Key Concepts

**Fixed Prices and Expenditure Plans**
In the very short run, firms do not change their prices and they sell the amount that is demanded. As a result:
- The price level is fixed.
- GDP is determined by aggregate demand.

**Aggregate planned expenditure** is the sum of planned consumption expenditure, planned investment, planned government purchases, and planned exports minus planned imports.

GDP and aggregate planned expenditures have a two-way link: An increase in real GDP increases aggregate planned expenditures, and an increase in aggregate expenditures increases real GDP.

Consumption expenditure, $C$, and saving, $S$, depend on disposable income ($\text{disposable income, } YD$, is income minus taxes plus transfer payments), the real interest rate, wealth, and expected future income.

The consumption function is the relationship between consumption expenditure and disposable income. Figure 13.1 illustrates a consumption function.

- The amount of consumption when disposable income is zero ($1 trillion in Figure 13.1) is called autonomous consumption. Consumption above this amount is called induced consumption.
- The marginal propensity to consume, $MPC$, is the fraction of a change in disposable income that is consumed, or $MPC = \frac{\Delta C}{\Delta YD}$ where $\Delta$ means “change in.”

* This is Chapter 29 in Economics.

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**Figure 13.1**
The Consumption Function

- The slope of the consumption function equals the $MPC$. The slope of the U.S. consumption function is about 0.9.
- Changes in the real interest rate, wealth, or expected future income shift the consumption function.

Consumption varies when real GDP changes because changes in real GDP change disposable income.

The saving function is the relationship between saving and disposable income. The marginal propensity to save, $MPS$, is the fraction of a change in disposable income that is saved, or $MPS = \frac{\Delta S}{\Delta YD}$.

The sum of the $MPC$ plus $MPS$ equals 1.

Domestic imports are determined in the short run mainly by U.S. GDP. The marginal propensity to import is the fraction of an increase in real GDP spent on imports.
Real GDP with a Fixed Price Level

The aggregate planned expenditure schedule shows how aggregate expenditure depends on real GDP. The aggregate expenditure curve plots the aggregate planned expenditure schedule. Figure 13.2 illustrates an aggregate expenditure curve, \( AE = C + I + G + NX \), where \( NX \) is exports minus imports.

- **Induced expenditure** is the sum of the components of aggregate expenditure that change with GDP.
- **Autonomous expenditure** is the sum of the components of aggregate expenditure that do not change when real GDP changes. In Figure 13.2 autonomous expenditure is $8 trillion.
- **Equilibrium expenditure** is the level of aggregate expenditure that occurs when aggregate planned expenditure equals real GDP. In Figure 13.2 the equilibrium expenditure is the point at which the 45° line crosses the \( AE \) line, or $10 trillion.
- If real GDP exceeds equilibrium expenditure, unplanned inventories accumulate; if real GDP is less than equilibrium expenditure, inventories are drawn down in an unplanned manner.

The Multiplier

A change in autonomous expenditure creates an additional change in induced expenditure. The multiplier is the amount by which a change in autonomous expenditure is multiplied to determine the change in equilibrium expenditure and real GDP. The multiplier is larger than 1.0 because a change in autonomous expenditure also changes induced expenditure.

- With no income taxes or imports, the multiplier equals \( \frac{1}{(1 - MPC)} \), or, equivalently, \( \frac{1}{MPS} \).
- Income taxes and imports shrink the multiplier.
- Imports and income taxes reduce the slope of the \( AE \) curve. With them the multiplier equals \( \frac{1}{(1-\text{slope of the } AE \text{ curve})} \).

- A business cycle expansion occurs when autonomous expenditure increases and the multiplier effect increases equilibrium expenditure; a business cycle recession occurs when autonomous expenditure decreases.

The Multiplier and the Price Level

The aggregate expenditure curve (\( AE \)) shows the relationship between aggregate planned expenditure and disposable income; the aggregate demand curve (\( AD \)) shows the relationship between the aggregate quantity of goods demanded and the price level. The \( AD \) curve is derived from the \( AE \) curve.

- An increase in the price level shifts the \( AE \) curve downward and equilibrium expenditure decreases.

Figure 13.3 illustrates this effect: When the price level rises from 130 to 170, the \( AE \) curve shifts
from $AE_0$ to $AE_1$ and equilibrium expenditure decreases from $10$ to $8$ trillion.

• Figure 13.3 shows that, when the price level is 130, the aggregate quantity demanded is $10$ trillion and, when the price level is 170, the aggregate quantity demanded is $8$ trillion. These are two points on the $AD$ curve in Figure 13.4.

**Figure 13.4**
**Increase in the Price Level and the $AD$ Curve**

An increase in the price level leads to a movement along the aggregate demand curve. Figure 13.4 shows how an increase in the price level from 130 to 170 lead to a movement along the $AD$ curve from point $a$ to point $b$. The $AD$ curve does not shift in response to a change in the price level.

• The $AD$ curve shifts when autonomous expenditure changes for any reason other than a change in the price level. For instance, a change in investment or government purchases shifts the $AD$ curve.

• The size of the shift in the $AD$ curve equals the multiplier times the change in autonomous expenditure. Figure 13.5 shows this result, where the $AD$ curve shifts rightward and the multiplied change in equilibrium expenditure is equal to the length of the double-headed arrow, $2$ trillion.

• The change in real GDP is less than the shift in the $AD$ curve. In Figure 13.5 the shift in the $AD$ curve is $2$ trillion. The increase in the price level reduces the increase in GDP; in the short run, real GDP in the figure increases by only $1$ trillion.

• In the long run, real GDP returns to potential real GDP and does not change as a result of a change in aggregate demand. In the long run, the multiplier is zero.

**Helpful Hints**

1. **Autonomous and Induced Expenditure:** Autonomous expenditure is independent of changes in real GDP, whereas induced expenditure varies as real GDP changes. In general, a change in autonomous expenditure creates a change in real GDP, which in turn creates a change in induced expenditure. The induced changes are at the heart of the multiplier effect.

2. **The Intuition of the Multiplier:** The concept of the multiplier is very important. An initial increase in autonomous expenditure, such as investment, increases real GDP directly, but that is not the end of the story. The initial increase in real GDP generates an increase in induced expenditure, which further increases real GDP and thus creates further increases in (induced) expenditure. Induced expenditure occurs because the increase in real GDP created by the increase in autonomous expenditure raises disposable income. For instance, an increase in investment purchases of computers raises the incomes of workers who are hired to manufacture the additional computers. Then, the
increase in disposable income increases these workers’ (induced!) consumption expenditures.

3. **The Multiplier and the Aggregate Supply Curve**: The multiplier shows the change in equilibrium expenditure. So, if the multiplier is 5.0 and investment (a component of autonomous expenditure) increases by $10 billion, the equilibrium expenditure increases by $50 billion. However, an increase in the equilibrium expenditure of $50 billion does not necessarily mean that equilibrium real GDP also increases by $50 billion. The change in equilibrium real GDP depends on the interaction of aggregate demand and aggregate supply. The $50 billion increase in equilibrium expenditure implies that the $AD$ curve shifts rightward by $50 billion, but this shift is one part of the picture. Depending on the aggregate supply curve, real GDP could increase by an amount close to $50 billion (if the $SAS$ curve is relatively flat) or by an amount less than $50 billion (how much less depends on the steepness of the $SAS$ curve).

Questions

**True/False and Explain**

**Fixed Prices and Expenditure Plans**

1. A change in disposable income shifts the consumption function.
2. The marginal propensity to consume equals consumption divided by disposable income.
3. The sum of the marginal propensity to consume and the marginal propensity to save equals 1.

**Real GDP with a Fixed Price Level**

4. When real GDP increases, induced expenditure increases along the $AE$ curve.
5. Planned aggregate expenditure can be different than the actual aggregate expenditure.
6. Equilibrium expenditure occurs when aggregate planned expenditure equals real GDP.
7. When aggregate planned expenditure exceeds real GDP, inventories rise more than planned.

**The Multiplier**

8. An increase in autonomous expenditure leads to an induced increase in consumption expenditure.

9. The multiplier equals $\frac{1}{1 - MPS}$.

10. The larger the marginal propensity to consume, the smaller the multiplier.

11. If the marginal propensity to consume is 0.8 and there are no income taxes nor imports, the multiplier equals 5.0.

**The Multiplier and the Price Level**

12. An increase in investment shifts the $AE$ curve upward and the $AD$ curve rightward.

13. In the short run, an increase in investment expenditure of $1 billion increases equilibrium GDP by more than $1 billion.

14. In the long run, an increase in investment expenditure of $1 billion increases equilibrium GDP by more than $1 billion.

**Multiple Choice**

**Fixed Prices and Expenditure Plans**

Use Figure 13.6 for the next question.

**Multiple Choice Question 1**

1. What is the marginal propensity to consume, $MPC$, in Figure 13.6?
   
   a. 1.00.
   b. 0.90.
   c. 0.67.
   d. $3$ trillion.
2. The fraction of a change in disposable income saved is called
   a. the marginal propensity to consume.
   b. the marginal propensity to save.
   c. the marginal tax rate.
   d. none of the above.

3. The $MPC$ plus $MPS$ equals
   a. 1.
   b. 0.
   c. a number between 1 and 0.
   d. a number not between 0 and 1.

4. Consumption expenditure increases when ___ increases.
   a. the interest rate
   b. the price level
   c. real GDP
   d. saving

5. Which of the following increases the amount a household saves?
   a. A decrease in the household’s current disposable income.
   b. An increase in the household’s expected future income.
   c. An increase in the household’s net taxes.
   d. A decrease in the household’s expected future income.

6. Which of the following shifts the consumption function downward?
   a. An increase in current disposable income.
   b. An increase in future expected income.
   c. An increase in wealth.
   d. A decrease in wealth.

7. An increase in expected future income ____ consumption expenditure and ____ saving.
   a. increases; increases
   b. increases; decreases
   c. decreases; increases
   d. decreases; decreases

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8. The aggregate expenditure curve shows the relationship between aggregate planned expenditure and
   a. government purchases.
   b. real GDP.
   c. the interest rate.
   d. the price level.

9. Autonomous expenditure is NOT influenced by
   a. the interest rate.
   b. taxes.
   c. real GDP.
   d. any variable.

10. If unplanned inventories rise, aggregate planned expenditure is
    a. greater than real GDP and firms increase their output.
    b. greater than real GDP and firms decrease their output.
    c. less than real GDP and firms increase their output.
    d. less than real GDP and firms decrease their output.

11. If aggregate planned expenditure exceeds real GDP, in the short run,
    a. aggregate planned expenditure will increase.
    b. real GDP will increase.
    c. the price level will fall to restore equilibrium.
    d. exports decrease to restore equilibrium.

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12. If investment increases by $200 and, in response, equilibrium expenditure increases by $800,
    a. the multiplier is 0.25.
    b. the multiplier is 4.0.
    c. the slope of the $AE$ curve is 0.25.
    d. None of the above.

13. The multiplier equals
    a. $1/(MPC)$.
    b. $MPC/(1 - MPC)$.
    c. $MPS/(MPC)$.
    d. $1/(1 - MPC)$. 

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14. Consumption expenditure increases when ___ increases.
    a. the interest rate
    b. the price level
    c. real GDP
    d. saving

15. Which of the following increases the amount a household saves?
    a. A decrease in the household’s current disposable income.
    b. An increase in the household’s expected future income.
    c. An increase in the household’s net taxes.
    d. A decrease in the household’s expected future income.

16. Which of the following shifts the consumption function downward?
    a. An increase in current disposable income.
    b. An increase in future expected income.
    c. An increase in wealth.
    d. A decrease in wealth.

17. An increase in expected future income ____ consumption expenditure and ____ saving.
    a. increases; increases
    b. increases; decreases
    c. decreases; increases
    d. decreases; decreases

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18. The aggregate expenditure curve shows the relationship between aggregate planned expenditure and
    a. government purchases.
    b. real GDP.
    c. the interest rate.
    d. the price level.

19. Autonomous expenditure is NOT influenced by
    a. the interest rate.
    b. taxes.
    c. real GDP.
    d. any variable.
14. When the marginal propensity to consume is 0.50 and there are no income taxes or imports, the multiplier equals
   a. 10.0.
   b. 5.0.
   c. 2.0.
   d. 0.5.

15. If the marginal propensity to consume is 0.75 and there are no income taxes nor imports, what does the multiplier equal?
   a. 1.33
   b. 1.50
   c. 2.00
   d. 4.00

16. An increase in autonomous expenditure shifts the $AE$ curve
   a. upward and leaves its slope unchanged.
   b. upward and makes it steeper.
   c. upward and makes it flatter.
   d. downward and makes it steeper.

17. Income taxes ___ the magnitude of the multiplier.
   a. increase
   b. do not change
   c. decrease
   d. sometimes increase and sometimes decrease

18. A recession begins when
   a. the multiplier falls in value because the marginal propensity to consume has fallen in value.
   b. autonomous expenditure increases.
   c. autonomous expenditure decreases.
   d. the marginal propensity to consume rises in value, which boosts the magnitude of the multiplier.

19. An increase in the price level shifts the $AE$ curve ___ and ____ equilibrium expenditure.
   a. upward; increases
   b. upward; decreases
   c. downward; increases
   d. downward; decreases

20. A fall in the price level leads to
   a. a downward shift in the aggregate expenditure curve and a movement along the aggregate demand curve.
   b. an upward shift in the aggregate expenditure curve and a rightward shift in the aggregate demand curve.
   c. an upward shift in the aggregate expenditure curve and a movement along the aggregate demand curve.
   d. a movement along both the aggregate expenditure curve and the aggregate demand curve.

21. The multiplier is 2.0 and, owing to an increase in expected future profit, investment increases by $10 billion. The increase in investment and the multiplier result in the $AD$ curve
   a. shifting rightward by exactly $20 billion.
   b. shifting rightward by more than $20 billion.
   c. shifting rightward by less than $20 billion.
   d. not shifting and the $SAS$ curve shifting rightward by $20 billion.

22. The multiplier is 2.0 and, owing to an increase in expected future profit, firms increase their investment by $10 billion. As long as the $SAS$ curve is not horizontal, in the short run, equilibrium real GDP will
   a. increase by $20 billion.
   b. increase by more than $20 billion.
   c. increase by less than $20 billion.
   d. be unaffected.

23. The multiplier is 2.0 and, owing to an increase in expected future profit, investment increases by $10 billion. If potential real GDP is unaffected, in the long run, equilibrium real GDP will
   a. increase by $20 billion.
   b. increase by more than $20 billion.
   c. increase by less than $20 billion.
   d. be unaffected.

24. Investment increases by $10 billion. In the short run, which of the following increases the effect of this change on equilibrium real GDP?
   a. A smaller value for the marginal propensity to consume.
   b. The presence of income taxes.
   c. A steeper short-run aggregate supply curve.
   d. A flatter short-run aggregate supply curve.
## Short Answer Problems

1. Explain why the $MPC$ plus the $MPS$ sum to 1.
2. What is the difference between autonomous and induced expenditure?
3. Suppose that aggregate planned expenditure is greater than real GDP so that inventories are decreasing. If prices are sticky, explain the process by which equilibrium expenditure is achieved.

### Table 13.1

**Aggregate Expenditure Components**

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>0.2</td>
<td>0.3</td>
<td>0.2</td>
</tr>
<tr>
<td>1.0</td>
<td>0.6</td>
<td>0.3</td>
<td>0.2</td>
</tr>
<tr>
<td>1.5</td>
<td>1.0</td>
<td>0.3</td>
<td>0.2</td>
</tr>
<tr>
<td>2.0</td>
<td>1.4</td>
<td>0.3</td>
<td>0.2</td>
</tr>
<tr>
<td>2.5</td>
<td>1.8</td>
<td>0.3</td>
<td>0.2</td>
</tr>
</tbody>
</table>

4. Table 13.1 shows the components of aggregate expenditure in the nation of Woodstock. All quantities are in billions of 2000 dollars. Woodstock has no foreign trade and no taxes.
   a. Plot these components of aggregate expenditure in Figure 13.7. Label the lines.

### Table 13.2

**Aggregate Expenditure**

<table>
<thead>
<tr>
<th>Real GDP (billions of 2000 dollars)</th>
<th>Aggregate expenditure (billions of 2000 dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>0.2</td>
</tr>
<tr>
<td>1.0</td>
<td>0.6</td>
</tr>
<tr>
<td>1.5</td>
<td>1.0</td>
</tr>
<tr>
<td>2.0</td>
<td>1.4</td>
</tr>
<tr>
<td>2.5</td>
<td>1.8</td>
</tr>
</tbody>
</table>

b. Complete Table 13.2 to show aggregate expenditure in Woodstock.

c. Use Table 13.2 and plot the aggregate expenditure line in Figure 13.7. Label it $AE$.

d. Draw a 45° line in Figure 13.7. What is equilibrium expenditure in Woodstock?

e. Use either Figure 13.7 or Table 13.1 to determine the equilibrium consumption expenditure, investment, and government purchases.

### Table 13.3

**New Aggregate Expenditure Components**

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>0.2</td>
<td>0.4</td>
<td>0.2</td>
</tr>
<tr>
<td>1.0</td>
<td>0.6</td>
<td>0.4</td>
<td>0.2</td>
</tr>
<tr>
<td>1.5</td>
<td>1.0</td>
<td>0.4</td>
<td>0.2</td>
</tr>
<tr>
<td>2.0</td>
<td>1.4</td>
<td>0.4</td>
<td>0.2</td>
</tr>
<tr>
<td>2.5</td>
<td>1.8</td>
<td>0.4</td>
<td>0.2</td>
</tr>
</tbody>
</table>

5. Continuing with the Woodstock nation, investment increases by $0.1$ billion to $0.4$ billion, as shown in Table 13.3.
   a. Taking into account the increase in investment, complete Table 13.4 to show aggregate expenditure in Woodstock.

### Table 13.4

**New Aggregate Expenditure**

<table>
<thead>
<tr>
<th>Real GDP (billions of 2000 dollars)</th>
<th>Aggregate expenditure (billions of 2000 dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>0.2</td>
</tr>
<tr>
<td>1.0</td>
<td>0.6</td>
</tr>
<tr>
<td>1.5</td>
<td>1.0</td>
</tr>
<tr>
<td>2.0</td>
<td>1.4</td>
</tr>
<tr>
<td>2.5</td>
<td>1.8</td>
</tr>
</tbody>
</table>
b. What is the new equilibrium level of expenditure? What is the increase in equilibrium consumption expenditure? Equilibrium investment? Equilibrium government purchases?

c. Compared to problem 4, what is the increase in consumption expenditure? In investment? In government purchases?

d. What is Woodstock’s multiplier? How does the fact that the multiplier exceeds 1.0 relate to your answers to part (c)?

6. Explain why the multiplier is larger if the marginal propensity to consume is larger.

7. a. Complete Table 13.5.
    b. Based on Table 13.5, how does a decrease in the size of the MPC affect the multiplier?

8. The island nation of Wet has no international trade and no income taxes. The marginal propensity to consume in Wet is 0.75.
    a. Investment increases by $20 billion. Before prices change, what is the change in equilibrium expenditure?
    b. By how much and in what direction does the aggregate demand curve shift?
    c. Suppose that instead of being 0.75, the marginal propensity to consume is 0.90. With this marginal propensity to consume, what is the change in equilibrium expenditure? The shift in the aggregate demand curve?
    d. In the short run, prices rise. Without giving a precise numeric answer, what is the effect of the higher price level on the change in equilibrium expenditure? The shift in the aggregate demand curve?

9. Briefly explain what the AE curve illustrates and how it is related to the AD curve.

10. Figure 13.8 shows the aggregate expenditure curve when the price level is 110. When the price level rises to 120, the AE curve shifts vertically downward from $AE_0$ by $1$ trillion. When the price level falls to 100, the AE curve shifts vertically upward from $AE_0$ by $1$ trillion.
    a. Draw two new AE curves in Figure 13.8 for the price levels of 100 and 120. What are the equilibrium levels of aggregate expenditure for these two price levels? Label as $b$ the equilibrium point when the price level is 100 and as $c$ the equilibrium when the price level is 120.
    b. Use Figure 13.8 to obtain three points, $a$, $b$, and $c$, on the aggregate demand curve. Plot these three points in Figure 13.9 on the next page. Assume that the aggregate demand curve is linear and draw the AD curve in Figure 13.9.
1. “I’ve got something of an idea about how the multiplier, $AD$, $SAS$, and $LAS$ curves all fit together, but I know I’m still a little confused. Remember when I helped you in our other class? C’mon, don’t you still owe me for that? Can you help me with this stuff?” Well, you actually might owe your friend some help. And, after all, your friend is asking you about a lot of material that is really important. So pay back your debt by explaining to your friend how these topics all fit together by using the example of an increase in investment. Explain how the shift in the $AD$ curve is determined, what the short-run effects are on the price level and real GDP, and what the long-run effects are on the price level and real GDP.
Answers

True/False Answers

Fixed Prices and Expenditure Plans
1. F A change in disposable income creates a movement along the consumption function, not a shift in it.
2. F The marginal propensity to consume equals the change in consumption divided by the change in disposable income.
3. T Because $MPC + MPS = 1$, the two formulas for the multiplier, $\frac{1}{(1 - MPC)}$ and $\frac{1}{MPS}$, are equivalent.

Real GDP with a Fixed Price Level
4. T The increase in GDP induces increases in aggregate expenditure. Indeed, that is why the $AE$ curve has a positive slope.
5. T If the economy is not in equilibrium, actual aggregate expenditure is different from planned aggregate expenditure.
6. T The question gives the definition of equilibrium expenditure.
7. F When aggregate planned expenditure exceeds real GDP, inventories fall because more goods and services are being purchased than are being produced.

The Multiplier
8. T The question presents the essential reason why the multiplier is larger than 1 in value.
9. F With the $MPC$, the multiplier is $\frac{1}{(1 - MPC)}$, with the $MPS$, the multiplier is $\frac{1}{MPS}$.
10. F The larger the marginal propensity to consume, the larger is the change in consumption resulting from any change in disposable income, which causes the multiplier to be larger.
11. T The multiplier is $\frac{1}{(1 - MPC)}$, so when the $MPC$ is 0.8, the formula equals $1/(1 - 0.8)$, and the multiplier is 5.0.

The Multiplier and the Price Level
12. T Any increase in autonomous expenditure not the result of a change in the price level shifts the $AE$ curve upward and the $AD$ curve rightward.
13. T An increase in investment creates a larger increase in GDP because of the multiplier.
14. F In the long run, the economy returns to potential GDP, so the long-run change in GDP is zero.

Multiple Choice Answers

Fixed Prices and Expenditure Plans
1. c The $MPC$ is $\left(\frac{\Delta C}{\Delta YD}\right)$, which here is $(\$2 trillion)/(\$3 trillion) = 0.67$.
2. b The question presents the definition of the marginal propensity to save.
3. a The fact that $MPC + MPS = 1.0$ means that knowing a value for one (say, the $MPC$) allows us to calculate the value of the other.
4. c An increase in real GDP induces increases in consumption expenditure.
5. d When people expect less income in the future than they did before, they respond by increasing their savings in order to (partially) make up for the newly recognized shortfall in future income.
6. d A decrease in wealth makes people poorer, so they decrease their consumption expenditure.
7. b As people perceive that their income will be higher in the future, they increase current spending and decrease current saving.

Real GDP with a Fixed Price Level
8. b The aggregate expenditure curve shows that, as real GDP increases, so does the quantity of planned expenditure.
9. c The definition of autonomous expenditure is expenditure that is not affected by changes in real GDP.
10. d If unplanned inventories rise, aggregate planned expenditure is less than production, that is, is less than GDP. In response to the unplanned rise in inventories, firms reduce their level of production and real GDP decreases.
11. b If aggregate planned expenditure exceeds real GDP (aggregate production), inventories decline. In response, to rebuild their inventories,
firms increase their production and GDP increases.

The Multiplier

12. b The multiplier here is 4.0 because 4.0 is the amount by which the change in autonomous spending is multiplied to give the change in equilibrium expenditure.

13. d Answer (d) is the formula for the multiplier.

14. c The multiplier is \( \frac{1}{1 - \text{MPC}} \), which means that, here, the multiplier equals 2.0.

15. d Comparing the answer to this question with the answer to the last question shows that as the \( \text{MPC} \) increases in magnitude, so does the multiplier.

16. a An increase in autonomous expenditure shifts the \( \text{AE} \) curve upward; a decrease shifts it downward.

17. c Income taxes reduce the effect a change in real GDP has on disposable income and thereby reduce the magnitude of the induced change in consumption expenditure.

18. c When autonomous expenditure decreases, firms’ inventories pile up, so firms decrease production and real GDP decreases.

The Multiplier and the Price Level

19. d An increase in the price level decreases consumption expenditure, thereby shifting the \( \text{AE} \) curve downward and hence decreasing the equilibrium level of expenditure.

20. c The change in the price level leads to a shift in the \( \text{AE} \) curve and a movement along the \( \text{AD} \) curve.

21. a The rightward shift in the \( \text{AD} \) curve equals the multiplied impact on equilibrium expenditure. In this case it is \( (2.0) \times ($10 \text{ billion}) = $20 \text{ billion} \), as illustrated in Figure 13.10 by the increase in the quantity of real GDP demanded from $50 \text{ billion} to $70 \text{ billion}.

22. c Even though the \( \text{AD} \) curve shifts rightward by $20 billion, the \( \text{SAS} \) curve slopes upward. So in the short run, the increase in the equilibrium level of real GDP is less than $20 billion. Figure 13.10 illustrates this situation, where the $20 billion rightward shift in the \( \text{AD} \) curve creates only a $10 billion increase in equilibrium GDP.

23. d In the long run, real GDP returns to potential GDP without any long-run effect on real GDP. In Figure 13.10 in the long run real GDP returns to the potential GDP of $50 billion.

24. d The flatter the \( \text{SAS} \) curve, the less prices rise and the larger is the increase in equilibrium GDP and aggregate expenditure.

Answers to Short Answer Problems

1. Only two things can be done with a dollar change, say an increase, in disposable income: Spend it (all or part) or save it (all or part). The \( \text{MPC} \), or marginal propensity to consume, indicates the fraction of the dollar change in disposable income that is spent on consumption, whereas the \( \text{MPS} \), or marginal propensity to save, indicates the fraction of the dollar that is saved. Because consumption and saving are the only two uses to which the dollar can be put, the two fractions must sum to one.

2. Autonomous expenditure does not change when real GDP changes, whereas induced expenditure does change.

3. In the discussion of aggregate expenditure and equilibrium expenditure in this chapter, we assume that individual prices are fixed so that the price level is fixed. This “thought experiment” allows us to develop the economic model of the components of aggregate expenditure without worrying about the complication of price level changes. As a result,
when we discuss how firms adjust to unwanted decreases in their inventories, we assume that firms respond by raising production, without prices changing. Hence when prices are fixed, equilibrium expenditure is attained by an increase in output.

FIGURE 13.11
Short Answer Problem 4 (a) and (c)

![Diagram showing consumption line (C), investment line (I), and government purchases line (G).](image)

4. a. Figure 13.11 shows the consumption line, C, the investment line, I, and the government purchases line, G.

<table>
<thead>
<tr>
<th>TABLE 13.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggregate Expenditure</td>
</tr>
<tr>
<td>Real GDP (billions of 2000 dollars)</td>
</tr>
<tr>
<td>0.5</td>
</tr>
<tr>
<td>1.0</td>
</tr>
<tr>
<td>1.5</td>
</tr>
<tr>
<td>2.0</td>
</tr>
<tr>
<td>2.5</td>
</tr>
</tbody>
</table>

b. Table 13.6 shows the schedule of aggregate expenditure. Aggregate expenditure equals the sum of consumption expenditure, investment, and government purchases. When GDP is, say, $1.0 billion, aggregate expenditure equals $0.6 billion + $0.3 billion + $0.2 billion, or $1.1 billion.

c. The aggregate expenditure curve, AE, is plotted in Figure 13.11. It is the vertical sum of the C + I + G curves in the figure.

d. Figure 13.12 shows the 45° line. The equilibrium level of expenditure equals $1.5 billion because the AE line crosses the 45° line at that point.

e. In Figure 13.12 the dotted line indicating the equilibrium level of expenditure shows that the equilibrium level of consumption expenditure is $1.0 billion, the equilibrium level of investment is $0.3 billion, and the equilibrium level of government purchases is $0.2 billion. Alternatively, in Table 13.6, the data in row 3, the row for which GDP is $1.5 billion, give the same answers for consumption expenditure, investment, and government purchases.

<table>
<thead>
<tr>
<th>TABLE 13.7</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Aggregate Expenditure</td>
</tr>
<tr>
<td>Real GDP (billions of 2000 dollars)</td>
</tr>
<tr>
<td>0.5</td>
</tr>
<tr>
<td>1.0</td>
</tr>
<tr>
<td>1.5</td>
</tr>
<tr>
<td>2.0</td>
</tr>
<tr>
<td>2.5</td>
</tr>
</tbody>
</table>

5. a. Table 13.7 shows the new schedule of aggregate expenditure. These expenditures are obtained in the same way as those in Table 13.6 in problem 4: At each level of real GDP, add consumption
expenditure, investment, and government purchases.

b. The new equilibrium expenditure is $2.0 billion because that level of aggregate expenditure equals real GDP. The equilibrium level of consumption is $1.4 billion; investment, $0.4 billion; and government purchases, $0.2 billion.
c. Consumption expenditure increased by $0.4 billion, from $1.0 billion to $1.4 billion. Investment increased by $0.1 billion, from $0.3 billion to $0.4 billion. But government purchases did not change.
d. The multiplier is 5.0: The $0.1 billion increase in investment created a $0.5 billion increase in aggregate expenditure. The $0.5 billion increase in aggregate expenditure can be divided into a $0.1 billion (autonomous) increase in investment and a $0.4 billion (induced) increase in consumption expenditure.

6. Any initial increase in autonomous expenditure generates a direct increase in equilibrium expenditure. The basic idea of the multiplier is that this initial increase in aggregate expenditure generates further increases in aggregate expenditure as increases in consumption expenditure are induced. In each round of the multiplier process, the increase in spending, and thus the further increase in aggregate expenditure, are determined by the marginal propensity to consume. Because a larger marginal propensity to consume means a larger increase in aggregate expenditure at each round, the total increase in equilibrium expenditure is greater. So, the multiplier is larger if the marginal propensity to consume is larger.

<table>
<thead>
<tr>
<th>MPC</th>
<th>MPS</th>
<th>Multiplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.9</td>
<td>0.1</td>
<td>10.0</td>
</tr>
<tr>
<td>0.8</td>
<td>0.2</td>
<td>5.0</td>
</tr>
<tr>
<td>0.7</td>
<td>0.3</td>
<td>3.3</td>
</tr>
<tr>
<td>0.6</td>
<td>0.4</td>
<td>2.5</td>
</tr>
<tr>
<td>0.5</td>
<td>0.5</td>
<td>2.0</td>
</tr>
</tbody>
</table>

7. a. Table 13.8 completes Table 13.5. Because \( MPC + MPS = 1.0 \), \( MPS = 1.0 - MPC \). For the first row, \( MPS = 1.0 - 0.9 = 0.1 \). The multipliers can be calculated using either of two equivalent formulas, \( \text{multiplier} = \frac{1}{(1 - MPC)} = \frac{1}{MPS} \).

8. a. The multiplier in Wet is \( \frac{1}{(1 - MPC)} \), or \( \frac{1}{(1 - 0.75)} = 4.0 \). So the change in equilibrium expenditure is \( (4.0)(20 \text{ billion}) \), or $80 billion.
b. The aggregate demand curve shifts by an amount equal to the change in equilibrium expenditure. Equilibrium expenditure increases by $80 billion, so the aggregate demand curve shifts rightward by $80 billion.
c. If the marginal propensity to consume is 0.90, the multiplier is 10.0. Hence, in this case, equilibrium expenditure increases by \( (10.0)(20 \text{ billion}) = 200 \text{ billion} \), and the aggregate demand curve shifts rightward by $200 billion.
d. When prices start to rise, the aggregate expenditure curve shifts downward. (The higher prices decrease consumption expenditure.) The downward shift in the aggregate expenditure curve reduces equilibrium expenditure. However, the aggregate demand curve does not shift. Instead, a movement occurs along the aggregate demand curve to a lower level of equilibrium real GDP.

9. The \( AE \) curve and the \( AD \) curve are different. The \( AE \) curve answers the question: For a given price level, how is equilibrium expenditure determined? When the price level rises, aggregate planned expenditure decreases so that the \( AE \) curve shifts downward and equilibrium expenditure decreases. Aggregate demand is different: It relates the quantity of real GDP demanded to differing values of the price level. In other words, the \( AD \) curve uses the results derived using the \( AE \) curve to show how equilibrium expenditure changes when the price level changes.

10. a. Figure 13.13 (on the next page) shows the aggregate expenditure curve for price levels of 100 (\( AE_1 \)) and 120 (\( AE_2 \)). The equilibrium points are \( b \) and \( c \), and the equilibrium levels of expenditure are $12 trillion and $8 trillion, respectively.
b. Figure 13.14 shows the three points on the $AD$ curve. When the price level is 100, the aggregate quantity demanded is the equilibrium expenditure of $12$ trillion (point $b$); when the price level is 110, the aggregate quantity demanded is the equilibrium expenditure of $10$ trillion (point $a$); and when the price level is 120, the aggregate quantity demanded is $8$ trillion (point $c$).

### You’re the Teacher

1. “Wow, you’re asking about a lot of stuff. Are you sure that I owe you that much? But, what the heck, let me go over this for you because it’s bound to help me, too.

   “Let’s tackle your questions by thinking about the situation in which investment increases by $10$ billion. Why did investment increase? I don’t know; maybe because expectations of future profits increased; maybe because the interest rate dropped. Whatever the reason, though, it increased by $10$ billion. Now, let’s also say that the $MPC$ equals 0.67.

   “The first thing we can do is to calculate the multiplier. We know that the multiplier equals \[
   \frac{1}{1 - MPC}
   \]
   so in this case we get
   \[
   \frac{1}{1 - 0.67} = 3.0.
   \]
   In other words, we know that the multiplier is 3.0 and that the $10$ billion increase in investment leads to a $(3.0)(10.0 \text{ billion}) = 30.0 \text{ billion}$ increase in equilibrium expenditure.

   “Now I need to draw a figure; let’s call it Figure 13.15. Check it out. Before investment increased, the economy was in equilibrium at point $a$. Here the initial aggregate demand curve, $AD_0$, crossed the short-run aggregate supply curve, $SAS_0$, and the long-run aggregate supply curve, $LAS$. The equilibrium price level was 110 and the level of real GDP was $60$ billion.
“Okay, now pay attention because here’s where your questions start: The increase in investment shifts the $AD$ curve rightward, and the size of the shift equals the change in equilibrium expenditure. In other words, the $AD$ curve shifts rightward to $AD_1$, and the size of the shift equals $30$ billion. The shift is the difference between point $b$ and point $a$ along the double headed arrow; this difference is $30$ billion. So the $AD$ curve shifts rightward by the multiplied impact on equilibrium expenditure.

“But a key point is that, in the short run, real GDP doesn’t increase by all $30$ billion. It would increase by the entire $30$ billion only if prices did not change. But, in the short run, prices are going to start to change. And as they rise, people reduce their consumption expenditures, and the equilibrium amount of expenditure doesn’t change by the entire $30$ billion; it changes by something less. Figure 13.15 shows that the short-run equilibrium — where $AD_1$ crosses $SAS_0$ — is at point $c$. And at point $c$, real GDP increases by (only) $15$ billion, to $75$ billion. Why don’t we go to point $b$? Because, in the short run, the price level has increased, from $110$ to $120$.

“But, look, point $c$ can’t be the end of the story. At point $c$, the price level has increased, but money wages haven’t changed. As more time passes, workers negotiate higher wages, which take into account the higher prices. And as money wage rates rise, the short-run aggregate supply curve shifts leftward.

“The final part of the story is illustrated in Figure 13.16. Here the $SAS$ curve has shifted leftward and the new, long-run equilibrium point is $d$, where the $AD$ curve crosses the $LAS$ curve and the $SAS$ curve, $SAS_1$. Thus at point $d$, we’ve returned to the long-run equilibrium because prices and money wages have both adjusted: Real GDP has returned to its potential level ($60$ billion) and the price level has increased to $130$.

“I think Table 13.9 shows some results that can help you tie all these changes together. In it I’ve listed the four points shown in the figures I’ve drawn. Basically, we begin at point $a$. Then the increase in investment starts to move us to point $b$. If prices are sticky long enough, the multiplier process will have time to complete itself and we’ll get to point $b$. But in the short run, prices rise and so we move to point $c$, where prices but not money wages have changed. And then, from point $c$, money wages start to adjust and we eventually move from point $c$ to point $d$, where both prices and money wages have risen. Point $d$ is the final, long-run equilibrium.

“Look, your question required a really long answer, so how about you springing for the pizza the next time we buy some?”
Chapter Quiz

1. Included in aggregate expenditure are
   a. consumption, saving, and government purchases.
   b. consumption expenditure, investment, and government purchases.
   c. investment, saving, and net exports.
   d. investment, government purchases, and disposable income.

2. When the consumption function lies above the 45° line,
   a. saving is positive.
   b. saving is negative.
   c. consumption expenditure is negative.
   d. disposable income is negative.

3. Expenditure that depends on the level of income is
   a. actual expenditure.
   b. induced expenditure.
   c. autonomous expenditure.
   d. equilibrium expenditure.

4. If the MPS = 0.1, then the multiplier equals
   a. 10.0.
   b. 5.0.
   c. 1.0.
   d. None of the above.

5. If prices are fixed and the multiplier is 5, an increase in investment spending of $10 billion increases equilibrium expenditure by
   a. $50 billion.
   b. $10 billion.
   c. $5 billion.
   d. $2 billion.

6. If prices are fixed and the MPC is 0.80, a $5 billion increase in investment increases equilibrium expenditure by
   a. $25 billion.
   b. $15 billion.
   c. $10 billion.
   d. None of the above.

7. A decrease in the price level
   a. shifts the AE curve upward.
   b. shifts the AE curve downward.
   c. does not shift the AE curve.
   d. perhaps shifts the AE curve depending on whether the MPC is greater than or less than the MPS.

8. An increase in investment spending shifts the AD curve ____ by a greater distance when the MPC is ____.
   a. rightward; larger
   b. rightward; smaller
   c. leftward; larger
   d. leftward; smaller

9. In the long run, the multiplier
   a. is greater than 1.0 in value.
   b. equals 1.0 in value.
   c. is precisely twice the short-run multiplier.
   d. equals 0.

10. A change in ____ does not change autonomous expenditure.
    a. the price level.
    b. the interest rate.
    c. real GDP.
    d. any economic variable.

The answers for this Chapter Quiz are on page 294