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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:

Have a contest and see which student can come closest
in guessing the level of GDP for the United States last
year.

that transfer payments are actually negative taxes
representing payments from the government to
individuals (with no good or service provided in
return) rather than payments from individuals to the
government. Define net taxes as the difference

interested in learning more about what it is. This
develops the basic
measure of *both* aggregate production and aggregate
income in the United States are fueling the domestic economy.

macroeconomic variation over a period of one year. This chapter
concentrates on the *value 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:

- Because every transaction has a buyer and a seller, the total
expenditure in the economy must equal the total income in the
economy.

- 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.

- 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).

- 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.

- 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.

<u>CHAPTER OUTLINE:</u>

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**

ALTERNATIVE CLASSROOM EXAMPLE:

Figure 2 that you point out that nominal GDP and real
GDP will be equal in the base year. This implies that
the GDP deflator for the base year will always be
equal to 100.

produces two goods: footballs and basketballs. Below is a   t is
table showing prices and quantities of output for three
years:

Year	Price of Footballs	Quantity of Footballs	Price of Basketballs	Quantity of Basketballs
Year 1	$10	120	$12	200
Year 2	12	200	15	300
Year 3	14	180	18	275

Nominal GDP in Year 1 = ($10 × 120) + ($12 × 200) = $3,600
Nominal GDP in Year 2 = ($12 × 200) + ($15 × 300) =
$6,900 economy.
Nominal GDP in Year 3 = ($14 × 180) + ($18 × 275) =
$7,470   GDP measures total expenditure on an economy's
        output of goods and services.

Using Year 1 as the Base Year:
Real GDP in Year 1 = ($10 × 120) + ($12 × 200) = $3,600
Real GDP in Year 2 = ($10 × 200) + ($12 × 300) = $5,600
Real GDP in Year 3 = ($10 × 180) + ($12 × 275) = $5,100
(Note that nominal GDP rises from Year 2 to Year 3, but lawn,

real GDP The expenditure on the lawn service ($100) is exactly equal to the income earned from the production of the lawn service ($100).

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

GDP deflator for Year 2 = ($6,900/$5,600) We can also use the circular-flow diagram from Chapter 12 to show why total income and total GDP deflator for Year 3 = ($7,470/$5,100) × 100 = 1.4647 × 100 = 146.47

expenditure must be
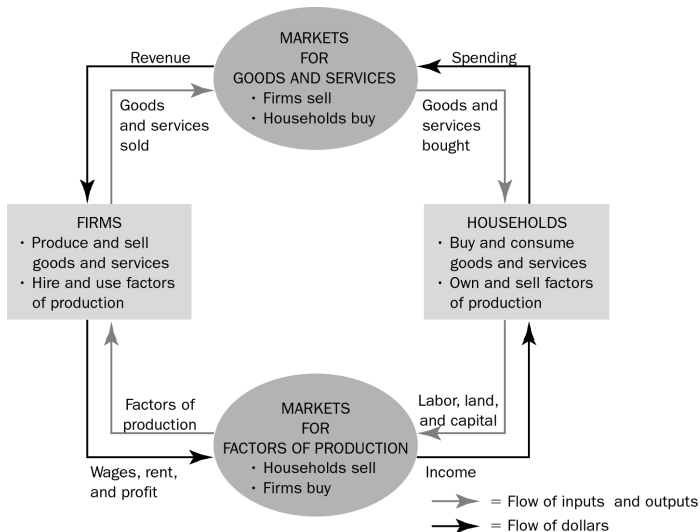
a. Households buy goods and services from firms; firms use this money to pay for resources purchased from households.

b. 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 paid by firms.

     c.   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**.

   B.   "GDP Is the Market Value . . ."

      1.   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. Only 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 her output is included in GDP for the United States. If an American owns a factory in Haiti, the value of the production of that factory 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 year or a quarter (three months).

2. When the government reports GDP, the data are generally reported on an annual basis.

3. In addition, data are generally adjusted for regular seasonal changes (such as Christmas).

I. In addition to summing expenditure, the government also calculates GDP by adding up total income in the economy.

    1. The two ways of calculating GDP almost exactly give the same answer.

    2. The difference between the two calculations of GDP is called the *statistical discrepancy*.

J. *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.

IV.   The Components of GDP

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

   1.   GDP accounting uses the word "investment" differently from how we use the term in everyday conversation.

   2.   When a student hears the word "investment," she thinks of financial instruments such as stocks and bonds.

   3.   In GDP accounting, investment means purchases of investment goods such as capital equipment, inventories, or structures.

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)**.

F.   *Case Study: The Components of U.S. GDP*

    1.   Table 1 shows these four components of GDP for 2012.

    2.   The data for GDP come from the Bureau of Economic Analysis, which is part of the Department of Commerce.

V.   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

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
2013	$1	100	$2	50
2014	$2	150	$3	100
2015	$3	200	$4	150

2. Definition of **nemimal GDP: the production of goods and services valued at current prices**.

    Nominal GDP for 2013 = ($1 × 100) + ($2 × 50) = $200.
    Nominal GDP for 2014 = ($2 × 150) + ($3 × 100) = $600.
    Nominal GDP for 2015 = ($3 × 200) + ($4 × 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 2013.

    Real GDP for 2013 = ($1 × 100) + ($2 × 50) = $200.
    Real GDP for 2014 = ($1 × 150) + ($2 × 100) = $350.
    Real GDP for 2015 = ($1 × 200) + ($2 × 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.

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**.

2.   Example Calculations

GDP Deflator for 2013= ($200 / $200) × 100 = 100.
GDP Deflator for 2014 = ($600 / $350) × 100 = 171.
GDP Deflator for 2015 = ($1200 / $500) × 100 = 240.

G.   *Case Study: Real GDP over Recent History*

1.   Figure 2 shows quarterly data on real GDP for the United States since 1965.

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.

VI.   Is GDP a Good Measure of 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.   *In the News: The Underground Economy*

   1.   The measurement of GDP misses many transactions that take place in the underground economy.

2. This article compares the underground economies of the United States and several other countries.

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

1. Table 3 shows real GDP per person, life expectancy, the average years of schooling among adults, and the percentage of the population that reports being satisfied with the quality of water they have available.

2. In rich countries, life expectancy is higher, adults have more years of schooling and a greater percentage of the population reports being satisfied with the quality of water they have available.

3. In poor countries, people typically die 10 to 20 years earlier, have less than half as much schooling, and about a third to a half of the population is unsatisfied with the quality of water they have to drink.

Activity 1—GDP and Well-Being

Type: In-class demonstration
Topics: Per capita GDP
Materials needed: None
Time: 15 minutes
Class limitations: Works in any size class

Purpose
This activity examines the usefulness and limits of measures of GDP. Students often have difficulty accepting the use of GDP as a proxy for well-being. Per capita GDP does not directly measure well-being but it is highly correlated with direct measures. Making this correlation explicit helps students understand the emphasis on GDP in macroeconomics.

Instructions
Ask students the following questions. Discuss each before moving to the next question.

1. If GDP is a good measure of well-being, why is Switzerland's GDP so much lower than India's GDP or China's GDP?
2. What measures would be better to compare the well-being of different countries?
3. How do you expect these direct measures to correlate with per capita GDP?

Common Answers and Points for Discussion
1. GDP itself tells very little; Switzerland's GDP is much lower than that of India or China, yet Swiss citizens have one of the highest standards of living in the world. The difference, of course, is population. Switzerland is a small country, so its GDP is relatively small, despite its wealth. The appropriate comparison is per capita GDP.

   A more interesting question is "Is per capita GDP a good measure of well-being?" Or worded another way: "What constitutes well-being?"
2. Well-being can be measured directly in a variety of ways. Students often suggest these:

Health care
Food
Education

      These are certainly better measures than money income, but they can be difficult to collect and interpret.

   3.   Although per capita GDP is not a direct measure of well-being, it can be used as a proxy for direct measures. The wealthiest countries have per capita incomes over 10 times higher than the poorest.

F.   *In the News: Measuring Macroeconomic Well-Being*

    1.   Some economists wonder if we need a better measure of economic well-being.

    2.   This article from *The Wall Street Journal* describes some attempts at creating a better measure of well-being.

Quick Quizzes:

1. Gross domestic product measures two things at once: (1) the total income of everyone in the economy and (2) the total expenditure on the economy's output of final goods and services. It can measure both of these things at once because all expenditure in the economy ends up as someone's income.

2. The production of a pound of caviar contributes more to GDP than the production of a pound of hamburger because the contribution to GDP is measured by market value and the price of a pound of caviar is much higher than the price of a pound of hamburger.

3. The four components of expenditure are: (1) consumption; (2) investment; (3) government purchases; and (4) net exports. The largest component is consumption, which accounts for more than 70 percent of total expenditure.

4. Real GDP is the production of goods and services valued at constant prices. Nominal GDP is the production of goods and services valued at current prices. Real GDP is a better measure of economic well-being because changes in real GDP reflect changes in the amount of output being produced. Thus, a rise in real GDP means people have produced more goods and services, but a rise in nominal GDP could occur either because of increased production or because of higher

prices.

5.   Although GDP is not a perfect measure of well-being, policymakers should care about it because a larger GDP means that a nation can afford better healthcare, better educational systems, and more of the material necessities of life.

Questions for Review:

1.   An economy's income must equal its expenditure, because every transaction has a buyer and a seller. Thus, expenditure by buyers must equal income to sellers.

2.   The production of a luxury car contributes more to GDP than the production of an economy car because the luxury car has a higher market value.

3.   The contribution to GDP is $3, the market value of the bread, which is the final good that is sold.

4.   The sale of used records does not affect GDP at all because it involves no current production.

5.   The four components of GDP are consumption, such as the purchase of a DVD; investment, such as the purchase of a computer by a business; government purchases, such as an order for military aircraft; and net exports, such as the sale of American wheat to Russia. (Many other examples are possible.)

6.   Economists use real GDP rather than nominal GDP to gauge economic well-being because real GDP is not

affected by changes in prices, so it reflects only changes in the amounts being produced. A rise in nominal GDP can be been caused by increased production, higher prices, or both.

7.

Year	Nominal GDP	Real GDP	GDP Deflator
2013	100 X $2 = $200	100 X $2 = $200	($200/$200) X 100 = 100
2014	200 X $3 = $600	200 X $2 = $400	($600/$400) X 100 = 150

The percentage change in nominal GDP is (600 – 200)/200 x 100 = 200%. The percentage change in real GDP is (400 – 200)/200 x 100 = 100%. The percentage change in the deflator is (150 – 100)/100 x 100 = 50%.

8. It is desirable for a country to have a large GDP because people could enjoy more goods and services. But GDP is not the only important measure of well-being. For example, laws that restrict pollution cause GDP to be lower. If laws against pollution were eliminated, GDP would be higher but the pollution might make us worse off. Or, for example, an earthquake would raise GDP, as expenditures on cleanup, repair, and rebuilding increase. But an earthquake is an undesirable event that lowers our welfare.

Quick Check Multiple Choice
1. b
2. c
3. d
4. c
5. a

6. b

Problems and Applications

1. a. Consumption increases because a refrigerator is a good purchased by a household.
   b. Investment increases because a house is an investment good.
   c. Consumption increases because a car is a good purchased by a household, but investment decreases because the car in Ford's inventory had been counted as an investment good until it was sold.
   d. Consumption increases because pizza is a good purchased by a household.
   e. Government purchases increase because the government spent money to provide a good to the public.
   f. Consumption increases because the bottle is a good purchased by a household, but net exports decrease because the bottle was imported.
   g. Investment increases because new structures and equipment were built.

2. With transfer payments, nothing is produced, so there is no contribution to GDP.

3. If GDP included goods that are resold, it would be counting output of that particular year, plus sales of goods produced in a previous year. It would double-count goods that were sold more than once. This double-counting would make GDP a less informative measure of economic well-being because it would overstate the value of production.

4.   a.   <u>Calculating nominal GDP:</u>
2013: ($1 per qt. of milk ´ 100 qts. milk) + ($2 per qt. of honey ´ 50 qts. honey) = $200
2014: ($1 per qt. of milk ´ 200 qts. milk) + ($2 per qt. of honey ´ 100 qts. honey) = $400
2015: ($2 per qt. of milk ´ 200 qts. milk) + ($4 per qt. of honey ´ 100 qts. honey) = $800

<u>Calculating real GDP (base year 2013):</u>
2013: ($1 per qt. of milk ´ 100 qts. milk) + ($2 per qt. of honey ´ 50 qts. honey) = $200
2014: ($1 per qt. of milk ´ 200 qts. milk) + ($2 per qt. of honey ´ 100 qts. honey) = $400
2015: ($1 per qt. of milk ´ 200 qts. milk) + ($2 per qt. of honey ´ 100 qts. honey) = $400

<u>Calculating the GDP deflator:</u>
2013: ($200/$200) ´ 100 = 100
2014: ($400/$400) ´ 100 = 100
2015: ($800/$400) ´ 100 = 200

   b.   <u>Calculating the percentage change in nominal GDP:</u>
Percentage change in nominal GDP in 2014 = [($400 – $200)/$200] ´ 100 = 100%.
Percentage change in nominal GDP in 2015 = [($800 – $400)/$400] ´ 100 = 100%.

<u>Calculating the percentage change in real GDP:</u>
Percentage change in real GDP in 2014 = [($400 –

$200)/$200]$\times$100 = 100%.

  Percentage change in real GDP in 2015 = [($400 –
$400)/$400]$\times$100 = 0%.

  <u>Calculating the percentage change in GDP deflator:</u>
  Percentage change in the GDP deflator in 2014 =
[(100 – 100)/100]$\times$100 = 0%.

  Percentage change in the GDP deflator in 2015 =
   [(200 – 100)/100]$\times$100 = 100%.

  Prices did not change from 2013 to 2014. Thus, the
percentage change in the GDP deflator is zero.
Likewise, output levels did not change from 2014 to
2015. This means that the percentage change in real
GDP is zero.

 c. Economic well-being rose more in 2014 than in
2015, since real GDP rose in 2014 but not in 2015. In
2014, real GDP rose but prices did not. In 2015, real
GDP did not rise but prices did.

5. a. <u>Calculating Nominal GDP:</u>

   Year 1: (3 bars $\times$ $4) = $12
   Year 2: (4 bars $\times$ $5) = $20
   Year 3: (5 bars $\times$ $6) = $30

 b. <u>Calculating Real GDP:</u>

   Year 1: (3 bars $\times$ $4) = $12
   Year 2: (4 bars $\times$ $4) = $16
   Year 3: (5 bars $\times$ $4) = $20

c. <u>Calculating the GDP deflator:</u>

Year 1: $12/$12 ´ 100 = 100
Year 2: $20/$16 ´ 100 = 125
Year 3: $30/$20 ´ 100 = 150

d. The growth rate of real GDP from Year 2 to Year 3 = (20 − 16)/16 ´ 100 = 25%

e. The inflation rate from Year 2 to Year 3 = (150 − 125)/125 ´ 100 = 20%.

f. To calculate the growth rate of real GDP, we could simply calculate the percentage change in the quantity of bars. To calculate the inflation rate, we could measure the percentage change in the price of bars.

6.

Year	Nominal GDP (billions)	GDP Deflator (base year: 2005)
2012	$15,676	115.4
2002	$10,642	92.2

a. The growth rate of nominal GDP = 100 ´ [($15,676/$10,642)$^{0.10}$ − 1] = 3.9%

b. The growth rate of the deflator = 100 ´ [(115.4/92.2)$^{0.10}$ − 1] = 2.3%

c. Real GDP in 2002 (in 2005 prices) is $10,642/(92.2/100) = $11,542.30.

d. Real GDP in 2012 (in 2005 prices) is

$15,676/(115.4/100) = \$13,584.06$.

    e.   The growth rate of real GDP $= 100 \times$
      $[(\$13584.06/\$11,542.30)^{0.10} - 1] = 1.6\%$

    f.   The growth rate of nominal GDP was higher than the growth rate of real GDP because of inflation.

7.   Many answers are possible.

8.   a.   GDP is the market value of the final good sold, $180.

    b.   Value added for the farmer: $100.
      Value added for the miller: $150 – $100 = $50.
      Value added for the baker: $180 – $150 = $30.

    c.   Together, the value added for the three producers is $100 + $50 + $30 = $180. This is the value of GDP. This example suggests that GDP could be calculated as the sum of the value added by all producers.

9.   In countries like India, people produce and consume more food at home that is not included in GDP than in the United States. So GDP per person in India and the United States will differ by more than their comparative economic well-being.

10.   a.   The increased labor-force participation of women has increased GDP in the United States, because it means more people are working and production has increased.

    b.   If our measure of well-being included time spent working in the home and taking leisure, it would not

rise as much as GDP, because the rise in women's labor-force participation has reduced time spent working in the home and taking leisure.

c.   Other aspects of well-being that are associated with the rise in women's increased labor-force participation include increased self-esteem and prestige for women in the workforce, especially at managerial levels, but decreased quality time spent with children, whose parents have less time to spend with them. Such aspects would be quite difficult to measure.

11.   a.   GDP equals the dollar amount Barry collects, which is $400.
 b.   NNP = GDP – depreciation = $400 – $50 = $350.
 c.   National income = NNP = $350.
 d.   Personal income = national income – retained earnings – indirect business taxes = $350 – $100 – $30 = $220.
 e.   Disposable personal income = personal income – personal income tax = $220 – $70 = $150.

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