CHAPTER 35: EXTENDING THE ANALYSIS OF AGGREGATE SUPPLY

Introduction
Our exploration of macroeconomics to this point has focused on measuring economic performance and the policies used to achieve short-run economic stabilization. We now turn to long-run economic growth and differing views on policies affecting aggregate supply. Chapter 35 focuses on aggregate supply, the relationship between inflation and unemployment in the short-run and long-run, and differences among economic theories on aggregate supply. These differences explain much of the debate between schools of economic thought, which will be explored in the next chapter. Material from Chapter 35 frequently appears in several multiple-choice questions, and the AP macroeconomics exam has included free-response questions about the Phillips curve and economic growth.

Short-Run Aggregate Supply
The short-run aggregate supply curve is upward-sloping, with point a, representing the price level (P1) at full-employment output (Q1). This output also represents the natural rate of unemployment. If the price level increases to P2, firms are enticed to increase output, because if production costs do not change, firms can increase their profits. In the short run, the firm increases output beyond full-employment output by hiring workers and offering overtime to current workers. So in the short run, real GDP, the price level, and employment all increase as the unemployment rate falls.

Conversely, if the price level falls to P3 but costs of production do not fall, revenues no longer cover the firm's costs. As the firm loses money, it reduces output and lays off workers. The real GDP falls, prices fall, and employment falls as the unemployment rate increases.

Long-Run Aggregate Supply

Short-run and long-run aggregate supply

The long-run aggregate supply curve is vertical at full-employment output. This long-run aggregate supply curve develops as a result of long-run adjustments to short-run changes in production. In the short run, an increase in price level to P2 resulted in a movement from a, to a2 on the aggregate supply curve, with firms increasing output because of increased profit. But this was based on the assumption that the costs of production (notably wages) would not increase. However, in the long run, the increased demand for productive inputs like labor pushes up the cost of those inputs. As a result of the higher costs of production, the aggregate supply curve shifts back to the left (AS2) until output returns to full-employment output on the long-run aggregate supply curve (at Point b1).
In the same way, a decrease in the price level leads firms to reduce output and employment because their lower revenues can not cover their costs. However, in the long run, if wages are downwardly flexible, the lower demand for resources leads to lower resource costs, as workers are willing to accept lower wages during a period of high unemployment. The lower cost of production causes the short-run aggregate supply curve to increase (AS₂) until output returns to full-employment output on the long-run aggregate supply curve at point c₁.

**Long-Run Equilibrium**

![Graph showing long-run equilibrium](image)

Equilibrium in the extended AD–AS model

Short-run equilibrium occurs at the output where short-run aggregate supply equals aggregate demand. In the short run, this equilibrium can occur at an output greater than full-employment output (a point to the right of point a), illustrating an inflationary gap. A short-run recessionary gap can also occur if equilibrium occurs at a lower output, to the left of point a. Long-run equilibrium occurs at full-employment output where short-run aggregate supply and aggregate demand meet long-run aggregate supply. The economy produces at full-employment output and the natural rate of unemployment is achieved.

**Bear in Mind**

You may be presented with a graph illustrating short-run equilibrium at a point not on the long-run aggregate supply curve, or you may be asked to draw a graph illustrating the economy producing at less than or greater than full-employment output. An economy producing at less than full-employment GDP must show the vertical long-run aggregate supply (LRAS) curve, with the downward-sloping aggregate demand (AD) curve and the upward-sloping short-run aggregate supply (SRAS) curve crossing to the left of full-employment output. It is important to draw your equilibrium lines illustrating the current output (real GDP) and price level at that point. An economy producing at greater-than-full-employment output would have the vertical LRAS, with SRAS and AD crossing to the right of full-employment output.

**Demand-Pull Inflation**

Demand-pull inflation results from increased purchases in the economy resulting from an increase in net exports, consumer confidence, investment or government spending, or a number of other factors. It causes an increase in aggregate demand from AD₁ to AD₂, which increases equilibrium from point a to point b and results in a positive GDP gap. In the short run, input prices like wages do not change, so output increases beyond full-employment output to Q₂, while the price level increases to P₂. But in the long run, the increased demand for resources like workers causes nominal wages to increase. This raises the firms' costs of production and results in a leftward shift in the short-run aggregate supply curve, until equilibrium comes to rest at full-employment output.
output at a higher price level \((P_3)\). In the short run, an increase in aggregate demand causes both output and price level to increase; in the long run, only the price level will increase along the vertical long-run aggregate supply curve.

![Graph showing AD-AS model with demand-pull inflation and cost-push inflation.](image)

**Demand-pull inflation in the extended AD–AS model**

**Cost-Push Inflation**

Cost-push inflation results from an increase in the costs of production, such as resource shortages and supply shocks. Short-run aggregate supply decreases from \(AS_1\) to \(AS_2\), increasing equilibrium from Point a to Point b, resulting in a negative GDP gap. As a result, the price level rises from \(P_1\) to \(P_2\) and output falls to \(Q_2\). But unlike demand-pull inflation, a leftward shift in aggregate supply will not soon return the economy to full-employment output, because this situation began with a decrease in aggregate supply. If policymakers decide to use fiscal or monetary policy to increase aggregate demand and restore the economy to full-employment output, it can do so but at the expense of a higher price level of \(P_3\) at point c. Policymakers could instead decide to adopt a hands-off approach, allowing the economy to linger in recession until deep unemployment and significant business failures create serious downward pressure on wages. As the costs of production fall, aggregate supply again increases until the economy returns to point a at full employment with the lower price level. Significant disagreement exists among economists as to whether adopting a hands-off approach is effective or even reasonable during a recession. It requires the assumption that wages and other costs are downwardly flexible and a willingness to allow the economy to experience sustained high unemployment over many months.
or even years, just waiting for the costs of production—primarily wages—to fall. These questions will be explored further in Chapter 36.

**Bear in Mind**
In AP macroeconomics exam questions that may deal with this kind of controversy, the questions will clearly ask you to assume that wages and prices are flexible or to assume that wages and prices are downwardly rigid or that the short-run aggregate supply curve is horizontal or upward-sloping. Watch carefully for the assumptions that are made at the beginning of such questions, as they provide valuable clues and information that are essential to your analysis of the situation.

**Ongoing Inflation**
While the demand-pull and cost-push models show the effects of a temporary increase in price levels, they do not fully explain the ongoing inflation that occurs in economies. In each case, we assumed that the aggregate demand or supply had shifted by a fixed amount and then there was a response. In reality, the curves remain in motion. Economic growth continues to increase aggregate supply, putting a slight downward pressure on the price level. At the same time, the Federal Reserve continues to increase the money supply to allow for purchases of these products, increasing aggregate demand and putting a slight upward pressure on the price level. Because the increase in aggregate demand is slightly stronger than the increase in aggregate supply, a small but persistent inflation rate results.

**Long-Run Economic Growth**

*Production possibilities and long-run aggregate supply*

Long-run economic growth results from improvements in technology; an increase in the number of land, labor, and capital resources; or more efficient use of resources. An increase in the production possibilities curve allows us to produce more of all products in the economy. In the same way, a rightward shift of the long-run aggregate supply curve demonstrates the economy is capable of producing more products at any price level.
Depicting U.S. growth via the extended AD–AS model

Low interest rates, which allow for increased investment in plant and equipment, are important in promoting long-run economic growth. While such purchases of plant and equipment initially increase short-run aggregate demand, bringing such improvements into operation increases the long-run aggregate supply, shifting it to the right. As firms actually increase output at the lower cost of production, short-run aggregate supply increases. Aggregate demand increases as the Fed injects more money into the money supply. And in the long run, short-run aggregate supply and aggregate demand reach equilibrium at the new, increased long-run aggregate supply, with an increased real GDP and a higher price level than was achieved at the previous equilibrium.

Bear in Mind
It is essential to remember the importance of low interest rates in fueling long-run economic growth. While some economic stabilization policies will help to promote both short-run and long-run economic growth, others will not. Expansionary monetary policy (reducing the reserve requirement and discount rate, along with the Fed purchasing securities on the open market) increases the money supply, reducing interest rates. That policy increases aggregate demand in the short run, while simultaneously increasing aggregate supply in the long run by promoting investment at the lower interest rate. But expansionary fiscal policy (reducing taxes and increasing government spending) may not. While these actions increase aggregate demand in the short run, if the government must borrow money to finance the deficit spending, it can hurt long-run growth. The increased demand in the loanable funds market pushes up interest rates, crowding private investment out of the market. This reduced investment slows long-run economic growth. Targeted tax cuts or subsidies for the purchase of equipment, expansion, or more rapid depreciation of capital may actually promote economic growth by promoting investment. But when questions ask about broader economic policies designed to address a recession or inflation, look for the effect on interest rates to determine the effects on long-run economic growth. Previous multiple-choice and free-response questions have explored this concept, so it is important to clearly understand the implications of such policies in both the short and the long run.

The Phillips Curve
The Phillips curve, named for British economist A.W. Phillips, illustrates the short-run inverse relationship between the inflation rate and the unemployment rate. When the inflation rate is high, the unemployment rate is low; at low rates of unemployment, the inflation rate is high. This short-run relationship results from changes in aggregate demand, assuming aggregate supply is
stable. When aggregate demand increases, output increases, so more workers are hired, lowering the unemployment rate. At the same time, the increased demand raises the price level. Thus, when aggregate demand increases, the unemployment rate decreases and the inflation rate increases. In the same way, if aggregate demand falls, output and employment fall, increasing the unemployment rate. At the same time, the rate of inflation falls because of the reduction of upward pressure on prices.

![Graph showing Phillips curve]

The Phillips curve: concept and empirical data

This stable relationship was the basis for our understanding of the effects of fiscal and monetary policy through the 1960s. When the economy fell into recession, policymakers used expansionary fiscal and monetary policy to reduce the unemployment rate, understanding that the inflation rate would increase as a result of the increase in aggregate demand. During periods of inflation, policymakers used contractionary policies to reduce the inflation rate, with the understanding that the tradeoff would be a higher unemployment rate.

Aggregate Supply Shocks and Stagflation

Events of the 1970s caused a serious revision of the theory after a series of supply shocks struck the U.S. economy. The primary blow was a quadrupling of the price of oil by OPEC, significantly increasing the cost of production for U.S. manufacturers. Major crop shortfalls, a weak dollar, slow productivity growth, and significant wage increases following release of wage and price controls combined to significantly reduce the aggregate supply. As a result, both the inflation rate and the unemployment rate skyrocketed, violating the assumed tradeoff relationship. This new situation, dubbed “stagflation,” demonstrated a “hat trick” of bad economic news—a stagnant economy, high inflation, and high unemployment, all at the same time.

In fact, economists discovered that the Phillips curve could move in response to changes in aggregate supply. When aggregate supply was stable, changes in aggregate demand resulted in movement among various points along a stationary Phillips curve, as demonstrated on the following chart by the 1960s data on the lowest Phillips curve. But as aggregate supply fell in the 1970s and 1980s, both the inflation and unemployment rates increased, showing that decreases in aggregate supply cause an outward shift in the Phillips curve. Increases in aggregate supply cause the Phillips curve to shift back inward, as you can see from the data points for the 1990s and since 2000.
Inflation rates and unemployment rates, 1960–2007

Stagflation created a unique dilemma for policymakers. Understanding the tradeoff between inflation and unemployment, with both at very high levels, any attempt to reduce one would cause the other to become worse. The Federal Reserve acted to significantly reduce the money supply, which successfully reduced inflation but plunged the economy into a severe recession with double-digit unemployment rates in many areas of the country. Eventually, wage reductions in some industries and a lower rate of wage growth in other industries, decreased reliance on oil and a reduction in OPEC’s market power, improvements in crop yields and worker productivity, and other factors combined to shift aggregate supply back to the right, lowering both the unemployment and inflation rates.

The Long-Run Phillips Curve

The long-run vertical Phillips curve

The long-run Phillips curve is a vertical curve set at the natural rate of unemployment where there is no cyclical unemployment. This point is often called the natural rate of unemployment or the non-accelerating inflation rate of unemployment (NAIRU). In the long run, there is no tradeoff between inflation and unemployment.

It is, of course, possible for inflation and unemployment rates to change from year to year. In this example, if the natural rate of unemployment is 5 percent, the economy is stable at a 3 percent inflation rate. At the expected 3 percent inflation rate, workers negotiate 3 percent increases in
their nominal wages to keep their real wages even with inflation, and banks add the 3 percent expected inflation into nominal interest rates on loans in order to receive dollars in repayment equal to the value of those loaned. But if aggregate demand rose and the inflation rate rose to 6 percent, firms could raise prices without seeing an increase in their resource costs. The higher resulting profit would lead firms to increase output and hire workers, reducing the unemployment rate from point $a_1$ to point $b_1$. Higher-than-expected inflation temporarily increases output and reduces unemployment.

However, this point will not remain stable in the long run. Given time, employees will realize their real wages are falling as inflation climbs, and they will renegotiate their contracts to include 6 percent wage increases to retain their purchasing power. As resource costs increase, firms' profits fall and they reduce production, laying off workers until unemployment returns to its natural rate—but inflation remains higher (PC$_2$ on the new Phillips curve) than it was initially.

The same thing happens in reverse during periods of recession. If the actual inflation rate is lower than the expected inflation rate, profits decrease, firms cut back production and lay off workers, and unemployment temporarily increases. As a result of the layoffs and lower inflationary expectations, workers accept lower wages (or at least lower increases in the wage rates), firms increase production at the lower cost, more workers are hired, and the unemployment rate returns to the natural rate of unemployment.

It is important to note that the natural rate of unemployment can actually shift—and has, in fact, shifted over time in response to changes in the labor force, technology, and economic policy. For example, child labor laws removing children under the age of sixteen from the labor force would have decreased the natural rate of unemployment. The influx of women into the labor force in the 1970s would have increased the natural rate of unemployment as significantly more workers sought jobs throughout the economy. The institution of unemployment benefits would have increased the natural rate of unemployment because workers could afford to take more time in their job search efforts. Improvements in technology and increased job search information in the computer age have likely contributed to another decrease in the NAIRU because unemployed workers can find information about positions more quickly and easily.

**Supply-Side Economic Theory**

Supply-side economists argue that fiscal and monetary (demand-side) policies only cause inflation and harm incentives to work, save, and invest. Supply-siders promote lower tax rates, arguing that if workers are allowed to keep more of their disposable income, they will increase the number of hours worked—working overtime, postponing retirement, and drawing even more workers into the labor force. Further, supply-siders argue that lowering the tax rate on interest from savings encourages households to increase saving, which increases the funds available for investment. Supply-siders call for lower tax rates for capital income, which would lead to greater investment in capital and equipment, which would in turn increase worker productivity, expanding long-run aggregate supply and spurring economic growth.

**The Laffer Curve**

The Laffer curve, popularized by American economist Arthur Laffer, illustrates the relationship between the tax rate and tax revenue received by the government. At a 0 percent tax rate, the government receives no revenue. As the tax rate increases, government revenue increases. However, at some theoretical level, the tax rate becomes so high that it serves as a work disincentive. If the government takes 90 percent of a worker's paycheck in taxes, that worker loses the incentive to go to work. This backward bend continues until at a 100 percent tax rate—where the government takes every penny of the worker's paycheck—the government receives
nothing, because no one is willing to work. Throughout the early 1980s, Laffer argued that the United States was on the upper section of the Laffer curve (such as point n) and significant cuts in the marginal income tax rate would result in the double benefit of giving workers a greater incentive to work and significantly increasing the federal government’s tax revenues.

The Laffer curve

Application of Supply-Side Theory
When President Reagan was elected in 1980, supply-side economics (sometimes called “Reaganomics” or “the trickle-down theory” because benefits begin with the wealthy and may eventually trickle down to workers) was put to the test with two major cuts in income tax rates, primarily directed at those with the highest incomes. The tax cuts did result in higher government revenue, but there is general agreement among economists that it did not result from a movement from point n to point m on the Laffer curve: in fact, the consensus among economists is that the U.S. economy is operating in the region below point m, closer to point l on the curve. The tax cuts did not spur an increased work incentive—for many workers it produced no incentive whatsoever, and for some, the extra take-home pay allowed them to work even fewer hours. So what increased the federal revenue when taxes were cut: an increase in aggregate demand, not aggregate supply. As consumers emerged from the deep recession of 1981–1982, they spent the tax cuts on goods and services, increasing real GDP and employment, and tax revenues increased as more workers went back to work and paid income taxes. Empirical evidence from the period shows that saving actually fell as a percentage of personal income, so productivity did not significantly grow and long-run aggregate supply showed little movement. But because government spending grew significantly during the period, the national debt exploded, leading to significantly increased public borrowing.

When President Clinton was elected in 1992, he reversed course, increasing the marginal income tax rates for those with the highest incomes in order to reduce deficits. His work with Congress in holding the line on spending while increasing revenues, paired with significant improvements in technology and productivity in the private sector, led to budget surpluses by the end of his administration.

When President George W. Bush came into office in 2001, he brought supply-side policy back into his administration. He worked with Congress to again significantly cut marginal tax rates, targeting those with the highest incomes. With the help of the Federal Reserve, which significantly reduced interest rates, the economy again expanded, but did it expand as a result of a shift in aggregate supply or in aggregate demand? It seems clear that aggregate demand increased, though a significant increase in oil prices caused a complication by pushing aggregate
supply to the left. In addition, massive increases in spending led to unprecedented deficits during the Bush administration, a repeat of the Reagan era.

While mainstream economists today recognize a relationship between tax rates and government revenue, because it is believed that the economy is actually operating on the bottom side of the graph, it is not believed that reducing taxes directly increases government revenue as a result of work incentives. However, the battle of the economists over appropriate economic policy has only begun and will be discussed in detail in Chapter 36.

**Multiple-Choice Questions**

1. Which of these situations would cause a decrease in short-run aggregate supply?
   (A) a decrease in corporate income taxes
   (B) an increase in the number of available workers in the labor supply
   (C) an increase in the cost of production
   (D) a decrease in the money supply
   (E) an increase in government spending

2. A favorable supply shock, such as a significant increase in crop output, will cause which of the following effects on real output and the price level?
   \[
   \begin{array}{cc}
   \text{Real Output} & \text{Price Level} \\
   \text{Increase} & \text{Increase} \\
   \text{Increase} & \text{Decrease} \\
   \text{Decrease} & \text{Increase} \\
   \text{Decrease} & \text{Decrease} \\
   \text{No change} & \text{Decrease} \\
   \end{array}
   \]
   (A) Increase Increase
   (B) Increase Decrease
   (C) Decrease Increase
   (D) Decrease Decrease
   (E) No change Decrease

3. Long-run economic growth is represented by
   (A) a rightward shift in the aggregate demand curve.
   (B) a rightward shift in the upward-sloping aggregate supply curve.
   (C) a leftward shift in the upward-sloping aggregate supply curve.
   (D) an upward shift in the aggregate demand curve.
   (E) a rightward shift in the vertical aggregate supply curve.

4. Demand-pull inflation is most likely to occur as a result of
   (A) an increase in interest rates.
   (B) an increase in consumer incomes.
   (C) a reduction in the money supply.
   (D) an increase in the unemployment rate.
   (E) an increase in the tax rate.

5. Which of the following factors could result in cost-push inflation?
   I. An increase in energy costs
   II. An increase in worker wages
   III. A decrease in interest rates
   (A) I only
   (B) III only
   (C) I and II only
   (D) II and III only
   (E) I, II, and III
6. Long-run economic growth is illustrated by
   I. an outward shift of the vertical aggregate supply curve.
   II. an outward shift of the upward-sloping aggregate supply curve.
   III. an outward shift of the production possibilities curve.
   (A) I only
   (B) II only
   (C) I and III only
   (D) II and III only
   (E) I, II, and III

7. Each of the following factors promotes long-run economic growth EXCEPT
   (A) an increase in the quantity of capital stock.
   (B) an increase in worker productivity.
   (C) an increase in the labor supply.
   (D) improvements in technology.
   (E) an increase in the interest rate.

8. Which of the following would be the most effective policy combination for resolving a recession in the short run, while still promoting long-run economic growth?

<table>
<thead>
<tr>
<th>Monetary Policy</th>
<th>Fiscal Policy</th>
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<tbody>
<tr>
<td>(A) Increase the money supply</td>
<td>Do nothing</td>
</tr>
<tr>
<td>(B) Reduce the money supply</td>
<td>Reduce government spending</td>
</tr>
<tr>
<td>(C) Do nothing</td>
<td>Increase government spending</td>
</tr>
<tr>
<td>(D) Reduce the money supply</td>
<td>Increase taxes</td>
</tr>
<tr>
<td>(E) Increase the money supply</td>
<td>Reduce taxes</td>
</tr>
</tbody>
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9. The short-run Phillips curve illustrates the relationship between
   (A) aggregate supply and aggregate demand.
   (B) tax rates and government revenue.
   (C) the money supply and interest rates.
   (D) inflation and unemployment.
   (E) interest rates and capital investment.

10. The long-run Phillips curve illustrates that the natural rate of unemployment
    (A) is relatively stable.
    (B) is quite unstable.
    (C) changes frequently with the level of aggregate demand.
    (D) changes frequently with the level of aggregate supply.
    (E) is inversely related to the interest rate.

11. Stagflation results from
    (A) an increase in aggregate demand.
    (B) a decrease in aggregate demand.
    (C) an increase in aggregate supply.
    (D) a decrease in aggregate supply.
    (E) simultaneous decreases in aggregate demand and aggregate supply.
12. According to the Laffer curve, economic growth is best promoted through the increased incentives to work, save, and invest provided by
(A) lower taxes.
(B) lower interest rates.
(C) lower government spending.
(D) lower imports.
(E) lower inflation rates.

Free-Response Questions
1. Assume a nation’s economy is operating at less than full employment output.
   (a) Draw a correctly labeled aggregate demand-aggregate supply graph showing each of the following.
      (i) long-run aggregate supply
      (ii) current output and price level
   (b) Identify an appropriate monetary policy to address the recessionary gap.
   (c) Explain the effect of the monetary policy you identified in (b) on each of the following.
      (i) the interest rate
      (ii) aggregate demand
      (iii) long-run aggregate supply

2. Assume a nation’s economy is operating at full employment output in year 1.
   (a) Draw a correctly labeled short-run Phillips curve and label a point on the curve “Year 1.”
   (b) Now assume the nation has entered into a recession in year 2. On the same graph you used for year 1, indicate the correct position for a point illustrating the impact of a recession and label that point “Year 2.”
   (c) Now assume that in year 3 the cost of energy has significantly increased for the nation. Illustrate the change on your graph and label your new point “Year 3.”
   (d) In year 3, if Congress begins with a balanced budget and addresses the impact of the increased energy costs on the country by lowering taxes, explain the impact of that fiscal policy on the following.
      (i) the unemployment rate
      (ii) the inflation rate
      (iii) the interest rate
      (iv) long-run economic growth

Multiple Choice Explanations
1. (C) An increase in the cost of production reduces supply for firms, decreasing output and increasing the price level.
2. (B) A favorable supply shock shifts the aggregate supply curve to the right, lowering the price level and increasing real GDP.
3. (E) The long-run aggregate supply curve represents full-employment output, and an increase, which shifts the curve to the right, illustrates economic growth.
4. (B) With additional income, consumers increase aggregate demand for products, pushing the price level higher. Higher interest rates, a reduction in the money supply, and an increase in the tax rate would instead work to decrease aggregate demand. An increase in the unemployment rate would result from lower aggregate demand or lower aggregate supply.
5. (C) An increase in the cost of production shifts aggregate supply to the left and causes cost-push inflation. A decrease in interest rates would lead to increased
investment, increasing aggregate demand in the short run and aggregate supply in the long run.

6. (C) The vertical aggregate supply curve is the long-run aggregate supply curve, and a rightward shift indicates long-run economic growth. The production possibilities curve also shifts outward to illustrate that even more of all products can be produced. The upward-sloping aggregate supply curve is the short-run curve which shows short-run changes in aggregate supply but not long-run growth.

7. (E) When interest rates go up, firms invest less in plant and equipment, which reduces long-run economic growth.

8. (A) Increasing the money supply reduces the interest rate, which promotes investment in plant and equipment. Aggregate demand increases in the short run as firms buy the equipment, resolving the recession; aggregate supply increases in the long run as firms put the plant and equipment into operation and increase production at a lower cost. While (E) would also address the recession through lower taxes, the government borrowing required to finance the deficit would push interest rates up, reducing long-run economic growth.

9. (D) The inverse relationship between the inflation rate and the unemployment rate shows that in the short run, if aggregate supply remains stable, then when the inflation rate increases, the unemployment rate decreases.

10. (A) The long-run Phillips curve is vertical at the natural rate of unemployment. While the unemployment rate may increase or decrease in the short run due to changes in aggregate supply and aggregate demand or changes in fiscal and monetary policy, in the long run, it returns to the natural rate of unemployment.

11. (D) A leftward shift in aggregate supply increases the price level while also increasing the unemployment rate.

12. (A) According to supply-siders, a lower tax rate gives workers an incentive to work more and increase both spending and savings, leading to increased investment and long-run economic growth.

Free Response Explanations

1. 10 points (3 + 1 + 6)

(a) 3 points:
- 1 point is earned for a correctly labeled aggregate demand–aggregate supply graph.
- 1 point is earned for including a vertical long-run aggregate supply curve.
- 1 point is earned for showing current equilibrium (output and price level) to the left of the long-run aggregate supply curve.

(b) 1 point:
- 1 point is earned for identifying an appropriate monetary policy: the Fed decreasing the reserve requirement or discount rate or purchasing bonds on the open market.

(c) 6 points:
- 1 point is earned for stating that the interest rate decreases.
- 1 point is earned for explaining that the monetary policy increases the money supply, causing the interest rate to fall.
- 1 point is earned for stating that the aggregate demand increases.
- 1 point is earned for explaining that as interest rates fall, investment and interest-sensitive consumer borrowing and spending increase, raising aggregate demand.
- 1 point is earned for stating that the long-run aggregate supply increases.
- 1 point is earned for explaining that the investment in plant and equipment fosters long-run economic growth.
2. **10 points** \((1 + 1 + 2 + 6)\)

(a) 1 point:
- 1 point is earned for a correctly labeled short-run Phillips curve with a point “Year 1” labeled on the curve.

(b) 1 point:
- 1 point is earned for correctly labeling point “Year 2” on the same short-run Phillips curve, indicating a higher unemployment rate and lower inflation rate than for “Year 1.”

(c) 2 points:
- 1 point is earned for drawing a new short-run Phillips curve, shifted out from the origin of the original Phillips curve.
- 1 point is earned for correctly labeling point “Year 3” on the new Phillips curve.

(d) 6 points:
- 1 point is earned for stating that the unemployment rate will decrease.
- 1 point is earned for stating that the inflation rate will increase.
- 1 point is earned for stating that the interest rate will increase.
- 1 point is earned for explaining that the interest rate increases because the government must borrow more money to finance the deficit spending.
- 1 point is earned for stating that long-run economic growth will decrease.
- 1 point is earned for explaining that because the interest rate increased, investment in plant and equipment decreased, reducing the long-run growth rate.