

Answers to Questions: Chapter 12

1. Labor productivity is the ratio of output to labor input. Multifactor productivity is the ratio of output to a weighted (geometric) average of multiple factor inputs.
2. The growth rate of labor's share of national income $= (w - p) - (y - n)$, where $(w - p)$ is the growth rate of real wages and $(y - n)$ is the growth rate of labor productivity. Labor's share rises, then, if real wage growth exceeds labor productivity growth, declines if real wage growth is slower than labor productivity growth, and remains constant if real wages grow at the same rate as labor productivity.
3. The Solow neoclassical growth model predicts that poor countries will steadily converge to the income levels of rich countries. However, the ratio of income per person in the richest countries to that of the poor countries has barely changed in the last 40 years. Some countries, for example, United States, Britain, and France have remained at the frontier of per person income over that time frame. Asia's "Four Tigers," Korea, Taiwan, Hong Kong, and Singapore, achieved the convergence predicted by the Solow growth model within a single generation. A third group of countries, including Pakistan, Bangladesh, as well as many countries in Africa and Latin America, have failed to converge. The Solow model predicts faster growth in poor nations than in rich ones. However, the overall correlation between income per worker and the growth rate in income per worker is zero (see Figure 12-3).
4. High investment rates are not necessary for convergence. The relationship between the investment rate (the share of investment in GDP) and the standard of living across many nations is very weak. Poor countries have investment ratios ranging all the way from 2 percent to 25 percent relative to GDP. Similarly, rich countries have investment rates ranging from 12 to 30 percent.
5. Real wages and labor productivity are positively related—they rise and fall together. However, the direction of the cause-and-effect relationship between these variables is not always the same. In Part a, an increase in the quantity of other factors of production increases labor productivity, which raises the real wage. In this case, the increase in labor productivity causes the real wage to increase. In Part b, on the other hand, a decline in the size of the work force reduces the quantity of workers available for firms to hire. That shortage of workers increases the real wage and also causes firms to employ less labor. Because firms employ fewer workers with a given amount of other factors of production, labor productivity rises. However, now it is the increase in real wage that has caused the increase in labor productivity.

6. Diversion includes bribes of government officials and other forms of corruption, thefts within and outside a business, very high levels of taxation, and protection money.

Governments tolerate or engage in diversion because it is either too costly to get rid of or because officials in the government benefit directly from the diversion.

7. Charles Jones points out three economic distortions (see Charles I. Jones, *Introduction to Economic Growth* (New York: Norton, 1998), pp. 109–111.). The first point is that the market values research according to the profit stream earned from the new idea. The market does not value the fact that the new invention may affect the productivity of future research. The second point is that the market does not take duplication into account in its valuation. Jones' final point is that while monopoly profits may be captured in the valuation, the consumer surplus is ignored.

8. Economic growth requires that people take risks to engage in activities that result in higher output per capita, such as starting businesses or providing funds to finance the purchase of capital equipment or giving up income now in order to increase human capital through education. For people to be willing to engage in these activities, they need to know that the legal and political system will protect the returns they expect to gain from doing so, such as the profits earned by a business or the higher levels of future income expected from investments in human capital.

Studies show that the protections provided to shareholders and creditors by the English common-law based legal system are stronger than those offered by legal systems based on the Napoleonic codes. These studies find that the capital markets tend to be better developed in the former colonies of the United Kingdom, which have the common-law system, than the former colonies of France and Spain, where the legal systems are based on the Napoleonic codes.

The contrast between the performances of the North and South Korean economies clearly demonstrates how important it is to have an economic system that provides incentives for individuals to engage in activities that contribute to economic growth, as well as the role that international trade can play in allowing companies to grow and expand by exporting goods and services.

9. Infrastructure is any type of capital not owned by an individual business firm that makes the firm's production more efficient. Infrastructure makes firms more efficient by reducing the costs of transporting goods, communicating with suppliers and customers, and obtaining resources such as water and electricity. Those efficiencies allow businesses to grow by being able to better compete with other companies in either domestic or international markets, either of which will contribute to a country's economic progress.

The rule for how high taxes should be raised is that the gain from additional infrastructure spending should exactly offset the loss of economic growth induced by the tax on other inputs which contribute to economic growth. The major practical difficulties in implementing such a rule include being able to estimate the precise benefits of additional infrastructure spending and the exact reduction in economic growth that result from the higher taxes. For example, it might be possible to estimate how much a new transportation facility will lower costs for existing businesses, but that facility may well result in the development of new firms as well. The benefits provided to those new firms need to be included in calculating the benefits of the facilities, but the estimate of how many new firms may spring up as a result of the facility is not likely to be very precise.

10. Professor Sachs argues that geography has contributed to the poor performance of some poor countries in that: (1) technologies, particularly agricultural ones, developed in temperate zones may not be suitable for tropical climates; (2) the high fixed costs and low production costs associated with technological innovation mean that the small economies in tropical regions may not be able to justify investing in the development of new technologies; (3) low agricultural productivity and diseases in rural tropical countries result in a population growth rate that is detrimental to economic development; and (4) most tropical countries are former colonies of temperate zone countries and during their colonization, the colonial powers invested little in the human capital of the colonized and restricted economic activity to industries with low levels of labor productivity.

The *IP Box* on page 407 discusses a number of economies in the tropics where high rates of economic growth are occurring, including Botswana, Singapore, Thailand, Malaysia, and Hong Kong. In Botswana, the political elite has been able to pursue policies that have contributed to growth, including an English-based legal system, encouragement of foreign investment, and minimization of bribery and political corruption. The governments of the four aforementioned Asian tropical countries encouraged the improvement of public health systems to bring down population growth early on and adopted policies aimed at encouraging the development of export-oriented firms in order to overcome the limitations of a domestic market in an effort to increase labor productivity.

11. The “immigration puzzle” is how a person who immigrates into a high-income economy from a low-income economy, without any change in human capital, can earn a wage increase that is too large to be explained simply by the difference in physical capital per worker. The expanded model of economic growth given by Equation (12.8) on page 406 shows that the jump in the workers’ labor productivity may well be due to other

differences between the two economies, such as geography, political capital, or infrastructure.

12. The two “Great Inventions” of the late nineteenth century were electricity in the 1870s and the internal combustion engine in the 1880s and 1890s. The invention of electricity resulted in electric lighting, elevators, faster urban transportation systems, residential and industrial air conditioning, and modern refrigeration, among other things. The most obvious result of the invention of the internal combustion engine is the automobile, but trucks, buses, and early airplanes, in addition to cars, all utilized the engine. These all allowed for faster movement of people and goods and the car provided people with greater personal freedom. In addition to these two inventions, other important developments were telephones, radio, motion pictures, and TV, all of which were dependent on the invention of electricity, and chemicals, central heating, and indoor plumbing and modern water systems.

All these inventions allowed firms to produce more using less resources, say for example, in transporting goods using trucks or losing less food to spoilage because of refrigeration, and therefore lead to productivity gains or to healthier lives, say for example, due to improvements in water systems.

13. The post-1995 revival of productivity growth through 2000 is thought to be due to high-tech investment in computers, telecommunications and the like. The continuation of the revival from 2000–04 is thought to be due to efforts by companies to return to profitability by cutting costs and investments in intangible capital.
14. There are two main reasons why real income per capita will grow more slowly over the next 10 to 20 years. First, the retirement of the baby boomers will reduce the number of workers relative to the number of retired people, resulting in a fall in the hours of work per person. That, by definition, causes income per person to grow more slowly than average labor productivity. Second, average labor productivity growth is likely to slow because the educational attainment of Americans stopped rising in 1990. Prior to 1990, the century long rise in average number of years of education of the American population increased the stock of human capital, which contributed to productivity growth.
15. *Ceteris paribus*, restrictive monetary policy results in a higher real interest rate, which reduces investment and slows the growth rate of capital, resulting in a lower rate of labor productivity growth. Restrictive fiscal policy, on the other hand, reduces the real interest rate and raises investment. This increases the growth rates of capital and labor productivity. Thus, the statement is true.
16. There are two reasons why pro-growth advocates might question the wisdom of this proposal. First is the empirical question of how large an effect the increase in education

expenditure will have on productivity growth. Second is the issue of opportunity cost. Either the funds for increased education will be reallocated from other federal programs or taxes will be increased or the budget deficit will rise, or necessitating sacrifice of the benefits from other government programs, personal consumption, or investment. The issue is whether the benefit of increased productivity growth, whatever its size, warrants these sacrifices.

17. There are two reasons why labor productivity in Europe declined relative to labor productivity in the United States. The first is that services in the Europe are less productive, mainly because of problems in the wholesale and retail sectors. These sectors are less productive because European land use and zoning restrictions have prevented the construction of highly productive “big box” stores such as Walmart or Target, political pressures have encouraged the preservation of small, inefficient stores in downtowns, differences in culture and languages have made it more difficult for retailers to expand across all of Europe, and regulations make it more difficult to start new businesses.

The second reason is related to the fact that during the Global Economic Crisis, European firms did not respond to the downturn in output by laying off as many workers as American businesses did; instead the European firms cut workers’ hours. Therefore Europe experienced less of the human costs of higher unemployment during the Global Economic Crisis than America did, but it came at the cost of lower productivity relative to the United States.