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Introduction to U.S. Economy: Productivity

What Is Productivity?

Productivity is broadly defined as the ratio of outputs to inputs. With respect to the economy, productivity measures how efficiently goods and services can be produced, comparing the amount of economic output with the amount of inputs (labor, capital, etc.) used to produce those goods.

Productivity Measures

There are two prominent measures of economic productivity: labor productivity (also known as output per hour) and multifactor productivity (also known as total factor productivity), both of which are produced by the Bureau of Labor Statistics (BLS) in the United States.

Labor productivity is defined as the ratio of the real (inflation-adjusted) value of output from the business sector to the total number of hours worked, or real output per labor hour, as shown below. Business sector output is defined as gross domestic product excluding outputs from general government, nonprofit institutions, paid employees of private households, and rental value of owner-occupied dwellings. BLS releases estimates of labor productivity quarterly. BLS also produces a non-farm business labor productivity measure, which further excludes output from the farm sector. Growth in labor productivity can be estimated by calculating the difference between growth in real output and growth in hours worked.

$$\text{Labor Productivity} = \frac{\text{Business sector real output}}{\text{Total number of hours worked}}$$

Multifactor productivity (MFP) is an alternative measure of productivity that compares real private business sector output to the level of combined inputs (labor and capital) used to produce goods and services. More specifically, MFP actually measures the portion of output that is unexplained by the value of inputs, providing a sense of how efficiently firms are using and combining inputs in the production process. BLS releases estimates of MFP annually. BLS also produces a private non-farm business measure of MFP, which further excludes output from the farm sector.

MFP, unlike labor productivity, differentiates among workers with respect to educational attainment and work experience. Therefore, changes in the composition of the labor force that increase the efficiency of workers (e.g., increased work experience) would not be registered as an increase in MFP but would be registered as an increase in labor productivity.

Measurement Complications

When attempting to measure productivity, a number of complications arise with the measurement of both outputs and inputs. Adjusting nominal output figures for inflation to produce estimates of real output can be complicated. This is especially true during periods of rapid technological progress where the introduction of new products and services and improvements in the quality of products and services complicate measuring inflation. Depending on the construction of the price index, estimates of real output may understate or overstate actual real output.

Gaps in the data available to BLS also complicate the measurement of labor inputs. The primary source of labor data only includes figures for total number of employees, average weekly hours of production, and nonsupervisory workers. BLS then has to estimate the number of hours worked by non-production and supervisory workers. Additionally, labor hour data for the self-employed and unpaid family workers must be forecasted from Internal Revenue Service data that lags by about three years.

BLS faces additional challenges when determining the value of capital inputs for MFP. To calculate MFP, BLS uses the total value of the services provided by productive capital in the economy, rather than the amount of physical capital. BLS uses a number of assumptions to first determine the level of productive capital in the economy by applying depreciation schedules to physical capital based on its age. Then BLS must determine the value of the services provided by that level of capital. Estimates of MFP are likely less precise than estimates of labor productivity due to the additional assumptions incorporated into estimating MFP.

Importance of Productivity Growth

Policymakers are interested in productivity because productivity growth is generally the most consequential determinant of long-term economic growth and substantive improvements in individual living standards. As productivity increases, society can produce more goods and services with the same level of resources, which increases incomes and access to goods and services, including additional leisure time.

Policymakers also are interested because government policies, institutions, and the regulatory environment can impact productivity growth. For example, strong and enforceable patent laws likely encourage companies to invest more in research and development, as the laws enable companies to profit from their new technologies and products.

Sources of Productivity Growth

Growth in output per hour of labor can be achieved through three different sources: improvements in the quality of workers (i.e., human capital), increases in the level of physical capital, and technological progress.

Human Capital

Improvements in the abilities and efficiency of individual workers, often referred to as increases in human capital, allow each individual worker to produce more goods and services per hour and therefore increase labor productivity. Increases in human capital generally result from increased education, work experience, on-the-job training, and so on.

Physical Capital

Increases in the level of physical capital (machines, factories, etc.) available to workers also result in productivity growth. Physical capital complements labor, allowing it to produce goods and services faster. The level of physical capital in the economy is dependent on investment spending on new physical capital and how quickly physical capital is worn out or depreciates. When investment spending on new capital exceeds the depreciation of old capital, the total amount of physical capital in the economy increases.

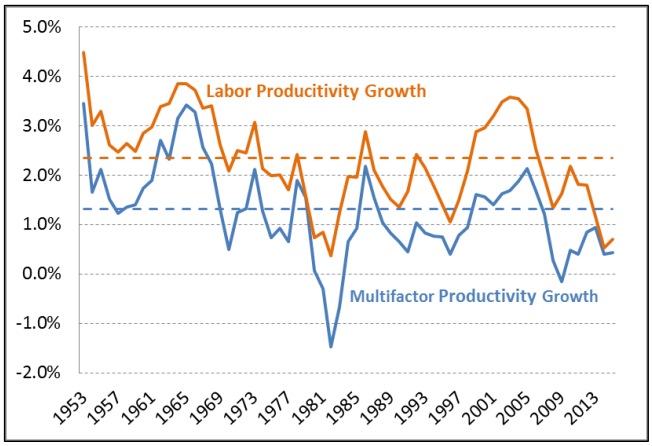
Technological Progress

Technological progress is potentially the most important and least understood source of productivity growth. Technological progress in this sense is a broad term including not only new and more efficient technologies but also new production processes and organizational structures for companies. The underlying drivers and policies that fuel technological progress are the least understood, compared with human and physical capital. One source of technological progress is research and development, which is one of the main drivers of technological breakthroughs.

Productivity Slowdown

Figure 1. Private Business Sector Labor Productivity and Multifactor Productivity Growth

(five-year moving average)



Source: CRS calculations using data from Bureau of Labor Statistics.

Notes: The value for each year represents the five-year average centered on the final year of that period. For example, the value for 2015 represents the average growth rate for the 2011 to 2015 period. Orange and Blue dashed lines represent average growth between 1949 and 2015 for output per hour and multifactor productivity, respectively.

In recent years, measures of productivity growth have slowed significantly compared to previous periods in history. As shown in **Figure 1**, average growth rates for both labor productivity and MFP have been in decline since the mid-2000s. Output per hour since the end of the so-called Great Recession has grown at an average pace of 0.8% per year (third quarter of 2009 to second quarter of 2016). Additionally, MFP has grown at an average annual rate of 0.3% since the end of the Great Recession (2010 to 2015). For comparison, the average annual growth rate of labor productivity and multifactor productivity between 1949 and 2015 were 2.3% and 1.3%, respectively, as shown in **Figure 1**.

Potential Causes

A number of hypotheses have been proposed to explain the recent downturn in productivity growth. Some have argued that the current slowdown is simply a return to 1974-1995 productivity growth rates after significant gains in productivity as a result of the information technology revolution of the 1990s. According to this view, firms reorganized and incorporated these new technologies, resulting in a spike in productivity growth, but now that these technologies have been fully incorporated productivity growth has returned to a slower pace.

Another possible explanation suggests a decline in new technologies and innovations that substantively improve productivity, compared to previous discoveries. For example, the advent of smartphones allows individuals to carry a computer with them at all times, but the productivity gains achieved through this technology are likely smaller than the productivity gains from the advent of internal combustion engines. Alternatively, a new wave of discoveries with more direct impacts on productivity could erase the slowdown; however, the likelihood of this occurring is unknown.

Others are more optimistic, suggesting that the current slowdown is a temporary phenomenon resulting from the financial crisis. During the Great Recession, there was a sharp decrease in investment spending, including research and development, by companies, which would likely slow the rate of technological progress. According to this view, the productivity slowdown is likely temporary and growth will speed up as investment returns to normal.

Still others suggest that there is no productivity slowdown and rather that the changing nature of the economy has rendered productivity measures less accurate. This view contends that the current productivity measures are less able to capture productivity gains from advances in digital goods and services. Issues arise because many goods and services that individuals once paid for are now provided for free through the Internet, which affects estimates of total output. For example, free calls through Skype may replace long-distance phone service. If a larger share of goods and services are now being provided for free through the Internet, output growth may understate gains in wellbeing.

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