- Economic growth is measured by changes in real gross domestic product or by changes in real GDP per capita.
- Long-run economic growth can be illustrated using a production possibilities curve or a long-run aggregate supply curve. It is shown graphically as a rightward shift of a nation's long-run aggregate supply curve or a rightward shift of its production possibilities curve.
- Long-run economic growth is concerned with increasing an economy's total productive capacity at full employment, also known as its natural rate of output. This output is represented by a vertical long-run aggregate supply curve.
- The rate of economic growth depends largely on increasing productivity. Productivity is affected by a variety of factors including investment in physical capital, increases in human capital, and technological progress.
- Governments can promote economic growth by promoting productivity growth, including:
  - Investing in physical capital (e.g., providing *infrastructure*— roads, bridges, power lines, information networks)
  - Providing for the development of human capital (e.g., education and training)
  - Facilitating technological progress (e.g., research and development)
  - Providing political stability, enforcing property rights, and providing the optimal amount of government intervention.

# *Economic Growth*

## Long-Run Aggregate Supply and the Production Possibilities Curve

The long-run aggregate supply (LRAS) curve is vertical at the full-employment level of output. This means that LRAS doesn't change as the price level changes. The location of the LRAS depends on the productive capacity of the economy. Developing more/better resources or improving technology will shift the LRAS curve outward.

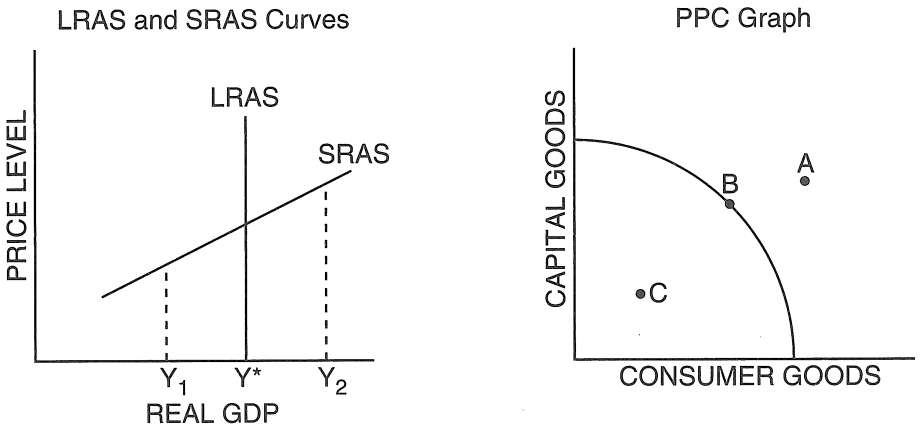
The LRAS curve represents a point on an economy's production possibilities curve (PPC). Remember that the PPC represents the maximum output that can be produced given scarce resources. The economy grows if the PPC shifts outward because of more/better resources or technological advances. For the same reason, the LRAS curve shifts outward with more/better resources or if there are technological advances.

Aggregate output in the economy can actually be greater than LRAS in the short run. This means that resources are being used more intensively. For example, workers can work double hours in the short run. However, they can't continue to work that number of hours in the long run. Eventually, the equilibrium level of output will always return to the full-employment level. Aggregate output can only increase in the long run if the LRAS has increased.

*Student Alert:* **Make sure you don't confuse real gross domestic product (GDP) changes in the short run due to business cycles with long-run economic growth!**

Use the graphs in Figure 6-1.1 to answer the questions that follow.

Figure 6-1.1
**Aggregate Supply and Production Possibilities Curves**



1. What does a PPC show? What are the assumptions about resources and technology in the PPC model?

2. List two things that could happen to allow the economy to produce at Point A.

3. In Figure 6-1.1, $Y^*$, $Y_1$, and $Y_2$ in the aggregate supply graph correspond to which points on the PPC graph? Explain.

   $Y^* \rightarrow$ Point _____

   $Y_1 \rightarrow$ Point _____

   $Y_2 \rightarrow$ Point _____

4. List two things that could happen to allow the economy to produce $Y_2$ output.

5. How can the economy produce at $Y_2$ in the short run? If it is producing at $Y_2$ in the short run, what will happen in the long run? Explain.

# *Productivity*

## Economic Growth and the Determinants of Productivity

An economy's productive capacity is determined by the quantity/quality of its productive resources and technology. In the short run an economy's total productive capacity is fixed, but in the long run an economy can increase its capacity to produce goods and services by increasing the quantity and/or the quality of its productive resources or through technological progress.

An economy's productive capacity is determined by the quantity and quality of its resources, including:

- **Human resources:** labor resources and *human capital.* Human capital refers to the education and skills possessed by labor resources. Education is an investment in human capital because it increases workers' ability to produce.
- **Natural resources:** the gifts of nature that are useful in producing goods and services.
- **Capital goods:** goods (e.g., equipment and machinery) used to make other goods and services.
- **Technology:** technology refers to the way that resources are combined to produce goods and services. Technological progress means that there is a new and better way to produce. Technological progress occurs when production becomes more efficient—that is, when more output can be produced using the same inputs.

Economic growth is often measured by changes in real gross domestic product (GDP) or real GDP per capita. For example, the rate of economic growth can be measured by the average annual percentage change in real GDP per capita. Real GDP per capita is often used to measure living standards across time and between countries. Economic growth occurs because an economy experiences technical progress, increased investments in physical capital, and increased investments in human capital. In the most fundamental sense, economic growth is concerned with increasing an economy's total productive capacity at full employment.

## Measuring Economic Growth in Hamilton County and Jefferson County

1. Use Table 6-2.1 to fill out Tables 6-2.2, 6-2.3, and 6-2.4. Recall that a percentage change is equal to the change divided by the starting value.

Table 6-2.1

| Year | Hamilton real GDP | Hamilton population | Jefferson real GDP | Jefferson population |
|---|---|---|---|---|
| 1 | $2.1 billion | 70,000 | $500,000 | 15 |
| 2 | $2.5 billion | 80,000 | $525,000 | 16 |
| 3 | $2.8 billion | 90,000 | $600,000 | 17 |
| 4 | $2.7 billion | 86,000 | $650,000 | 18 |

Table 6-2.2

| Time period | Hamilton % change in real GDP | Jefferson % change in real GDP |
|---|---|---|
| From Year 1 to Year 2 | | |
| From Year 2 to Year 3 | | |
| From Year 3 to Year 4 | | |

Table 6-2.3

| Year | Hamilton per capita real GDP | Jefferson per capita real GDP |
|---|---|---|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |

Table 6-2.4

| Time period | Hamilton % change in per capita real GDP | Jefferson % change in per capita real GDP |
|---|---|---|
| From Year 1 to Year 2 | | |
| From Year 2 to Year 3 | | |
| From Year 3 to Year 4 | | |

2. When did Hamilton County experience the largest growth in real GDP? _____

   (A) When did Hamilton County experience the largest growth in per capita real GDP? _____

   (B) Why are these growth rates different?

3. When did Jefferson County experience the largest growth in real GDP? _____

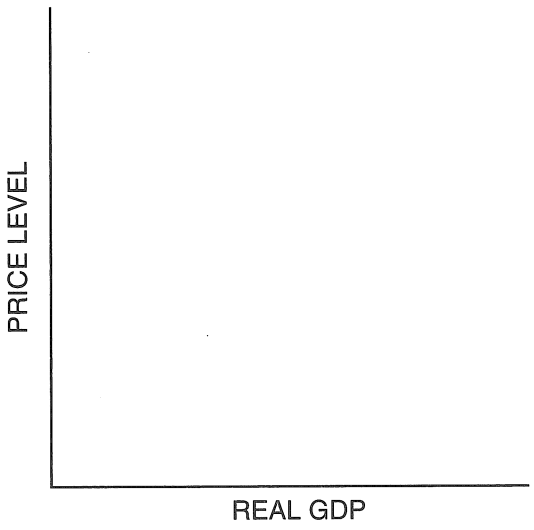
   (A) When did Jefferson County experience the largest growth in per capita real GDP? _____

   (B) Why are these growth rates different?

4. Which county do you believe is better off? Explain.

## Analyzing Economic Growth

5. Economic growth can be illustrated using both the LRAS curve and the PPC. Use the following graphs to illustrate economic growth.

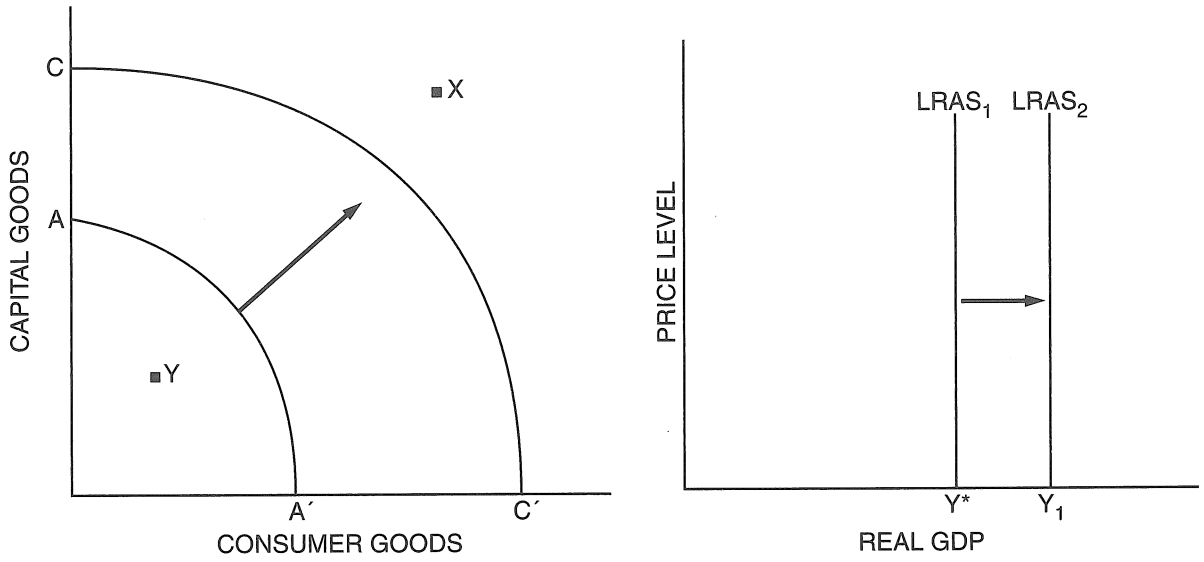



# *Policies to Promote Economic Growth*

A country experiences economic growth if it has increased its long-run ability to produce goods and services, no matter the current short-run phase of the nation's business cycle. Recall that short-run fluctuations in the business cycle are caused by changes in either aggregate demand or short-run aggregate supply. These short-run changes lead to increases, or decreases, in real gross domestic product (GDP). However, these changes are movements around the long-run stability of full-employment GDP. So another way to think about economic growth is to consider the level of real GDP when the nation is at full employment. If this level of full-employment output, as seen by the location of the long-run aggregate supply curve in Figure 6-3.1, is increasing, the nation is experiencing real growth.

Using the production possibilities model, economic growth is shown as an outward movement of the production possibilities curve, as shown in Figure 6-3.1. This allows a nation to produce combinations of goods and services that were previously unattainable, given the nation's stock of resources and technology.

Figure 6-3.1
**Long-Run Economic Growth**




Does each of the following policies lead to economic growth? State yes or no and explain.

1. The government provides subsidies and tax incentives for firms to research new, more efficient, technology in production.

2. With renewed emphasis on education, the nation's high school graduation rate increases from 70 percent to 85 percent, and the literacy rate rises from 98 percent to 99.5 percent.

3. The central bank expands the money supply in an attempt to boost spending and recover from a recession.

4. Because the nation is experiencing unusually low rates of spending and high unemployment, the government lowers household income tax rates and increases military spending.

## Government Policies to Promote Long-Run Economic Growth

The key to economic growth is the productivity of the nation where productivity is commonly measured as the quantity of goods and services produced from each unit of labor. The following factors contribute to a nation's productivity, and thus its economic growth.

*Capital per worker.* A country's workforce is more productive if the workforce has more and better tools with which to work. When tools are produced as physical capital, they are themselves paired with labor to produce goods and services. Therefore, if a country invests in capital production, the country's workforce will be more productive. The thing about capital tools is that they wear out (depreciate) so they must always be replaced at a rate that outpaces the rate of depreciation. The government can promote economic growth through policies that encourage investment in physical capital.

In addition to the private capital workers use to produce goods and services, a country has public capital used for production. This type of capital is known as *infrastructure.* Governments invest directly in physical capital by providing infrastructure such as roads, bridges, power lines, and information networks.

*Human capital per worker.* In addition to using the physical capital tools, the workforce also uses its collective experience and education to produce goods and services. Human capital can be acquired through formal schooling, occupational training, or simply accumulated experience at the workplace. Human capital, like physical capital, depreciates over time. Governments promote economic growth by investing in the country's human capital, through investment in its education system.

*Natural resources per worker.* Natural resources are production inputs that come from the world around us. These resources include minerals, sources of energy, rivers, forests, and fisheries. A country's workforce can be more productive when they have abundant natural resources, but to ensure long-run economic growth, the quality of those resources should be protected and they should be sustainably extracted. For example, a country might have a very large supply of clean water or timber, but if that renewable water or timber resource is used at a rate faster than the regeneration rate, the resource will be exhausted. Likewise, all the water in the world won't do a country any good if it's polluted. In other words, natural resources can also be depreciated and rendered unproductive unless the government protects and invests in them.

*Technology.* A country's state of knowledge is the understanding of how best to produce goods and services. A country with little technology may see the best way to farm a crop is with a mule-drawn plow. A country with better technology can also farm that crop but does it with enormous diesel powered harvesters. The country with better technology can harvest much more output, with the same amount of land, in less time, and at lower per-unit costs. Governments can promote economic growth by facilitating technological progress through research and development.

In addition, governments promote economic growth by providing political stability, enforcing property rights, and providing the optimal amount of government intervention.

5. How will each of the following policies affect economic growth and why?

   (A) The government raises taxes on businesses.

   (B) The government invests in improvements in the national highway system.

   (C) Research and development leads to improvements in technology.

   (D) Labor productivity increases as a result of a new education initiative.

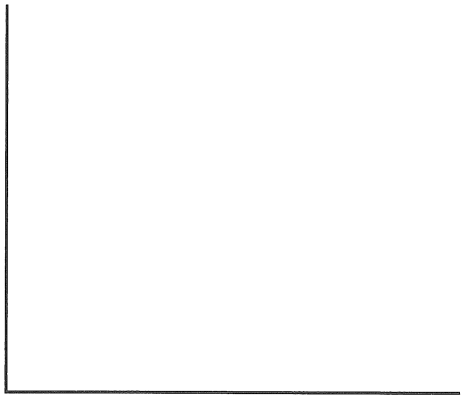
   (E) Expansionary economic policy leads to lower interest rates.

   (F) A country's government is unable to enforce property rights and the country is on the verge of a civil war.

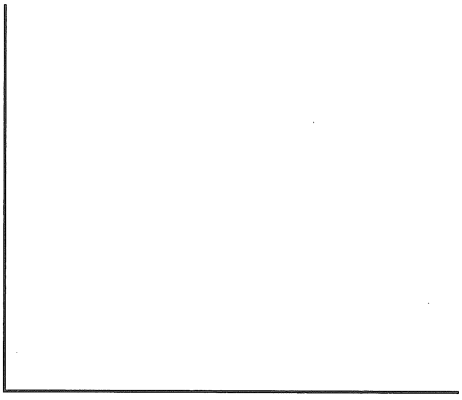
   (G) Government agencies establish regulations to maintain natural resources at sustainable levels.

6. Draw an aggregate demand and aggregate supply (AS/AD) graph to show the U.S. economy in long-run equilibrium.

   (A) Suppose the U.S. economy experiences increased productivity. Show the short-run impact on your graph.



   (B) Now suppose that these increased productivity gains last into the long run and create real economic growth in the United States. Show the long-run impact of this growth on real GDP and the price level in the graph.

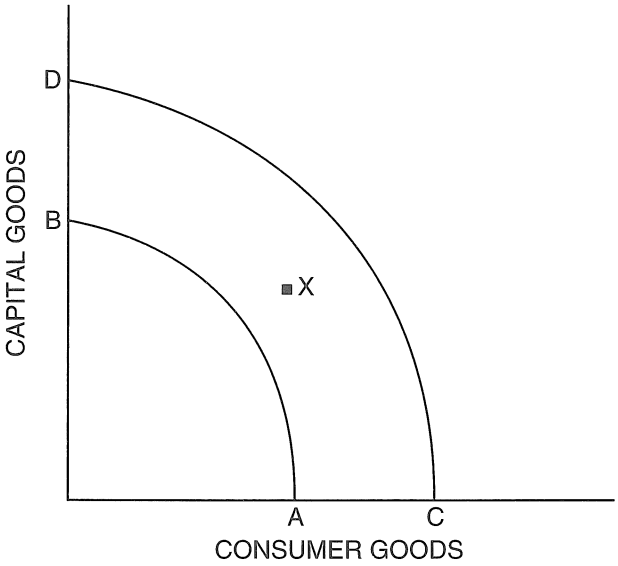


*Circle the letter of each correct answer.*

1. Which of the following would best portray long-run economic growth?
   (A) A leftward shift of the aggregate demand curve
   (B) A rightward shift of the aggregate demand curve
   (C) A leftward shift of the production possibilities curve
   (D) A leftward shift of the long-run aggregate supply curve
   (E) A rightward shift of the long-run aggregate supply curve

2. An increase in which of the following would be most likely to increase long-run economic growth?
   (A) Taxes
   (B) Interest rates
   (C) Consumer spending
   (D) Productivity
   (E) Value of domestic currency

*Use the following graph to answer questions 3 and 4.*




3. If the production possibilities curve of an economy shifts from AB to CD, it most likely is caused by
   (A) full employment of resources.
   (B) technology advances.
   (C) allocative efficiency.
   (D) a decrease in the price level.
   (E) productive efficiency.

4. If the production possibilities curve of an economy is CD and the economy is producing at Point X, which of the following is true?
   (A) Technology advances changed industrial production.
   (B) The quality and quantity of productive resources increased.
   (C) Improvements in productivity led to increased output.
   (D) Resources are not fully employed.
   (E) Aggregate demand decreased.

5. Which of the following is the best measure of economic growth?
   (A) Nominal GDP
   (B) Real GDP
   (C) Nominal GDP per capita
   (D) Real GDP per capita
   (E) The business cycle

6. Which of the following will cause the PPC to shift outward?
   (A) A decrease in unemployment
   (B) An increase in aggregate demand
   (C) A decrease in the price level
   (D) Depreciation of physical capital
   (E) Technological change

7. Which of the following is *not* an economic resource?
   (A) Physical capital
   (B) Human capital
   (C) Nature's gifts
   (D) Labor
   (E) Money

8. Which of the following will lead to an increase in human capital?
   (A) Job training
   (B) A decrease in wages
   (C) An increase in wages
   (D) A minimum wage law
   (E) Technological change

9. An economy's natural resources include which of the following?
   (A) Labor
   (B) Entrepreneurship
   (C) Population
   (D) Technology
   (E) Land

10. Which of the following is true of the long-run aggregate supply curve? It
    (A) has a positive slope.
    (B) is used to determine the phase of the business cycle.
    (C) will shift to the left when there is economic growth.
    (D) is horizontal at the full-employment level of output.
    (E) represents a point on the PPC.

11. The productive capacity of an economy is measured by the
    (A) slope of the LRAS curve.
    (B) intersection of the SRAS and AD curves.
    (C) slope of the PPC.
    (D) horizontal intercept of the LRAS.
    (E) phase of the business cycle.

12. Which of the following is true regarding productivity? It
    (A) can be increased by human capital investment in the short run.
    (B) is fixed in the short run.
    (C) cannot be increased in the long run.
    (D) has no effect on an economy's standard of living.
    (E) can increase in the long run.

13. Which of the following will not increase productivity?
    (A) Investment in human capital
    (B) Increases in physical capital
    (C) Depreciation of capital stock
    (D) Technological change
    (E) Increases in the labor force

14. Aggregate output must be
    (A) greater than LRAS.
    (B) less than LRAS.
    (C) equal to LRAS.
    (D) either less than or equal to LRAS.
    (E) increasing if there is economic growth in the economy.

15. Which of the following is a government policy to promote growth?
    (A) Decreasing taxes
    (B) Raising government spending
    (C) Increasing interest rates
    (D) Providing public education
    (E) Regulating businesses

16. Economic growth occurs when
    (A) the economy recovers from a recession.
    (B) monetary policy is effective.
    (C) fiscal policy increases aggregate demand.
    (D) the economy's productive capacity increases.
    (E) nominal GDP increases over time.

17. Which of the following is an example of infrastructure?
    (A) Roads
    (B) Bridges
    (C) Airports
    (D) Education
    (E) Schools

18. Which of the following is not true of the LRAS curve? It
    (A) is vertical.
    (B) is a function of the price level.
    (C) measures productive capacity.
    (D) represents a point on the PPC.
    (E) shifts as a result of productivity increases.

19. Natural resources are
    (A) always renewable.
    (B) never renewable.
    (C) not important for long-run economic growth.
    (D) subject to depreciation.
    (E) part of physical capital.

20. Governments can promote economic growth by providing which of the following?
    (A) Excessive government intervention
    (B) High tax rates
    (C) Political stability
    (D) Common property
    (E) Private investment