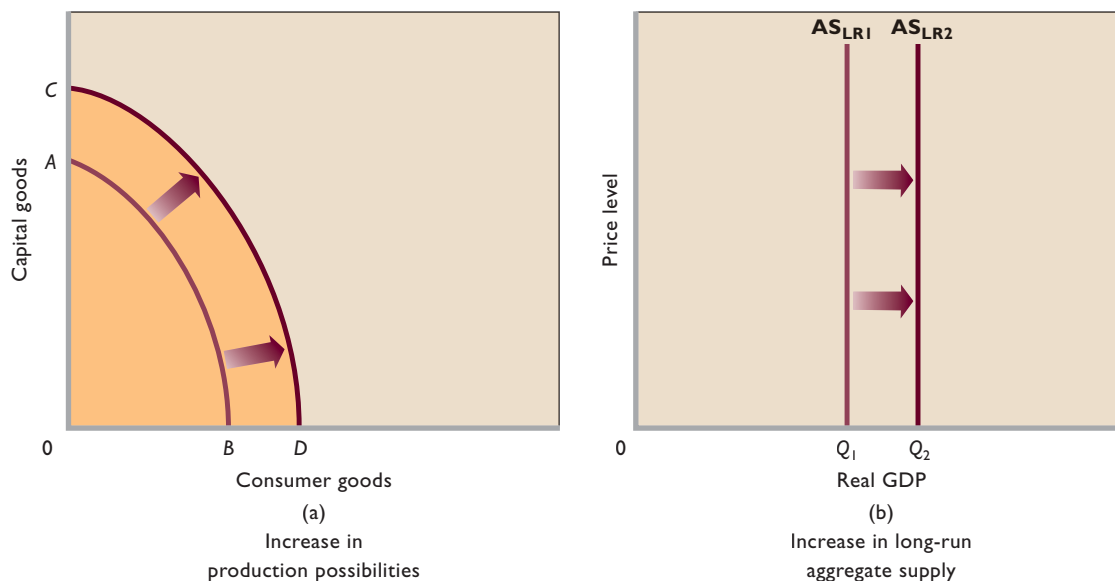


FIGURE 35.6 Production possibilities and long-run aggregate supply. (a) Economic growth driven by supply factors (such as improved technologies or the use of more or better resources) shifts an economy's production possibilities curve outward, as from AB to CD . (b) The same factors shift the economy's long-run aggregate supply curve to the right, as from AS_{LR1} to AS_{LR2} .



themselves, would tend to cause ongoing deflation. But, at the same time, central banks engineer ongoing increases in the money supply in order to cause slightly faster continuous rightward shifts of the aggregate demand curve. Taken alone, these rightward shifts in aggregate demand are inflationary. And because the central banks cause the inflationary rightward shifts of the aggregate demand curve to proceed just a little faster than the deflationary rightward shifts of the aggregate supply curve that are caused by economic growth, the net effect is (usually) a small positive rate of inflation. (We say “usually” because unexpected shocks to either aggregate demand or aggregate supply may cause inflation to be either a bit higher or a bit lower than the small positive rate that the central banks are attempting to engineer.)

Economic Growth and Aggregate Supply

As discussed in Chapter 25, economic growth is driven by supply factors such as improved technologies and access to more or better resources. Economic growth can be illustrated either as an outward shift of an economy's production possibilities curve or as a rightward shift of its long-run aggregate supply curve. As shown in Figure 35.6, the outward shift of the production possibilities curve from AB to CD in graph (a) is equivalent to the rightward shift of the economy's long-run aggregate supply curve from AS_{LR1} to AS_{LR2} in graph (b).

Economic Growth in the Extended AD-AS Model

In Figure 35.7 we use the extended aggregate

demand–aggregate supply model to depict economic growth in the United States.

Suppose the economy's aggregate demand curve, long-run aggregate supply curve, and short-run aggregate supply curve initially are AD_1 , AS_{LR1} , and AS_1 , as shown. The equilibrium price level and level of real output are P_1 and Q_1 .

Now let's assume that economic growth driven by changes in supply factors (quantity and quality of resources and technology) shifts the long-run aggregate supply curve rightward from AS_{LR1} to AS_{LR2} . The economy's potential output has increased, as reflected by the expansion of available real output from Q_1 to Q_2 .

With no change in aggregate demand, the increase in long-run aggregate supply from AS_{LR1} to AS_{LR2} in Figure 35.7 would expand real GDP and lower the price level. Put plainly, economic growth is deflationary, other things equal. But declines in the price level are not a part of the U.S. growth experience. The reason? The Federal Reserve has expanded the nation's money supply over the years such that increases in aggregate demand have more than matched the increases in aggregate supply. We show this increase in aggregate demand as the shift from AD_1 to AD_2 .

The increases of aggregate supply and aggregate demand in Figure 35.7 have increased real output from Q_1 to Q_2 and have boosted the price level from P_1 to P_2 . At the higher price level P_2 , the economy confronts a new short-run aggregate supply curve AS_2 . The changes shown in Figure 35.7 describe the actual U.S. experience: economic growth, accompanied by mild inflation.

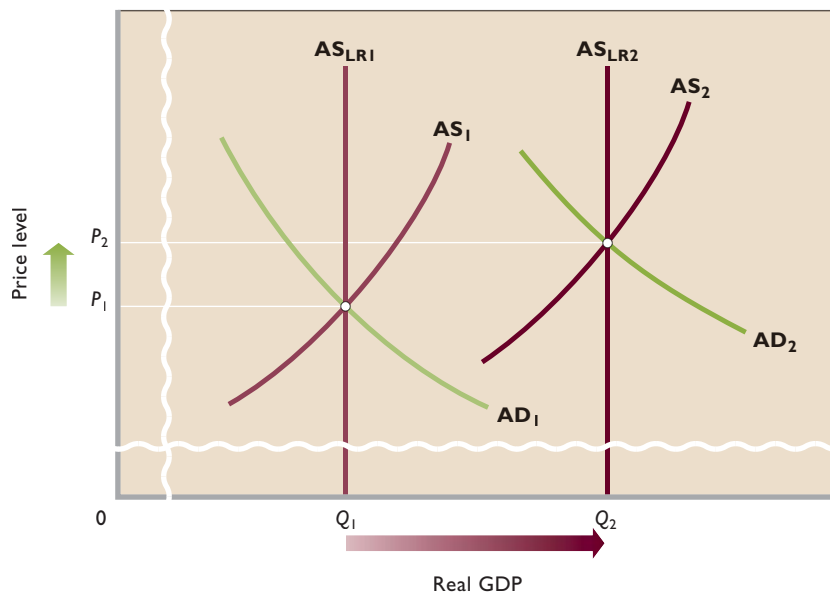


FIGURE 35.7 Depicting U.S. growth via the extended AD-AS model. Long-run aggregate supply and short-run aggregate supply have increased over time, as from AS_{LR1} to AS_{LR2} and AS_1 to AS_2 . Simultaneously, aggregate demand has shifted rightward, as from AD_1 to AD_2 . The actual outcome of these combined shifts has been economic growth, shown as the increase in real output from Q_1 to Q_2 , accompanied by mild inflation, shown as the rise in the price level from P_1 to P_2 .

In brief, economic growth causes increases in long-run aggregate supply. Whether deflation, zero inflation, mild inflation, or rapid inflation accompanies growth depends on the extent to which aggregate demand increases relative to aggregate supply. Any inflation that occurs is the result of the growth of aggregate demand. It is not the result of the growth of real GDP. (**Key Question 5**)

QUICK REVIEW 35.2

- In the short run, demand-pull inflation raises both the price level and real output; in the long run, nominal wages rise, the short-run aggregate supply curve shifts to the left, and only the price level increases.
- Cost-push inflation creates a policy dilemma for the government: If it engages in an expansionary policy to increase output, additional inflation will occur; if it does nothing, the recession will linger until input prices have fallen by enough to return the economy to producing at potential output.
- In the short run, a decline in aggregate demand reduces real output (creates a recession); in the long run, prices and nominal wages presumably fall, the short-run aggregate supply curve shifts to the right, and real output returns to its full-employment level.
- The economy has ongoing inflation because the Fed uses monetary policy to shift the AD curve to the right faster than economic growth shifts the AS curve to the right.

The Inflation-Unemployment Relationship

We have just seen that the Fed can determine how much inflation occurs in the economy by how much it causes aggregate demand to shift relative to aggregate supply. Given that low inflation and low unemployment rates are the Fed's major economic goals, its ability to control inflation brings up at least two interesting policy questions: Are low unemployment and low inflation compatible goals or conflicting goals? What explains situations in which high unemployment and high inflation coexist?

The extended AD-AS model supports three significant generalizations relating to these questions:

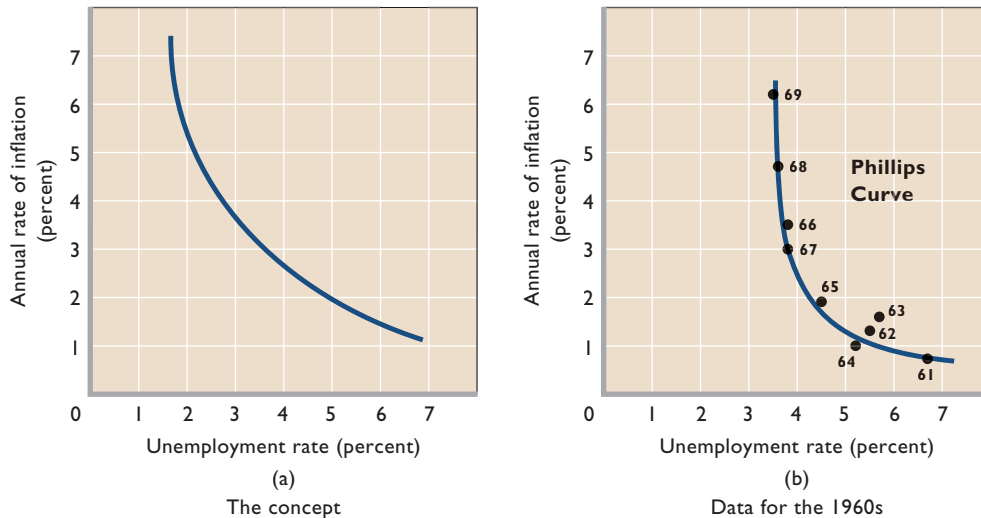
- Under normal circumstances, there is a short-run trade-off between the rate of inflation and the rate of unemployment.
- Aggregate supply shocks can cause both higher rates of inflation and higher rates of unemployment.
- There is no significant trade-off between inflation and unemployment over long periods of time.

Let's examine each of these generalizations.

The Phillips Curve

We can demonstrate the short-run trade-off between the rate of inflation and the rate of unemployment through the **Phillips Curve**, named after A. W. Phillips, who developed the idea in Great Britain. This curve, generalized

FIGURE 35.8 The Phillips Curve: concept and empirical data. (a) The Phillips Curve relates annual rates of inflation and annual rates of unemployment for a series of years. Because this is an inverse relationship, there presumably is a trade-off between unemployment and inflation. (b) Data points for the 1960s seemed to confirm the Phillips Curve concept. (Note: The unemployment rates are annual averages and the inflation rates are on a December-to-December basis.)



Source: Bureau of Labor Statistics, www.bls.gov.

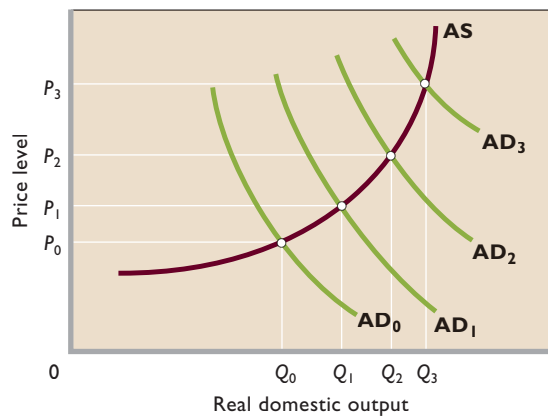
ORIGIN OF THE IDEA
35.1
 Phillips Curve

in Figure 35.8a, suggests an inverse relationship between the rate of inflation and the rate of unemployment. Lower unemployment rates (measured as leftward movements on the horizontal axis) are associated with higher rates of inflation (measured as upward movements on the vertical axis).

The underlying rationale of the Phillips Curve becomes apparent when we view the short-run aggregate supply curve in Figure 35.9 and perform a simple mental experiment. Suppose that in some short-run period aggregate demand expands from AD_0 to AD_2 , either because firms decided to buy more capital goods or the government decided to increase its expenditures. Whatever the cause, in the short run the price level rises from P_0 to P_2 and real output rises from Q_0 to Q_2 . As real output rises, the unemployment rate falls.

Now let's compare what would have happened if the increase in aggregate demand had been larger, say, from AD_0 to AD_3 . The new equilibrium tells us that the amount of inflation and the growth of real output would both have been greater (and that the unemployment rate would have been lower). Similarly, suppose aggregate demand during the year had increased only modestly, from AD_0 to AD_1 . Compared with our shift from AD_0 to AD_2 , the amount of inflation and the growth of real output would have been smaller (and the unemployment rate higher).

FIGURE 35.9 The short-run effect of changes in aggregate demand on real output and the price level. Comparing the effects of various possible increases in aggregate demand leads to the conclusion that the larger the increase in aggregate demand, the higher the rate of inflation and the greater the increase in real output. Because real output and the unemployment rate move in opposite directions, we can generalize that, given short-run aggregate supply, high rates of inflation should be accompanied by low rates of unemployment.



The generalization we draw from this mental experiment is this: *Assuming a constant short-run aggregate supply curve*, high rates of inflation are accompanied by low rates of unemployment, and low rates of inflation are accompanied by high rates of unemployment. Other things equal, the expected relationship should look something like Figure 35.8a.

Figure 35.8b reveals that the facts for the 1960s nicely fit the theory. On the basis of that evidence and evidence from other countries, most economists working at the end of the 1960s concluded there was a stable, predictable trade-off between unemployment and inflation. Moreover, U.S. economic policy was built on that supposed trade-off. According to this thinking, it was impossible to achieve “full employment without inflation”: Manipulation of aggregate demand through fiscal and monetary measures would simply move the economy along the Phillips Curve. An expansionary fiscal and monetary policy that boosted aggregate demand and lowered the unemployment rate would simultaneously increase inflation. A restrictive fiscal and monetary policy could be used to reduce the rate of inflation but only at the cost of a higher unemployment rate and more forgone production. Society had to choose between the incompatible goals of price stability and full employment; it had to decide where to locate on its Phillips Curve.

For reasons we will soon see, today’s economists reject the idea of a stable, predictable Phillips Curve. Nevertheless, they agree there is a short-run trade-off

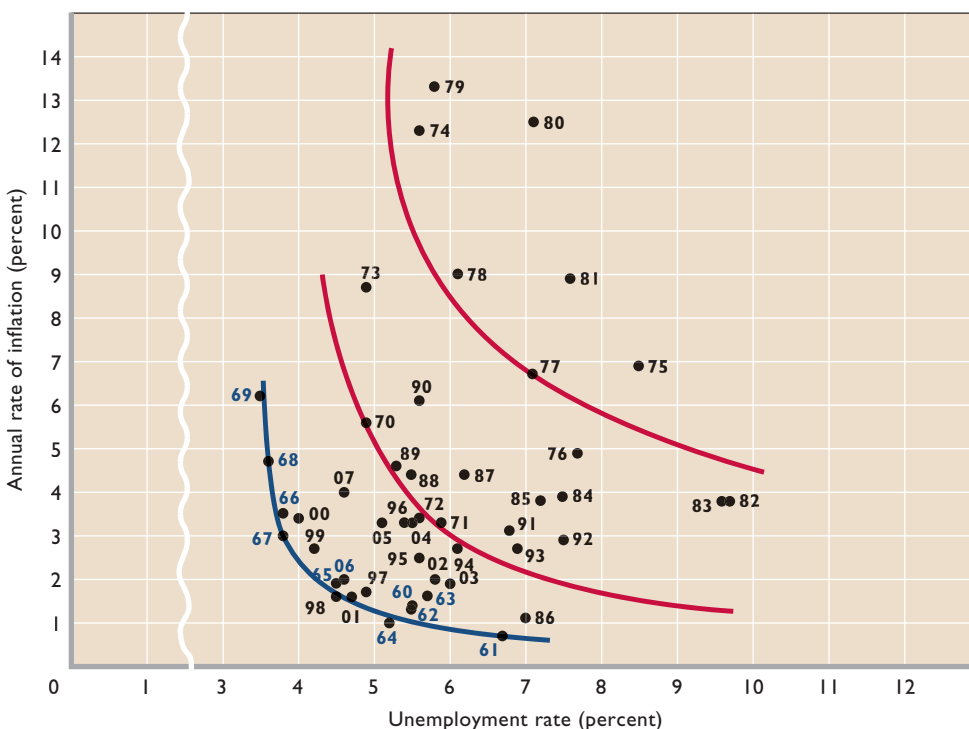
between unemployment and inflation. *Given short-run aggregate supply*, increases in aggregate demand increase real output and reduce the unemployment rate. As the unemployment rate falls and dips below the natural rate, the excessive spending produces demand-pull inflation. Conversely, when recession sets in and the unemployment rate increases, the weak aggregate demand that caused the recession also leads to lower inflation rates.

Periods of exceptionally low unemployment rates and inflation rates do occur, but only under special sets of economic circumstances. One such period was the late 1990s, when faster productivity growth increased aggregate supply and fully blunted the inflationary impact of rapidly rising aggregate demand (review Figure 29.11).

Aggregate Supply Shocks and the Phillips Curve

The unemployment-inflation experience of the 1970s and early 1980s demolished the idea of an always-stable Phillips Curve. In Figure 35.10 we show the Phillips

FIGURE 35.10 Inflation rates and unemployment rates, 1960–2007. A series of aggregate supply shocks in the 1970s resulted in higher rates of inflation and higher rates of unemployment. So data points for the 1970s and 1980s tended to be above and to the right of the Phillips Curve for the 1960s. In the 1990s the inflation-unemployment data points slowly moved back toward the original Phillips Curve. Points for the late 1990s and 2000s are similar to those from the earlier era. (Note: The unemployment rates are annual averages and the inflation rates are on a December-to-December basis.)



Source: Bureau of Labor Statistics, www.bls.gov.

Curve for the 1960s in blue and then add the data points for 1970 through 2007. Observe that in most of the years of the 1970s and early 1980s the economy experienced both higher inflation rates and higher unemployment rates than it did in the 1960s. In fact, inflation and unemployment rose simultaneously in some of those years. This condition is called **stagflation**—a media term that combines the words “stagnation” and “inflation.” If there still was any such thing as a Phillips Curve, it had clearly shifted outward, perhaps as shown.

Adverse Aggregate Supply Shocks The data points for the 1970s and early 1980s support our second generalization: Aggregate supply shocks can cause both higher rates of inflation and higher rates of unemployment. A series of adverse **aggregate supply shocks**—sudden, large increases in resource costs that jolt an economy’s short-run aggregate supply curve leftward—hit the economy in the 1970s and early 1980s. The most significant of these shocks was a quadrupling of oil prices by the Organization of Petroleum Exporting Countries (OPEC). Consequently, the cost of producing and distributing virtually every product and service rose rapidly. (Other factors working to increase U.S. costs during this period included major agricultural shortfalls, a greatly depreciated dollar, wage hikes previously held down by wage-price controls, and slower rates of productivity growth.)

These shocks shifted the aggregate supply curve to the left and distorted the usual inflation-unemployment relationship. Remember that we derived the inverse relationship between the rate of inflation and the unemployment rate shown in Figure 35.8a by shifting the aggregate demand curve along a stable short-run aggregate supply curve (Figure 35.9). But the cost-push inflation model shown in Figure 35.4 tells us that a *leftward shift* of the short-run aggregate supply curve increases the price level and reduces real output (and increases the unemployment rate). This, say most economists, is what happened in two periods in the 1970s. The U.S. unemployment rate shot up from 4.9 percent in 1973 to 8.5 percent in 1975, contributing to a significant decline in real GDP. In the same period, the U.S. price level rose by 21 percent. The stagflation scenario recurred in 1978, when OPEC increased oil prices by more than 100 percent. The U.S. price level rose by 26 percent over the 1978–1980 period, while unemployment increased from 6.1 to 7.1 percent.

Stagflation’s Demise Another look at Figure 35.10 reveals a generally inward movement of the inflation-unemployment points between 1982 and 1989. By 1989 the lingering effects of the earlier period had subsided. One

precursor to this favorable trend was the deep recession of 1981–1982, largely caused by a restrictive monetary policy aimed at reducing double-digit inflation. The recession upped the unemployment rate to 9.5 percent in 1982. With so many workers unemployed, those who were working accepted smaller increases in their nominal wages—or, in some cases, wage reductions—in order to preserve their jobs. Firms, in turn, restrained their price increases to try to retain their relative shares of a greatly diminished market.

Other factors were at work. Foreign competition throughout this period held down wage and price hikes in several basic industries such as automobiles and steel. Deregulation of the airline and trucking industries also resulted in wage reductions or so-called wage givebacks. A significant decline in OPEC’s monopoly power and a greatly reduced reliance on oil in the production process produced a stunning fall in the price of oil and its derivative products, such as gasoline.

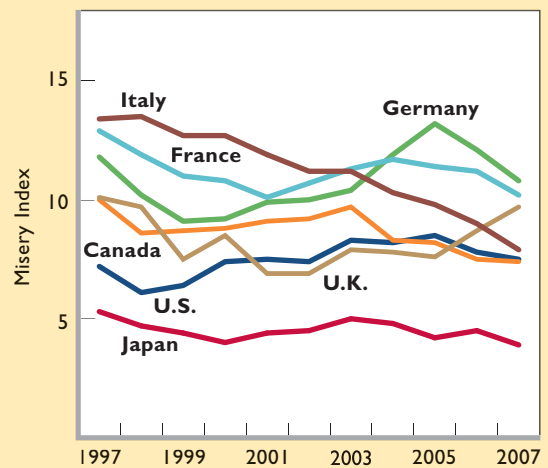
All these factors combined to reduce per-unit production costs and to shift the short-run aggregate supply curve rightward (as from AS_2 to AS_1 in Figure 35.4). Employment and output expanded, and the unemployment rate fell from 9.6 percent in 1983 to 5.3 percent in 1989. Figure 35.10



GLOBAL PERSPECTIVE 35.1

The Misery Index, Selected Nations, 1997–2007

The misery index adds together a nation’s unemployment rate and its inflation rate to get a measure of national economic discomfort. For example, a nation with a 5 percent rate of unemployment and a 5 percent inflation rate would have a misery index number of 10, as would a nation with an 8 percent unemployment rate and a 2 percent inflation rate.



Source: Bureau of Labor Statistics, stats.bls.gov.