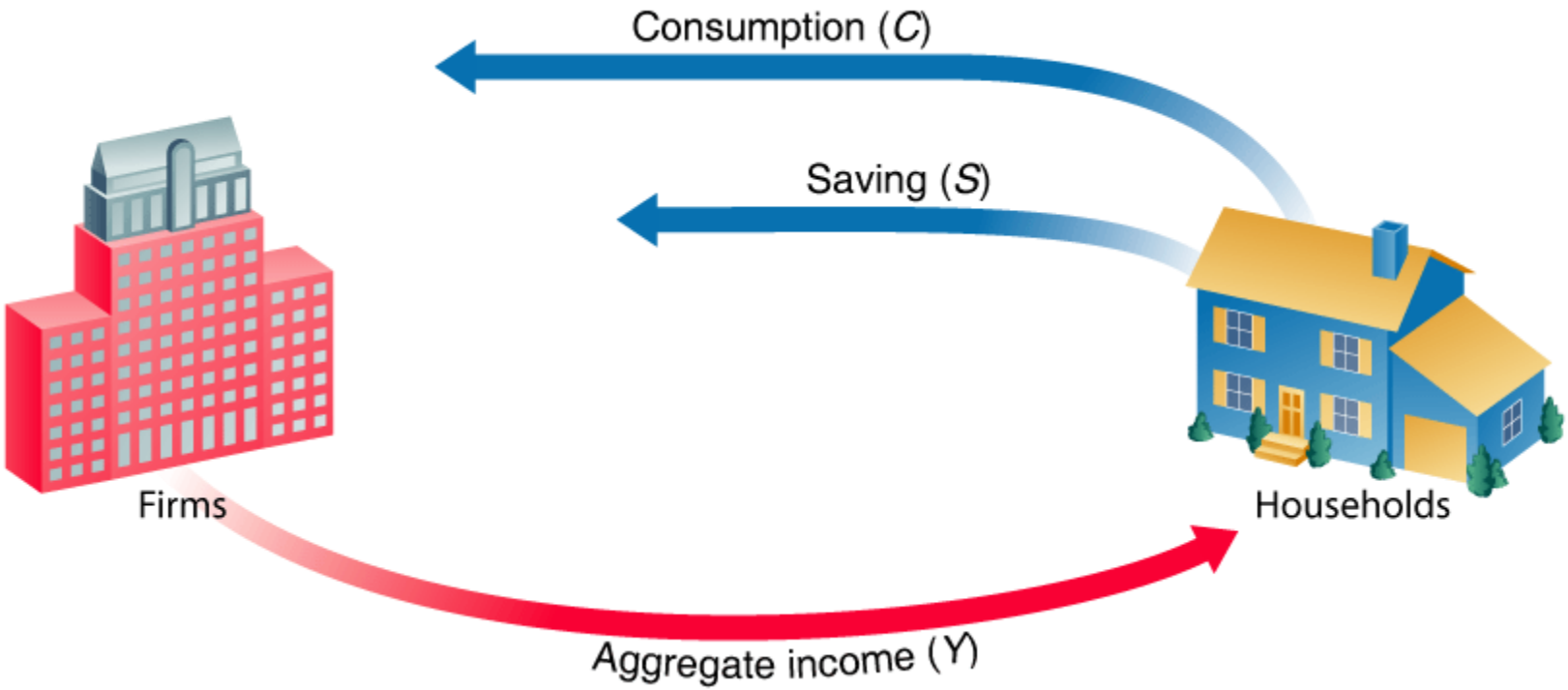



**FIGURE 8.2** Saving ≡ Aggregate Income − Consumption

# AGGREGATE OUTPUT AND AGGREGATE INCOME (*Y*)

**saving (*S*)** The part of its income that a household does not consume in a given period. Distinguished from savings, which is the current stock of accumulated saving.

$$\text{Saving} \equiv \text{income} - \text{consumption}$$

$$S \equiv Y - C$$

**identity** Something that is always true.

# AGGREGATE OUTPUT AND AGGREGATE INCOME (*Y*)

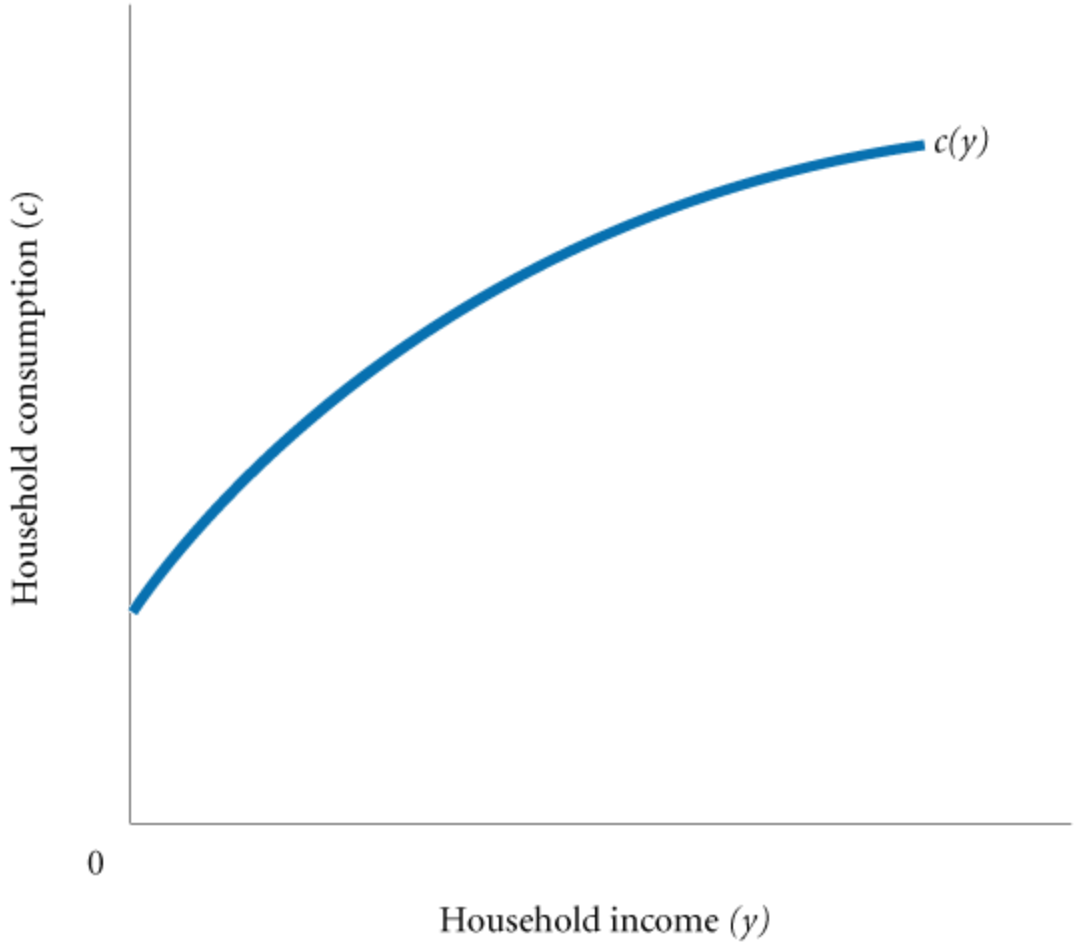



**FIGURE 8.3** A Consumption Function for a Household

# AGGREGATE OUTPUT AND AGGREGATE INCOME (*Y*)

## EXPLAINING SPENDING BEHAVIOR

### Household Consumption and Saving

**Some determinants of aggregate consumption include:**

1. **Household income**
2. **Household wealth**
3. **Interest rates**
4. **Households' expectations about the future**

**The higher your income is, the higher your consumption is likely to be. People with more income tend to consume more than people with less income.**

**consumption function** The relationship between consumption and income.

# AGGREGATE OUTPUT AND AGGREGATE INCOME (*Y*)

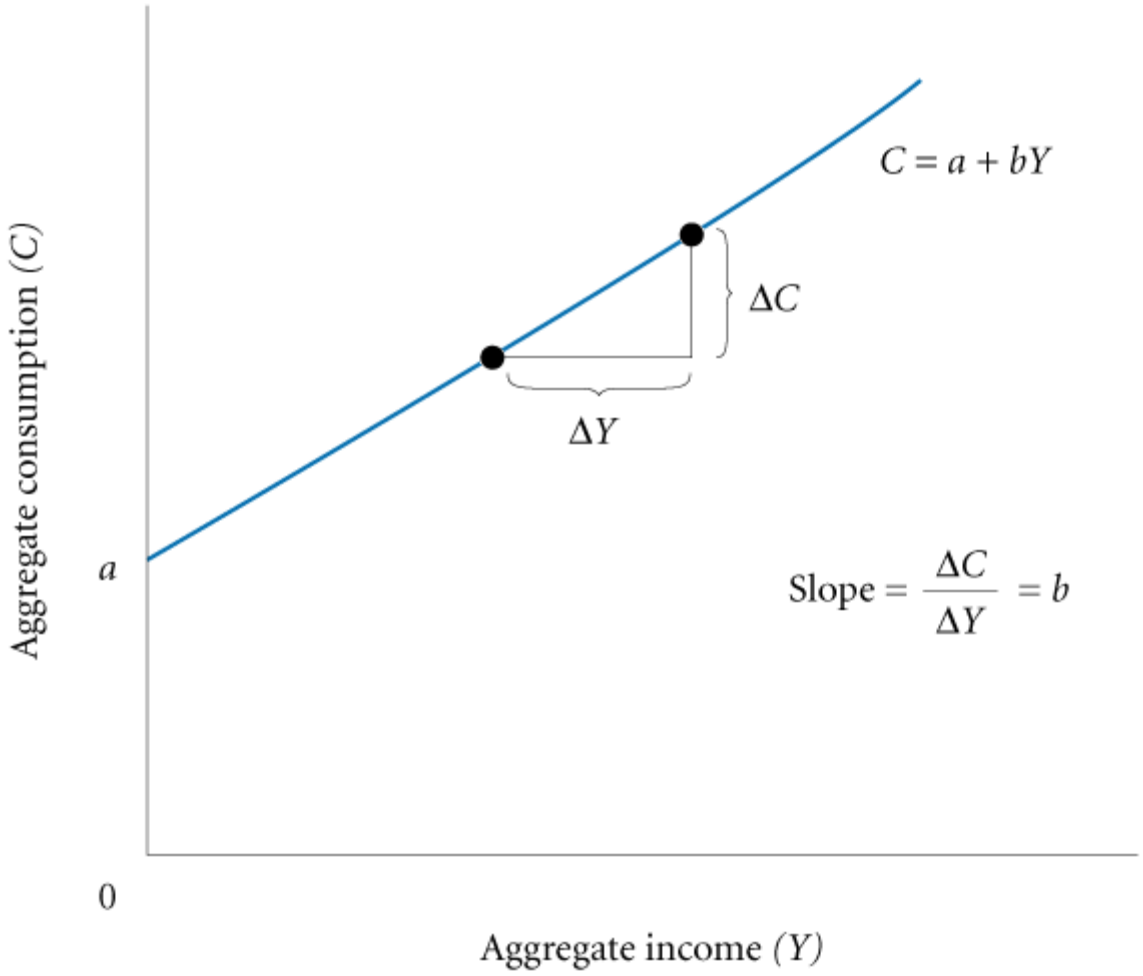



**FIGURE 8.4** An Aggregate Consumption Function

# AGGREGATE OUTPUT AND AGGREGATE INCOME (*Y*)

Because the aggregate consumption function is a straight line, we can write the following equation to describe it:

$$C = a + bY$$

**marginal propensity to consume (*MPC*)** That fraction of a change in income that is consumed, or spent.

$$\text{marginal propensity to consume} \equiv \text{slope of consumption function} \equiv \frac{\Delta C}{\Delta Y}$$

# AGGREGATE OUTPUT AND AGGREGATE INCOME (*Y*)

**marginal propensity to save (*MPS*)**
That fraction of a change in income that is saved.

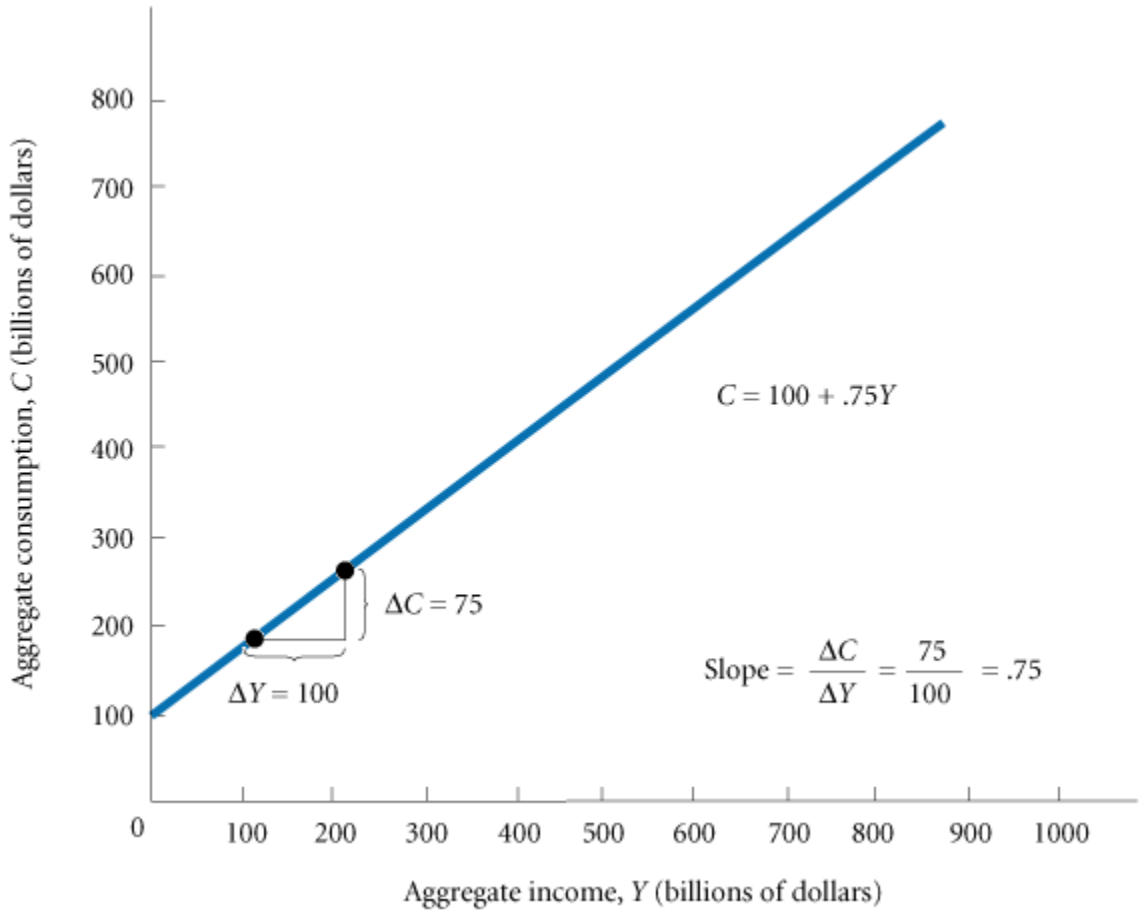
$$MPC + MPS \equiv 1$$

Because the *MPC* and the *MPS* are important concepts, it may help to review their definitions.

**The marginal propensity to consume (*MPC*) is the fraction of an increase in income that is consumed (or the fraction of a decrease in income that comes out of consumption). The marginal propensity to save (*MPS*) is the fraction of an increase in income that is saved (or the fraction of a decrease in income that comes out of saving).**

# AGGREGATE OUTPUT AND AGGREGATE INCOME (*Y*)

## Numerical Example

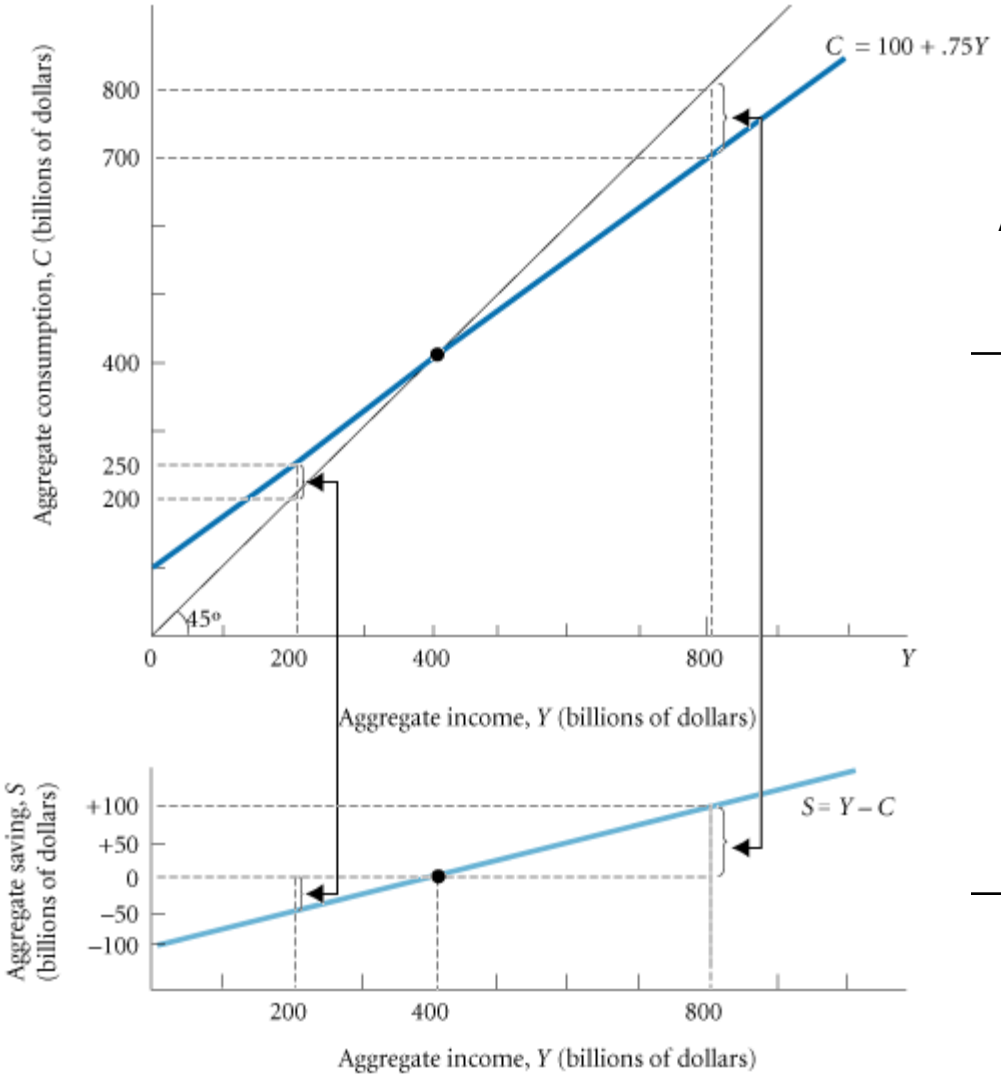



| AGGREGATE INCOME, *Y* (BILLIONS OF DOLLARS) | AGGREGATE CONSUMPTION, *C* (BILLIONS OF DOLLARS) |
|---|---|
| 0 | 100 |
| 80 | 160 |
| 100 | 175 |
| 200 | 250 |
| 400 | 400 |
| 600 | 550 |
| 800 | 700 |
| 1,000 | 850 |

**FIGURE 8.5** An Aggregate Consumption Function Derived from the Equation $C = 100 + .75Y$

# AGGREGATE OUTPUT AND AGGREGATE INCOME (*Y*)




| *Y* AGGREGATE INCOME (Billions of Dollars) | - | *C* AGGREGATE CONSUMPTION (Billions of Dollars) | = | *S* AGGREGATE SAVING (Billions of Dollars) |
|---|---|---|---|---|
| 0 | | 100 | | -100 |
| 80 | | 160 | | -80 |
| 100 | | 175 | | -75 |
| 200 | | 250 | | -50 |
| 400 | | 400 | | 0 |
| 600 | | 550 | | 50 |
| 800 | | 700 | | 100 |
| 1,000 | | 850 | | 150 |

**FIGURE 8.6** Deriving a Saving Function from a Consumption Function

# AGGREGATE OUTPUT AND AGGREGATE INCOME (*Y*)

- Where the consumption function is *above* the 45° line, consumption exceeds income, and saving is negative.
- Where the consumption function *crosses* the 45° line, consumption is equal to income, and saving is zero.
- Where the consumption function is *below* the 45° line, consumption is less than income, and saving is positive.

Note that the slope of the saving function is $\Delta S/\Delta Y$, which is equal to the marginal propensity to save (*MPS*).

**The consumption function and the saving function are mirror images of one another. No information appears in one that does not also appear in the other. These functions tell us how households in the aggregate will divide income between consumption spending and saving at every possible income level. In other words, they embody aggregate household behavior.**

# AGGREGATE OUTPUT AND AGGREGATE INCOME (*Y*)

## PLANNED INVESTMENT (*I*)

### What Is Investment?

**investment** Purchases by firms of new buildings and equipment and additions to inventories, all of which add to firms' capital stock.

# AGGREGATE OUTPUT AND AGGREGATE INCOME (*Y*)

## Actual versus Planned Investment

**change in inventory** Production minus sales.

**One component of investment—inventory change—is partly determined by how much households decide to buy, which is not under the complete control of firms. If households do not buy as much as firms expect them to, inventories will be higher than expected, and firms will have made an inventory investment that they did not plan to make.**

# AGGREGATE OUTPUT AND AGGREGATE INCOME (*Y*)



**desired,** or **planned, investment** Those additions to capital stock and inventory that are planned by firms.

**actual investment** The actual amount of investment that takes place; it includes items such as unplanned changes in inventories.

# AGGREGATE OUTPUT AND AGGREGATE INCOME (*Y*)

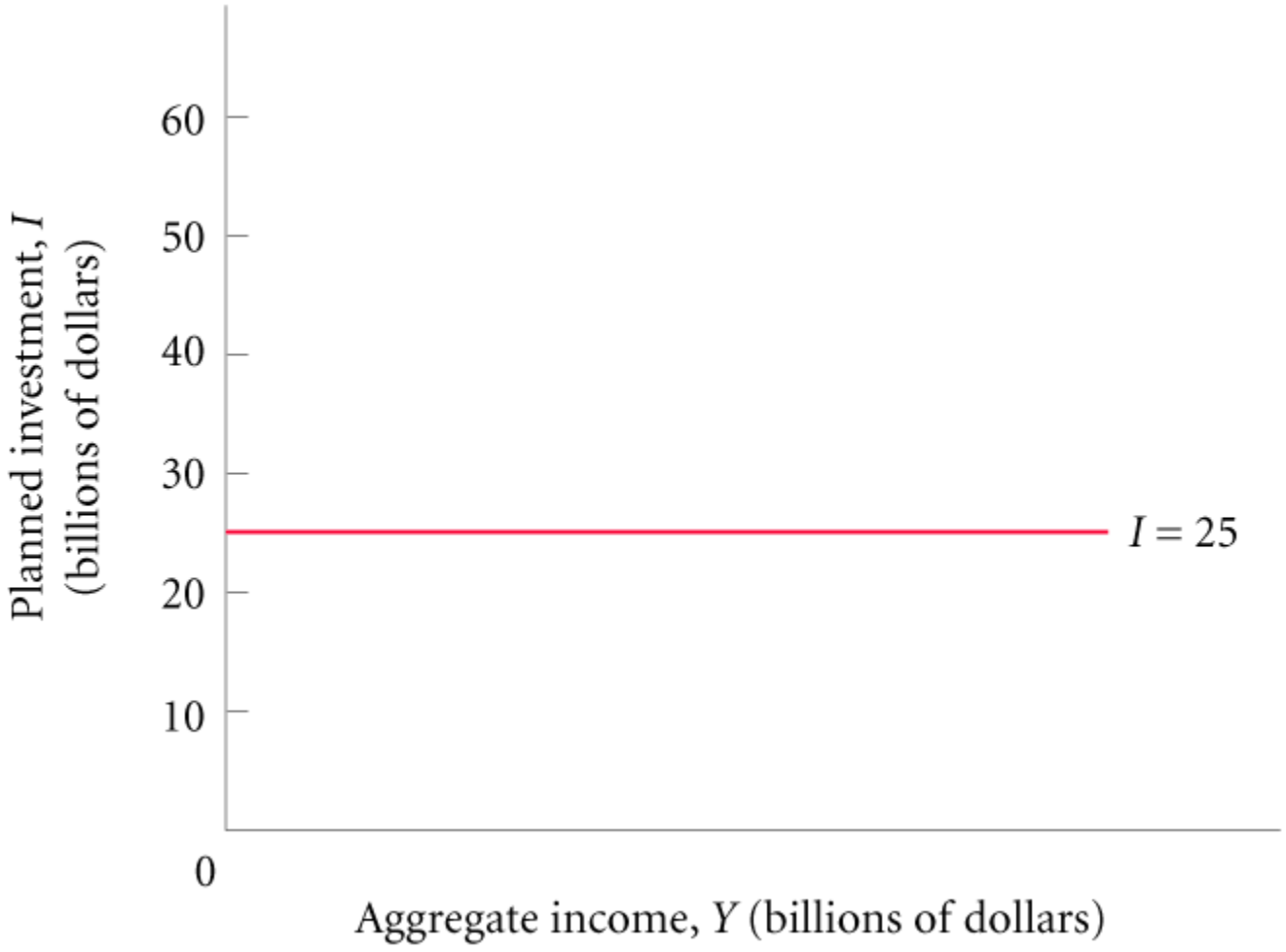



**FIGURE 8.7** The Planned Investment Function

# AGGREGATE OUTPUT AND AGGREGATE INCOME (*Y*)

## PLANNED AGGREGATE EXPENDITURE (*AE*)

**planned aggregate expenditure (*AE*)**
The total amount the economy plans to spend in a given period. Equal to consumption plus planned investment: $AE \equiv C + I$.

planned aggregate expenditure ≡ consumption + planned investment

$$AE \equiv C + I$$

# EQUILIBRIUM AGGREGATE OUTPUT (INCOME)

**equilibrium** Occurs when there is no tendency for change. In the macroeconomic goods market, equilibrium occurs when planned aggregate expenditure is equal to aggregate output.

**aggregate output ≡ *Y***

**planned aggregate expenditure ≡ *AE* ≡ *C* + *I***

**equilibrium: *Y* = *AE*, or *Y* = *C* + *I***

# EQUILIBRIUM AGGREGATE OUTPUT (INCOME)

$$Y > C + I$$

aggregate output > planned aggregate expenditure
inventory investment is greater than planned
actual investment is greater than planned investment

$$C + I > Y$$

planned aggregate expenditure > aggregate output
inventory investment is smaller than planned
actual investment is less than planned investment

**Equilibrium in the goods market is achieved only when aggregate output (*Y*) and planned aggregate expenditure (*C* + *I*) are equal, or when actual and planned investment are equal.**

# EQUILIBRIUM AGGREGATE OUTPUT (INCOME)

**TABLE 8.1** Deriving the Planned Aggregate Expenditure Schedule and Finding Equilibrium (All Figures in Billions of Dollars) The Figures in Column 2 Are Based on the Equation $C = 100 + .75Y$.

| (1) AGGREGATE OUTPUT (INCOME) ($Y$) | (2) AGGREGATE CONSUMPTION ($C$) | (3) PLANNED INVESTMENT ($I$) | (4) PLANNED AGGREGATE EXPENDITURE ($AE$) $C + I$ | (5) UNPLANNED INVENTORY CHANGE $Y - (C + I)$ | (6) EQUILIBRIUM? ($Y = AE$?) |
|---|---|---|---|---|---|
| 100 | 175 | 25 | 200 | – 100 | No |
| 200 | 250 | 25 | 275 | – 75 | No |
| 400 | 400 | 25 | 425 | – 25 | No |
| 500 | 475 | 25 | 500 | 0 | Yes |
| 600 | 550 | 25 | 575 | + 25 | No |
| 800 | 700 | 25 | 725 | + 75 | No |
| 1,000 | 850 | 25 | 875 | + 125 | No |

# EQUILIBRIUM AGGREGATE OUTPUT (INCOME)

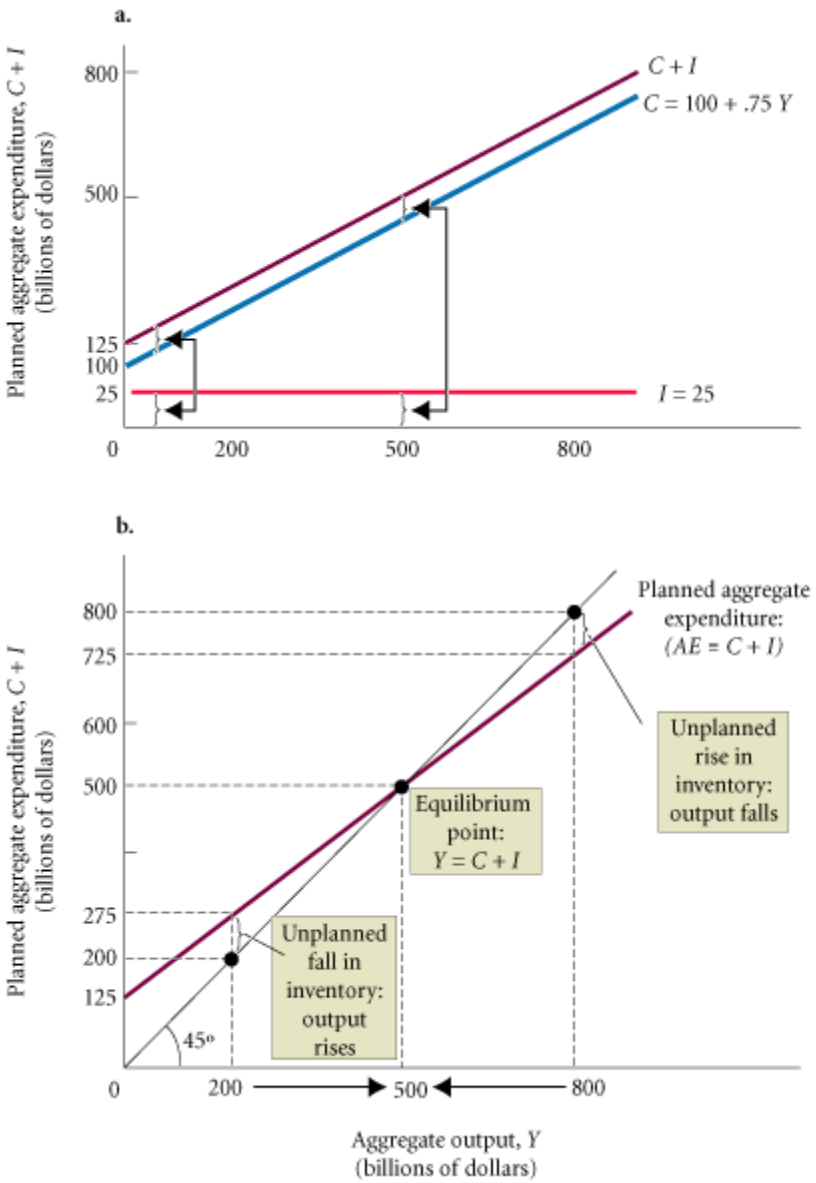



**FIGURE 8.8** **Equilibrium Aggregate Output**

# EQUILIBRIUM AGGREGATE OUTPUT (INCOME)

## THE SAVING/INVESTMENT APPROACH TO EQUILIBRIUM

Because aggregate income must either be saved or spent, by definition, $Y \equiv C + S$, which is an identity. The equilibrium condition is $Y = C + I$, but this is not an identity because it does not hold when we are out of equilibrium. By substituting $C + S$ for $Y$ in the equilibrium condition, we can write:

$$C + S = C + I$$

Because we can subtract $C$ from both sides of this equation, we are left with:

$$S = I$$

Thus, only when planned investment equals saving will there be equilibrium.

# EQUILIBRIUM AGGREGATE OUTPUT (INCOME)

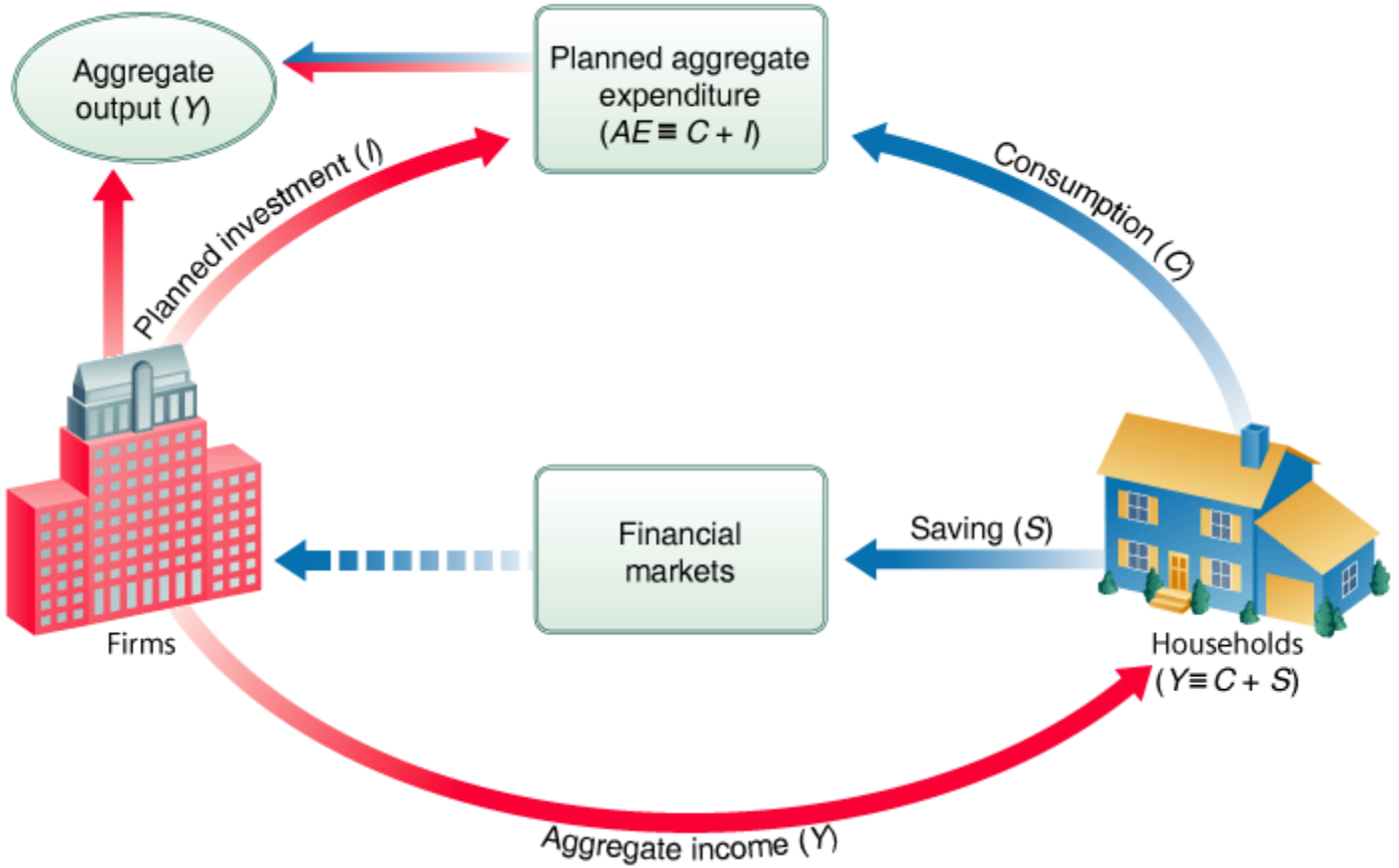



**FIGURE 8.9** **Planned Aggregate Expenditure and Aggregate Output (Income)**

# EQUILIBRIUM AGGREGATE OUTPUT (INCOME)

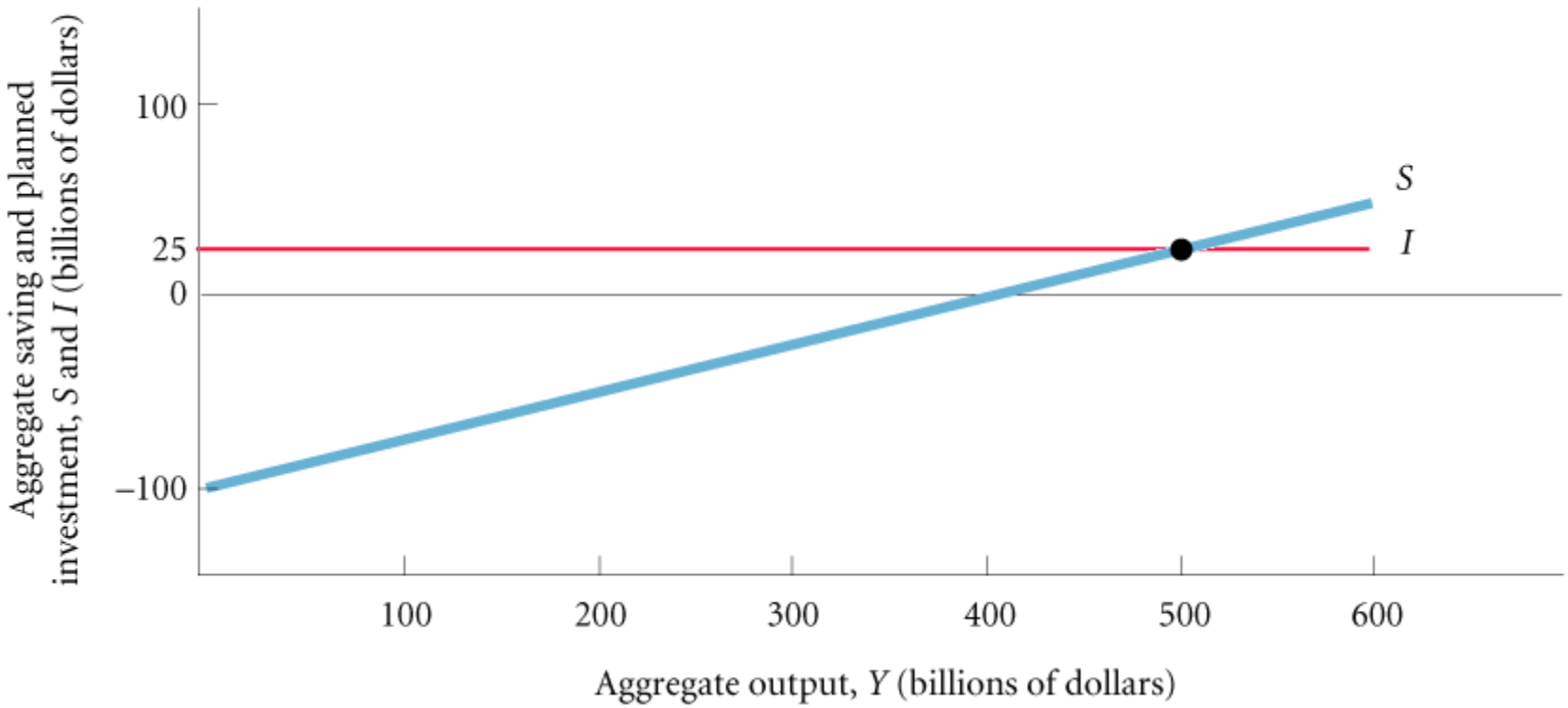



**FIGURE 8.10** The *S* = *I* Approach to Equilibrium

# EQUILIBRIUM AGGREGATE OUTPUT (INCOME)

## ADJUSTMENT TO EQUILIBRIUM

**The adjustment process will continue as long as output (income) is below planned aggregate expenditure. If firms react to unplanned inventory reductions by increasing output, an economy with planned spending greater than output will adjust to equilibrium, with *Y* higher than before. If planned spending is less than output, there will be unplanned increases in inventories. In this case, firms will respond by reducing output. As output falls, income falls, consumption falls, and so forth, until equilibrium is restored, with *Y* lower than before.**

# THE MULTIPLIER

**multiplier** The ratio of the change in the equilibrium level of output to a change in some autonomous variable.

**autonomous variable** A variable that is assumed not to depend on the state of the economy—that is, it does not change when the economy changes.

**This added income does not vanish into thin air. It is paid to households that spend some of it and save the rest. The added production leads to added income, which leads to added consumption spending.**

# THE MULTIPLIER

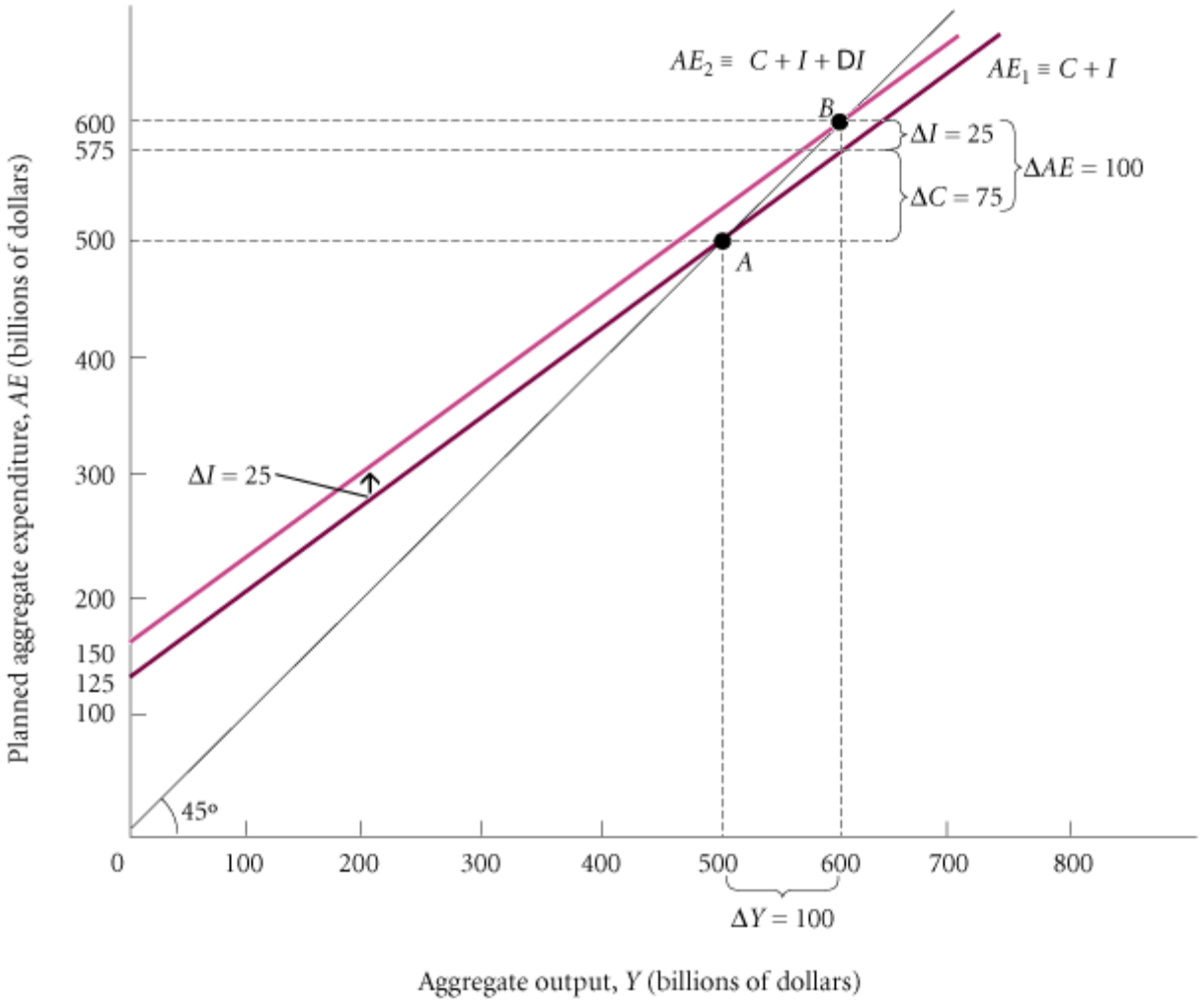



**FIGURE 8.11** The Multiplier as Seen in the Planned Aggregate Expenditure Diagram

# THE MULTIPLIER

## THE MULTIPLIER EQUATION

**Equilibrium will be restored only when saving has increased by exactly the amount of the initial increase in *I*.**

The marginal propensity to save may be expressed as:

$$MPS = \frac{\Delta S}{\Delta Y}$$

Because $\Delta S$ must be equal to $\Delta I$ for equilibrium to be restored, we can substitute $\Delta I$ for $\Delta S$ and solve:

$$MPS = \frac{\Delta I}{\Delta Y} \quad \text{therefore,} \quad \Delta Y = \Delta I \times \frac{1}{MPS}$$

$$multiplier \equiv \frac{1}{MPS} \quad \text{, or} \quad multiplier = \frac{1}{1 - MPC}$$

# THE MULTIPLIER

## THE SIZE OF THE MULTIPLIER IN THE REAL WORLD

**In reality, the size of the multiplier is about 1.4. That is, a sustained increase in autonomous spending of $10 billion into the U.S. economy can be expected to raise real GDP over time by about $14 billion.**

# REVIEW TERMS AND CONCEPTS

actual investment
aggregate income
aggregate output
aggregate output (income) (*Y*)
autonomous variable
change in inventory
consumption function
desired, or planned, investment
equilibrium
identity
investment
marginal propensity to consume (*MPC*)
marginal propensity to save (*MPS*)
multiplier
paradox of thrift
planned aggregate expenditure (*AE*)
saving (*S*)

1. $S \equiv Y - C$
2. $MPC = \text{slope of consumption function} = \frac{\Delta C}{\Delta Y}$
3. $MPC + MPS \equiv 1$
4. $AE \equiv C + I$
5. Equilibrium condition: $Y = AE$ or $Y = C + I$
6. Saving/investment approach to equilibrium: $S = I$
7. $\text{Multiplier} \equiv \frac{1}{MPS} \equiv \frac{1}{1 - MPC}$

# Appendix

## DERIVING THE MULTIPLIER ALGEBRAICALLY

Recall that our consumption function is:

$$C = a + bY$$

where *b* is the marginal propensity to consume. In equilibrium:

$$Y = C + I$$

Now we solve these two equations for *Y* in terms of *I*. By substituting the first equation into the second, we get:

$$Y = \underbrace{a + bY}_{C} + I$$

# Appendix

## DERIVING THE MULTIPLIER ALGEBRAICALLY

This equation can be rearranged to yield:

$$Y - bY = a + I$$
$$Y(1 - b) = a + I$$

We can then solve for $Y$ in terms of $I$ by dividing through by $(1 - b)$:

$$Y = (a + I)\left(\frac{1}{1-b}\right)$$

# Appendix

## DERIVING THE MULTIPLIER ALGEBRAICALLY

Now look carefully at this expression and think about increasing *I* by some amount, $\Delta I$, with a held constant. If *I* increases by $\Delta I$, income will increase by

$$\Delta Y = \Delta I \times \frac{1}{1-b}$$

Because $b \equiv MPC$, the expression becomes

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

# Appendix

## DERIVING THE MULTIPLIER ALGEBRAICALLY

The multiplier is

$$\frac{1}{1 - MPC}$$

Finally, because *MPS* + *MPC* ≡ 1, *MPS* is equal to 1 − *MPC*, making the alternative expression for the multiplier 1/*MPS*, just as we saw in this chapter.