# Economic Growth and the Wealth of Nations

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## There's more to prosperity than natural resources

Many people believe that natural resources, such as trees, oil, and farmland, are the primary sources of economic growth. They believe that nations like the United States and Australia are prosperous because these nations have vast natural resources to use in the production of goods and services. A variation on this idea emphasizes geography: nations with the best shipping locations and mildest climates have more prosperous economies.

Striving for economic growth is not only about accumulating more wealth. Yes, economic growth brings smartphones and Jet Skis, but it's much more important than that; economic growth offers the potential for more women and infants to survive childbirth, more people to have access to clean water and better sanitation, and more people to live healthier, longer, and more educated lives.

In this chapter, we begin by looking at the implications of economic growth for human welfare; we then consider the impact of an economy's resources and technology on economic growth. Finally, we discuss the key elements an economy needs in order to grow.

**Big Questions**

- Why does economic growth matter?
- How do resources and technology contribute to economic growth?
- What institutions foster economic growth?
- How are some economists testing new ideas?

## Why do economic growth matter?

In 1900, life expectancy in the United States was 47 years; about 140 of every 1,000 children died before their first birthday. Only about one-third of American homes had running water and income [in 2021 dollars] was less than $ 5,500 per person. Most people lived less than a mile from their job and almost nobody owned an automobile. Yes, this is also a description of life in low-income countries today. What happened in the United States in the meantime? Economic growth! In this section, we examine how economic growth affects the lives of people around the world. We also examine the historical data on economic growth and explain some mathematics.

### Some ugly facts

Before looking at data on growth, we need to recall how economists measure economic growth. In Chapter 6, we defined economic growth as the percentage change in real per capita GDP. We know that real per capita GDP measures the average level of income in a nation. For most people, life is not all about the pursuit of more income; however, economic growth does alleviate human misery and lengthen lives. Wealthier societies provide better living standards, which include better nutrition, educational opportunities, healthcare, freedom, and even sources of entertainment.

Let's look around the world and compare life in low-income countries. Table 11.1 presents human welfare indicators for some of the world's highest- and lowest-income nations in 2020. Among the low-income nations are Afghanistan, Ethiopia, North Korea, Liberia, Niger, Syria, and Yemen. The high-income nations include Australia, Denmark, Israel, Japan, Germany, South Korea, and the United States.

TABLE 11.1

**Living Conditions in Low- versus High-Income Nations, 2020**

| Life indicators | Low income | High income |
|---|---|---|
| GDP per capita (PPP) | $691 | $44,003 |
| Infant mortality rate (per 1,000 live births) | 47 | 4 |
| Under-5 mortality rate (per 1,000) | 66 | 5 |
| Life expectancy at birth (years) | 64 | 81 |
| Physicians (per 10,000) | 3 | 37 |
| Access to safely managed sanitation service (%) | 18 | 87 |
| Access to electricity (%) | 40.9 | 100 |
| Mobile celluar subscriptions (per 100 people) | 60 | 128 |
| Literacy rate, adult male (%) | 69 | 99 |
| Literacy rate, adult female (%) | 54 | 99 |
| Female/male secondary enrollment (ratio) | 0.36 | 1.00 |

*Source:* World Bank, World Development Indicators, 2020.

*Note:* Low income is $1,045 or less and includes 27 nations. High income is $12,696 or more and includes 80 nations. See list of nations here: https://data helpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups.

The data in Table 11.1 support the contention that per capita GDP matters - not for the sake of more income per se, but because it correlates with better human welfare conditions, which matter to everyone.

## Learning from the past

We can learn a lot about the roots of economic growth by considering the past; historically, a common person's life focused on subsistence, simply trying to find enough food, shelter, and clothing to survive. As we saw in the previous section, even today many people still live on the margins of subsistence; what can history tell us about how high -income nations achieved economic development? This answer will help clairfy possible policy alternatives.

## We were all poor once

When you look around the globe today, you see rich nations and poor nations; you can probably name many rich nations: the United States, Japan, Taiwan, and the Western European nations, among others. You might also know the very poor nations: much of Africa, parts of Latin America, and significant parts of Asia; but the world was not always this way. If we consider the longer history of humankind, only recently did the incomes of common people rise above subsistence level.

The Industrial Revolution, during which many economies moved away from agriculture and toward manufacturing in the 1800s, is at the very center of the big increase in world income growth. Beginning with the Industrial Revolution, the rate of technical progress increased so rapidly, it was able to outpace population growth. The foundation for the Industrial Revolution was laid in the preceding decades, and these foundations included private property protection and several technologies innovations. We don't claim that the Industrial Revolution was idyllic for those who lived through it, but legal and other institutional innovations of that era paved the way for the unprecedented gains in human welfare that people have since experienced.

**TABLE 11.2**

**Important Inventions since the U.S. Civil War**

| | | | |
|---|---|---|---|
| Typewriter | 1867 | Electron microscope | 1939 |
| Sheep shears | 1868 | Electric clothes dryer | 1940 |
| Telephone | 1876 | Nuclear reactor | 1942 |
| Phonograph | 1877 | Microwave oven | 1945 |
| Milking machine | 1878 | Computer | 1946 |
| Two-stroke engine | 1878 | Xerography | 1946 |
| Blowtorch | 1880 | Videotape recorder | 1952 |
| Arc welder | 1886 | Airbags | 1952 |
| Diesel engine | 1892 | Satellites | 1958 |
| Electric motor (AC) | 1892 | Laser | 1960 |
| X-ray machine | 1895 | Floppy disk | 1965 |
| Electric drill | 1895 | Microprocessor | 1971 |
| Radio | 1906 | Personal computer | 1975 |
| Assembly line | 1908 | Fiber-optic cables | 1977 |
| Cash register | 1919 | Cell phone | 1983 |
| Dishwasher | 1924 | GPS | 1989 |
| Rocket | 1926 | Laser eye surgery | 1989 |
| Television | 1926 | Internet | 1991 |
| Antilock brakes | 1929 | DVD | 1995 |
| Radar | 1934 | Smartphone | 2007 |
| Tape recorder | 1935 | Self-driving cars | 2008 |
| Jet engine | 1939 | Gene-editing technology | 2013 |

*Sources:* Michael Cox and Richard Alm, *Myths of Rich and Poor* (New York: Basic Books, 1999), and miscellaneous other sources.

This data do not imply that life is always easy and predictable comfortable for everyone in the modern world, but opportunities for the average person alive today are very different from those for the average person alive today are very different from those for the average person in past centuries. Table 11.2 lists a sampling of some of the major innovations of the past century and a half. Try to imagine life without any of these, and you'll get a sense of the gains we've made since the Industrial Revolution.

## Some got rich, others stayed poor

Although wealth has increased over the past two centuries, it is not evenly distributed around the globe. Figure 11.2 shows real per capita GDP (in 2020 U.S dollars) for various

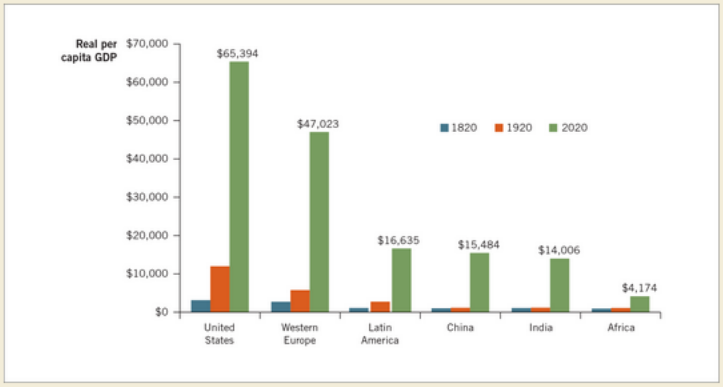
world regions. In 1820, the income of the average U.S citizen $ 3,160, or about $ 9 per day. Imagine trying to live on $ 9 per day in today's world - that is, $ 9 to buy all the food, clothing, shelter, education, transportation, and anything else you might need to purchase. That was life in the United States in 1820, but it also describes the plight of many people in the world today.

FIGURE 11.2

**Real Per Capita GDP over 200 Years (in 2020 U.S. dollars)**

Two hundred years ago, all regions and nations were poor. The modern differences in wealth we see around the world today began to emerge before 1900. But the twentieth century saw unprecedented growth take hold in the United States and Western Europe. Unfortunately, some parts of the globe today are no better off than the United States and Western Europe were in 1800.

*Source:* Maddison Project Database (MPD) 2020.




While many of the current disparities between nations began about 200 years ago, some nations have moved from poor to rich as recently as the past few decades.

## Measuring Economic Growth

Overall, people today are much wealthier than they were 200 years ago; however, this properity did not occur overnight. Rather, income grew a little bit each year; there is a striking mathematical truth about growth: small difference in growth rates lead to large differences in wealth levels over time. In this section, we explain how economic growth rates are computed, and we consider the level of growth a nation needs for its population to experience significant improvements in living standards.

The Mathematics of growth rates

TABLE 11.3

**World Economic Growth for Different Historical Eras**

| Years | Annual growth rate |
|---|---|
| AD 1–1800 | 0.02% |
| 1800–1900 | 0.64 |
| 1900–1950 | 1.04 |
| 1950–2000 | 2.12 |

*Source:* Angus Maddison, "Statistics on World Population, GDP and Per Capita GDP, 1–2008 AD."

We have seen that economic growth is the annual growth rate of real per capita GDP. It is our measure of how an average person's income changes over time, including an allowance for price changes; but the government reports overall GDP data in nominal terms. Therefore, to get an accurate growth rate, we need to account for both inflation and population growth; we can use the following equation to approximate economic growth, where $\%\Delta$ indicates the percentage change in a variable:

$$\text{economic growth} \approx \%\Delta\text{in nominal GDP} - \%\Delta\text{price level} - \%\Delta\text{population} \qquad (1)$$

A word of caution about terminology is in order. There's a big difference between nominal GDP growth, real GDP growth, and real per capita GDP growth. (In Table 11.4, these terms appear in orange.); but sloppy economic reporting sometimes confuses the terms. You may read something like "the U.S economy grew by 2.3% in 2019," which refers to real GDP growth and is not calculated on a per capita basis; it would be an even bigger mistake to claim that U.S economic growth in 2019 was 4.1% , a number not adjusted for either population growth or inflation. Such confusing wording is a common mistake in reports on international economic growth statistics.

TABLE 11.4

| Computing an Economic Growth Rate | | |
|---|---|---|
| U.S. GDP in 2018 (in millions) | $20,580,200 | |
| U.S. GDP in 2019 (in millions) | $21,427,700 | |
| **Nominal GDP growth** | 4.1% | |
| – Price growth (inflation) | 1.8% | |
| = **Real GDP growth** | 2.3% | |
| – Population growth | 0.5% | |
| ≈ **Real per capita GDP growth** | 1.8% | ≈ **Economic growth** |

*Sources:* GDP data, U.S. Bureau of Economic Analysis, https://www.bea.gov/data/gdp/gross-domestic-product; population data, U.S. Census Bureau, https://www.census.gov/newsroom/press-releases/2019/popest-nation.html.

## Growth rates and income levels

Before we consider policies that might aid economic growth, we need to look more closely at how growth rates affect income level.

First, consider how significant it is when income doubles, or increases by 100%. If your income doubled today - all else being equal - you could afford twice as much of everything you are currently buying. Now imagine what would happen if income doubled for an entire country or even for all countries. In the United States, real per capita GDP doubled in the 40 years between 1980 and 2020. This means that the average person living in the United States now can afford twice as much food, clothing, transportation, education, and even government services as the average U.S resident in 1980; that's quite a difference.

But increasing real income by 100% in a single year is not realistic; let's use an annual growth rate closer to reality - say, 2%, which has historically been an average rate of economic growth for the United States. With 2% annual growth, how long does it take to double your income?

Table 11.5 illustrates the process of compounding over time by showing the increase from year to year.

TABLE 11.5

**Compound Growth**

| | Income | 2% increase in income | Income in next year |
|---|---|---|---|
| Year 1 | $50,000.00 | $1,000.00 | $51,000.00 |
| Year 2 | 51,000.00 | 1,020.00 | 52,020.00 |
| Year 3 | 52,020.00 | 1,040.40 | 53,060.40 |
| Year 4 | 53,060.40 | 1,061.21 | 54,121.61 |
| Year 5 | 54,121.61 | 1,082.43 | 55,204.04 |
| . . . | | | |
| Year 35 | 100,000 | | |

TABLE 11.6

**A Dollar of Income at Different Growth Rates**

| Annual growth rate | Years to double | Value after 70 years (approximate) |
|---|---|---|
| 0% | Never | $1 |
| 1 | 70 | 2 |
| 2 | 35 | 4 |
| 3 | 23.3 | 8 |
| 4 | 17.5 | 16 |

The Rule of 70

We saw that when income grows at 2% per year, it doubles in approximately 35 years. A simple rule known as the rule of 70 determines the lenght of time necessary for a sum of money to double at a particular growth rate. According to the rule of 70: *If the annual growth rate of a variable $x\%$ , size of that variable doubles approximately every* $70 \div x$ *years.*

The rule of 70 is an approximation, but it works well with typical economic growth rates.

Table 11.6 illustrates the rule of 70 by showing how long it takes for a single dollar of income to double in value, given different growth rates.

The rule of 70 shows us that small and consistent growth rates, if sustained for a decade or two, can greatly improve living standards. Over the long course of history, growth rates were essentially zero, but the past two centuries have seen small, consistent growth rates, and the standard of living for many has increased dramatically.

We can look at actual growth rates of various countries over a long period to see the impact on income levels. Table 11.7 presents growth rates of several countries over the 66 years from 1950 to to 2016.

**TABLE 11.7**

**Economic Growth, 1950–2016**

| | Average annual growth rate | | Real per capita GDP in 1950 | Real per capita GDP in 2016 |
|---|---|---|---|---|
| less than 1% growth | −0.5% | Haiti | 2,485 | 1,728 |
| | −0.3 | Afghanistan | 2,392 | 1,929 |
| | −0.3 | Liberia | 1,005 | 829 |
| | 0.3 | Burundi | 536 | 665 |
| about 1% growth | 1.1 | Honduras | 2,381 | 4,796 |
| | 1.1 | Kenya | 1,496 | 3,169 |
| | 1.2 | Argentina | 8,759 | 18,875 |
| about 2% growth | 1.9 | United States | 15,241 | 53,015 |
| | 2.1 | Hungary | 6,034 | 23,279 |
| | 2.1 | Mexico | 4,179 | 16,133 |
| | 2.1 | Sweden | 11,385 | 44,659 |
| greater than 2% growth | 3.0 | Turkey | 2,583 | 17,906 |
| | 3.1 | Spain | 4,098 | 30,110 |
| | 3.1 | India | 824 | 6,125 |
| | 3.1 | Israel | 4,192 | 31,701 |
| | 3.9 | Japan | 3,023 | 37,465 |
| | 4.6 | Botswana | 779 | 15,198 |
| | 4.6 | China | 637 | 12,569 |
| | 5.3 | South Korea | 1,178 | 36,103 |

*Sources:* Maddison Project Database, version 2018; Jutta Bolt, Robert Inklaar, Herman de Jong, and Jan Luiten van Zanden, "Rebasing 'Maddison': New Income Comparisons and the Shape of Long-Run Economic Development," Maddison Project Working Paper No. 10, January 2018, https://www.rug.nl/ggdc/historicaldevelopment/maddison/research.

Note: Real GDP per capita figures are rounded to the nearest dollar, and population figures are rounded to the nearest 1,000.

Clearly, economic growth experiences have varied widely across time and place, but relatively small and consistent growth rates are sufficent to move a nation out of poverty the period of a few generation. And this movement out of poverty really matters for the people who live in these nations.

TABLE 11.8

**The United States: 1960 versus 2018**

| General Characteristics | 1960 | 2018 |
|---|---|---|
| Life expectancy | 69.7 years | 78.7 years |
| Physicians per 10,000 people | 14.8 | 26 |
| Years of school completed | 10.5 (median) | 13 (average) |
| Portion of income spent on food | 27% | 11% |
| Average workweek | 40.9 hours | 34.5 hours |
| Workforce in agriculture or manufacturing | 37% | 16% |
| Home ownership | 61.9% | 64.3% |
| **New Home** |  |  |
| Size | 1,200 square feet | 2,645 square feet |
| Bedrooms | 2 | 4 |
| Bathrooms | 1 | 3 |
| Central air conditioning? | no | yes |
| **Best-Selling Car** |  |  |
| Model | Chevrolet Impala | Toyota Camry |
| Price (2018 dollars) | $22,637 | $23,645 |
| Miles per gallon | 13–16 | 29–41 |
| Horsepower | 135 | 203 |
| Air conditioning? | optional | standard |
| Automatic transmission? | optional | standard |
| Airbags? | no | standard |
| Power locks and windows? | no | standard |
| **TV** |  |  |
| Size | 23 inches | 65 inches |
| Display | black & white | high-definition color |
| Price (2018 dollars) | $1,594 | $699 |

Sources: U.S. Census Bureau, *Statistical Abstract of the United States*; U.S. Bureau of Labor Statistics.

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## How do resources and technology contribute to economic growth?

At this point, you may wonder what can be done to provide the best opportunity for economic growth. We see economic growth in many, though certainly not all, nations; but even in those that have grown in the past, future growth is not assured. We now turn to major sources of economic growth.

Economists continue to debate the relative importance of the factors leading to economic growth. However, there is a general consensus on the significance of three factors for economic growth: *resources, technology, and institutions*. In this section, we examine the first two; later in the chapter, we look at institutions.