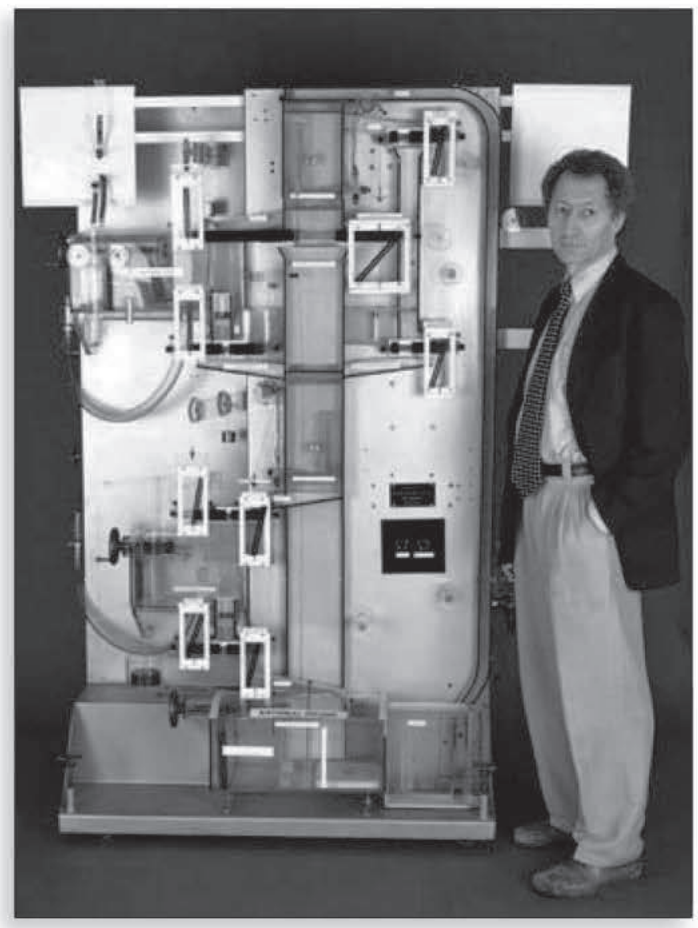
chapter 26W

The Multiplier Model



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> "Keynes stirred the stale economic frog pond to its depth."
>
> —Gottfried Haberler

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Chapter Outline

After reading this chapter, you should be able to:

LO26W-1 State the components of the multiplier model and explain the difference between induced and autonomous expenditures.

LO26W-2 Show how equilibrium income is determined in the multiplier model.

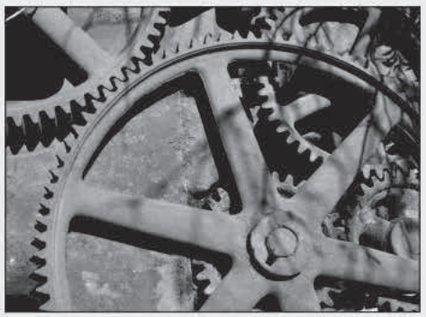
LO26W-3 Demonstrate how, through the multiplier process, fiscal policy can eliminate recessionary and inflationary gaps.

LO26W-4 List seven reasons why the multiplier model might be misleading.

ADDED DIMENSION

Econometric Models

U.S. government agencies and virtually every major corporation in the United States subscribe to, or generate their own, forecasts of the economy. Such forecasts about interest rates, prices, investment, consumption, and government policy actions are essential to corporate decisions from whether to open a new factory to how much to pay employees. They are also essential to government decisions that impact the economy. If some day you work in government or in a firm, you will likely come across a report that forecasts the economy.



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Economists forecast the future of the economy using *econometric* models, models that forecast a variety of *measures* of the economy. (The word *metric* means measure.) The models presented in this chapter are a major simplification of econometric models. Two well-known econometric models are the Fed (Federal Reserve Bank) econometric model and the DRI–WEFA model. In econometric models, economists find standard relationships among aspects of the macroeconomy and use those relationships to predict what will happen to inflation, unemployment, and growth under certain conditions. For example, when President Obama wanted to know the effect of his health care initiative on the economy, he went to economists who used their econometric models to estimate the effect.

While econometric models are much more complicated than the models presented in this text, they have the same structure: a short-run aggregate supply component with essentially fixed prices, an aggregate demand component, and a potential output component.

no longer incorporates the dynamics of the economy accurately. In such cases, some variant of the multiplier model becomes a better model. In this chapter, I present that multiplier model.

The Multiplier Model

We'll start our discussion of the multiplier model by looking separately at production decisions and expenditure decisions.

Aggregate Production

Aggregate production (*AP*) is *the total amount of final goods and services produced in every industry in an economy.* It is at the center of the multiplier model. As I noted in the chapter on measuring the aggregate economy, production is equal to output; it creates an equal amount of income, so aggregate income, output, and production are always equal; the terms can be used interchangeably.

Graphically, aggregate production in the multiplier model is represented by a 45° line through the origin.

Graphically, aggregate production in the multiplier model is represented by a 45° line on a graph, with real income measured in dollars on the horizontal axis and real production measured in dollars on the vertical axis, as in Figure 26W-1. Given the definition of the axes, connecting all the points at which real production equals real income produces a 45° line through the origin. Since, by definition, production creates an amount of income equal to the amount of production or output, this 45° line can be thought of as an *aggregate production curve,* or, alternatively, the *aggregate income curve.* At all points on the aggregate production curve, income equals production. For example, consider point *A* in Figure 26W-1, where real income (measured on the horizontal axis) is $4,000 and real production (measured on the vertical axis) is also $4,000.

Q-1 What is true about the relationship between income and production on the aggregate production curve?

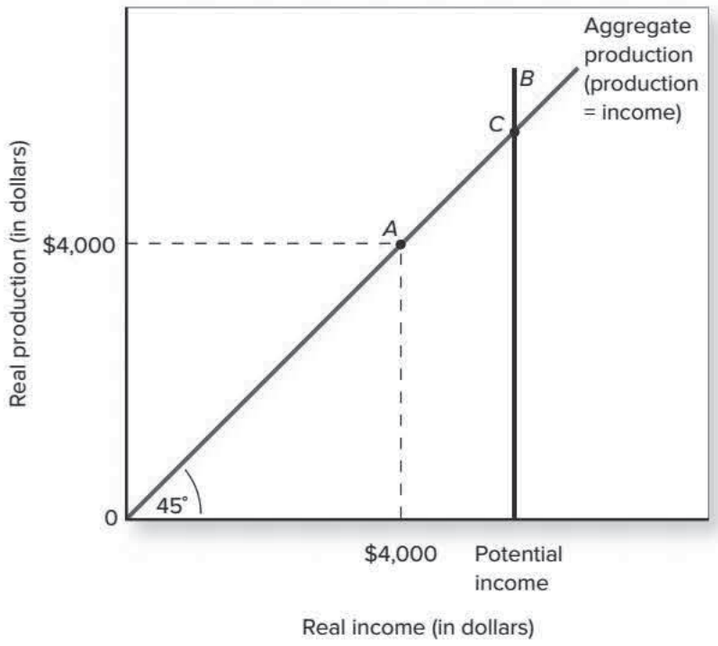


FIGURE 26W-1
The Aggregate Production Curve

Since, by definition, real output equals real income, on each point of the aggregate production curve, income must equal production. This equality holds true only on the 45° line.

That identity between real production and real income is true only on the 45° line. Output and income, however, cannot expand without limit. The model is most relevant when output is below its potential. Once production expands to the capacity constraint of the existing institutional structure—to potential income (line *B*)—any increase beyond that can only be temporary.

Aggregate Expenditures

Aggregate expenditures in an economy (*AE*) equal $C + I + G + (X - M)$.

The term **aggregate expenditures** refers to *the total amount of spending on final goods and services in the economy.* This amount consists of four main expenditure classifications: consumption (spending by consumers), investment (spending by business), spending by government, and net exports (the difference between U.S. exports and U.S. imports). These four components were presented in our earlier discussion of aggregate accounting, which isn't surprising since the aggregate accounts were designed around the multiplier model. In the multiplier model, we focus on the four components' relationship to income. The multiplier model asks the question "How does each of these change as income changes?" To keep the exposition as simple but as general as possible, we focus in this chapter on the aggregate relationship between all expenditure components combined and income, that is, on the relationship between aggregate expenditures and income. (In Appendix A at the end of this chapter, we present a disaggregated discussion.)

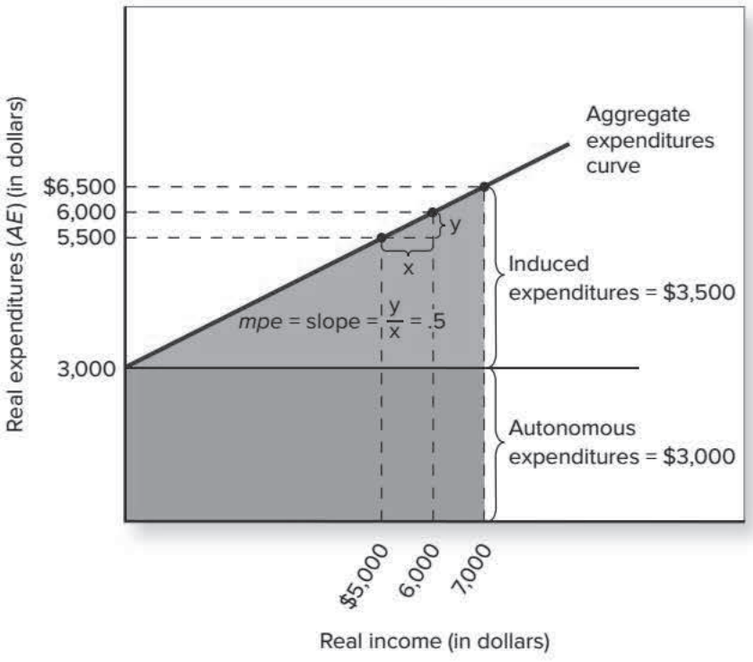
AUTONOMOUS AND INDUCED EXPENDITURES For purposes of the multiplier model, all forms of expenditures are classified as either autonomous or induced. **Autonomous expenditures** are *expenditures that do not systematically vary with income.* **Induced expenditures** are *expenditures that change as income changes.* Say that each time income rises by 100, expenditures increase by 60. The induced expenditures would be 60.

Autonomous expenditures are expenditures that do not systematically vary with income.

This assumed empirical relationship between income and aggregate expenditures can be represented graphically with the aggregate expenditure (*AE*) curve. To keep the

FIGURE 26W-2 Aggregate Expenditures Curve

The *AE* curve depicted here has a slope of .5, the *mpe,* and an intercept of $3,000, the level of autonomous expenditures. The brown shaded area represents induced expenditures. Aggregate expenditures are the sum of these two components.



analysis simple, the *AE* curve is usually estimated to be a linear relationship (a straight line) for incomes near current income. To make the graphical exposition easier, we will also assume that the linear relationship continues for all levels of income. This allows us to draw a linear aggregate expenditures curve such as the one shown in Figure 26W-2.

Notice that when income is $6,000, aggregate expenditures are also $6,000; but when income rises by $1,000 to $7,000, aggregate expenditures rise by $500 to $6,500. The reason is that only induced expenditures change as income changes. When income falls to $5,000, expenditures fall to $5,500. Along this *AE* curve, induced expenditures fall by $500 when income falls by $1,000.

To figure out autonomous expenditures, we have to extend the *AE* curve to the left, to the point where income is zero (where the *AE* curve intersects the vertical axis). Doing so, you can see that when income is zero, aggregate expenditures are $3,000. So, autonomous expenditures are $3,000. Consumption, investment, government spending, and net exports each has an autonomous component. Autonomous expenditures are the sum of all of them. It is the level of expenditures that would exist at zero income, assuming the *AE* curve is linear. (Again, it is important to recognize that this linear extension is just for expositional purposes. In reality, income is not expected to fall to zero, and the model is used to describe changes around the existing level of income.) The point to remember about autonomous expenditures is that they remain constant at all levels of income; therefore, a graph of autonomous expenditures is a straight, horizontal line as shown in Figure 26W-2.

Autonomous expenditures are unrelated to income; induced expenditures are directly related to income.

To summarize, aggregate expenditures comprise two components: autonomous expenditures that do not vary with income and induced expenditures that vary with income. The gray shaded region in Figure 26W-2 represents autonomous expenditures; the brown shaded region represents induced expenditures. So, at income $7,000, aggregate expenditures of $6,500 consist of $3,000 of autonomous expenditures and $3,500 of induced expenditures.

Q-2 What is the difference between induced expenditures and autonomous expenditures?

THE MARGINAL PROPENSITY TO EXPEND The slope of an aggregate expenditures curve is equal to the **marginal propensity to expend (*mpe*)**—*the ratio of the change in aggregate expenditures to a change in income.* (Remember, slope is the change in the value on the vertical axis divided by the change in the value on the horizontal axis, or rise over run.) The expenditures function I have drawn has a slope of .5, which means that for every $1,000 increase in income, aggregate expenditures rise by $500. If the *mpe* were .4, the slope of the *AE* curve would be .4 and aggregate expenditures would rise by $400 for every $1,000 increase in income.

$$mpe = \frac{\text{Change in expenditures}}{\text{Change in income}}$$

Q-3 If expenditures change by $60 when income changes by $100, what is the *mpe*?

The marginal propensity to expend is assumed to be greater than 0 and less than 1. Therefore, the aggregate expenditures curve will have a slope that is less than the 45° *AP* curve and greater than a horizontal line (such as autonomous expenditures). Economists estimate the slope of the *AE* curve by looking at how much aggregate expenditures have changed with a change in income around past income and then use that information to estimate the relationship for current levels of income.

The marginal propensity to expend is an aggregation of the various relationships between each component of aggregate expenditures (consumption, investment, government spending, exports, and imports) and aggregate income. There is a marginal propensity to consume, a marginal propensity to import, and, in more complicated models, a variety of other marginal propensities. (Appendix A at the end of the chapter provides a disaggregated presentation of these components.) But it is the aggregate of these—the *mpe*—that is the key to the multiplier model.

While the presentation will focus on the aggregate *mpe,* let me briefly discuss its components. The most important determinant of the marginal propensity to expend is the marginal propensity to consume (*mpc*)—the change in consumption that occurs with a change in income.[1] It is less than 1 because individuals tend to save a portion of their income, so when income goes up by 100 their spending will go up by, say, only 80. In that case the marginal propensity to consume would be .8. If induced consumption were the only component, the marginal propensity to expend would be .8.

The marginal propensity to consume (*mpc*) is the most important component of the *mpe*.

While the marginal propensity to consume is important to expenditures, other important, policy-relevant factors also affect how expenditures change with income. One of these factors is the income tax. As income rises, people pay higher income tax, which lowers how much additional income people have at their disposal to spend, which lowers the increase in their expenditures. Thinking back to the national income classifications, disposable income is less than GDP. So taxes reduce the size of the marginal propensity to expend from what it would have been if all income were available to households to spend. In the United States, taxes that vary with income are approximately 20 percent of total income.

Another important determinant of the marginal propensity to expend is the marginal propensity to import—the change in imports that occurs with a change in income. With increasing globalization, individuals are spending a larger portion of their income on imports. That portion is not part of aggregate expenditures on domestic goods. Instead, it is part of the aggregate expenditures of other countries, so the fact that imports increase as income increases also reduces the size of the marginal propensity to expend. Americans spend about 15 percent of increases of their income on imports. In some countries, such as the Netherlands, that fraction can be as high as 50 or 60 percent.

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[1]The importance of this component has led some to concentrate the multiplier model presented in principles books on consumption and the marginal propensity to consume. However, to keep the analysis simple, this focus generally requires them to assume that the other components do not vary with income. I focus on a broader concept—marginal propensity to expend—because it is more inclusive, requires less algebraic manipulation, and incorporates two other primary reasons why income may not get translated into expenditures. This allows us to talk more about policy and less about the model.

ADDED DIMENSION

History of the Multiplier Model

Policy fights in economics occur on many levels. Keynes fought on most of them. But it wasn't Keynes who convinced U.S. policy makers to accept his ideas. (Indeed, President Franklin D. Roosevelt met Keynes only once and thought he was a pompous academic.) Instead, it was Alvin Hansen, a textbook writer and policy adviser to government who was hired away from the University of Wisconsin by Harvard in the mid-1930s, who played the key role in getting Keynesian economic policies introduced into the United States.

The story of how Hansen converted to Keynes' ideas is somewhat mysterious. At the time, almost all economists were Classicals, and Hansen was no exception. (Otherwise it's doubtful Harvard would have recruited him.) But, somehow, on the train trip from Wisconsin to Massachusetts, Hansen metamorphosed from a Classical to a Keynesian. His graduate seminar at Harvard in the late 1930s and the 1940s became the U.S. breeding ground for Keynesian economics.

What made Hansen and other economists switch from Classical to Keynesian economics? It was the Depression; the Keynesian story explained it much better than did the Classical story, which centered on the real wage being too high.

Hansen quickly realized that talking about interdependencies of supply and demand decisions didn't work for policy makers and businesspeople. They wanted numbers—specifics—and Keynes' work had no specifics. So Alvin Hansen and his students, especially Paul Samuelson, set about to develop specifics. They developed the multiplier model of Keynesian economics.

THE AGGREGATE EXPENDITURES FUNCTION The relationship between aggregate expenditures and income that is depicted by the *AE* curve can be written mathematically as follows:

$$AE = \underbrace{AE_0}_{\text{autonomous}} + \underbrace{mpeY}_{\text{induced}}$$

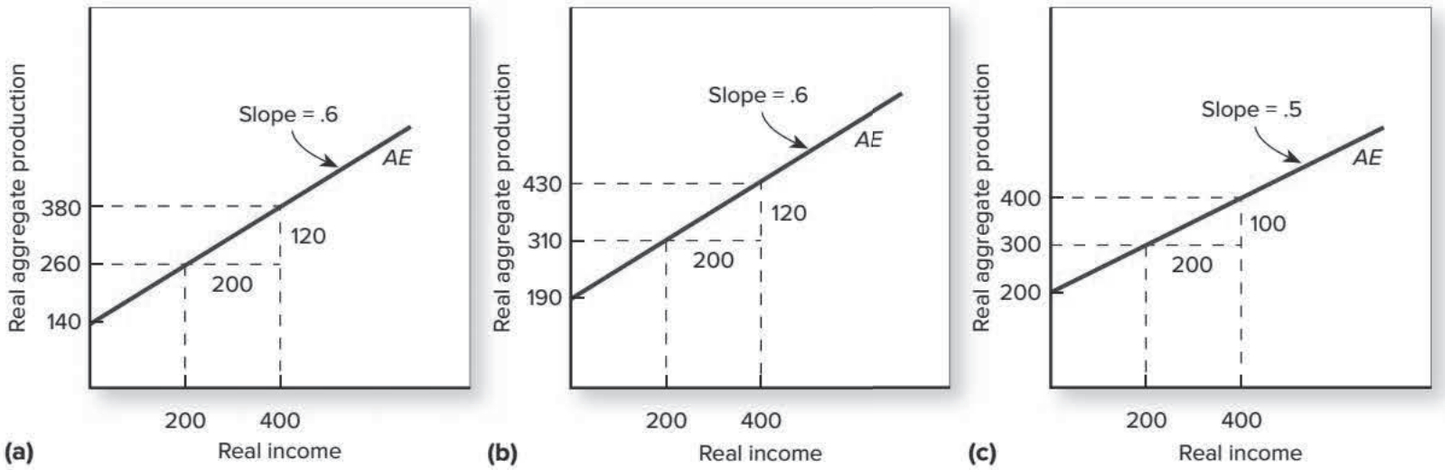
It consists of the same two components that make up the *AE* curve: autonomous expenditures (the AE_0—the subscript zero tells you it is autonomous) and induced expenditures (the *mpeY*). The aggregate expenditures function depicted by the *AE* curve we've discussed so far and shown in Figure 26W-2 is $AE = \$3{,}000 + .5Y$. Autonomous expenditures are $3,000 and the *mpe* is .5. Just like the *AE* curve, the aggregate expenditures function takes into account all components of aggregate spending. Therefore, autonomous expenditures are the sum of the autonomous components of expenditures $[AE_0 = C_0 + I_0 + G_0 + (X_0 - M_0)]$ and induced expenditures are the sum of the induced components of expenditures. These induced expenditures are determined by the marginal propensity to consume, the marginal propensity to import, and taxes that vary with income.

$AE_0 = C_0 + I_0 + G_0 + (X_0 - M_0)$

In Figure 26W-3, I graph three expenditures functions. A good exercise is to determine which of the *AE* curves (*a, b,* or *c*) is associated with which expenditures function described by the following situations:

- *Situation 1:* Autonomous consumption is 100; autonomous investment is 40; autonomous net exports are 30; autonomous spending by government is 20; and the marginal propensity to expend is .6.
- *Situation 2:* Autonomous consumption is 100; autonomous investment is 40; autonomous net exports are 30; autonomous spending by government is 30; and the marginal propensity to expend is .5.
- *Situation 3:* Autonomous expenditures are 140 and the marginal propensity to expend is .6.

FIGURE 26W-3 (A, B, AND C) Three Aggregate Expenditures Functions



The answers are 1-*b,* 2-*c,* and 3-*a.* There are a number of ways you could have associated each of these situations with the graphs. Since the marginal propensity to expend in situation 2 was .5, its slope had to be .5. Thus, only graph *c* is consistent with it. Situations 1 and 3 have the same marginal propensity to expend, so we have to differentiate them by their autonomous expenditures component. Adding up autonomous expenditures in situation 1 gives us 190, so the intercept (the level of expenditures at zero income) must be 190. That is the case for *b.* Checking, graph *a* has an intercept of 140, and a slope of .6, which means that it is consistent with situation 3.

The aggregate expenditures function is important because once you have estimated an expenditures function for the economy, you can predict expenditures at any income. Say you have estimated an aggregate expenditures function to be $AE = 240 + .4Y$. If income is \$500, you would estimate aggregate expenditures to be \$440, that is, [240 + .4(500)]. Estimating aggregate expenditures is fundamental to predicting whether the economy will grow or fall into a recession.

AUTONOMOUS SHIFTS IN THE EXPENDITURES FUNCTION A key element of the expenditures function for our purposes concerns changes in autonomous expenditures. These changes are usually classified by which of the four subcomponents of autonomous expenditures changed—autonomous consumption, autonomous investment, autonomous government spending, or autonomous net exports. All of these can change suddenly, and, when one or more do, the *AE* curve shifts up or down. For example, if autonomous consumption rises by \$200 and autonomous investment falls by \$80, autonomous expenditures will rise by \$120 (\$200 − \$80).

Economists keep close tabs on these autonomous components as they develop their forecasts of the economy. For example, imagine that consumer confidence suddenly decreases, perhaps because of a terrorist threat. Consumers figure they had better save more to prepare themselves for the upcoming recession, so they cut back expenditures; autonomous consumption falls and the expenditures function shifts down. Alternatively, imagine that businesses come to believe that the economy will grow faster than they had expected. To prepare, they will increase investment, increasing autonomous investment and shifting the aggregate expenditures curve up.

I'll let you work these final two examples by yourself. The first is that the government enters into a major war, and the second is that the country's exchange rate suddenly falls,

causing the price of the country's exports to fall and the price of imports to rise. If you answered that they both shift the expenditures function up, you've got the reasoning down.

The multiplier model is a historical model most useful for analyzing shifts in autonomous expenditures.

The reason it is important to focus on shifts is that the multiplier model is a historical model. It can be used to analyze shifts in aggregate expenditures from a historically given income level, but not to determine income independent of the economy's historical position. Notice how I discussed the model in the examples—some shift in autonomous expenditures occurred and that shift led to a change in income from its existing level.

As I mentioned above, while economists speak of what expenditures would be at zero income, or while we say the *mpe* is constant over all ranges of income, that is done simply to make the geometric portrayal of the model easier. What is actually assumed is that within the relevant range around existing income—say a 5 percent increase or decrease—the *mpe* remains constant, and the autonomous portion of the expenditures is the intercept that would occur if we extended the expenditures function.

Determining the Equilibrium Level of Aggregate Income

Now that we've developed the graphical framework for the multiplier model, we can put the aggregate production and aggregate expenditures together and see how the level of aggregate income is determined. We begin by considering the relationship between the aggregate expenditures curve and the aggregate production curve more carefully. We do so in Figure 26W-4.

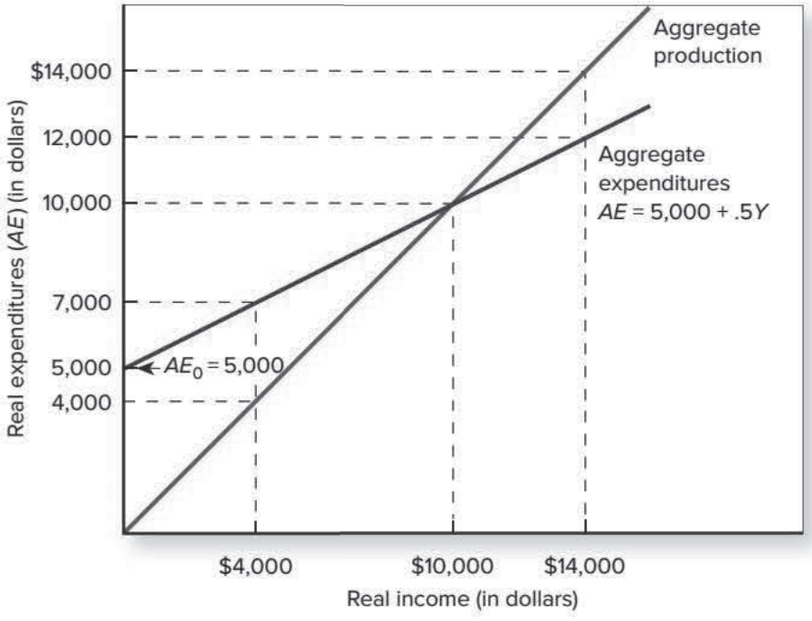
To determine income graphically in the multiplier model, you find the income level at which aggregate expenditures equal planned aggregate production.

The aggregate production (*AP*) curve is a 45° line up until the economy reaches potential income. Its slope is 1, so at all points on the *AP* curve, aggregate expenditures equal aggregate income. It tells you the level of aggregate production and also the level of aggregate income since, by definition, real income equals real production when the price level does not change. Expenditures are shown by the *AE* curve. Planned expenditures (expenditures as calculated using the expenditures function) do not necessarily equal production or income. In equilibrium, however, planned expenditures must equal production.

FIGURE 26W-4 Comparing *AE* to *AP* and Solving for Equilibrium Graphically

Equilibrium in the multiplier model is determined where the *AE* and *AP* curves intersect. That equilibrium is at $10,000. At income levels higher or lower than that, planned production will not equal planned expenditures.

Real Income	Planned Expenditures	Aggregate Production	Inventories
$ 0	$ 5,000	$ 0	−$5,000
4,000	7,000	4,000	−3,000
10,000	**10,000**	**10,000**	**0**
14,000	12,000	14,000	+2,000



To see why that's the case, let's first say that production, and hence income, is $14,000. As you can see, at income of $14,000, planned expenditures are $12,000. Aggregate production exceeds planned aggregate expenditures. Firms are producing more goods than are bought, and inventories are rising by more than firms want. This is true for any income level above $10,000. Similarly, at all income levels below $10,000, aggregate production is less than planned aggregate expenditures and inventories are falling below levels desired by firms. For example, at a production level of $4,000, planned aggregate expenditures are $7,000. Inventories are falling by $3,000.

The only income level at which aggregate production equals planned aggregate expenditures is $10,000. Since we know that, in equilibrium, planned aggregate expenditures must equal planned aggregate production, $10,000 is the equilibrium level of income in the economy. It is the level of income at which neither producers nor consumers have any reason to change what they are doing. At any other level of income, since there is either a shortage or a surplus of goods, firms' inventory is greater than or less than desired, and they will have an incentive to change production. Thus, you can use the aggregate production curve and the aggregate expenditures curve to determine the level of income at which the economy will be in equilibrium.

The Multiplier Equation

Another useful way to determine the level of income in the multiplier model is through the **multiplier equation,** *an equation that tells us that income equals the multiplier times autonomous expenditures.*[2]

The multiplier equation is an equation showing the relationship between autonomous expenditures and the equilibrium level of income: Y = Multiplier × Autonomous expenditures.

$$Y = \text{Multiplier} \times \text{Autonomous expenditures}$$

The **expenditures multiplier** is *a number that tells us how much income will change in response to a change in autonomous expenditures.* To calculate the expenditures multiplier, you divide 1 by (1 − *mpe*). Thus:

The expenditures multiplier is a number that tells us how much income will change in response to a change in autonomous expenditures: [1/(1 − *mpe*)].

$$\text{Multiplier} = \frac{1}{(1 - mpe)}$$

Once you know the value of the marginal propensity to expend, you can calculate the expenditures multiplier by reducing [1/(1− *mpe*)] to a simple number. For example, if *mpe* = .8, the multiplier is

$$\frac{1}{(1 - .8)} = \frac{1}{2} = 5$$

To determine equilibrium income using the multiplier equation, you determine the expenditures multiplier and multiply it by the level of autonomous expenditures.

Since the expenditures multiplier tells you the relationship between autonomous expenditures and income, once you know the multiplier and the level of autonomous expenditures, calculating the equilibrium level of income is easy. All you do is multiply autonomous expenditures by the multiplier. For example, using the autonomous expenditures of $5,000 and a multiplier of 2, from Figure 26W-4, we can calculate equilibrium income in the economy to be $10,000. This is the same equilibrium income we got from the graphical exercise.

Let's see how the equation works by considering another example. Say the *mpe* is .4. Subtracting .4 from 1 gives .6. Dividing 1 by .6 gives approximately 1.7. Say, also, that autonomous expenditures (AE_0) are $750. The multiplier equation tells us that to calculate income, multiply autonomous expenditures, $750, by 1.7. Doing so gives 1.7 × $750 = $1,275.

[2]The multiplier equation does not come out of thin air. It comes from combining the set of equations underlying the graphical presentation of the multiplier model into the two brackets. The multiplier equation is derived in the box "Solving for Equilibrium Income Algebraically" on page 26W-12.

The multiplier equation gives you a simple way to determine equilibrium income in the multiplier model. Five different marginal propensities to expend and the multiplier associated with each (I round off to the nearest 10th) are shown in the table below.

Q-4 If the *mpe* = .5, what is the expenditures multiplier?

mpe	Multiplier = 1/(1 – *mpe*)
.3	1.4
.4	1.7
.5	2
.75	4
.8	5

Notice as *mpe* increases, the multiplier increases. The reason is that as the *mpe* gets larger, the induced effects of any initial shift in income also get larger. Knowing the multiplier associated with each marginal propensity to expend gives you an easy way to determine equilibrium income in the economy.

Q-5 If autonomous expenditures are $2,000 and the *mpe* = .4, what is the level of equilibrium income in the economy?

Let's look at one more example of the multiplier. Say that the *mpe* is .4 and that autonomous expenditures rise by $250 so they are $1,000 instead of $750. What is the level of equilibrium income? Multiplying autonomous expenditures, $1,000, by 1.7 tells us that equilibrium income is $1,700. With a multiplier of 1.7, income rises by $425 (250 × 1.7) as a result of the $250 increase in autonomous expenditures.

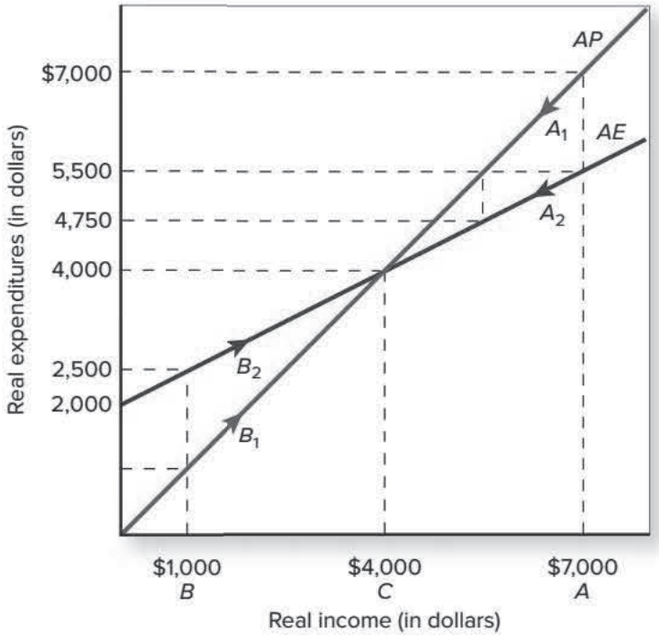
The Multiplier Process

Let's now look more carefully at the forces that are pushing the economy toward equilibrium. What happens when the macroeconomy is in disequilibrium—when the amount being injected into the economy does not equal the amount leaking from the economy? Put another way, what happens when aggregate production does not equal aggregate expenditures? Figure 26W-5 shows us.

FIGURE 26W-5

The Multiplier Process

At income levels *A* and *B*, the economy is in disequilibrium. Depending on which direction the disequilibrium goes, it generates increases or decreases in planned production and expenditures until the economy reaches income level *C*, where planned aggregate expenditures equal aggregate production.



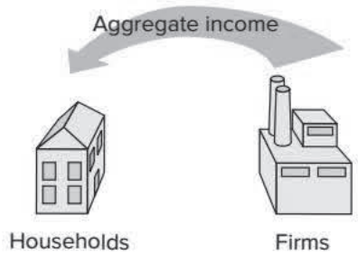
Let's first consider the economy at income level *A,* where aggregate production equals $7,000 and planned aggregate expenditures equal $5,500. Since production exceeds planned expenditures by $1,500 at income level *A,* firms can't sell all they produce; inventories pile up. In response, firms make an adjustment. They decrease aggregate production and hence income. As businesses slow production, the economy moves inward along the aggregate production curve, as shown by arrow A_1. As income falls, people's expenditures fall, and the gap between aggregate production and aggregate expenditures decreases. For example, say businesses decrease aggregate production to $5,500. Aggregate income also falls to $5,500, which causes aggregate expenditures to fall, as indicated by arrow A_2, to $4,750. Production still exceeds planned expenditures, but the gap has been reduced by $750, from $1,500 to $750.

Since a gap still remains, production and income keep falling. A good exercise is to go through two more steps. With each step, the economy moves closer to equilibrium.

Now let's consider the economy at income level *B* ($1,000) and expenditures level $2,500. Here production is *less* than planned expenditures. Firms find their inventory is running down. (Their investment in inventory is far less than they'd planned.) In response, they increase aggregate production and hence income. The economy starts to expand as aggregate production moves along arrow B_2 and aggregate expenditures move along arrow B_1. As individuals' income increases, their expenditures also increase, but by less than the increase in income, so the gap between aggregate expenditures and aggregate production decreases. But as long as expenditures exceed production, production and hence income keep rising.

Q-6 When inventories fall below planned inventories, what is likely happening to the economy?

Finally, let's consider the economy at income level *C,* $4,000. At point *C,* production is $4,000 and planned expenditures are $4,000. Firms are selling all they produce, so they have no reason to change their production levels. The aggregate economy is in equilibrium. This discussion should give you insight into what's behind the arithmetic of those earlier models.



Circular-flow diagram.

The Circular-Flow Model and the Intuition behind the Multiplier Process

Now let's think about the intuition behind the multiplier. You know from the circular-flow diagram in Chapter 3 that when all individuals spend all their income (which they derive from production), the aggregate economy is in equilibrium. The circular-flow diagram in the margin shows the aggregate income definitional identity: Aggregate income equals aggregate output. The flow of expenditures equals the flow of income (production). How, if not all income is spent (the *mpe* is less than 1), can expenditures equal income? The answer is that the withdrawals (income that is not spent on domestic goods) are offset by injections of autonomous expenditures.

When thinking about the multiplier process, I picture a leaking bathtub. Withdrawals are leaks out of the bathtub. Injections are people dumping buckets of water into the tub. When the water leaking out of the bathtub just equals the water being poured in, the level of water in the tub will remain constant; the bathtub will be in equilibrium. If the amount being poured in is either more or less than the amount leaking out, the level of the water in the bathtub will be either increasing or decreasing. Thus, equilibrium in the economy requires the withdrawals from the spending stream to equal injections into the spending stream. If they don't, the economy will not be in equilibrium and will be either expanding or contracting.

To see this, let's consider what happens if injections and withdrawals are not equal. Say that withdrawals exceed injections (more water is leaking out than is being poured in). In that case, the income in the economy (the level of water in the bathtub) will be

ADDED DIMENSION

Solving for Equilibrium Income Algebraically

For those of you who are mathematically inclined, the multiplier equation can be derived by combining the equations presented in the text algebraically to arrive at the equation for income. Rewriting the expenditures relationship, we have

$$AE = AE_0 + mpeY$$

Aggregate production, by definition, equals aggregate income (Y) and, in equilibrium, aggregate income must equal the four components of aggregate expenditures. Beginning with the equilibrium condition, we have

$$Y = AE$$

Substituting the terms from the first equation, we have

$$Y = AE_0 + mpeY$$

We want to solve this equation for Y, so first we subtract $mpeY$ from both sides,

$$Y - mpeY = AE_0$$

We then factor out Y:

$$Y(1 - mpe) = AE_0$$

and finally we solve for Y by dividing both sides by $(1 - mpe)$:

$$Y = \left[\frac{1}{(1 - mpe)}\right] \times [AE_0]$$

This is the multiplier equation, and $\left[\frac{1}{(1 - mpe)}\right]$ is the multiplier.

declining. As income declines, so will withdrawals. Income will continue to decline until the autonomous injections flowing in (the buckets of water) just equal the withdrawals flowing out (the water leaks).

The Multiplier Model in Action

Determining the equilibrium level of income using the multiplier is an important first step in understanding the multiplier analysis. The second step is to modify that analysis to answer a question that is of much more interest to policy makers: How much would a change in autonomous expenditures change the equilibrium level of income? This second step is important since it is precisely those sudden changes in autonomous expenditures that can cause a recession. That is why we discussed shifts in autonomous expenditures above.

It is because autonomous expenditures are subject to sudden shifts that I was careful to point out *autonomous* means "determined outside the model and not affected by income." Autonomous expenditures can, and do, shift for a variety of reasons. When they do, the multiplier process is continually being called into play.

Autonomous means "determined outside the model."

THE STEPS OF THE MULTIPLIER PROCESS Any initial change in autonomous aggregate expenditures is amplified by the dynamic feedback effects in the multiplier process. Let's see how this works in the example in Figure 26W-6, which will also serve as a review. Assume that trade negotiations between the United States and other countries have fallen apart and U.S. exports decrease by $100. This is shown in the AE curve's downward shift from AE_1 to AE_2.

Q-7 If exports fall by $30 and the $mpe = .9$, what happens to equilibrium income?

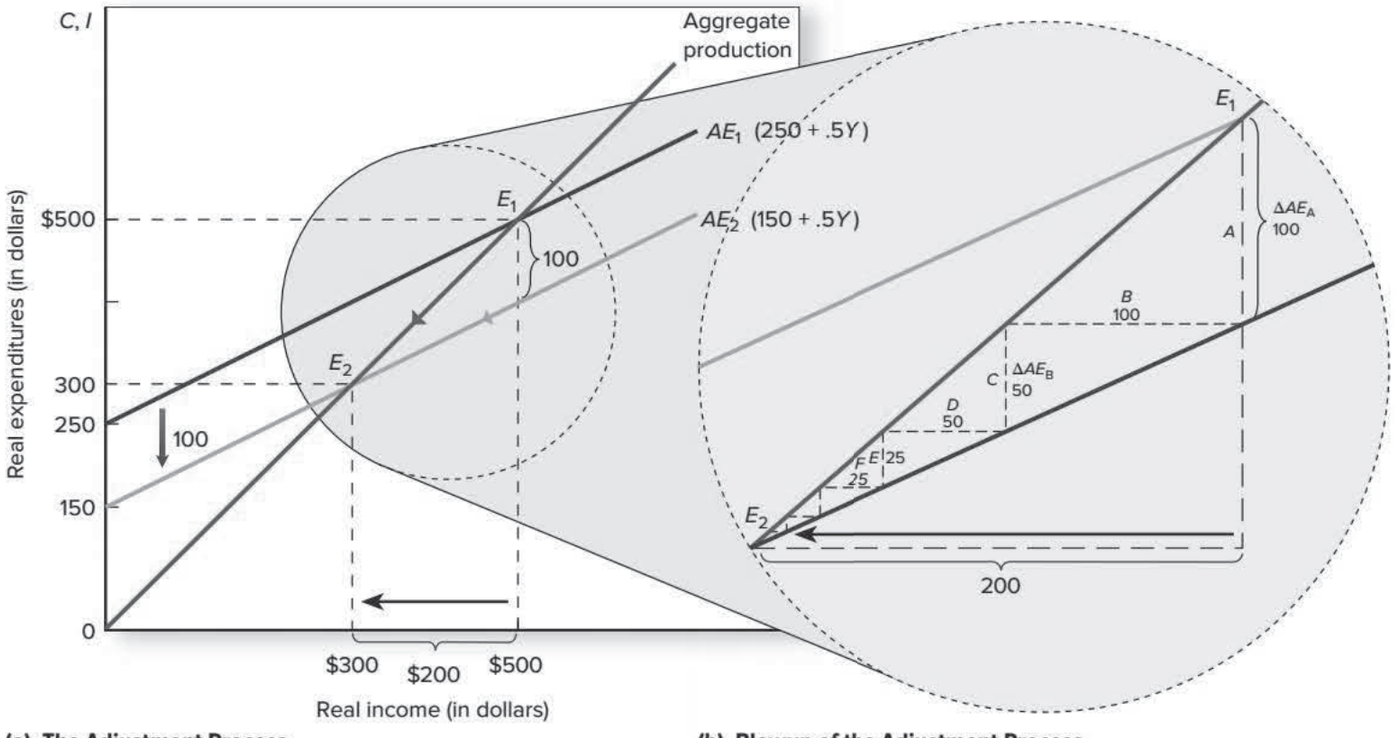
How far must income fall until equilibrium is reached? To answer that question, we need to know the initial change, $\Delta AE = -\$100$, and the size of the multiplier, $[1/(1 - mpe)]$. In this example, $mpe = .5$, so the multiplier is 2. That means the final decrease in income that brings about equilibrium is $200 (two times as large as the initial shift of $100).

Figure 26W-6(b), a blowup of the circled area in Figure 26W-6(a), shows the detailed steps of the multiplier process so you can see how it works. Initially, autonomous expenditures fall by $100 (length A), causing firms to decrease production by $100 (length B). But that decrease in income causes expenditures to

FIGURE 26W-6 (A AND B) Shifts in the Aggregate Expenditures Curve

Graph (**a**) shows the effect of a shift of the aggregate expenditures curve. When autonomous expenditures decrease by $100, the aggregate expenditures curve shifts downward from AE_1 to AE_2. In response, income falls by a multiple of the shift, in this case by $200.

Graph (**b**) shows the multiplier process under a microscope. In it the adjustment process is broken into discrete steps. For example, when income falls by $100 (length *B*), expenditures fall by $50 (length *C*). In response to that fall of expenditures, producers reduce output by $50, which decreases income by $50 (length *D*). The lower income causes expenditures to fall further (length *E*) and the process continues.



decrease by another $50 (.5 × $100) (length *C*). Again firms respond by cutting production, this time by $50 (length *D*). Again income falls (length *E*), causing production to fall (length *F*). The process continues again and again (the remaining steps) until equilibrium income falls by $200, two times the amount of the initial change. The *mpe* tells how much closer at each step aggregate expenditures will be to aggregate production.

The final result can be calculated as follows:

Change in income = [1/(1 – *mpe*)] × Change in autonomous expenditures

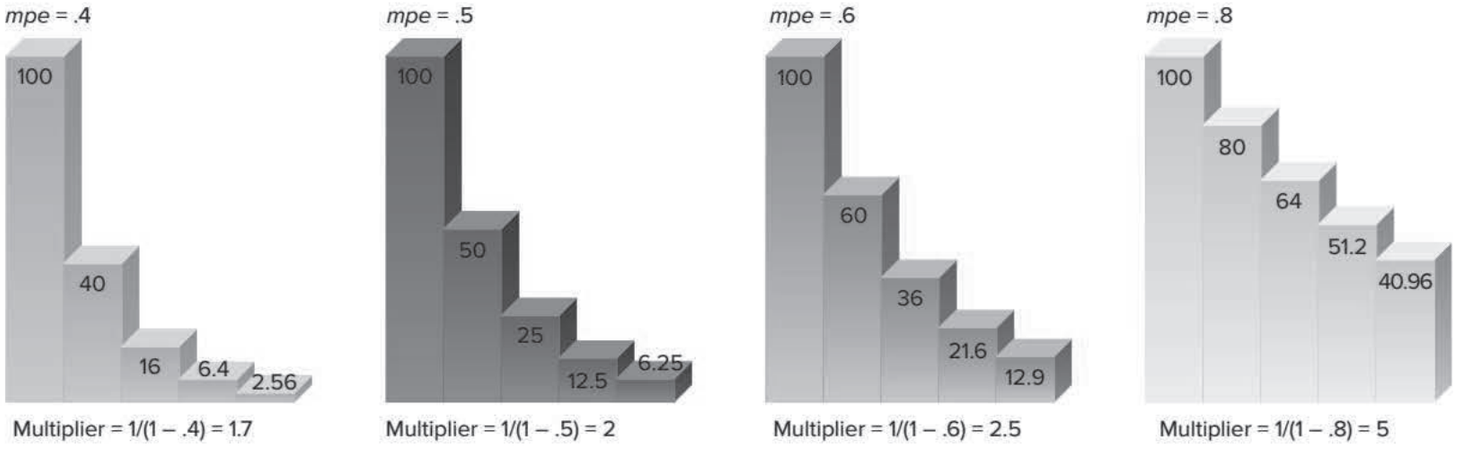
You can see this adjustment process in Figure 26W-7, which shows the first steps with multipliers of various sizes.

Examples of the Effect of Shifts in Aggregate Expenditures

There are many reasons for shifts in autonomous expenditures that can affect the economy: natural disasters, changes in investment caused by technological developments, shifts in government expenditures, large changes in the exchange rate, and so on. As I discussed above, in order to focus on these shift factors, autonomous expenditures are often broken up into their component parts: autonomous consumption (C_0), autonomous investment (I_0), autonomous government spending (G_0), and autonomous net exports ($X_0 - M_0$) (the difference between autonomous exports and autonomous imports). Changes in consumer sentiment affect C_0; major technological breakthroughs affect I_0; changes in government's spending decisions affect G_0; and changes in foreign income and exchange rates affect ($X_0 - M_0$).

FIGURE 26W-7 The First Five Steps of Four Multipliers

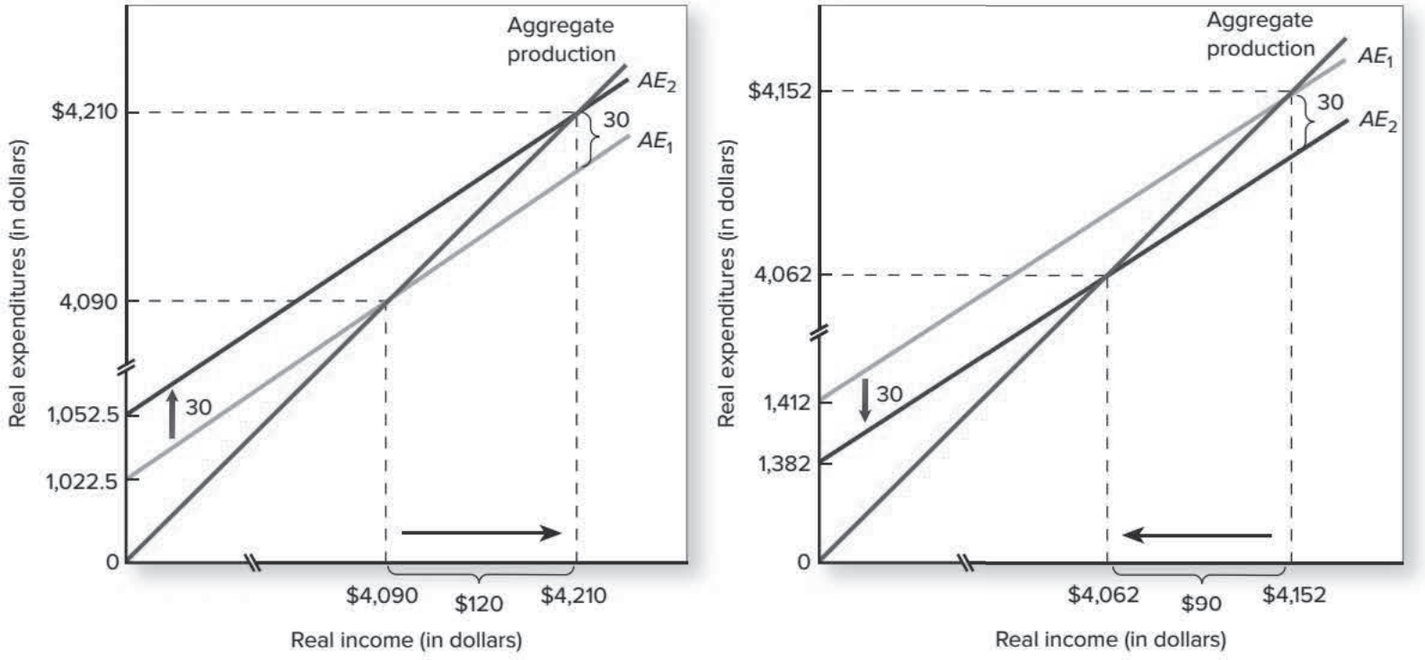
The larger the marginal propensity to expend, the more steps are required before the shifts become small.



Learning to work with the multiplier model requires practice, so in Figure 26W-8 (a and b) I present two different expenditures functions and two different shifts in autonomous expenditures. Below each model is the equation representing how much

FIGURE 26W-8 (A AND B) Two Different Expenditures Functions and Two Different Shifts in Autonomous Expenditures

The steeper the slope of the *AE* curve, the greater the effect of a shift in the *AE* curve on equilibrium income. In (**a**) the slope of the *AE* curve is .75 and a shift of $30 of autonomous expenditures causes an increase in income of $120. In (**b**), the slope of the *AE* curve is .66 and a shift of $30 of autonomous expenditures causes a decrease in income of $90.



aggregate income changes in terms of the multiplier and autonomous expenditures. As you see, the multiplier equation calculates the shift, while the graph determines it in a visual way. Now let's turn to two real-world examples.

Let's first consider Japan in the 1990s. A dramatic appreciation of the Japanese exchange rate in the mid-1990s cut Japanese exports, decreasing aggregate expenditures so that aggregate production was greater than planned aggregate expenditures. Then, simultaneously, consumers became worried and autonomous consumption fell. Suppliers could not sell all that they produced. Their reaction was to lay off workers and decrease output. That response would have solved the problem if only one firm had been affected. But since all firms (or at least a large majority) were affected, the fallacy of composition came into play. As all producers responded in this fashion, aggregate income, and hence aggregate expenditures, also fell. The suppliers' cutback started what is sometimes called a vicious cycle. Aggregate expenditures and production spiraled downward, which is what the multiplier process explains.

Our second example is the worldwide recession of 2008. The recession began when the housing market in the United States collapsed. As a result the financial market almost collapsed and the stock market dropped precipitously. These led to a sudden large shift down in the *AE* curve, with aggregate output falling so much that many economists feared the world economy was falling into a depression.

Fiscal Policy in the Multiplier Model

The multiplier model is of interest to policy makers not only because it allows them to predict the effects of shifts in autonomous expenditures but also because they believe that it allows them to control the level of output with countershifts of their own. By implementing policies affecting autonomous spending, governments can shift the *AE* curve up or down and, in the model at least, achieve the desired level of output.

Fighting Recession: Expansionary Fiscal Policy

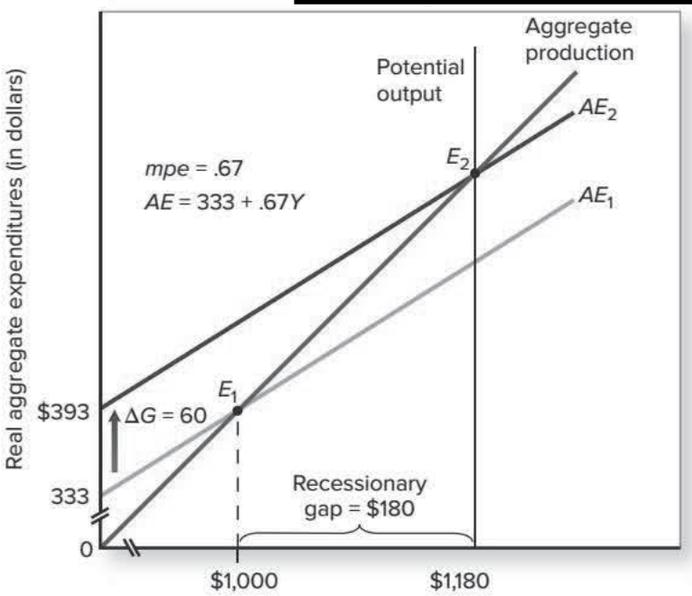
To see how this is done, let's consider how government policy can get an economy out of a recession with fiscal policy. [redacted] The top panel shows fiscal policy in the multiplier model. [redacted] Initially the economy is in equilibrium at income level $1,000, which is below potential income ($1,180). The economy is in a recessionary gap. This is what ideally happens: The government recognizes this recessionary gap in aggregate income of, say, $180 and responds with expansionary fiscal policy by increasing government expenditures by $60.

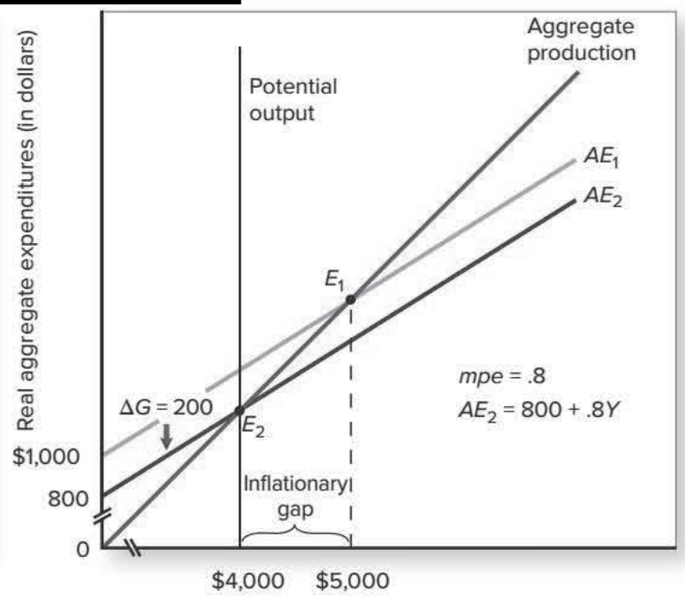
Assuming the price level is constant (the *SAS* curve is flat), the increased government spending shifts the *AE* curve from AE_1 upward to AE_2. Businesses that receive government contracts hire the workers who have been laid off by other firms and open new plants; output increases by the initial expenditure of $60. But the process doesn't stop there. At this point, the multiplier process sets in. As the newly employed workers spend more, other businesses find that their demand increases. They hire more workers, who spend an additional $40 (since their $mpe = .67$). This increases income further. The same process occurs again and again. By the time the process has ended, income has risen by $180 to $1,180, the potential level of income.

[redacted]

FIGURE 26W-9 (A AND B) Fiscal Policy

In (**a**) if the economy is below its potential income level, the government can increase government spending to stimulate the economy. [redacted] income expands by a multiple of that increase. In (**b**) we see appropriate government policy for an inflationary gap. In the absence of any policy, shortages and accelerating inflation will occur. To prevent this, government must use contractionary fiscal policy, shifting the AE curve downward from AE_1 to AE_2 to reduce equilibrium income from \$5,000 to \$4,000. [redacted]





[redacted]

(a) Fighting a Recession **(b) Fighting Inflation**

How did the government economists know to increase spending by \$60? By backward induction. They empirically estimated that the *mpe*—the slope of the aggregate expenditures curve—was .67, which meant that the multiplier was $1/(1 - .67) = 1/.33 = 3$. They divided the multiplier, 3, into the recessionary gap, \$180, and determined that if they increased spending by \$60, income would increase by \$180.

ADDED DIMENSION

Keynes and Fiscal Policy

One of the themes of this book is that economic thought and policy are more complicated than an introductory book must necessarily make them seem. Fiscal policy is a good case in point. In the early 1930s, before Keynes wrote *The General Theory,* he was advocating public works programs and deficits (government spending in excess of tax revenues) as a way to get the British economy out of the Depression. He came upon what we now call the *Keynesian theory* as he tried to explain to Classical economists why he supported deficits. After arriving at his new theory, however, he spent little time advocating fiscal policy and, in fact, never mentions fiscal policy in *The General Theory.* The book's primary policy recommendation is the need to socialize investments—for the government to take over the investment decisions from private individuals. When one of his followers, Abba Lerner, advocated expansionary fiscal policy at a seminar Keynes attended, Keynes strongly objected, leading Evsey Domar, another Keynesian follower, to whisper to a friend, "Keynes should read *The General Theory.*"

What's going on here? There are many interpretations, but the one I find most convincing is the one presented by historian Peter Clarke. He argues that, while working on *The General Theory,* Keynes turned his interest from a policy revolution to a theoretical revolution. He believed he had found a serious flaw in Classical economic theory. The Classicals assumed that an economy in equilibrium was at full employment, but they did not show how the economy could move to that equilibrium from a disequilibrium. That's when Keynes' interest changed from a policy to a theoretical revolution.

His followers, such as Lerner, carried out the policy implications of his theory. Why did Keynes sometimes oppose these policy implications? Because he was also a student of politics and he recognized that economic theory can often lead to politically unacceptable policies. In a letter to a friend, he later said Lerner was right in his logic, but he hoped the opposition didn't discover what Lerner was saying. Keynes was more than an economist; he was a politician as well.

[redacted]

Fighting Inflation: Contractionary Fiscal Policy

Q-8 Demonstrate graphically the effect of contractionary fiscal policy in relation to the *AS/AD* model with a fixed price level.

Fiscal policy can also work in reverse, decreasing expenditures that are too high. Expenditures are "too high" when the economy temporarily exceeds its potential output. An economy operating above potential will generate accelerating inflation.

[redacted]

Potential income is $4,000, but the equilibrium level of income is $5,000. The difference between the two, $1,000, is the inflationary gap. This inflationary gap causes upward pressure on wages and prices with no additional lasting increase in output. If the government wants to avoid inflation, it can use contractionary policy. By how much should government reduce government expenditures? To determine that, it

[redacted]

Q-9 The marginal propensity to expend is .33, and there is an inflationary gap of $100. What fiscal policy would you recommend?

has to calculate the multiplier. In this example, the marginal propensity to expend is assumed to be .8, which means that the multiplier would be 5. So a cut in autonomous expenditures of $200 would shift the *AE* curve down by $200 and decrease equilibrium income by $1,000.

Using Taxes Rather than Expenditures as the Tool of Fiscal Policy

As a brain teaser, you might try to figure out what you would have advised the government to do if it had wanted to increase taxes rather than decrease expenditures to get the economy out of the inflationary gap in Figure 26W-9(b). By how much should it increase taxes? If you said by $200 since the multiplier is 5, you're on the right wavelength, but not quite right. True, the multiplier, $1/(1 - mpe)$, is 5, but a change in taxes affects initial expenditures in a slightly different way than does a direct change in expenditures. Specifically, expenditures will not decrease by the full amount of the tax increase. The reason is that people will likely reduce their saving in order to hold up their expenditures. Expenditures will initially fall by that portion of the decrease in their disposable income that consumers spend on U.S. goods, which, as I stated earlier, is measured by the consumer's marginal propensity to consume (*mpc*). For simplicity, let's assume that the marginal propensity to consume equals the marginal propensity to expend. Then, initially, the decrease in expenditures from the tax increase will be $(.8 \times \$200) = \$160$, rather than $200. To get the initial shift of $200 from increasing taxes, the government must increase taxes by $200/.8, or $250. Then when people reduce spending by .8 of that, their expenditures will fall by $200.

A change in taxes affects initial expenditures differently than a direct change in expenditures.

Limitations of the Multiplier Model

On the surface, the multiplier model makes a lot of intuitive sense. However, surface sense can often be misleading. The multiplier model leaves out many aspects of the aggregate economy and overemphasizes others. Models must be used with care when relating them to the real world. They focus on certain relationships and in doing so direct our focus away from other relationships. These other relationships are considered by the model to be exogenous noise.

The multiplier model both underestimates and overestimates the effects of changes in the economy. Specifically, when shifts in aggregate demand are small, the random fluctuations, which economists call noise, that tend to bring the economy back to its original equilibrium drown out much of the multiplier effect predicted by the model. Therefore, the multiplier model overestimates the effects of shifting demand. That's why the multiplier model lost favor in the 1970s. When shifts in demand are large, as in 2008, the opposite occurs: The noise that destabilizes the economy overwhelms the model's predicted effect and the model instead underestimates the effect of shifting demand. The multiplier model portrayed the economy as globally stable in the sense that the aggregate economy would settle down to a new equilibrium. But, as I will discuss below, that is not necessarily the case.

So let me briefly list some of the limitations of the multiplier model.

The Multiplier Model Is Not a Complete Model of the Economy

The multiplier model provides a technical method of determining equilibrium income. But in reality the model doesn't do what it purports to do—determine equilibrium income from scratch. Why? Because it doesn't tell us where those autonomous expenditures come from or how we would go about measuring them.

At best, what we can measure, or at least estimate, are directions and rough sizes of autonomous demand shifts, and we can determine the direction and possible overadjustment the economy might make in response to those changes. If you think back to our initial discussion of the multiplier model, this is how I introduced it—as an explanation of forces affecting the adjustment process, not as a determinant of the final equilibrium independent of where the economy started. It is a historical, not an analytical, model. Without some additional information about where the economy started from, or what the desired level of output is, the multiplier model is incomplete.

At best, what we can estimate are directions and rough sizes of autonomous demand or supply shifts.

Shifts Are Sometimes Not as Great as the Model Suggests

A second problem with the multiplier model is that it leads people to overemphasize changes in aggregate expenditures that would occur in response to a shift in autonomous expenditures. Say people decide to save some more. You might think that it would lead to a fall in expenditures. But wait, some of that saving will go into the financial sector and be translated back into the expenditures sector as loans to other consumers or as loans to businesses funding investment. So if you take a broad view of aggregate expenditures, many of the changes in expenditures are simply rearrangements from one group of expenditures to another.

Fluctuations Can Sometimes Be Greater than the Model Suggests

The multiplier model allows changes in output to affect demand for output only through the income-expenditures interdependencies, making the size of the marginal propensity to expend central. Because the marginal propensity to expend is less than 1 (recall, the *mpe* is defined as being between zero and 1), the model predicts that the fluctuations will be dampened. After the aggregate economy experiences a decrease in demand, it will settle down to a new equilibrium. But that need not be the case. If changes in output change the expectations of future output, or influence the demand for output through some other path, the result can be a model in which changes in demand are magnified, creating a global instability in the model that causes output to fall seemingly uncontrollably.

Let's consider an example of one such model called the **multiplier-accelerator model**—*a model in which changes in output are accelerated because changes in investment depend on changes in income (rather than on the level of income).* In this model, when aggregate demand falls, output falls as in the standard multiplier model. But as output falls, unlike in the simple multiplier model, investment also falls since firms can see no reason to invest. (Why invest if there is no demand for your goods?) This new interconnection accelerates the fall in aggregate demand, and in output, possibly making the second shift larger than the first shift. Under certain conditions, output can be pushed into an uncontrollable freefall, unless something else changes.

There are many other possible accelerants of decreasing aggregate demand, all of which can create a push toward such an uncontrollable freefall. For example, expectations might be endogenous, in which case the fall in aggregate demand creates self-fulfilling expectations of further decreases in aggregate demand—the economy becomes worse because people expect it to become worse. It was precisely such conditions that the U.S. economy faced in 2008 when it fell into a serious recession.

The Price Level Will Often Change in Response to Shifts in Demand

One of the assumptions of the multiplier model is that the price level is fixed—that makes aggregate production a 45° line. But in reality the price level can change as aggregate demand changes because price markups and labor market conditions change. These changes in the price level make the model more complicated. Some adjustment must be made when the price level changes in response to changes in aggregate demand. That adjustment is usually made by shifting the *AE* curve up (in the case of a falling price level) or down (in the case of a rising price level) if the standard effects of price-level changes on aggregate demand are considered. But if expectations feed back on aggregate demand, the price-level changes can be destabilizing. These other paths through which changes in price level affect output make the effect of policy on real income uncertain. (These adjustments are discussed in Appendix B at the end of this chapter.)

People's Forward-Looking Expectations Make the Adjustment Process Much More Complicated

People's forward-looking expectations make the adjustment process much more complicated. The multiplier model presented here assumes that people respond to current changes in income. Most people, however, act on the basis of expectations of the future. Consider the assumed response of businesses to changes in expenditures. They lay off workers and cut production at the slightest fall in demand. In reality, their response is far more complicated. They may well see the fall as a temporary blip. They will allow their inventory to rise in the expectation that the next month another temporary blip will offset the previous fall. Business decisions about production are forward-looking, and do not respond simply to current changes. As a contrast to the simple multiplier model, some modern economists have put forward a **rational expectations model** of the macroeconomy in which *all decisions are based on the expected equilibrium in the economy.* Some economists go so far as to argue that since people rationally expect the economy to achieve its potential income, it will do so. Other economists emphasize extrapolative expectations, which can cause the aggregate economy to explode or implode in boom and bust cycles.

Shifts in Expenditures Might Reflect Desired Shifts in Supply and Demand

There is an implicit assumption in the multiplier model that shifts in demand are not reflections of shifts in desired production or supply. Reality is much more complicated. Shifts can occur for many reasons, and many shifts can reflect desired shifts in aggregate production, which are accompanied by shifts in aggregate expenditures. An example of such a change occurred in Japan in the 1990s as Japan's industries lost their

competitive edge to Korean, Chinese, and Taiwanese industries. The Japanese economy faltered, but the problem was not simply a fall in aggregate demand, and therefore the solution to it was not simply to increase aggregate demand. A simultaneous shift in aggregate supply had to be dealt with. Today, more and more U.S. economists see the United States as in the same position as Japan in the 1990s.

Suppliers operate in the future—shifting supply, not to existing demand, but to expected demand, making the relationship between aggregate production and current aggregate demand far more complicated than it seems in the multiplier model. Expansion of this line of thought has led some economists, called *real-business-cycle economists,* to develop the **real-business-cycle theory** of the economy: *the theory that fluctuations in the economy reflect real phenomena—simultaneous shifts in supply and demand, not simply supply responses to demand shifts.* Supply drives the economy. Let's consider the expansion of the U.S. economy leading up to the 2008 recession. [redacted]

Real-business-cycle theory suggests that fluctuations in the economy reflect real phenomena.

The real-business-cycle theory would attribute that shift in income to businesses' decision to increase supply in response to technological developments, and a subsequent increase in demand via Say's law.

Expenditures Depend on Much More than Current Income

Let's say your income goes down 10 percent. The multiplier model says that your expenditures will go down by some specific percentage of that. But will they? If you are rational, it seems reasonable to base your consumption on more than one year's income—say, instead, on your permanent or lifetime income. What happens to your income in a particular year has little effect on your lifetime income. If it is true that people base their spending primarily on lifetime income, not yearly income, the marginal propensity to consume out of changes in current income could be very low, approaching zero. In that case, the expenditures function would essentially be a flat line, and the multiplier would be 1. There would be no secondary effects of an initial shift in expenditures. This set of arguments is called the **permanent income hypothesis**—*the hypothesis that expenditures are determined by permanent or lifetime income.* It undermines the reasoning of much of the specific results of the simple multiplier model.

Q-10 What effect would expenditures being dependent on permanent income have on the size of the multiplier?

Conclusion

While each of the above criticisms has some validity, most macro policy makers still use some variation of the multiplier model as the basis for their policy decisions. They don't see it as a *mechanistic model*—a model that pictures the economy as representable by a mechanically determined, timeless model with a determinant equilibrium. Modern economists have come to the conclusion that there is no simple way to understand the aggregate economy. Any mechanistic interpretation of an aggregate model is doomed to fail. The hope of economists to have a model that would give them a specific numeric guide to policy has not been fulfilled.

The model is still useful if it is seen as an interpretive model or an aid in understanding complicated disequilibrium dynamics. The specific results of the multiplier model are a guide to common sense, enabling us to emphasize a particular important dynamic interdependency while keeping others in mind. With that addendum—that it is not meant to be taken literally but only as an aid to intuition—the simple multiplier model deals with the issues that concern today's highest-level macro theorists.

Summary

- The multiplier model focuses on the induced effect that a change in production has on expenditures, which affects production, and so on. (*LO26W-1*)
- The multiplier model is made up of the aggregate production and aggregate expenditures curves. In equilibrium, aggregate production must equal planned aggregate expenditures. (*LO26W-1*)
- The aggregate production (*AP*) curve is a line along which real income equals real production. It is a 45° line. (*LO26W-1*)
- Aggregate expenditures (*AE*) are made up of consumption, investment, government spending, and net exports: (*LO26W-1*)

$$AE = C + I + G + (X - M)$$

- Expenditures depend on the level of income; the marginal propensity to expend (*mpe*) tells us the change in expenditures that occurs with a change in income. (*LO26W-1*)
- The *AE* curve shows aggregate expenditures graphically. Its slope is the *mpe* and its *y*-intercept equals autonomous expenditures. (*LO26W-2*)
- Equilibrium output, or income, is where the *AP* and *AE* curves intersect. (*LO26W-2*)
- Equilibrium output can be calculated using the multiplier equation: (*LO26W-2*)

$$Y = \text{Multiplier} \times \text{Autonomous expenditures}$$

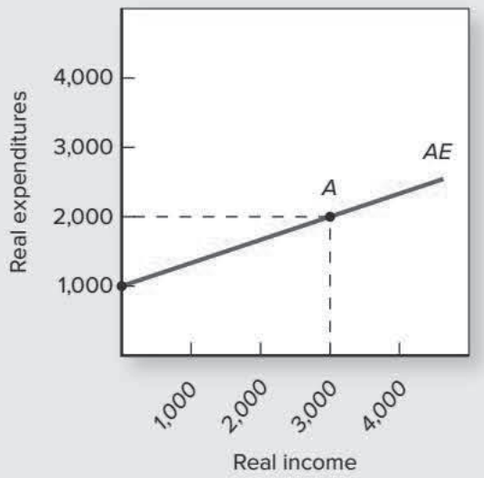
- The multiplier tells us how much a change in autonomous expenditures will change equilibrium income. The multiplier equals $1/(1 - mpe)$. (*LO26W-2*)
- When an economy is in equilibrium, withdrawals from the spending stream equal injections into the spending stream (autonomous expenditures). (*LO26W-2*)
- Shifts in autonomous expenditures can be the initial change that begins the multiplier process. The multiplier process expands that initial shift to a much larger decrease or increase in production and income. (*LO26W-2*)
- Expansionary fiscal policy, increasing government expenditures or decreasing taxes, is represented graphically as an upward shift of the aggregate expenditures curve or a rightward shift in the *AD* curve. (*LO26W-3*)
- Contractionary fiscal policy, decreasing government expenditures or increasing taxes, is represented graphically as a downward shift of the aggregate expenditures curve or a leftward shift in the *AD* curve. (*LO26W-3*)
- The multiplier model has limitations: (1) It is incomplete without information about where the economy started and what is the desired level of output, (2) it overemphasizes shifts that occur in aggregate expenditures, (3) it can both over- and underestimate the effects of changes in the economy, (4) it assumes that the price level is fixed when in reality it isn't, (5) it doesn't take expectations into account, (6) it ignores the possibility that shifts in expenditures are desired, and (7) it ignores the possibility that consumption is based on lifetime income, not annual income. (*LO26W-4*)
- Macroeconomic models cannot be applied mechanistically; they are only guides to common sense. (*LO26W-4*)

Key Terms

aggregate expenditures
aggregate production (*AP*)
autonomous expenditures
expenditures multiplier
induced expenditures
marginal propensity to expend (*mpe*)
multiplier-accelerator model
multiplier equation
multiplier model
permanent income hypothesis
rational expectations model
real-business-cycle theory

Questions and Exercises connect

1. When is the multiplier model more appropriate: for small or large changes in aggregate demand? (*LO26W-1*)
2. What are induced and autonomous expenditures at point *A* in the accompanying graph? (*LO26W-1*)



3. What happens to the aggregate expenditures curve when autonomous expenditures fall? (*LO26W-1*)
4. If planned expenditures are below actual production, what will happen to income? Explain the process by which this happens. (*LO26W-2*)
5. Are inventories building up at levels of output above or below equilibrium output? Explain your answer. (*LO26W-2*)
6. What happens to equilibrium income when the marginal propensity to expend rises? (*LO26W-2*)
7. What is equilibrium income if the aggregate expenditures function is $AE = 300 + .4Y$? (*LO26W-2*)
8. The marginal propensity to expend is .8. Autonomous expenditures are $4,200. What is the level of equilibrium income in the economy? Demonstrate graphically. (*LO26W-2*)
9. The marginal propensity to expend is .66 and autonomous expenditures have just fallen by $20. (*LO26W-2*)
   a. What will likely happen to equilibrium income?
   b. Demonstrate graphically.
10. If withdrawals were instantaneously translated into expenditures, what would be the multiplier's size? What would be the level of autonomous expenditures? (*LO26W-2*)
11. Congratulations. You've been appointed economic adviser to the president of Happyland. Your research assistant says the country's *mpe* is .8 and autonomous expenditures have just risen by $20. (*LO26W-2*)
    a. What will happen to income?
    b. Your research assistant comes in and says he's sorry but the *mpe* wasn't .8; it was .5. How does your answer change?
    c. He runs in again and says exports have fallen by $10 and investment has risen by $10. How does your answer change?
    d. You now have to present your analysis to the president, who wants to see it all graphically. Naturally you oblige.
12. Congratulations again. You've just been appointed economic adviser to the president of Examland. The *mpe* is .6; autonomous investment is $1,000; autonomous government spending is $8,000; autonomous consumption is $10,000; and autonomous net exports are $1,000. (*LO26W-2*)
    a. What is the equilibrium level of income in the country?
    b. Autonomous net exports increase by $2,000. What will happen to income?
    c. You've just learned the *mpe* changed from .6 to .5. How will this information change your answers in *a* and *b*?
13. What forces could cause shocks to aggregate expenditures? (*LO26W-3*)
14. The marginal propensity to expend is .5 and there is a recessionary gap of $200. What fiscal policy would you recommend? (*LO26W-3*)
15. Why does cutting taxes by $100 have a smaller effect on GDP than increasing expenditures by $100? (*LO26W-3*)
16. In 1992, as President George H. W. Bush was running (unsuccessfully) for reelection, the economy slowed down; then in late 1993, after President Bill Clinton's election, the economy picked up steam. (*LO26W-3*)
    a. Demonstrate graphically with the multiplier model a shift in the *AE* curve that would have caused the slowdown.
    b. Demonstrate graphically with the multiplier model a shift in the *AE* curve that would have caused the improvement.
17. Congratulations yet again. You've just been appointed chairman of the Council of Economic Advisers in Textland. You must rely on your research assistant for the specific numbers. He says income is $50,000, *mpe* is .75, and the president wants to raise output by $2,000. (*LO26W-3*)
    a. Advise him.

b. Your research assistant comes in and says "Sorry, I meant that the *mpe* is .67." Redo your calculations.
c. You're just about to see the president when your research assistant comes running in, saying, "Sorry, sorry, I meant that the *mpe* is .5." Redo your calculations.

18. State what fiscal policy you would recommend to eliminate the inflationary or recessionary gap in the following scenarios: (*LO26W-3*)
a. Recessionary gap of $800; *mpe* = .5.
b. Inflationary gap of $1,500; *mpe* = .8.
c. Real GDP = $10,200; potential GDP = $9,000; *mpe* = .2.
d. Real GDP = $40,500; potential GDP = $42,000; *mpe* = .7.

19. Congratulations one more time. You have been appointed chair of Economic Advisers in Fantasyland. Income is currently $600,000, unemployment is 5 percent, and there are signs of coming inflation. You rely on your research assistant for specific numbers. He tells you that potential income is $564,000 and the *mpe* is .5. (*LO26W-3*)
a. The government wants to eliminate the inflationary gap by changing expenditures. What policy do you suggest?
b. Your research assistant comes in and says, "Sorry, I meant that the *mpe* is .8." Redo your calculations for part *a*.

20. Why is the circular-flow diagram of the economy an only partially correct conception of the multiplier model? (*LO26W-4*)

21. How do mechanistic models differ from interpretive models? (*LO26W-4*)

22. If the multiplier model multiplies the effect of initial changes in autonomous expenditures, how can it also be a model of dampened fluctuations? (*LO26W-4*)

23. How does the multiplier-accelerator model magnify changes in demand? (*LO26W-4*)

24. How does the permanent income hypothesis affect the multiplier model? Why? (*LO26W-4*)

Questions from Alternative Perspectives

1. Traffic engineer Hans Monderman has shown that traffic flows can be made safer and flow better if the number of road signs is reduced and, in many types of intersections, eliminated altogether. What relevance do his insights about traffic flows have for macroeconomic policy? *(Austrian)*

2. During the Great Depression, Norman Cousins made the following remark: "There are approximately 10,000,000 people out of work in the U.S. today. There are also 10,000,000 or more women married and single who are job holders. Simply fire the women, who should not be working anyway, and hire the men. Presto! No unemployment. No relief. No Depression." How would you evaluate this statement? Is work a human right or a gender-based privilege? Do you think that men would have taken jobs that were traditionally considered "women's work" in the 1930s even if they were unemployed? *(Feminist)*

3. When the federal government uses expenditures to stimulate the economy, it changes not only the present but the future as well. Use the *AS/AD* model and the production possibility curve to explore the probable near-term and long-term consequences of three alternative stimulus options: medical care for all Americans; an increased military presence across the Middle East to promote U.S. domestic tranquility; the development of oil-saving and climate-friendly energy alternatives. In your analysis be sure to include the effect of increased deficits on investment. *(Institutionalist)*

4. One remarkable thing about U.S. households is how little they save. The U.S. personal savings rate through the first five months of 2007 was negative. This negative savings rate seems to be the product of increased borrowing by poorer households, reduced savings by richer households, and the proliferation of low-wage jobs (which provide incomes too low to enable saving). The flip side of the savings rate is the marginal propensity to consume. Rough estimates suggest that the *mpc* for the U.S. economy averaged about 90 percent between 1946 and 1990. But between 1991 and 2000, the *mpc* was 105 percent, and has been even higher since then. People are, on balance, consuming all their income and then some, and are up to their eyeballs in consumer debt.
a. What do these data imply for a multiplier model?
b. What do these data say about what powered the U.S. economy from 2001 to 2008, and should the data have suggested that the expansion was unsustainable? *(Radical)*

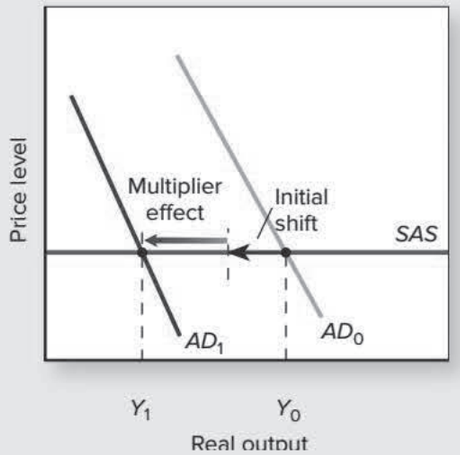
5. Coaxing spending out of the private sector, especially investment spending, has never been an easy matter. What persuades investors to part with their money? Economist Stephen Fazzari provided one answer to that question in his study of 5,000 U.S. manufacturing firms. Fazzari found that interest rates exerted far less influence on investment decisions than either sales growth or a firm's available funds or financial conditions. What do Fazzari's findings suggest about the importance of Classical cost-side factors and Keynesian spending-side factors in the investment decisions of manufacturing firms? Also, what do Fazzari's findings suggest about what public policies might effectively promote investment? *(Post-Keynesian)*

Issues to Ponder

1. What is the current state of U.S. fiscal policy? Would you advise the United States to change its fiscal policy? Why?
2. Mr. Whammo has just invented a magic pill. Take it and it transports you anywhere. Explain his invention's effects on the economy.
3. Charlie Black, a GOP strategist, was once quoted as stating, "I can't tell you why this happens, but there's a lag time (before people tune into good economic news)." What is the effect of this delay in the adjustment of expectations by consumers on the dynamics of the multiplier model?

Answers to Margin Questions

1. Income equals production on the aggregate production curve. (*LO26W-1*)
2. Induced expenditures change as income changes. Autonomous expenditures are independent of income. (*LO26W-1*)
3. The *mpe* is .6. (*LO26W-1*)
4. The multiplier is 2 when the *mpe* = .5. (*LO26W-2*)
5. The level of income is $3,333. (*LO26W-2*)
6. When inventories fall below planned inventories, the economy is probably expanding; firms will likely increase production, which will cause expenditures to increase, which will further draw down inventories. (*LO26W-2*)
7. Equilibrium income falls by $300. (*LO26W-3*)
8. As you can see in the accompanying graph, contractionary fiscal policy shifts the *AD* curve to the left. The multiplier then takes over to shift the *AD* curve to the left by a multiple of the initial decline in aggregate expenditures. Assuming a flat *SAS* curve, income falls by a multiple of the initial shift. In the multiplier model, the *AE* curve shifts down and equilibrium income falls by a multiple of the decline in government expenditures. (*LO26W-3*)



9. Since there is an inflationary gap, I would recommend contractionary fiscal policy. Since the multiplier is 1.5 (given the marginal propensity to expend of .33), I would recommend decreasing government spending by $66. (*LO26W-3*)
10. If expenditures are dependent on permanent income, not current income, expenditures would not change as much with a change in current income and the multiplier would get smaller. (*LO26W-4*)

APPENDIX A

An Algebraic Presentation of the Expanded Multiplier Model

In the chapter, I developed the basic multiplier model, focusing on the *mpe*. In this appendix, I briefly outline a fuller presentation in which consumption, taxes, and imports are related to income. That means that instead of having a single expenditures curve, we have a separate curve for each component of aggregate expenditures: consumption, investment, government spending, and net exports.