

AP Macro Economics

A Thought Exercise on Growth

1. Productivity as determinant of GDP
"Living standards is tied to productive ability"

Productivity: quantity of goods and services that a worker can produce for each hour of work.

2. GDP is a measure of income earned by everyone in the economy and the total expenditures on the economy's output. ($Y=C+I+G+N_x$)
3. Must focus on ability to produce goods and services.
4. Why are some good at it and some not so good?

I. The Basics of Economic Growth

A. Calculating Growth Rates

1. The **economic growth rate** is the annual percentage change of real GDP. The growth rate of real GDP equals:

$$\frac{(\text{Real GDP in current year} - \text{Real GDP in previous year})}{(\text{Real GDP in previous year})} \times 100.$$

2. The standard of living depends on **real GDP per person**, which is real GDP divided by the population. The growth rate of real GDP per person equals:

$$\text{Growth rate of real GDP} - \text{Growth rate of population}.$$

B. The Magic of Sustained Growth

1. The Rule of 70 demonstrates the magic of economic growth. The **Rule of 70** states that the number of years it takes for the level of any variable to double is approximately 70 divided by the annual percentage growth rate of the variable.

2. Sustained growth of real GDP per person can transform a poor society into a wealthy one.

II. The Sources of Economic Growth

The factors that influence real GDP growth can be divided into those that increase aggregate hours and those that increase change labor productivity.

A. Aggregate Hours

Aggregate hours increase over time because of population growth.

B. Labor Productivity

Labor productivity is the quantity of real GDP produced by one hour of labor.

$$\text{Labor productivity} = (\text{Real GDP}) \div (\text{Aggregate hours}).$$

$$\text{Rearranging, real GDP} = (\text{Aggregate hours}) \times (\text{Labor productivity}),$$

so growth in real GDP can be divided into growth in aggregate hours and growth in labor productivity.

Three factors influence the growth of labor productivity:

1. Saving and investment in physical capital
2. Expansion of human capital
3. Discovery of new technologies

C. Sources of Economic Growth

1. Growth in aggregate hours results from population growth, increases in labor force participation, and increases in average hours per worker.
2. Growth in labor productivity results from growth in physical capital, growth in human capital, and technological advances.

D. The Productivity Curve

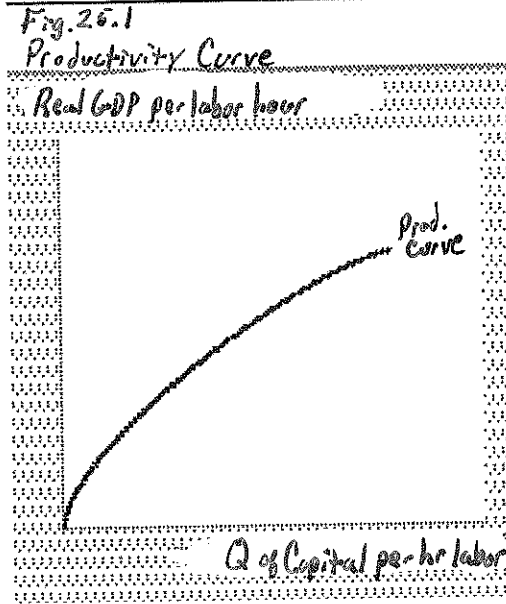
The **productivity curve**, illustrated in Figure 25.1, shows the relationship between real GDP per hour of labor and the quantity of capital per hour of labor with a given state of technology. A change in capital per hour of labor results in a movement along the productivity curve. A change in human capital or technology shifts the productivity curve.

1. Diminishing returns

As the quantity of one input increases with quantities of all other inputs remaining the same, output increases but by ever smaller increments. The shape of the productivity curve reflects diminishing returns—each additional unit of capital per hour of labor produces a successively smaller additional amount of real GDP per hour of labor.

2. The **one third rule** is the observation

that on the average, with no change in human capital and technology, a *one percent* increase in capital per hour of labor brings a *one third percent* increase in labor productivity. The one third rule can be used to divide economic growth into its sources.



III. Theories of Economic Growth

A. Classical Growth Theory

Classical growth theory is the theory that the clash between an exploding population and limited resources will eventually bring economic growth to an end. **Malthusian theory** is another name for classical growth theory—named after Thomas Robert Malthus.

1. The Basic Idea

a. Economic growth raises GDP per person but induces a population explosion, which eventually ends the prosperity.

2. Classical Theory of Population Growth

a. When real income exceeds the subsistence real income, the population grows. Population growth decreases the amount of capital per hour of labor so that labor productivity and real GDP per person decrease.

3. Productivity Curve Illustration

a. An increase in capital per hour creates a movement along the productivity curve to higher real GDP per hour of labor and a technological advance shifts the productivity curve upward to a higher level of real GDP per hour of labor. But population growth increases, resulting in a movement down along the productivity curve to the subsistence level of real GDP per hour of labor.

B. Neoclassical Growth Theory

Neoclassical growth theory is the theory that real GDP per person will increase as long as technology keeps advancing.

1. Population growth

a. The historical population trends contradict the view of the classical economists. One of the key economic influences on population growth is the opportunity cost of a woman's time. As women's wage rates rise, the opportunity cost of having children rises, families choose to have fewer children, and the birth rate falls.

2. Technological change

The neoclassical theory emphasizes that technological change influences the rate of economic growth but not vice versa. Technological change results from chance.

3. The Basic Idea

The basic idea is that prosperity (high real GDP per person) will last but economic growth (growth in real GDP per person) will not, unless technology keeps advancing.

4. A Problem with Neoclassical Growth Theory

A problem with neoclassical growth theory is that the theory does not explain what determines technological change.

C. New Growth Theory

New growth theory is the theory that our unlimited wants will lead us to ever greater productivity and perpetual economic growth.

1. Choices and Innovation

a. Human capital grows because of choices.

b. Discoveries result from choices.

c. Discoveries bring profit, and competition destroys profit.

d. Discoveries can be used by everyone

e. Production activities can be replicated so that identical firms can each produce the same quantity of an item.

2. Perpetual motion

a. Economic growth is driven by insatiable wants, which lead us to pursue profit and to innovate. The new and better products mean that old firms go out of business. New firms start up, which creates new and better jobs and leads to greater consumption and leisure. But insatiable wants simply start the growth cycle all over again.

3. Productivity Curve and New Growth Theory

The productivity curve constantly shifts upward as capital increases and technology advances to bring unending growth.

D. Growth in the Global Economy

Economic growth is a global phenomenon, not just a national one. Neoclassical theory predicts that real GDP per person in different nations converges, but convergence is slow and does not appear to be imminent for all countries. New growth theory predicts that growth rates depend on national incentives to save, invest, accumulate human capital, and innovate, so that real GDP gaps between rich and poor countries might persist.

IV. Achieving Faster Growth

A. Preconditions for Economic Growth

1. **Economic freedom** is a condition in which people are able to make personal choices, their private property is protected, and they are free to buy and sell in markets.
2. **Property rights** are the social arrangements that govern the protection of private property. Clearly established and enforced property rights provide people with the incentive to work and save.
3. Markets enable people to trade and to save and invest. Markets cannot operate without property rights.

B. Policies to Achieve Faster Growth

1. Create Incentive Mechanisms

Enforce property rights with a well-functioning legal system.

2. Encourage Saving

Increased saving can increase the growth of capital and stimulate economic growth.

- a. East Asian countries have the highest growth rates and saving rates.
- b. Some African economies have the lowest saving rates and the lowest economic growth rates.

3. Encourage Research and Development

More research and development creates technological advances. Governments can direct public funds toward financing basic research.

4. Encourage International Trade

International trade extracts all the available gains from specialization and exchange.

5. Improve the Quality of Education

The social benefits of education go beyond the benefits accrued to the individuals who receive the education. The government can help by financing more basic education to raise skills in language, math and science.

C. How Much Difference Can Policy Make?

Change brings gains to some and losses to others. Because societies balance the interests of one group against the interests of another group, change is slow to occur and so changes that would increase the economic growth rate are slow to occur. And the government cannot simply dial up large changes in the economic growth rate.

Determinants of Economic Growth

Physical Capital Workers are more productive if they have tools with which to work. The stock of equipment and structures that are used to produce **physical capital** goods and services is called physical capital, or just *capital*. For example, when *woodworkers* make furniture, they use saws, lathes, and drill presses. More tools *allow* work to be done more quickly and more accurately. That is, a worker with only basic hand tools can make less furniture each week than a worker with sophisticated and specialized woodworking equipment. As you may recall from Chapter 2, the inputs used to produce goods and services—labor, capital, and so on—are called the *factors of production*. An important feature of capital is that it is a *produced* factor of production. That is, capital is an input into the production process that in the past was an output from the production process. The woodworker uses a lathe to make the leg of a table. Earlier the lathe itself was the output of a firm that manufactures lathes. The lathe manufacturer in turn used other equipment to make its product. Thus, capital is a factor of production used to produce all kinds of goods and services, including more capital.

Human Capital A second determinant of productivity is human capital. Human capital is the economist's term for the knowledge and skills that workers acquire through education, training, and experience. Human capital includes the skills accumulated in early childhood programs, grade school, high school, *college*, and on-the-job training for adults in the labor force. Although education, training, and experience are less tangible than lathes, bulldozers, and buildings, human capital is like physical capital in many ways. Like physical capital, human capital raises a nation's ability to produce goods and services. Also like physical capital, human capital is a produced factor of production. Producing human capital requires inputs in the form of teachers, libraries, and student time. Indeed, students can be viewed as "workers" who have the important job of producing the human capital that will be used in future production.

Natural Resources A third determinant of productivity is natural *the inputs into the production of* resources. Natural resources are inputs into production that are provided *by nature*, such as land, rivers, and mineral deposits. Natural resources take two *by nature, such as land, rivers, and* forms: renewable and nonrenewable. A forest is an example of a renewable resource. When one tree is cut down, a seedling can be planted in its place to be harvested in the future. Oil is an example of a nonrenewable resource. Because oil is produced by nature over many thousands of years, there is only a limited supply. Once the supply of oil is depleted, it is impossible to create more. Differences in natural resources are responsible for some of the differences in standards of living around the world. The historical success of the United States was driven in part by the large supply of land well suited for agriculture. Today, some countries in the Middle East, such as Kuwait and Saudi Arabia, are rich simply because they happen to be on top of some of the largest pools of oil in the world. Although natural resources can be important, they are not necessary for an economy to be highly productive in producing goods and services. Japan, for instance is one of the richest countries in the world, despite having few resources it needs, such as oil, and exports, its manufactured goods to economies rich in natural resources.

Technological Knowledge . A fourth determinant of productivity is technological knowledge-the understanding of the best ways to produce goods. A hundred years ago, most Americans worked on farms, because technology required a high input of labor in order to feed the entire population. Today, thanks to advances in the technology of farming, a small fraction of the population can produce enough food to feed the entire country. This technological change made labor available to produce other goods and services.

Technological knowledge takes many forms. Some technology is common knowledge-after it becomes used by one person, everyone becomes aware of it. For example, once Henry Ford successfully introduced production in assembly lines, other car makers quickly followed suit. Other technology is proprietary-it is known only by the company that discovers it. Only the Coca-Cola Company, for instance, knows the secret recipe for making its famous soft drink. Still other technology is proprietary for a short time. When a drug company discovers a new drug, the patent system gives that company a temporary right to be the exclusive manufacturer of this particular drug. When the patent expires, however, other companies are allowed to make the drug. All these forms of technological knowledge are important for the economy's production of goods and services.

It is worthwhile to distinguish between technological knowledge and human capital. Although they are closely related, there is an important difference. Technological knowledge refers to society's understanding about how the world works. Human capital refers to the resources expended transmitting this understanding to the labor force. To use a relevant metaphor, knowledge is the quality of society's textbooks, whereas human capital is the amount of time that the population has devoted to reading them. Worker's productivity depends on both the quality of textbooks they have available and the amount of time they have spent studying them.