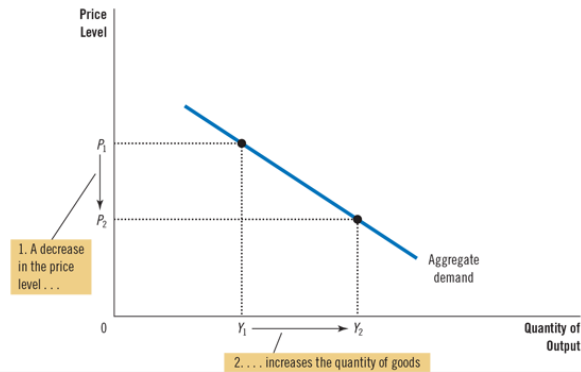


20-3 The Aggregate-Demand Curve

The aggregate-demand curve tells us the quantity of all goods and services demanded in the economy at any given price level. As Figure 3 illustrates, the aggregate-demand curve slopes downward. Other things being equal, a decrease in the economy's overall level of prices (from, say, P_1 to P_2) raises the quantity of goods and services demanded (from Y_1 to Y_2). Conversely, an increase in the price level reduces the quantity of goods and services demanded.

Figure 3 The Aggregate-Demand Curve

A fall in the price level from P_1 to P_2 increases the quantity of goods and services demanded from Y_1 to Y_2 . There are three reasons for this negative relationship. As the price level falls, real wealth rises, interest rates fall, and the exchange rate depreciates. These effects stimulate spending on consumption, investment, and net exports. Increased spending on any or all of these components of output means a larger quantity of goods and services demanded.



20-3a Why the Aggregate-Demand Curve Slopes Downward

Why does a change in the price level move the quantity of goods and services demanded in the opposite direction? To answer this question, it is useful to recall that an economy's GDP (which we denote as Y) is the sum of its consumption (C), investment (I), government purchases (G), and net exports (NX):

$$Y = C + I + G + NX.$$

Each of these four components contributes to the aggregate demand for goods and services. For now, we assume that government spending is fixed by policy. The other three components of spending—consumption, investment, and net exports—depend on economic conditions and, in particular, on the price level. Therefore, to understand the downward slope of the aggregate-demand curve, we must examine how the price level affects the quantity of goods and services demanded for consumption, investment, and net exports.

The Price Level and Consumption: The Wealth Effect

Consider the money that you hold in your wallet and your bank account. The nominal value of this money is fixed: One dollar is always worth one dollar. Yet the *real* value of a dollar is not fixed. If a candy bar costs one dollar, then a dollar is worth one candy bar. If the price of a candy bar falls to 50 cents, then one dollar is worth two candy bars. Thus, when the price level falls, the dollars you hold rise in value, increasing your real wealth and your ability to buy goods and services.

This logic gives us the first reason the aggregate-demand curve slopes downward. *A decrease in the price level raises the real value of money and makes consumers wealthier, thereby encouraging them to spend more. The increase in consumer spending means a larger quantity of goods and services demanded. Conversely, an increase in*

and the quantity of goods and services demanded.

The Price Level and Investment: The Interest-Rate Effect

The price level is one determinant of the quantity of money demanded. When the price level is lower, households do not need to hold as much money to buy the goods and services they want. Therefore, when the price level falls, households try to reduce their holdings of money by lending some of it out. For instance, a household might use its excess money to buy interest-bearing bonds. Or it might deposit its excess money in an interest-bearing savings account, and the bank would use these funds to make more loans. In either case, as households try to convert some of their money into interest-bearing assets, they drive down interest rates. (The next chapter analyzes this process in more detail.)

Interest rates, in turn, affect spending on goods and services. Because a lower interest rate makes borrowing less expensive, it encourages firms to borrow more to invest in new plants and equipment, and it encourages households to borrow more to invest in new housing. (A lower interest rate might also stimulate consumer spending, especially spending on large durable purchases such as cars, which are often bought on credit.) Thus, a lower interest rate increases the quantity of goods and services demanded.

This logic gives us the second reason the aggregate-demand curve slopes downward. *A lower price level reduces the interest rate, encourages greater spending on investment goods, and thereby increases the quantity of goods and services demanded. Conversely, a higher price level raises the interest rate, discourages investment spending, and decreases the quantity of goods and services demanded.*

The Price Level and Net Exports: The Exchange-Rate Effect

As we have just discussed, a lower price level in the United States lowers the U.S. interest rate. In response to the lower interest rate, some U.S. investors will seek higher returns by investing abroad. For instance, as the interest rate on U.S. government bonds falls, a mutual fund might sell U.S. government bonds to buy German government bonds. As the mutual fund tries to convert its dollars into euros to buy the German bonds, it increases the supply of dollars in the market for foreign-currency exchange.

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The increased supply of dollars to be exchanged for euros causes the dollar to depreciate relative to the euro. This alters the real exchange rate—the relative price of domestic and foreign goods. Because each dollar buys fewer units of foreign currencies, foreign goods become more expensive relative to domestic goods.

The change in relative prices affects spending, both at home and abroad. Because foreign goods are now more expensive, Americans buy less from other countries, causing U.S. imports of goods and services to decrease. At the same time, because U.S. goods are now cheaper, foreigners buy more from the United States, so U.S. exports increase. Net exports equal exports minus imports, so both of these changes cause U.S. net exports to increase. Thus, the depreciation of the dollar leads to an increase in the quantity of goods and services demanded.

This logic yields the third reason the aggregate-demand curve slopes downward. *When a fall in the U.S. price level causes U.S. interest rates to fall, the real value of the dollar declines in foreign exchange markets. This depreciation stimulates U.S. net exports and thereby increases the quantity of goods and services demanded. Conversely, when the U.S. price level rises and causes U.S. interest rates to rise, the real value of the dollar increases, and this appreciation reduces U.S. net exports and the quantity of goods and services demanded.*

Summing up

There are three distinct but related reasons a fall in the price level increases the quantity of goods and services demanded:

1. Consumers become wealthier, stimulating the demand for consumption goods.
2. Interest rates fall, stimulating the demand for investment goods.
3. The currency depreciates, stimulating the demand for net exports.

20-3b Why the Aggregate-Demand Curve Might Shift

The downward slope of the aggregate-demand curve shows that a fall in the price level raises the overall quantity of goods and services demanded. Many other factors, however, affect the quantity of goods and services demanded at a given price level. When one of these other factors changes, the quantity of goods and services demanded at every price level changes and the aggregate-demand curve shifts.

Let's consider some examples of events that shift aggregate demand. We can categorize them according to the component of spending that is most directly affected.

Shifts Arising from Changes in Consumption

Suppose Americans suddenly become more concerned about saving for retirement and, as a result, reduce their current consumption. Because the quantity of goods and services demanded at any price level is now lower, the aggregate-demand curve shifts to the left. Conversely, imagine that a stock market boom makes people wealthier and less concerned about saving. The resulting increase in consumer spending means a greater quantity of goods and services demanded at any given price level, so the aggregate-demand curve shifts to the right.

Thus, any event that changes how much people want to consume at a given price level shifts the aggregate-demand curve. One policy variable that has this effect is the level of taxation. When the government cuts taxes, it encourages people to spend more, so the aggregate-demand curve shifts to the right. When the government raises taxes, people cut back on their spending and the aggregate-demand curve shifts to the left.

Shifts Arising from Changes in Investment

Any event that changes how much firms want to invest at a given price level also shifts the aggregate-demand curve. For instance, imagine that the computer industry introduces a faster line of computers and many firms

Shifts Arising from Changes in Investment

Any event that changes how much firms want to invest at a given price level also shifts the aggregate-demand curve. For instance, imagine that the computer industry introduces a faster line of computers and many firms decide to invest in new computer systems. Because the quantity of goods and services demanded at any price level is now higher, the aggregate-demand curve shifts to the right. Conversely, if firms become pessimistic about future business conditions, they may cut back on investment spending, shifting the aggregate-demand curve to the left.

Tax policy can also influence aggregate demand through investment. For example, an investment tax credit (a tax rebate tied to a firm's investment spending) increases the quantity of investment goods that firms demand at any given interest rate and therefore shifts the aggregate-demand curve to the right. The repeal of an investment tax credit reduces investment and shifts the aggregate-demand curve to the left.

Another policy variable that can influence investment and aggregate demand is the money supply. As we discuss more fully in the next chapter, an increase in the money supply lowers the interest rate in the short run. This decrease in the interest rate makes borrowing less costly, stimulating investment spending and thereby shifting the aggregate-demand curve to the right. Conversely, a decrease in the money supply raises the interest rate, discourages investment spending, and thereby shifts the aggregate-demand curve to the left. Many economists believe that throughout U.S. history, changes in monetary policy have been an important source of shifts in aggregate demand.

Shifts Arising from Changes in Government Purchases

The most direct way that policymakers shift the aggregate-demand curve is through government purchases. For example, suppose Congress decides to reduce purchases of new weapons systems. Because the quantity of goods and services demanded at any price level is now lower, the aggregate-demand curve shifts to the left. Conversely, if state governments start building more highways, the result is a greater quantity of goods and services demanded at any price level, so the aggregate-demand curve shifts to the right.

Shifts Arising from Changes in Net Exports

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Shifts Arising from Changes in Net Exports

Any event that changes net exports for a given price level also shifts aggregate demand. For instance, when Europe experiences a recession, it buys fewer goods from the United States. U.S. net exports decline at every price level, shifting the aggregate-demand curve for the U.S. economy to the left. When Europe recovers from its recession, it buys more U.S. goods and the aggregate-demand curve shifts to the right.

Net exports can also change because international speculators cause movements in the exchange rate. Suppose, for instance, that these speculators lose confidence in foreign economies and want to move some of their wealth into the U.S. economy. In doing so, they bid up the value of the U.S. dollar in the foreign exchange market. This appreciation of the dollar makes U.S. goods more expensive relative to foreign goods, depressing net exports and shifting the aggregate-demand curve to the left. Conversely, speculation that causes a depreciation of the dollar stimulates net exports and shifts the aggregate-demand curve to the right.

Summing up

In the next chapter, we analyze the aggregate-demand curve in more detail. There we examine more precisely how the tools of monetary and fiscal policy can shift aggregate demand and whether policymakers should use these tools for that purpose. At this point, however, you should have some idea about why the aggregate-demand curve slopes downward and what kinds of events and policies can shift this curve. [Table 1](#) summarizes what we have learned so far.

20-4 The Aggregate-Supply Curve

The aggregate-supply curve tells us the total quantity of goods and services that firms produce and sell at any given price level. Unlike the aggregate-demand curve, which always slopes downward, the aggregate-supply curve shows a relationship that depends crucially on the time horizon examined. *In the long run, the aggregate-supply curve is vertical, whereas in the short run, the aggregate-supply curve slopes upward.* To understand short-run economic fluctuations, and how the short-run behavior of the economy deviates from its long-run behavior, we need to examine both the long-run aggregate-supply curve and the short-run aggregate-supply curve.

20-4a Why the Aggregate-Supply Curve Is Vertical in the Long Run

What determines the quantity of goods and services supplied in the long run? We implicitly answered this question earlier in the book when we analyzed the process of economic growth. *In the long run, an economy's production of goods and services (its real GDP) depends on its supplies of labor, capital, and natural resources and on the available technology used to turn these factors of production into goods and services.*

When we analyzed these forces that govern long-run growth, we did not need to make any reference to the overall level of prices. We examined the price level in a separate chapter, where we saw that it was determined by the quantity of money. We learned that if two economies were identical in every way except that one had twice as much money in circulation as the other, the price level would be twice as high in the economy with more money. But since the amount of money does not affect technology or the supplies of labor, capital, and natural resources, the output of goods and services in the two economies would be the same.

Because the price level does not affect the long-run determinants of real GDP, the long-run aggregate-supply curve is vertical, as in [Figure 4](#). In other words, in the long run, the economy's labor, capital, natural resources, and technology determine the total quantity of goods and services supplied, and this quantity supplied is the same regardless of the price level.

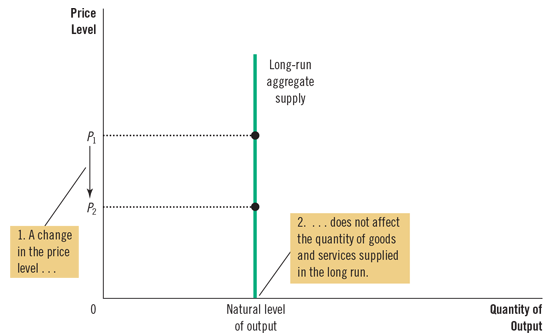
Figure 4 The Long-Run Aggregate-Supply Curve

In the long run, the quantity of output supplied depends on the economy's quantities of labor, capital, and natural resources and on the technology for turning these inputs into output. Because the quantity supplied does not depend on the overall price level, the long-run aggregate-supply curve is vertical at the natural level of output.

Price
Level

Figure 4 The Long-Run Aggregate-Supply Curve

In the long run, the quantity of output supplied depends on the economy's quantities of labor, capital, and natural resources and on the technology for turning these inputs into output. Because the quantity supplied does not depend on the overall price level, the long-run aggregate-supply curve is vertical at the natural level of output.



The vertical long-run aggregate-supply curve is a graphical representation of the classical dichotomy and monetary neutrality. As we have already discussed, classical macroeconomic theory is based on the assumption that real variables do not depend on nominal variables. The long-run aggregate-supply curve is consistent with this idea because it implies that the quantity of output (a real variable) does not depend on the level of prices (a nominal variable). As noted earlier, most economists believe this principle works well when studying the economy over a period of many years but not when studying year-to-year changes. Thus, *the aggregate-supply curve is vertical only in the long run*.

20-4b Why the Long-Run Aggregate-Supply Curve Might Shift

Because classical macroeconomic theory predicts the quantity of goods and services produced by an economy in the long run, it also explains the position of the long-run aggregate-supply curve. The long-run level of production is sometimes called *potential output* or *full-employment output*. To be more precise, we call it the **natural level of output** because it shows what the economy produces when unemployment is at its natural, or normal, rate. The natural level of output is the rate of production toward which the economy gravitates in the long run.

Any change in the economy that alters the natural level of output shifts the long-run aggregate-supply curve. Because output in the classical model depends on labor, capital, natural resources, and technological knowledge, we can categorize shifts in the long-run aggregate-supply curve as arising from these four sources.

Shifts Arising from Changes in Labor

Imagine that an economy experiences an increase in immigration. Because increased immigration results in a greater number of workers, the quantity of goods and services supplied would increase. As a result, the long-run aggregate-supply curve would shift to the right. Conversely, if many workers left the economy to go abroad, the long-run aggregate-supply curve would shift to the left.

The position of the long-run aggregate-supply curve also depends on the natural rate of unemployment, so any change in the natural rate of unemployment shifts the long-run aggregate-supply curve. For example, if Congress made unemployment insurance substantially more generous, unemployed workers might search less hard for new jobs, increasing the natural rate of unemployment and reducing the economy's production of goods and services. As a result, the long-run aggregate-supply curve would shift to the left. Conversely, if Congress enacted a successful job training program for unemployed workers, the natural rate of unemployment would fall and the long-run aggregate-supply curve would shift to the right.

Shifts Arising from Changes in Capital

An increase in the economy's capital stock increases productivity and thereby increases the quantity of goods and services supplied. As a result, the long-run aggregate-supply curve shifts to the right. Conversely, a decrease in the economy's capital stock decreases productivity and the quantity of goods and services supplied, shifting the long-run aggregate-supply curve to the left.

Notice that the same logic applies regardless of whether we are discussing physical capital such as machines and factories or human capital such as college degrees. An increase in either type of capital will raise the economy's ability to produce goods and services and, thus, shift the long-run aggregate-supply curve to the right.

Shifts Arising from Changes in Natural Resources

An economy's production depends on its natural resources, including its land, minerals, and weather. The discovery of a new mineral deposit shifts the long-run aggregate-supply curve to the right. A change in weather patterns that makes farming more difficult shifts the long-run aggregate-supply curve to the left.

In many countries, crucial natural resources are imported. A change in the availability of these resources can also shift the aggregate-supply curve. For example, as we discuss later in this chapter, developments in the world oil market have historically been an important source of shifts in aggregate supply for the United States and other oil-importing nations.

Shifts Arising from Changes in Technological Knowledge

Perhaps the most important reason that the economy today produces more than it did a generation ago is that our technological knowledge has advanced. The invention of the computer, for instance, has allowed us to produce more goods and services from any given amounts of labor, capital, and natural resources. As computer use has spread throughout the economy, it has shifted the long-run aggregate-supply curve to the right.

Although not literally technological, many other events act like changes in technology. For instance, opening up international trade has effects similar to inventing new production processes because it allows a country to

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Although not literally technological, many other events act like changes in technology. For instance, opening up international trade has effects similar to inventing new production processes because it allows a country to specialize in higher-productivity industries; therefore, it also shifts the long-run aggregate-supply curve to the right. Conversely, if the government passes new regulations preventing firms from using some production methods, perhaps to address worker safety or environmental concerns, the result is a leftward shift in the long-run aggregate-supply curve.

Summing Up

Because the long-run aggregate-supply curve reflects the classical model of the economy we developed in previous chapters, it provides a new way to describe our earlier analysis. Any policy or event that raised real GDP in previous chapters can now be described as increasing the quantity of goods and services supplied and shifting the long-run aggregate-supply curve to the right. Any policy or event that lowered real GDP in previous chapters can now be described as decreasing the quantity of goods and services supplied and shifting the long-run aggregate-supply curve to the left.

20-4c Using Aggregate Demand and Aggregate Supply to Depict Long-Run Growth and Inflation

Having introduced the economy's aggregate-demand curve and the long-run aggregate-supply curve, we now have a new way to describe the economy's long-run trends. [Figure 5](#) illustrates the changes that occur in an economy from decade to decade. Notice that both curves are shifting. Although many forces influence the economy in the long run and can in theory cause such shifts, the two most important forces in practice are technology and monetary policy. Technological progress enhances an economy's ability to produce goods and services, and the resulting increases in output are reflected in continual shifts of the long-run aggregate-supply curve to the right. At the same time, because the Fed increases the money supply over time, the aggregate-demand curve also shifts to the right. As the figure illustrates, the result is continuing growth in output (as shown by increasing Y) and continuing inflation (as shown by increasing P). This is just another way of representing the classical analysis of growth and inflation we conducted in earlier chapters.

Figure 5 Long-Run Growth and Inflation in the Model of Aggregate Demand and Aggregate Supply

As the economy becomes better able to produce goods and services over time, primarily because of technological progress, the long-run aggregate-supply curve shifts to the right. At the same time, as the Fed increases the money supply, the aggregate-demand curve also shifts to the right. In this figure, output grows from Y_{2000} to Y_{2010} and then to Y_{2020} , and the price level rises from P_{2000} to P_{2010} and then to P_{2020} . Thus, the model of aggregate demand and aggregate supply offers a new way to describe the classical analysis of growth and inflation.

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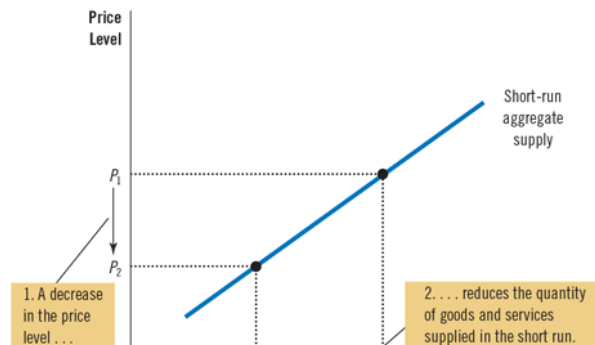
Long-run

20-4d Why the Aggregate-Supply Curve Slopes Upward in the Short Run

The key difference between the economy in the short run and in the long run is the behavior of aggregate supply. The long-run aggregate-supply curve is vertical because, in the long run, the overall level of prices does not affect the economy's ability to produce goods and services. By contrast, in the short run, the price level *does* affect the economy's output. That is, over a period of a year or two, an increase in the overall level of prices in the economy tends to raise the quantity of goods and services supplied, and a decrease in the level of prices tends to reduce the quantity of goods and services supplied. As a result, the short-run aggregate-supply curve slopes upward, as shown in Figure 6.

Figure 6 The Short-Run Aggregate-Supply Curve

In the short run, a fall in the price level from P_1 to P_2 reduces the quantity of output supplied from Y_1 to Y_2 . This positive relationship could be due to sticky wages, sticky prices, or misperceptions. Over time, wages, prices, and perceptions adjust, so this positive relationship is only temporary.



0

 $Y_2 \leftarrow Y_1$ Quantity of
Output

Why do changes in the price level affect output in the short run? Macroeconomists have proposed three theories for the upward slope of the short-run aggregate-supply curve. In each theory, a specific market imperfection causes the supply side of the economy to behave differently in the short run than it does in the long run. The following theories differ in their details, but they share a common theme: *The quantity of output supplied deviates from its long-run, or natural, level when the actual price level in the economy deviates from the price level that people expected to prevail.* When the price level rises above the level that people expected, output rises above its natural level, and when the price level falls below the expected level, output falls below its natural level.

The Sticky-Wage Theory

The first explanation of the upward slope of the short-run aggregate-supply curve is the sticky-wage theory. This theory is the simplest of the three approaches to aggregate supply, and some economists believe it highlights the most important reason why the economy in the short run differs from the economy in the long run. Therefore, it is the theory of short-run aggregate supply that we emphasize in this book.

According to this theory, the short-run aggregate-supply curve slopes upward because nominal wages are slow to adjust to changing economic conditions. In other words, wages are “sticky” in the short run. To some extent, the slow adjustment of nominal wages is attributable to long-term contracts between workers and firms that fix nominal wages, sometimes for as long as three years. In addition, this prolonged adjustment may be attributable to slowly changing social norms and notions of fairness that influence wage setting.

An example can help explain how sticky nominal wages can result in a short-run aggregate-supply curve that slopes upward. Imagine that a year ago a firm expected the price level today to be 100, and based on this expectation, it signed a contract with its workers agreeing to pay them, say, \$20 an hour. In fact, the price level turns out to be only 95. Because prices have fallen below expectations, the firm gets 5 percent less than expected for each unit of its product that it sells. The cost of labor used to make the output, however, is stuck at \$20 per

nominal wages, sometimes for as long as three years. In addition, this prolonged adjustment may be attributable to slowly changing social norms and notions of fairness that influence wage setting.

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The same logic works in reverse. Suppose the price level turns out to be 105 and the wage remains stuck at \$20. The firm sees that the amount it is paid for each unit sold is up by 5 percent, while its labor costs are not. In response, it hires more workers and increases the quantity of output supplied. Eventually, the workers will demand higher nominal wages to compensate for the higher price level. But for a while, the firm can take advantage of the profit opportunity by increasing employment and production above their long-run levels.

In short, according to the sticky-wage theory, the short-run aggregate-supply curve slopes upward because nominal wages are based on expected prices and do not respond immediately when the actual price level turns out to be different from what was expected. This stickiness of wages gives firms an incentive to produce less output when the price level turns out lower than expected and to produce more when the price level turns out higher than expected.

The Sticky-Price Theory

Some economists have advocated another approach to explaining the upward slope of the short-run aggregate-supply curve, called the sticky-price theory. As we just discussed, the sticky-wage theory emphasizes that nominal wages adjust slowly over time. The sticky-price theory emphasizes that the prices of some goods and

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To see how sticky prices explain the aggregate-supply curve's upward slope, suppose that each firm in the economy announces its prices in advance based on the economic conditions it expects to prevail over the coming year. Suppose further that after prices are announced, the economy experiences an unexpected contraction in the money supply, which (as we have learned) reduces the overall price level in the long run. What happens in the short run? Although some firms reduce their prices quickly in response to the unexpected change in economic conditions, many other firms want to avoid additional menu costs. As a result, they temporarily lag behind in cutting their prices. Because these lagging firms have prices that are too high, their sales decline. Declining sales, in turn, cause these firms to cut back on production and employment. In other words, because not all prices adjust immediately to changing conditions, an unexpected fall in the price level leaves some firms with higher-than-desired prices, and these higher-than-desired prices depress sales and induce firms to reduce the quantity of goods and services they produce.

Similar reasoning applies when the money supply and price level turn out to be above what firms expected when they originally set their prices. While some firms raise their prices quickly in response to the new economic environment, other firms lag behind, keeping their prices at the lower-than-desired levels. These low prices

lagging firms are operating with outdated prices, there is a positive association between the overall price level and the quantity of output. This positive association is represented by the upward slope of the short-run aggregate-supply curve.

The Misperceptions Theory

A third approach to explaining the upward slope of the short-run aggregate-supply curve is the misperceptions theory. According to this theory, changes in the overall price level can temporarily mislead suppliers about what is happening in the individual markets in which they sell their output. As a result of these short-run misperceptions, suppliers respond to changes in the level of prices, and this response leads to an upward-sloping aggregate-supply curve.

To see how this might work, suppose the overall price level falls below the level that suppliers expected. When suppliers see the prices of their products fall, they may mistakenly believe that their *relative* prices have fallen; that is, they may believe that their prices have fallen compared to other prices in the economy. For example, wheat farmers may notice a fall in the price of wheat before they notice a fall in the prices of the many items they buy as consumers. They may infer from this observation that the reward for producing wheat is temporarily low, and they may respond by reducing the quantity of wheat they supply. Similarly, workers may notice a fall in their nominal wages before they notice that the prices of the goods they buy are also falling. They may infer that the reward for working is temporarily low and respond by reducing the quantity of labor they supply. In both cases, a lower price level causes misperceptions about relative prices, and these misperceptions induce suppliers to respond to the lower price level by decreasing the quantity of goods and services supplied.

Similar misperceptions arise when the price level is above what was expected. Suppliers of goods and services may notice the price of their output rising and infer, mistakenly, that their relative prices are rising. They would conclude that it is a good time to produce. Until their misperceptions are corrected, they respond to the higher price level by increasing the quantity of goods and services supplied. This behavior results in a short-run aggregate-supply curve that slopes upward.

Summing Up

price level by increasing the quantity of goods and services supplied. This behavior results in a short-run aggregate-supply curve that slopes upward.

Summing Up

There are three alternative explanations for the upward slope of the short-run aggregate-supply curve:

1. sticky wages,
2. sticky prices, and
3. misperceptions about relative prices.

Economists debate which of these theories is correct, and it is possible that each contains an element of truth. For our purposes in this book, the similarities of the theories are more important than the differences. All three theories suggest that output deviates in the short run from its natural level when the actual price level deviates from the price level that people had expected to prevail. We can express this mathematically as follows:

$$\begin{array}{l} \text{Quantity} \\ \text{of output} \\ \text{supplied} \end{array} = \begin{array}{l} \text{Natural} \\ \text{level of} \\ \text{output} \end{array} + a \left(\begin{array}{l} \text{Actual} \\ \text{price} \\ \text{level} \end{array} - \begin{array}{l} \text{Expected} \\ \text{price} \\ \text{level} \end{array} \right),$$

where a is a number that determines how much output responds to unexpected changes in the price level.

Notice that each of the three theories of short-run aggregate supply emphasizes a problem that is likely to be temporary. Whether the upward slope of the aggregate-supply curve is attributable to sticky wages, sticky prices, or misperceptions, these conditions will not persist forever. Over time, nominal wages will become unstuck, prices will become unstuck, and misperceptions about relative prices will be corrected. In the long run, it is reasonable to assume that wages and prices are flexible rather than sticky and that people are not confused about relative prices. Thus, while we have several good theories to explain why the short-run aggregate-supply curve slopes upward, they are all consistent with a long-run aggregate-supply curve that is vertical.

20-4e Why the Short-Run Aggregate-Supply Curve Might Shift

The short-run aggregate-supply curve tells us the quantity of goods and services supplied in the short run for any given level of prices. This curve is similar to the long-run aggregate-supply curve, but it is upward-sloping rather than vertical because of sticky wages, sticky prices, and misperceptions. Thus, when thinking about what shifts the short-run aggregate-supply curve, we have to consider all those variables that shift the long-run aggregate-supply curve. In addition, we have to consider a new variable—the expected price level—that influences the wages that are stuck, the prices that are stuck, and the perceptions about relative prices that may be flawed.

Let's start with what we know about the long-run aggregate-supply curve. As we discussed earlier, shifts in the long-run aggregate-supply curve normally arise from changes in labor, capital, natural resources, or technological knowledge. These same variables shift the short-run aggregate-supply curve. For example, when an increase in the economy's capital stock increases productivity, the economy is able to produce more output, so both the long-run and short-run aggregate-supply curves shift to the right. When an increase in the minimum wage raises the natural rate of unemployment, the economy has fewer employed workers and thus produces less output, so both the long-run and short-run aggregate-supply curves shift to the left.

The important new variable that affects the position of the short-run aggregate-supply curve is the price level that people expected to prevail. As we have discussed, the quantity of goods and services supplied depends, in the short run, on sticky wages, sticky prices, and misperceptions. Yet wages, prices, and perceptions are set based on the expected price level. So when people change their expectations of the price level, the short-run aggregate-supply curve shifts.

To make this idea more concrete, let's consider a specific theory of aggregate supply—the sticky-wage theory. According to this theory, when workers and firms expect the price level to be high, they are likely to reach a

To make this idea more concrete, let’s consider a specific theory of aggregate supply—the sticky-wage theory. According to this theory, when workers and firms expect the price level to be high, they are likely to reach a bargain with a higher level of nominal wages. Higher wages raise firms’ costs, and for any given actual price level, higher costs reduce the quantity of goods and services supplied. Thus, when the expected price level rises, wages are higher, costs increase, and firms produce a smaller quantity of goods and services at any given actual price level. Thus, the short-run aggregate-supply curve shifts to the left. Conversely, when the expected price level falls, wages are lower, costs decline, firms increase output at any given price level, and the short-run aggregate-supply curve shifts to the right.

A similar logic applies in each theory of aggregate supply. The general lesson is the following: *An increase in the expected price level reduces the quantity of goods and services supplied and shifts the short-run aggregate-supply curve to the left. A decrease in the expected price level raises the quantity of goods and services supplied and shifts the short-run aggregate-supply curve to the right.* As we will see in the next section, the influence of expectations on the position of the short-run aggregate-supply curve plays a key role in explaining how the economy makes the transition from the short run to the long run. In the short run, expectations are fixed and the economy finds itself at the intersection of the aggregate-demand curve and the short-run aggregate-supply curve. In the long run, if people observe that the price level is different from what they expected, their expectations adjust and the short-run aggregate-supply curve shifts. This shift ensures that the economy eventually finds itself at the intersection of the aggregate-demand curve and the long-run aggregate-supply curve.

You should now have some understanding about why the short-run aggregate-supply curve slopes upward and what events and policies can cause this curve to shift. [Table 2](#) summarizes our discussion.

Table 2 The Short-Run Aggregate-Supply Curve: Summary

Why Does the Short-Run Aggregate-Supply Curve Slope Upward?

You should now have some understanding about why the short-run aggregate-supply curve slopes upward and what events and policies can cause this curve to shift. [Table 2](#) summarizes our discussion.

Table 2 The Short-Run Aggregate-Supply Curve: Summary

Why Does the Short-Run Aggregate-Supply Curve Slope Upward?

- 1. *The Sticky-Wage Theory:* An unexpectedly low price level raises the real wage, causing firms to hire fewer workers and produce a smaller quantity of goods and services.
- 2. *The Sticky-Price Theory:* An unexpectedly low price level leaves some firms with higher-than-desired prices, depressing their sales and leading them to cut back production.
- 3. *The Misperceptions Theory:* An unexpectedly low price level leads some suppliers to think their relative prices have fallen, inducing a fall in production.

Why Might the Short-Run Aggregate-Supply Curve Shift?

- 1. *Shifts Arising from Changes in Labor:* An increase in the quantity of labor available (perhaps due to a fall in the natural rate of unemployment) shifts the aggregate-supply curve to the right. A decrease in the quantity of labor available (perhaps due to a rise in the natural rate of unemployment) shifts the aggregate-supply curve to the left.
- 2. *Shifts Arising from Changes in Capital:* An increase in physical or human capital shifts the aggregate-supply curve to the right. A decrease in physical or human capital shifts the aggregate-supply curve to the left.
- 3. *Shifts Arising from Changes in Natural Resources:* An increase in the availability of natural resources shifts the aggregate-supply curve to the right. A decrease in the availability of natural resources shifts the aggregate-supply curve to the left.
- 4. *Shifts Arising from Changes in Technology:* An advance in technological knowledge shifts the aggregate-supply curve to the right. A decrease in the available technology (perhaps due to government regulation) shifts the aggregate-supply curve to the left.
- 5. *Shifts Arising from Changes in the Expected Price Level:* A decrease in the expected price level shifts the short-