

10

MEASURING A NATION'S INCOME

LEARNING OBJECTIVES:

By the end of this chapter, students should understand:

- why an economy's total income equals its total expenditure.
- how gross domestic product (GDP) is defined and calculated.
- the breakdown of GDP into its four major components.
- the distinction between real GDP and nominal GDP.
- whether GDP is a good measure of economic well-being.

CONTEXT AND PURPOSE:

Chapter 10 is the first chapter in the macroeconomic section of the text. It is the first of a two-chapter sequence that introduces students to two vital statistics that economists use to monitor the macroeconomy—GDP and the consumer price index. Chapter 10 develops how economists measure production and income in the macroeconomy. The following chapter, Chapter 11, develops how economists measure the level of prices in the macroeconomy. Taken together, Chapter 10 concentrates on the *quantity* of output in the macroeconomy while Chapter 11 concentrates on the *price* of output in the macroeconomy.

The purpose of this chapter is to provide students with an understanding of the measurement and the use of gross domestic product (GDP). GDP is the single most important measure of the health of the macroeconomy. Indeed, it is the most widely reported statistic in every developed economy.

KEY POINTS:

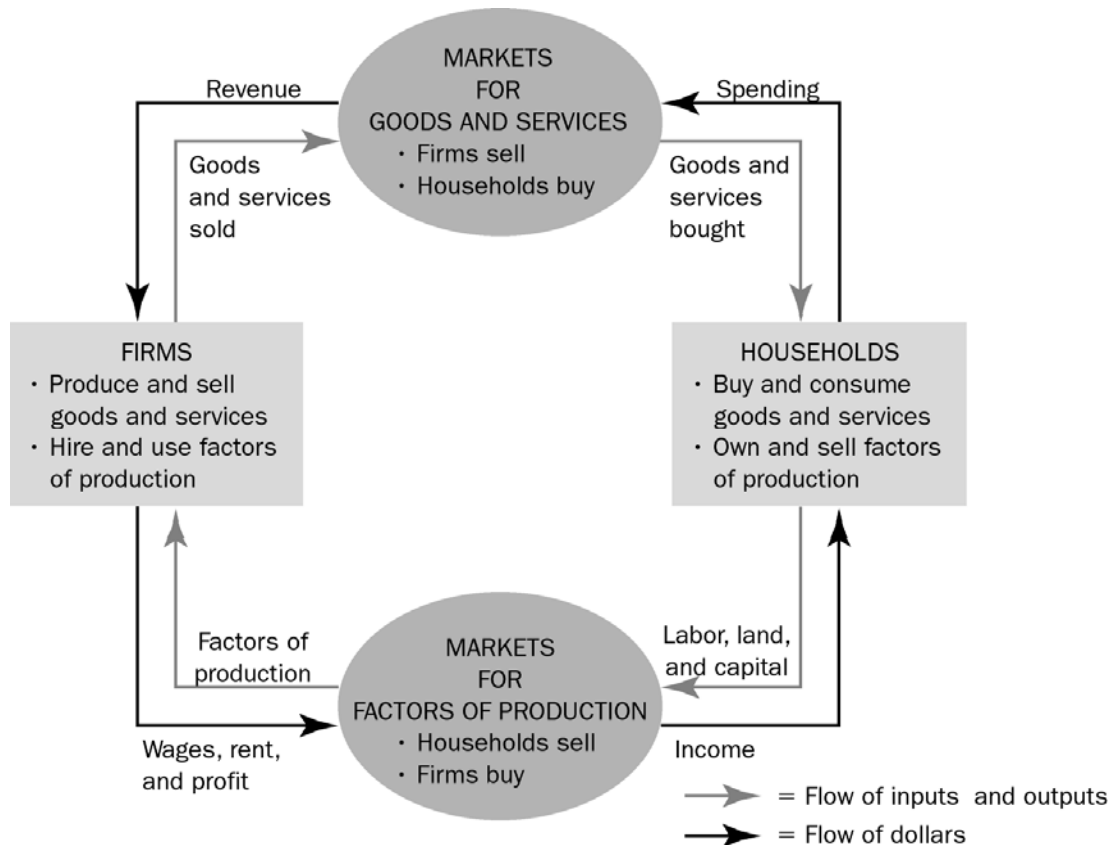
1. Because every transaction has a buyer and a seller, the total expenditure in the economy must equal the total income in the economy.
2. Gross domestic product (GDP) measures an economy's total expenditure on newly produced goods and services and the total income earned from the production of these goods and services. More precisely, GDP is the market value of all final goods and services produced within a country in a given period of time.

3. GDP is divided among four components of expenditure: consumption, investment, government purchases, and net exports. Consumption includes spending on goods and services by households, with the exception of purchases of new housing. Investment includes spending on new equipment and structures, including households' purchases of new housing. Government purchases include spending on goods and services by local, state, and federal governments. Net exports equal the value of goods and services produced domestically and sold abroad (exports) minus the value of goods and services produced abroad and sold domestically (imports).
4. Nominal GDP uses current prices to value the economy's production of goods and services. Real GDP uses constant base-year prices to value the economy's production of goods and services. The GDP deflator—calculated from the ratio of nominal to real GDP—measures the level of prices in the economy.
5. GDP is a good measure of economic well-being because people prefer higher incomes to lower incomes. But it is not a perfect measure of well-being. For example, GDP excludes the value of leisure and the value of a clean environment.

CHAPTER OUTLINE:

- I. Review of the Definitions of Microeconomics and Macroeconomics
 - A. Definition of **microeconomics**: the study of how households and firms make decisions and how they interact in markets.
 - B. Definition of **macroeconomics**: the study of economy-wide phenomena including inflation, unemployment, and economic growth.
- II. The Economy's Income and Expenditure
 - A. To judge whether or not an economy is doing well, it is useful to look at Gross Domestic Product (GDP).
 1. GDP measures the total income of everyone in the economy.
 2. GDP measures total expenditure on an economy's output of goods and services.
 - B. For an economy as a whole, total income must equal total expenditure.
 1. If someone pays someone else \$100 to mow a lawn, the expenditure on the lawn service (\$100) is exactly equal to the income earned from the production of the lawn service (\$100).
 2. We can also use the circular flow diagram from Chapter 2 to show why total income and total expenditure must be equal.

Figure 1



- Households buy goods and services from firms; firms use this money to pay for resources purchased from households.
- In the simple economy described by this circular flow diagram, calculating GDP could be done by adding up the total purchases of households or summing total income earned by households.
- Note that this simple diagram is somewhat unrealistic as it omits saving, taxes, government purchases and investment purchases by firms. However, because a transaction always has a buyer and a seller, total expenditure in the economy must be equal to total income.

III. The Measurement of Gross Domestic Product

- A. Definition of **gross domestic product (GDP)**: the market value of all final goods and services produced within a country in a given period of time.



GDP represents the amount of money one would need to purchase one year's worth of the economy's production of all final goods and services.

- B. "GDP is the Market Value . . ."

- To add together different items, market values are used.

2. Market values are calculated by using market prices.
- C. "... of All ..."
1. GDP includes all items produced and sold legally in the economy.
 2. The value of housing services is somewhat difficult to measure.
 - a. If housing is rented, the value of the rent is used to measure the value of the housing services.
 - b. For housing that is owned (or mortgaged), the government estimates the rental value and uses this figure to value the housing services.
 3. GDP does not include illegal goods or services or items that are not sold in markets.
 - a. When you hire someone to mow your lawn, that production is included in GDP.
 - b. If you mow your own lawn, that production is not included in GDP.
- D. "... Final ..."
1. Intermediate goods are not included in GDP.
 2. The value of intermediate goods is already included as part of the value of the final good.
 3. Goods that are placed into inventory are considered to be "final" and included in GDP as a firm's inventory investment.
 - a. Goods that are sold out of inventory are counted as a decrease in inventory investment.
 - b. The goal is to count the production when the good is finished, which is not necessarily the same time that the product is sold.
- E. "... Goods and Services ..."
1. GDP includes both tangible goods and intangible services.
- F. "... Produced ..."
1. As mentioned above, current production is counted.
 2. Used goods that are sold do not count as part of GDP.
- G. "... Within a Country ..."
1. GDP measures the production that takes place within the geographical boundaries of a particular country.

2. If a Canadian citizen works temporarily in the United States, the value of his output is included in GDP for the United States. If an American owns a firm in Haiti, the value of the production of that firm is not included in U.S. GDP.
- H. "... in a Given Period of Time."
1. The usual interval of time used to measure GDP is a quarter (three months).
 2. When the government reports GDP, the data is generally reported on an annual basis.
 3. In addition, data are generally adjusted for regular seasonal changes (such as Christmas).

IV. *FYI: Other Measures of Income*

- A. Gross National Product (GNP) is the total income earned by a nation's permanent residents.
 1. GNP includes income that American citizens earn abroad.
 2. GNP excludes income that foreigners earn in the United States.
- B. Net National Product (NNP) is the total income of a nation's residents (GNP) minus losses from depreciation (wear and tear on an economy's stock of equipment and structures).
- C. National income is the total income earned by a nation's residents in the production of goods and services.
 1. National income differs from NNP by excluding indirect business taxes and including business subsidies.
 2. NNP and national income also differ due to "statistical discrepancy."
- D. Personal income is the income that households and noncorporate businesses receive.
- E. Disposable personal income is the income that households and noncorporate businesses have left after taxes and other obligations to the government.

V. The Components of GDP

- A. GDP (Y) can be divided into four components: consumption (C), investment (I), government purchases (G), and net exports (NX).

$$Y = C + I + G + NX$$

- B. Definition of **consumption**: spending by households on goods and services, with the exception of purchases of new housing.
- C. Definition of **investment**: spending on capital equipment, inventories, and structures, including household purchases of new housing.

- D. Definition of **government purchases**: **spending on goods and services by local, state, and federal governments.**
1. Salaries of government workers are counted as part of the government purchases component of GDP.
 2. Transfer payments are not included as part of the government purchases component of GDP.
- E. Definition of **net exports**: **spending on domestically produced goods by foreigners (exports) minus spending on foreign goods by domestic residents (imports).**

Table 1

F. *Case Study: The Components of GDP*

1. Table 1 shows these four components of GDP for 2001.
2. The data for GDP come from the Bureau of Economic Analysis, which is part of the Department of Commerce.

G. UK data

<http://www.hm-treasury.gov.uk/media/E5A/11/E5A1172B-BCDC-D4B3-10F6E1A09924135E.xls>

<http://www.statistics.gov.uk/>

VI. Real Versus Nominal GDP

- A. There are two possible reasons for total spending to rise from one year to the next.
1. The economy may be producing a larger output of goods and services.
 2. Goods and services could be selling at higher prices.
- B. When studying GDP over time, economists would like to know if output has changed (not prices).
- C. Thus, economists measure real GDP by valuing output using a fixed set of prices.
- D. A Numerical Example

Table 2

1. Two goods are being produced: hot dogs and hamburgers.

Year	Price of Hot Dogs	Quantity of Hot Dogs	Price of Hamburgers	Quantity of Hamburgers
2001	\$1	100	\$2	50
2002	\$2	150	\$3	100

2003	\$3	200	\$4	150
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2. Definition of **nominal GDP**: the production of goods and services valued at current prices.

Nominal GDP for 2001 = $(\$1 \times 100) + (\$2 \times 50) = \$200$.

Nominal GDP for 2002 = $(\$2 \times 150) + (\$3 \times 100) = \$600$.

Nominal GDP for 2003 = $(\$3 \times 200) + (\$4 \times 150) = \$1,200$.

3. Definition of **real GDP**: the production of goods and services valued at constant prices.

Let's assume that the base year is 2001.

Real GDP for 2001 = $(\$1 \times 100) + (\$2 \times 50) = \$200$.

Real GDP for 2002 = $(\$1 \times 150) + (\$2 \times 100) = \$350$.

Real GDP for 2003 = $(\$1 \times 200) + (\$2 \times 150) = \$500$.

- E. Because real GDP is unaffected by changes in prices over time, changes in real GDP reflect changes in the amount of goods and services produced.



When there is inflation, nominal GDP can increase while real GDP actually declines. Real GDP will be used as a proxy for aggregate production throughout the course.

ALTERNATIVE EXAMPLE:

The county of Leicestershire produces two goods: cricket balls and rugby balls. Below is a table showing prices and quantities of output for three years:

Year	Price of Cricket balls	Quantity of Cricket balls	Price of Rugby balls	Quantity of Rugby balls
Year 1	\$10	120	\$12	200
Year 2	12	200	15	300
Year 3	14	180	18	275

Nominal GDP in Year 1 = $(\$10 \times 120) + (\$12 \times 200) = \$3,600$

Nominal GDP in Year 2 = $(\$12 \times 200) + (\$15 \times 300) = \$6,900$

Nominal GDP in Year 3 = $(\$14 \times 180) + (\$18 \times 275) = \$7,470$

Using Year 1 as the Base Year:

Real GDP in Year 1 = $(\$10 \times 120) + (\$12 \times 200) = \$3,600$

Real GDP in Year 2 = $(\$10 \times 200) + (\$12 \times 300) = \$5,600$

Real GDP in Year 3 = $(\$10 \times 180) + (\$12 \times 275) = \$5,100$

(Note that nominal GDP rises from Year 2 to Year 3, but real GDP falls.)

GDP deflator for Year 1 = $(\$3,600/\$3,600) \times 100 = 1 \times 100 = 100$

GDP deflator for Year 2 = $(\$6,900/\$5,600) \times 100 = 1.2321 \times 100 = 123.21$

GDP deflator for Year 3 = $(\$7,470/\$5,100) \times 100 = 1.4647 \times 100 = 146.47$

F. The GDP Deflator

1. Definition of **GDP deflator**: a measure of the price level calculated as the ratio of nominal GDP to real GDP times 100.

$$\text{GDP deflator} = \frac{\text{Nominal GDP}}{\text{Real GDP}} \times 100$$

2. Example Calculations

GDP Deflator for 2001 = $(\$200 / \$200) \times 100 = 100$.

GDP Deflator for 2002 = $(\$600 / \$350) \times 100 = 171$.

GDP Deflator for 2003 = $(\$1200 / \$500) \times 100 = 240$.



Nominal GDP and real GDP are equal in the base year. This implies that the GDP deflator for the base year will always be 100.

G. Case Study: Real GDP over Recent History

Figure 2

1. Figure 2 shows quarterly data on real GDP for the United States since 1970.
2. We can see that real GDP has increased over time.
3. We can also see that there are times when real GDP declines. These periods are called recessions.

H. In the News: GDP Lightens Up

1. Over the years, products produced in the United States have become lighter in weight due to changes in the types of products produced and the resources used.
2. This is a *Wall Street Journal* article discussing comments made by Federal Reserve Chairman Alan Greenspan concerning this change.

VII. GDP and Economic Well-Being

- A. GDP measures both an economy's total income and its total expenditure on goods and services.
- B. GDP per person tells us the income and expenditure level of the average person in the economy.
- C. GDP, however, may not be a very good measure of the economic well-being of an individual.

1. GDP omits important factors in the quality of life including leisure, the quality of the environment, and the value of goods produced but not sold in formal markets.
2. GDP also says nothing about the distribution of income.
3. However, a higher GDP does help us achieve a good life. Nations with larger GDP generally have better education and better health care.

D. *Case Study: International Differences in GDP and the Quality of Life*

Table 3

1. Table 3 shows real GDP per person, life expectancy, and adult literacy rates for 12 countries.
2. In rich countries, life expectancy is higher and adult literacy rates are also high.
3. In poor countries, people typically live only into their 50s and only about half of the adult population is literate.

E. *Case Study: Who Wins at the Olympics?*

1. When the Olympics end, commentators use the number of medals each nation takes as a measure of success.
2. In studying the determinants of success at the Olympics, two economists have found that the level of total GDP matters. It does not matter if the high total comes from a high level of GDP per person or from a large population.
3. In addition to GDP, two other factors influence the number of medals won.
 - a. Being the host country.
 - b. Being a centrally planned economy.