Appendix 10.1. Basic National Income Accounting

Chapter 10 discusses several modifications and alternatives to traditional national income accounting. Standard accounting measures, such as **gross national product (GNP)** and **gross domestic product (GDP)**, are widely accepted estimates of the health of a national economy. However, these measures have numerous technical and conceptual limitations. Some background knowledge of how they are calculated and interpreted is useful for understanding the arguments for adjusting or replacing these measures. If you have not taken an introductory macroeconomics course or need to refresh your knowledge, this appendix will help you work through the concepts presented in the chapter.

gross national product (GNP): the total market value of all final goods and services produced by citizens of a particular country in a year, regardless of where such production takes place.
gross domestic product (GDP): the total market value of all final goods and services produced within a national border in a year.

National income accounting was first developed in the United States in the 1930s to provide policy makers with information on the overall level of economic activity in the country. National income accounting was not designed to estimate the welfare of society—only the aggregate level of economic production. Also, at the time the accounts were being designed, environmental degradation was not an important issue.

For many years, the official measure of national economic activity in the United States was the gross national product, defined as the final market value of all new goods and services produced by the citizens of the country over a period of time (typically one year). GNP includes goods and services produced by U.S. citizens and corporations in foreign countries but not goods and services produced within U.S. borders by foreign citizens and corporations.

In the early 1990s the United States switched to gross domestic product as its official measure to conform with international standards developed by the United Nations. GDP measures the value of goods and services produced within the national boundaries of a country regardless of the producer's nationality. Thus, GDP excludes production by U.S. citizens and corporations in foreign countries. In practice, there is normally little quantitative difference between GNP and GDP. In 2024 the values differed by less than 1% in the United States.

It is important to note that GNP and GDP measure only the final value of goods and services. Intermediate values are excluded to avoid double counting. For example, consider some of the steps involved in producing this textbook. First, a lumber company harvested wood and sold the wood to a paper mill. Then, the paper mill produced paper and sold it to a printing company. The printing company then printed the text under contract with the publisher. The publisher then sold the book to a retail store for final sale to you. If we add up the prices paid by the paper mill, printing company, publisher, retail store, and you, we end up with a value much higher than the price you paid for the book. The greater the number of intermediate production steps taken to produce an item, the higher the sum of all the prices paid. So all the intermediate steps are not counted, and only the final price you paid is included in GNP and GDP.

Since it may be difficult in practice to distinguish intermediate from final goods, the accounting method generally used to compute GNP/GDP is the **value-added method**, in which the extra value added at each step of the production process is counted. In the textbook example, the value added for the paper mill is the value of its output minus the cost of inputs purchased from the lumber company. The sum of the values added at all stages of production is equal to the value of the final good.

value-added method: the additional value of a good or service from each step in the production process.

GNP and GDP only count the production of new goods. If you purchased this book second-hand from a store or another student, then it would not be included in the national accounts. The sale of used products does not contribute to current economic production.

Adjusting for Depreciation, Population Growth, and Inflation

One reason GDP is not the best measure of national income is that a portion of investment in capital equipment, such as factories and machinery, simply replaces worn-out capital. Since capital that wears out or becomes obsolete decreases national wealth, the depreciation of this capital should be counted as a deduction from GDP. Gross investment minus depreciation is called net investment. If we deduct capital depreciation from GDP, we get a measure called

net domestic product (NDP). The depreciation of fixed capital amounts to about 15% of GDP in the United States.

net domestic product (NDP) gross domestic product minus the value of depreciation of produced, or human-made, capital.

Of course, politicians and economists hope that the economy expands over time and GDP increases. But an increase in GDP does not necessarily indicate greater wealth for a country's citizens. GDP could increase simply because the country has a higher population. We can account for population growth (or decline) in national accounting by calculating GDP per capita, equal to GDP divided by population. Data on GDP per capita also allows us to compare economic production across different countries. For example, U.S. GDP is much greater than Norwegian GDP, but when we adjust for population size, we find that GDP per capita is higher in Norway than in the United States.

The other factor we need to control for when comparing GDP values across time is inflation. Remember that GDP is based on market prices, and it could grow simply because market prices have risen. When comparing GDP data from different years, we need to use **constant dollars**. For example, suppose that the general level of prices in 2020 was twice as high as it was in 1990. If we wanted to compare GDP for these two years, we could compare them using 2020 dollars by doubling the GDP from 1990. Or we could compare them using 1990 dollars by dividing the GDP for 2020 in half. The first method gives us **real GDP** in 2020 dollars, while the second gives us real GDP in 1990 dollars.

constant dollars: an adjustment of economic time series data to account for changes in inflation.
real GDP: gross domestic product corrected for inflation using a price index.

U.S. GDP has grown tremendously in recent decades. As seen in Table 1, GDP increased by a factor of 97 between 1950 and 2024 if we do not consider any adjustments. Adjusting for population, we find that economic production per person has increased by about a factor of 43. But most of this increase is due to inflation. When we adjust for differences in price level by calculating real GDP per capita in 2017 dollars, we discover that economic production per person has actually increased by a factor of 4.2. This still suggests a large

increase in the standard of living for the average American, but a much less significant increase than would be implied looking at the unadjusted aggregate GDP data.

Table 1. Historical Gross Domestic Product (GDP) Data, United States

Year	Unadjusted U.S. GDP ($ Billion)	Unadjusted GDP per Capita (Dollars)	GDP per Capita in 2017 Dollars
1950	300	1,977	16,208
1960	542	3,001	19,364
1970	1,073	5,233	25,922
1980	2,857	12,547	31,869
1990	5,963	23,835	39,618
2000	10,251	36,300	49,915
2010	15,049	48,570	54,189
2020	21,354	64,351	61,076
2024	29,185	85,784	68,501

Source: U.S. Bureau of Economic Analysis, Table 7.1. Selected Per Capita Product and Income Series in Current and Chained Dollars.

Comparing GDP for Different Countries

A final adjustment that is made when comparing GDP data across countries is to adjust for **purchasing power parity (PPP)**. Even if we use currency exchange rates to put all countries' GDP per capita in U.S. dollars, we should still adjust for differences in what a dollar can purchase in different countries. For example, a U.S. dollar converted into Chinese currency will buy a lot more in China than it will in the United States.

purchasing power parity (PPP): an adjustment to GDP to account for differences in spending power across countries.

National income accounting data illustrate the varying economic conditions of people in different countries. We can use the data to compare rates of economic development and to determine income inequality between countries. But we need to be careful about interpreting national accounting data. GDP measures only the aggregate level of economic production; it does not measure social welfare. If GDP per capita rises only because people are working longer hours, we cannot conclude that they are happier. Also, GDP per capita could increase only because the wealthy members of society are becoming wealthier. GDP data tell us nothing about the level of economic inequality in a country. This and other known problems with GDP make it important to be aware of its limits as a measure of well-being—even before we consider the environmental and resource issues discussed in this chapter.