



OVERVIEW

Economic growth allows societies to produce more goods and services, raise incomes, and improve living standards. While growth depends on an economy's labor, capital, and natural resources, it also depends on productivity and how effectively resources are used. This episode explores two channels that lead to economic growth. Creative destruction occurs when new firms or products replace older ones. Creative accumulation occurs when existing firms continuously improve their own products and production processes. While dramatic new innovations often receive the most attention, research suggests that most economic growth comes from incremental productivity improvements within existing firms. At the same time, the possibility of creative destruction encourages firms to continue innovating, making both forces essential to sustained economic growth.

Key Macroeconomics Links

- **Economic Growth:** An increase in the rate of production of goods and services in an economy over time, often measured by the annual percentage change in real gross domestic product (GDP).
- **Productivity:** The quantity of goods and services produced from each unit of input (labor, capital, and natural resources). When productivity increases, more output is produced from the same quantity of inputs.
- **Production Technology:** The ideas, knowledge, innovations, and production methods that society uses to produce goods and services.
- **Creative Destruction:** A process in which new firms, products, or technologies replace existing ones.
- **Creative Accumulation:** A process in which existing firms increase productivity through continuous improvements to their products, production processes, or technologies without displacing existing firms.

Preview Question

Which contributes more to long-run economic growth: breakthrough innovations or continuous productivity improvements?

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Discussion Questions

1. Why is productivity growth often more important for long-run increases in living standards than simply increasing the amount of inputs like labor or capital?
2. What are some examples of improvements in knowledge, organization, or production methods that increase productivity without changing the product produced?
3. The episode distinguishes between creative accumulation and creative destruction. How are these two sources of growth different? Why are both important for overall economic growth?
4. Think of a product or service that has improved gradually over time (such as telephones, automobiles, or televisions). How did many small innovations contribute to their current form?
5. Can you think of an industry that has experienced creative destruction? What was the innovation that replaced the original product or business? Who benefited from the transition, and who faced challenges?
6. Why might society benefit from breakthrough innovations even if they cause some firms or workers to lose jobs in the short run? Can you identify historical examples where this occurred?
7. The episode uses the production function to explain economic growth. What does this equation help us understand? What doesn't it explain?
8. Artificial intelligence is changing many industries today. Is AI more likely to generate creative accumulation, creative destruction, or both? Explain your reasoning.
9. Why does the concept of economic growth matter so much? How might annual economic growth differ across countries that are in different stages of development?
10. For economies that are developing, how might creative destruction and creative accumulation benefit the well-being of people living in those economies?

Multiple Choice Questions

1. Why do economists often emphasize the importance of increasing productivity for sustained economic growth, instead of simply increasing the quantity of labor, capital, or natural resources?
 - A. Productivity growth allows the economy to produce more with existing resources, supporting higher living standards over time.
 - B. Productivity growth always eliminates unemployment.
 - C. Productivity growth guarantees equal incomes.
 - D. Productivity growth reduces the need for investment in labor and capital.

Answer: A

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2. Which of the following is the best example of an increase in production technology rather than an increase in labor or capital?
- A. Hiring more workers
 - B. Building another factory
 - C. Improving the production process
 - D. Discovering a new source of oil

Answer: C

3. A car manufacturer improves the fuel efficiency of its vehicles every year through hundreds of small engineering improvements. This is an example of:
- A. Creative destruction
 - B. Creative accumulation
 - C. Increasing natural resources
 - D. Capital depreciation

Answer: B

4. Which of the following is the best example of creative destruction?
- A. A restaurant updates its menu each season.
 - B. A smartphone manufacturer improves battery life each year.
 - C. Streaming services replace DVD rental stores.
 - D. A factory hires additional employees during the holidays.

Answer: C

5. Why can creative destruction increase economic well-being even if some firms suffer in the short run?
- A. It permanently eliminates firm bankruptcy
 - B. It replaces less productive technologies with more productive ones, increasing output over time.
 - C. It guarantees that all workers immediately find higher-paying jobs.
 - D. It reduces competition among firms.

Answer: B

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6. A government wants to increase long-run economic growth. Which policy is most likely to increase production technology?

- A. Encouraging research and development and supporting innovation
- B. Increasing the legal retirement age
- C. Expanding the amount of farmland
- D. Increasing imports of consumer goods

Answer: A

7. Which statement best summarizes the main message of the episode?

- A. Economic growth depends primarily on increasing labor and natural resources.
- B. Breakthrough innovations are the only important source of economic growth.
- C. Productivity growth depends only on technological inventions developed by new firms.
- D. Most long-run productivity growth comes from continuous improvements within existing firms, while occasional breakthrough innovations remain important because they create the possibility of creative destruction.

Answer: D

8. In the production function $Y = A \times f(L, K, N)$, what does the variable A represent?

- A. The amount of available labor
- B. The stock of physical capital
- C. Production technology, including knowledge and innovation
- D. Natural resources

Answer: C

9. Suppose an economy doubles the number of factories but does not improve production methods. According to the production function, this change would most directly increase:

- A. Labor (L)
- B. Capital (K)
- C. Production technology (A)
- D. Natural resources (N)

Answer: B

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10. How does creative accumulation shift the production function?

- A. It increases the amount of labor (L)
- B. It increases the amount of capital (K)
- C. It shifts the production function downward
- D. It shifts the production function upward

Answer: D

True / False Questions

1. Economists use inflation as a measure of overall economic growth in an economy.

Answer: False

2. Production technology refers only to new machines and computers.

Answer: False

3. If an economy builds more factories but production methods remain unchanged, an increase in output comes from an increase in capital.

Answer: True

4. Productivity growth allows an economy to produce more goods and services using the same amount of resources.

Answer: True

5. Developing a more efficient production process is an example of increasing capital rather than improving production technology.

Answer: False

6. Creative accumulation refers to productivity gains that result from many small, continuous improvements over time.

Answer: True

7. Creative destruction occurs only when an entirely new industry is created that never affects existing industries.

Answer: False

8. Although creative destruction may cause short-run job losses, it can increase long-run economic well-being by replacing less productive technologies with more productive ones.

Answer: True

9. Policies that encourage research and development and innovation can increase production technology.

Answer: True

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10. Long-run economic growth depends only on breakthrough innovations, and small, incremental improvements have little effect on productivity.
Answer: False

Application Questions

Question #1: Output Over Time

Suppose a firm has the following production function:

$Y = A \times f(L, K, N)$

Over the next five years, labor, capital, and natural resources remain unchanged, but production technology (A) improves according to Table 1.

Table 1. Output Over Time

Year	Technology (A)	Output (Y)
2025	1.00	100
2026	1.05	105
2027	1.10	110
2028	1.15	115
2029	1.20	120

Questions

1. Calculate the percentage increase in output between each year.
2. Explain why production technology (A) is multiplied by the production function, rather than being an input to production like L, K, or N.
3. What does this example illustrate about the role of productivity in economic growth?

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Answers

1. Output increases by 5 units each year, equal to 5% of the initial 2025 output. The percentage growth rate is as follows:
 - 2025–2026: 5.0%
 - 2026–2027: 4.8%
 - 2027–2028: 4.5%
 - 2028–2029: 4.3%
2. Labor, capital, and natural resources are inputs used in production. Production technology (A) represents how effectively those inputs are transformed into output, so an increase in A allows the same combination of inputs to produce more.
3. The example shows that an economy can increase output even without increasing its inputs. Better production technology allows the same labor, capital, and natural resources to produce more output, making productivity an important source of economic growth.

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Question #2: Drawing Production Functions

The production function shows the maximum amount of output an economy can produce with different combinations of inputs. Assume a simplified version of the economy with one input, labor.

- Create a line graph with Output (Y) on the vertical axis and Labor (L) on the horizontal axis. Draw and label the initial production function as curve PF_1 .
- Draw a second production function showing improved production technology and label it curve PF_2 .
- Add arrows showing how improved production technology shifts the production function.

Questions

1. Does improved production technology move the economy along the original production function or shift the production function? Illustrate in the graph.
2. At the same level of inputs, which curve produces more output? Illustrate in the graph.
3. How would more education and training affect the production function? Explain whether it changes labor (L), production technology (A), or both.

Answers

1. Improved production technology shifts the entire production function upward, rather than moving the economy along the original curve. With the same amount of labor, the economy can produce more output because production technology makes workers and other inputs more productive. See the "Episode in a Graph" for more detail.
2. Curve PF_2 (the production function with improved production technology) produces more output at every level of labor than Curve PF_1 . For any given amount of labor, the economy can produce more and productivity increases. See the "Episode in a Graph" for more detail.
3. More education and training improve workers' skills and productivity. In this lesson, human capital is included as part of labor (L), so a more skilled workforce allows labor to produce more output. This shifts the production function upward from Curve PF_1 toward Curve PF_2 , illustrating higher productivity for each laborer.

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Innovative Ways to Extend the Lessons

1. Listen to our podcast!

- Student Assignment: Listen to the generated podcast summary and reflect: *What is lost or gained when research is translated into casual language? What do you note here that you did not when watching the video? What does the video do a better job of explaining? What do you understand better from both listening to the podcast and watching the video?*

2. Applying the Production Function

- Student Assignment: Select an industry that has seen technological transformations over a 10- or 20-year period, such as agriculture, healthcare, education, manufacturing, or software development.

For your chosen industry:

- Identify examples of Labor (L), Capital (K), Natural Resources (N), and production technology (A).
- Explain how each contributes to production.
- Explain how either technological changes or changes in education and skills have led to changes in output for this industry during this time.
- How do you think this industry will evolve in the future as a result of technological change?

Present your work as a labeled diagram or infographic using the production function:

$$Y = A \times f(L, K, N)$$

3. Compare Countries

- Economic data: Using the [Our World in Data](#) website, ask students to find economic measurements of economic growth over time for a few countries. Are there any time periods that you can clearly explain where the changes in growth are due to creative destruction or accumulation? How do you think creative destruction impacts developing countries, compared to developed countries?

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* Instructor Note

The production function presented in the episode is:

$$Y = A \times f(L, K, N)$$

where L includes workers' human capital (education, skills, and experience). Many economics textbooks instead write the production function as:

$$Y = A \times f(L, H, K, N)$$

where H represents human capital separately. Both approaches convey the same economic intuition. This lesson uses the simpler version emphasizing that productivity growth comes from improvements in production technology (A) that allow labor, capital, and natural resources to produce more output. A simple measure of productivity commonly used is output per laborer (Y/L), which is introduced in some textbooks. Instructors may alter specifications in these examples based on the technical level and emphasis of their course.