Measuring economic growth

The economic growth rate is calculated from data on GDP estimated by countries´statistical agencies. The rate of growth of GDP/capita is calculated from data on GDP and people for the initial and final periods included in the analysis.

Determinants of per capita GDP growth[edit]

In national income accounting, per capita output can be calculated using the following factors: output per unit of labor input (labor productivity), hours worked (intensity), the percentage of the working age population actually working (participation rate) and the proportion of the working-age population to the total population (demography). "The rate of change of GDP/population is the sum of the rates of change of these four variables plus their cross products."[4]

Productivity[edit]

Increases in labor productivity (the ratio of the value of output to labor input) have historically been the most important source of real per capita economic growth.[5][6][7][8][9] "In a famous estimate, MIT Professor Robert Solow concluded that technological progress has accounted for 80 percent of the long-term rise in U.S. per capita income, with increased investment in capital explaining only the remaining 20 percent."[10]

(Note: There are various measures of productivity. The term used here applies to a broad measure of productivity. By contrast, Total factor productivity (TFP) growth measures the change in total output relative to the change in capital and labor inputs. Many of the cited references use TFP.) Increases in productivity lower the real cost of goods. Over the 20th century the real price of many goods fell by over 90%.[11]

Historical sources of productivity growth[edit]

Main article: Productivity improving technologies (economic history)

Economic growth has traditionally been attributed to the accumulation of human and physical capital and the increase in productivity arising from technological innovation.[12]

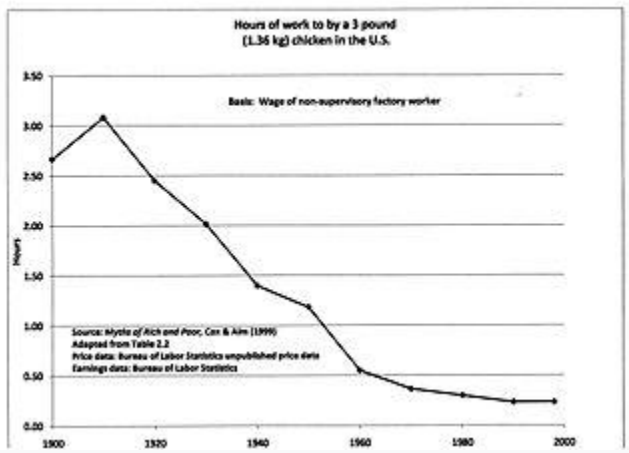
Before industrialization technological progress resulted in an increase in the population, which was kept in check by food supply and other resources, which acted to limit per capita income, a condition known as the Malthusian trap.[13][14] The rapid economic growth that occurred during the Industrial Revolution was remarkable because it was in excess of population growth, providing an escape from the Malthusian trap.[15] Countries that industrialized eventually saw their population growth slow down, a phenomenon known as the demographic transition.

Increases in productivity are the major factor responsible for per capita economic growth – this has been especially evident since the mid-19th century. Most of the economic growth in the 20th century was due to increased output per unit of labor, materials, energy, and land (less input per widget). The balance of the growth in output has come from using more inputs. Both of these changes increase output. The increased output included more of the same goods produced previously and new goods and services.[16]

During the Industrial Revolution, mechanization began to replace hand methods in manufacturing, and new processes streamlined production of chemicals, iron, steel, and other products.[17] Machine tools made the economical production of metal parts possible, so that parts could be interchangeable.[18] See: Interchangeable parts.

During the Second Industrial Revolution, a major factor of productivity growth was the substitution of inanimate power for human and animal labor. Also there was a great increase in power as steam powered electricity generation and internal combustion supplanted limited wind and water power.[17] Since that replacement, the great expansion of total power was driven by continuous improvements in energy conversion efficiency.[19] Other major historical sources of productivity were automation, transportation infrastructures (canals, railroads, and highways),[20][21] new materials (steel) and power, which includes steam and internal combustion engines and electricity. Other productivity improvements included mechanized agriculture and scientific agriculture including chemical fertilizers and livestock and poultry management, and the Green Revolution. Interchangeable parts made with machine

tools powered by electric motors evolved into mass production, which is universally used today.[18]



Productivity lowered the cost of most items in terms of work time required to purchase. Real food prices fell due to improvements in transportation and trade, mechanized agriculture, fertilizers, scientific farming and the Green Revolution.

Great sources of productivity improvement in the late 19th century were railroads, steam ships, horse-pulled reapers and combine harvesters, and steam-powered factories.[22][23] The invention of processes for making cheap steel were important for many forms of mechanization and transportation. By the late 19th century both prices and weekly work hours fell because less labor, materials, and energy were required to produce and transport goods. However, real wages rose, allowing workers to improve their diet, buy consumer goods and afford better housing.[22]

Mass production of the 1920s created overproduction, which was arguably one of several causes of the Great Depression of the 1930s.[24] Following the Great Depression, economic growth resumed, aided in part by increased demand for existing goods and services, such as automobiles, telephones, radios, electricity and household appliances. New goods and services included television, air conditioning and commercial aviation (after 1950), creating enough new demand to stabilize the work week.[25] The building of highway infrastructures also contributed to post World War II growth, as did capital investments in manufacturing and chemical industries.[26] The post World War II economy also benefited from the discovery of vast amounts of oil around

the world, particularly in the Middle East. By John W. Kendrick's estimate, three-quarters of increase in U.S. per capita GDP from 1889 to 1957 was due to increased productivity.[9]

Economic growth in the United States slowed down after 1973.[27] In contrast growth in Asia has been strong since then, starting with Japan and spreading to Korea, China, the Indian subcontinent and other parts of Asia. In 1957 South Korea had a lower per capita GDP than Ghana,[28] and by 2008 it was 17 times as high as Ghana's.[29] The Japanese economic growth has slackened considerably since the late 1980s.

Productivity in the United States grew at an increasing rate throughout the 19th century and was most rapid in the early to middle decades of the 20th century.[30][31][32][33][34] US productivity growth spiked towards the end of the century in 1996–2004, due to an acceleration in the rate of technological innovation known as Moore's law.[35][36][37][38] After 2004 U.S. productivity growth returned to the low levels of 1972–96.[35]

Intensity (hours worked)[edit]

The work week declined considerably over the 19th century.[39][40] By the 1920s the average work week in the U.S. was 49 hours, but the work week was reduced to 40 hours (after which overtime premium was applied) as part of the National Industrial Recovery Act of 1933.

Demographic changes[edit]

Demographic factors may influence growth by changing the employment to population ratio and the labor force participation rate.[5] Industrialization creates a demographic transition in which birth rates decline and the average age of the population increases.

Women with fewer children and better access market employment tend to join the labor force in higher percentages. There is a reduced demand for child labor and children spend more years in school. The increase in the percentage of women in the labor force in the U.S. contributed to economic growth, as did the entrance of the baby boomers into the work force.[5] See: Spending wave

Other factors affecting growth[edit]

Political institutions, property rights, and rule of law[edit]

See also: Great Divergence § Property rights, Great Divergence § Efficiency of markets and state intervention, and Great Divergence § State prohibition of new technology

“As institutions influence behavior and incentives in real life, they forge the success or failure of nations.”[41]

In economics and economic history, the transition to capitalism from earlier economic systems was enabled by the adoption of government policies that facilitated commerce and gave individuals more personal and economic freedom. These included new laws favorable to the establishment of business, including contract law and laws providing for the protection of private property, and the abolishment of anti-usury laws.[42][43] When property rights are less certain, transaction costs can increase, hindering economic development. Enforcement of contractual rights is necessary for economic development because it determines the rate and direction of investments. When the rule of law is absent or weak, the enforcement of property rights depends on threats of violence, which causes bias against new firms because they can not demonstrate reliability to their customers.[44]

In many poor and developing countries much land and housing is held outside the formal or legal property ownership registration system. In many urban areas the poor "invade" private or government land to build their houses, so they do not hold title to these properties. Much unregistered property is held in informal form through various property associations and other arrangements. Reasons for extra-legal ownership include excessive bureaucratic red tape in buying property and building. In some countries it can take over 200 steps and up to 14 years to build on government land. Other causes of extra-legal property are failures to notarize transaction documents or having documents notarized but failing to have them recorded with the official agency.[45]

Not having clear legal title to property limits its potential to be used as collateral to secure loans, depriving many poor countries one of their most important potential

sources of capital. Unregistered businesses and lack of accepted accounting methods are other factors that limit potential capital.[45]

Businesses and individuals participating in unreported business activity and owners of unregistered property face costs such as bribes and pay-offs that offset much of any taxes avoided.[45]

"Democracy Does Cause Growth," according to Acemoglu et al. Specifically, "democracy increases future GDP by encouraging investment, increasing schooling, inducing economic reforms, improving public goods provision, and reducing social unrest."[46]

Capital[edit]

Capital in economics ordinarily refers to physical capital, which consists of structures and equipment used in business (machinery, factory equipment, computers and office equipment, construction equipment, business vehicles, etc.).[2] Up to a point increases in the amount of capital per worker are an important cause of economic output growth. Capital is subject to diminishing returns because of the amount that can be effectively invested and because of the growing burden of depreciation.

In the development of economic theory the distribution of income was considered to be between labor and the owners of land and capital.[47]

In recent decades there have been several Asian countries with high rates of economic growth driven by capital investment.[48]

New products and services[edit]

Another major cause of economic growth is the introduction of new products and services and the improvement of existing products. New products create demand, which is necessary to offset the decline in employment that occurs through labor saving technology.[36][49]

Growth phases and sector shares[edit]

Main article: Rostow's stages of growth

Economic growth in the U.S. and other developed countries went through phases that affected growth through changes in the labor force participation rate and the relative sizes of economic sectors. The transition from an agricultural economy to manufacturing increased the size of the sector with high output per hour (the high-productivity manufacturing sector), while reducing the size of the sector with lower output per hour (the lower productivity agricultural sector). Eventually high productivity growth in manufacturing reduced the sector size, as prices fell and employment shrank relative to other sectors.[50][51] The service and government sectors, where output per hour and productivity growth is low, saw increases in their shares of the economy and employment during the 1990s.[5] The public sector has since contracted, while the service economy expanded in the 2000s.