

Chapter 2

The Measurement of Income, Prices, and Unemployment

■ Chapter Outline

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 - a. Defining GDP
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Appendix

■ Chapter Overview

This chapter provides a straightforward approach to national income accounting and the measurement of prices and unemployment. By showing how aggregate economic variables are measured, students see both how economic performance can be evaluated and how the validity of our theoretical results can be tested. Therefore, this chapter serves the important purpose of establishing the basic relationship between economic measurement and the theories to be developed by the text.

The chapter begins by describing the interrelationships between the various sectors of the economy with circular-flow diagrams. When introducing the circular-flow diagrams, be sure students know the difference between flow magnitudes, which are magnitudes that can only be measured in terms of a specified period, and stock magnitudes, which are magnitudes measured at a particular moment. Then, after giving a detailed definition of GDP, the chapter explains why intermediate goods are not counted in real GDP.

Total expenditure is composed of household, business, government, and net foreign purchases of domestic goods; it is equal to GDP because total income must equal total expenditure for the economy. When explaining the contribution of each sector of the economy to GDP, point out the distinction between consumption spending, done by households, and investment spending, done by businesses. Because the term “investment” is very broad, it is important to clarify that in economics, unless otherwise specified, investment refers to the activity of business firms in acquiring income-yielding capital. Note that what is most commonly regarded as investment by students, household financial investment in stocks and bonds, is not an expenditure item at all in the NIPA, but personal saving. Explain that, because saving is a part of household income that is not consumed, it is a “leakage” out of household income. In the simplest economy with just households and business firms, the equality of investment (I) and saving (S) arises only from the identity that total income must equal total expenditure and not from the direct physical definition of investment and saving. This is more clearly seen as the economy is generalized to include the other sectors.

The introduction of the government sector adds a government spending component (G) to total expenditure and net tax revenue (T) as another leakage from household income. Also, because GDP measures domestic product, any domestic purchases of foreign products (imports) should be subtracted from total expenditure, while any foreign purchases of domestic products should be added into GDP. Therefore, the inclusion of the foreign sector adds net exports ($NX = \text{exports} - \text{imports}$) as a component of total expenditure.

Section 2-5 discusses the “magic” equation. The identity that total income equals total expenditure simplifies to the magic equation, which states that total leakages out of household income ($S + T$) equals total injections of non-consumption spending ($I + G + NX$). At this point in your lecture, it will be useful to compare this result to that of the simple economy. Point out that the saving-equals-investment result of the simple economy also implies that total leakages equal total injections. However, it is a specific case that ignores the injections and leakages created by the inclusion of the government and foreign sectors. With the inclusion of these sectors, $S = I$ no longer has to hold, and the general result that $S + T = I + G + NX$ becomes the identity.

Section 2-5 concludes with a discussion of the government budget surplus. By rearranging the national income accounting identity of the complete four-sector economy, we see that the size of the government budget surplus ($T - G$) is determined by the excess of investment ($I + NX$) over saving (S). Explain that ($-NX$) represents the amount of foreign capital inflow by saying that the U.S. dollars obtained by foreigners through U.S. purchases of imports will eventually be used by foreigners in the purchasing of U.S. real or financial assets.

Section 2-6 defines and distinguishes between gross and net national product, personal and disposable income, as well as taxes and transfers (Table 2-1). From this, one sees that total leakages are equal to total injections for the economy, the magic equation once again.

Section 2-7 distinguishes nominal (current-dollar) from real (constant-dollar) magnitudes and applies this distinction to the measurement of GDP. Here Gordon explains why we care about real GDP and inflation or GDP deflator. He also explains how the rate of growth of the GDP and inflation rate can be calculated. In the box, he has provided a simple logarithmic formula that can be applied to any calculator to compute the rate of growth or the rate of inflation.

The chapter turns in Section 2-8 to measuring unemployment, describing the monthly unemployment survey and the labor force definitions—total labor force, civilian employed, unemployed, and not in the labor force—obtained from it. Gordon notes that although flaws exist in the definition and measurement of the unemployment rate, they are quantitatively of minor importance, since the official definition exhibits the same cyclical movements that are observed in broader unemployment measures. The chapter ends with a case study of the conflicting measurements given by the BLS household survey and the BLS payroll employment survey, the latter often being considered more reliable. Gordon explains how these conflicting measurements were used by the Republicans and Democrats in the 2004 Presidential elections.

“Why We Care About Real GDP and GDP Deflator” develops a detailed illustration of the calculation of fixed-weight and chain-weighted real GDP and GDP deflators based on a hypothetical two-good (apples and oranges) economy (Table 2-2), explaining both the logic behind each concept and the motivation for using the chain-weighted measures. A box in this section shows how to calculate inflation and growth rates using logarithms.

■ Changes in the Eleventh Edition

Although the user will find a large number of changes in Chapter 2, the basic structure of the chapter has not changed much from the 10th edition. In Section 2-3, two more subsections, (b) “Intermediate Goods, Final Goods, and Value Added” and (c) “GNP versus GDP,” have been added. The last one was moved from Section 2-4. Similarly the box, “Where to Find the Numbers: A Guide to the Data,” has also been moved from Sections 2-4 to 2-3. In this box, new sources of data from international monetary fund Grnigen growth and development center have been added. . . . Use of the Internet as a data source has been emphasized. The old photo has been replaced by a more current photo. In Section 2-4, Part d “GNP vs. GDP” has been eliminated and the heading for “Net Exports” has been changed to “Net Exports and Net Foreign Investment.” In Section 2-6, *IP Box*: “Saving, Investment and Government Deficits Around the World,” has been eliminated. “A Summary of Types of Spending” has been dropped from the 10th edition. Table 2-1, “Households Get What Remains After All the Leakages,” has been updated to year 2007:Q3s. Section 2-7 has been reorganized with Section 2-8. Some parts of Section 2-8 have been merged into Section 2-7, and the rest of the chapter has been designated as Appendix. The subsection, “Why We Care About Real GDP and the GDP Deflator,” has been rewritten with a reference to Appendix. . . . The numbers for the implicit GDP inflator example have been updated to reflect the new base year. Figure 2-4 has been updated to the new time period of 1900–2007. In the new Section 2-8 (previously 2-9) with the heading “Measuring Unemployment,” the numerical example for the unemployment rate has been updated. Figure 2-5 has been updated including the year 2007. The case study comprising Section 2-9 on unemployment and the output ratio has been revamped with the example of and detailed discussion about whether the recent recovery was “jobless” or not. In the new Appendix (previously Section 2-8), calculation of chain-weighted price index has been mentioned, but more emphasis was put on the

discussion of the implicit GDP deflator. In the summary, Points 1, 5 and 10 have been revised, three points have been deleted, and the rest were renumbered. The Appendix has been added at the end of Chapter 2. Here the author has emphasized the role of price indices and exhibited how to calculate the real GDP and GDP deflator from specific price and quantities of individual products in a more detailed way.

■ Answers to Questions in Textbook

1. A flow magnitude moves from one economic unit to another over a period of time. A stock magnitude is in the possession of a given economic unit at a particular point in time.
(a), (b), (e), (f), (j), (k), (l) are flows.
(c), (d), (g), (h), (i) are stocks.
2.
 - a. No, the peaches are an intermediate good in the production of peach ice cream by the peach maker.
 - b. Yes, the new machine is part of private investment.
 - c. Yes, your purchase of ice cream is part of consumption expenditures.
 - d. No, the peach ice cream is an intermediate good in the production of peach smoothies.
 - e. Yes, your cousin's purchase is an export for the United States.
 - f. No, only currently produced books would be included in GDP.
 - g. Yes, the peaches are part of consumption, but the value of the time you spend in making the ice cream is not included in GDP.
 - h. Yes, but unlike the purchase of the machine by a business, your purchase of the ice cream maker would be part of consumption expenditures and not private investment.
 - i. No, you are giving a gift to your cousin; the ice cream was not sold on the market.
3.
 - a. The salary would be included in GNP, but not GDP, since it is income that is earned by an American from production that takes place in Japan.
 - b. The profits would be included in GDP, but not GNP, since it is income earned by a foreign company on production that takes place in the United States.
 - c. The software is part of exports, which is included in both GDP and GNP.
4. The Europeans are buying goods and services produced in the United States. This makes these purchases part of our exports. Similarly, when an American on vacation in Ireland buys an Irish sweater, that is equivalent to an American who buys the same sweater in a store in the United States that specializes in clothes imported from Ireland.
5. There are at least two reasons why you cannot compare the well-being of the average individual in the two countries simply by comparing the GDPs of the two countries. The first is that the populations of the two countries are different. In particular, the population of China is approximately four times larger than that of the United States. Therefore, if the real GDP of the United States is twice as large as China's, the amount of output for each person in the United States is eight times as large as the amount of output for each person in China.

A second reason why it is not possible to compare the well-being of the average individual in the two economies simply by comparing their total output is that real GDP provides no information on how that aggregate output is distributed among the each economy's members. For example, if in one economy, a larger percentage of its output is received by a smaller percentage of its population, then the well-being of a larger percentage of its population would be less than in the other economy, all other things being equal.

6. Because activity in the underground economy goes unrecorded, official measures understate GDP and productivity and overstate unemployment, with the degree of inaccuracy in these measures directly related to the size of the underground economy. This makes it more difficult for policymakers to estimate how close the economy is to its natural real GDP and natural rate of unemployment and to accurately gauge threats of inflation and recession.
7.
 - a. For the interest rate data, go to research.stlouisfed.org/fred2. When you get to that page, click on the link for interest rates, and then click on the link for the Treasury constant maturity page. That page will allow you to either view or download the interest rate data for many Treasury securities, including the two asked for in the question.
 - b. To obtain the value of the GDP deflator in the latest quarter, go to www.bea.gov and click on the link for Gross Domestic Product. When that page comes up, click on the link for Gross National Product that follows the caption News Release. It is easier to read and/or print the news release in PDF format rather than HTML format. The GDP deflator is contained in Table 6 and is referred to as the price index for Gross Domestic Product.
 - c. These data can be obtained by going to www.bls.gov and clicking on the link for National Employment. When that page comes up, click on the Economic New Releases link. When the new releases page comes up, click on the Employment Situation Summary link. The data you are looking for are contained in Table A.
 - d. Follow the same links that are needed to get the GDP deflator. The data you are looking for in this part of the question are contained in Table 3 of the News Release. Data for nominal GDP and nominal personal consumption expenditures are listed in the billions of current dollars portion of Table 3. Data for real GDP and real personal consumption expenditures are listed in the billions of chained (2000) dollars portion of Table 3.
8.
 - a. Savings and taxes are leakages from the spending stream in the circular flow diagram. Savings go into capital markets and taxes go the government. Imports are also leakages from the spending stream and become part of the rest of the world's income.
 - b. Private domestic investment and government purchases of goods and services are injections into the spending stream in the circular flow diagram. The funds for private domestic investment come from capital markets. Government purchases of goods and services are financed either through taxes or borrowing from capital markets. Exports are also an injection into the spending stream in the circular flow diagram. They come from the rest of the world.
9. When the government runs a budget surplus, it retires more debt than it issues. The amount of debt retired is the value of the bonds that the government buys from bondholders, which exceeds the value of the bonds that it sells to bondholders when the government runs a budget surplus. As a result, funds flow from the government to capital markets.
10. Domestic income, by definition, includes income earned by the factors of production in current production. But as we move from domestic income to personal income, we subtract from income earned that portion paid to the government as corporate taxes and social security contributions, as well as undistributed corporate profits (i.e., income earned but not received). We also add into the flow of income certain payments such as government transfers (interest on the national debt and welfare payments) and personal interest payments (i.e., income received but not earned).
11. If all parts for the car, other than the tires, are produced in 1999:
1998: 400 tires @ \$75 each = \$30,000.
1999: 100 cars @ \$30,000 each = \$3,000,000 minus the decrease in inventory of \$30,000
= \$2,970,000.

12.
 - a. income: \$1,500,000.
 - b. consumption expenditures: \$1,250,000.
 - c. personal saving: \$250,000.
 - d. investment: \$250,000.
13. The “magic equation” tells us that private saving equals the total of domestic private and net foreign investment minus government saving. Therefore, if private saving declines, either government saving must rise to offset that decline or domestic private investment or net foreign investment must decrease to match the decline in private saving.
14. Many alternative combinations of changes in prices and output could yield an increase in nominal GDP; thus, with this limited information, you can’t say what happened to output and prices. If real GDP had increased in 1999, then you would know that output had gone up; however, you still would not know what happened to prices.
15. Deflation means that prices are falling. Therefore, the prices used to calculate real GDP would be higher than the prices used to calculate nominal GDP. As a result, real GDP would grow faster than nominal GDP.

16. The main differences between how the “household” and the “establishment” surveys measure employment is who is contacted in each survey and what is counted in terms of employment. The “household” survey obtains information from individuals concerning whether they are employed or not, whereas the “establishment” survey obtains information from businesses concerning how many people they employ. Therefore, you can think of the “household” survey as measuring employment by contacting employees, whereas the “establishment” survey obtains information from employers.

A second difference between the two surveys is that the “household” survey attempts to count the number of people who have at least one job, whereas the “establishment” survey attempts to count the number of jobs. This could be a source of difference between the two surveys to the extent to which one or more persons in the “household” survey is working two or more jobs. In this case, other things being equal, the “household” survey would show less employment than the “establishment” survey.

The “household” survey showed that employment increased by 1.8 million people from early 2001 until late 2004, whereas the “establishment survey” showed that employment decreased by almost a million jobs over that same time. When attempting to explain why the two surveys sent conflicting signals concerning the state of the labor market during 2001–2004, some argue that many people who lost their jobs at firms in the “establishment” survey started their own businesses and that these new businesses would not be immediately included in the “establishment” survey. Therefore, the “establishment” survey would show a decline in the number of jobs, whereas the “household” survey would pick up the people starting their own businesses and count them as employed.

17. The unemployment rate would go down. This is a nice trick that might be used by an administration that wanted to convince people that a prolonged recession is ending (assuming people didn’t understand the mechanics of the situation).
18.
 - a. Don is considered unemployed because he is on a temporary layoff.
 - b. Ellen is considered employed since she now has another job.
 - c. Since Frank has resigned his position and is taking no steps to seek part-time work while he is in school, he is considered not in the labor force. On the other hand, since Frank’s wife is actively seeking employment, she is considered unemployed.

■ Answers to Problems in Textbook

1. a. Gross domestic product (GDP) equals consumption expenditures plus private domestic investment plus government purchases of goods and services plus net exports. To compute GDP, we first need to compute private domestic investment and net exports. The information given allows us to calculate private domestic investment by adding net fixed investment plus depreciation plus the change in inventory. Therefore, private domestic investment equals $688.2 + 990.8 + 56.5 = 1735.5$. Net exports equal exports minus imports, so that net exports equal $1,096.3 - 1,475.8 = -379.5$. Therefore, gross domestic product equals $6,739.4 + 1,735.5 + 1,721.6 + (-379.5) = 9,817.0$.
- b. Gross national product equals gross domestic product plus receipts of factor income from the rest of the world minus payment of factor income to the rest of the world. Therefore, gross national product equals $9,817.0 + 382.7 - 343.7 = 9,856.0$.
- c. Net domestic product equals gross domestic product minus depreciation. Therefore, net domestic product equals $9,817.0 - 990.8 = 8,826.2$.
- d. Domestic income equals net domestic income minus indirect business taxes. Therefore, domestic income equals $8,826.2 - 664.6 = 8,161.6$.
- e. Personal income equals domestic income minus undistributed corporate profits minus corporate income taxes minus social security contributions plus government transfer and interest payments. Therefore, personal income equals $8,161.6 - 130.3 - 265.2 - 702.7 + 1,366.3 = 8,429.7$.
- f. Disposable personal income equals personal income minus personal taxes. Therefore, disposable personal income equals $8,429.7 - 1,235.7 = 7,194.0$.
- g. Personal saving equals disposable personal income minus consumption expenditures minus personal interest payments. Therefore, personal saving equals $7,194.0 - 6,739.4 - 286.2 = 168.4$.
2. $NX = -200$. Since domestic saving is inadequate to finance both domestic investment and the government deficit, net exports must be negative in order to finance injections. Rearranging Equation (2.4), $G - T = S - (I + NX)$, then $NX = S - I - (G - T) = 1000 - 800 - 400 = -200$.
3. a. Consumers buy eight billion dollars from supermarkets, which is the amount oranges contribute to GDP. Consumers buy 18 billion dollars in orange juice from supermarkets and eight billion dollars in orange juice from restaurants. So orange juice contributes 26 billion dollars to GDP. Together, oranges and orange juice contribute 34 billion dollars to GDP.
- b. The value added by orange growers is 21 billion dollars, the value of the crops that they sold to orange juice processors and supermarkets. The value added by orange juice processors is three billion dollars which is the difference between what they sell orange juice to supermarkets for and what they pay orange growers for their oranges. The supermarkets add two billion dollars in value to oranges, which is the difference between what consumers pay to buy oranges from supermarkets and what supermarkets pay the oranges growers for the oranges. Supermarkets add four billion dollars to the value of orange juice, which is the difference between what they sell orange juice to consumers and restaurants for and the amount the supermarkets pay to the processors for the orange juice. So supermarkets add a total of six billion dollars to the value of output. Finally, restaurants add four billion dollars to the value of orange juice, which is the difference between what they sell orange juice to consumers and what restaurants pay to the supermarkets for the orange juice. The total of the values added by orange growers, orange juice processors, supermarkets, and restaurants equals $21 + 3 + 6 + 4 = 34$ billion dollars, which equals the combined value of oranges and orange juice purchased by consumers.

4. We are going to use the following information as given in the problem to find the solutions:

	Year 1	Year 2
1. Prices		
a. Automobiles	20,000	22,000
b. Fast PCs	3,000	700
2. Quantities		
a. Automobiles	1,000	1,000
b. Fast PCs	10,000	15,000
3. Current-dollar expenditures		
a. Automobiles	20,000,000	22,000,000
b. Fast PCs	30,000,000	10,500,000
c. Total: Nominal GDP	50,000,000	32,500,000
4. Constant-dollar expenditures		
a. At fixed year 1 prices	50,000,000	65,000,000
b. At fixed year 2 prices	29,000,000	32,500,000
5. Real GDP (index, year 1 = 1.00)		
a. At fixed year 1 prices	1.00	1.30
b. At fixed year 2 prices	1.00	1.12
c. Chain-weighted (geometric mean, 5.a and 5.b)	1.00	1.21
6. Additional indexes, year 1 = 1.00		
a. Nominal GDP	1.00	0.65
b. GDP deflator	1.00	0.58

a.

	Year 1	Year 2
Nominal GDP	50,000,000	32,500,000

	Year 1	Year 2
Constant-dollar expenditures		
i. at fixed year 1 prices	50,000,000	65,000,000
ii. at fixed year 2 prices	29,000,000	32,500,000

b.

	Year 1	Year 2
Real GDP (year 1 = 1.00)		
i. at fixed year 1 prices	1.00	1.30
ii. at fixed year 2 prices	1.00	1.12
iii. Chain-weighted (geometric mean)	1.00	1.21
The percentage change in real GDP is 21 percent.		

c.

	Year 1	Year 2
Nominal GDP	1.00	0.65
Implicit GDP Deflator	1.00	0.54

5. The implicit GDP deflator equals nominal GDP/real GDP = $10,608/10,400 = 1.02$.
6. Nominal GDP equals real GDP when the implicit GDP deflator equals one. Therefore, nominal GDP = 10,000.
7. Since the GDP deflator equals nominal GDP/real GDP, real GDP equals nominal GDP/GDP deflator. Therefore, real GDP equals $11,200/1.025 = 10,926.8$.
8. These answers use the formula given in the boxed material on page 41 to calculate the percentage annual growth rates.
 - a. The growth rate of labor productivity between the first quarters of 1973 and 1996 equals $100 \times (\text{LN}(103.4/73.7)/23) = 1.47$ percent.
 The growth rate of labor productivity between the first quarters of 1996 and 2007 equals $100 \times (\text{LN}(136.6/103.4)/11) = 2.53$ percent.
 Since productivity growth is a measure of how fast living standards are rising, this shows that they rose about 72 percent faster between 1996 and 2007 than they did from 1973 through 1995.
 - b. The rate of inflation between 1975 and 1980 equals $100 \times (\text{LN}(54.1/38.0)/5) = 7.06$.
 The rate of inflation between 1980 and 1985 equals $100 \times (\text{LN}(69.7/54.1)/5) = 5.07$ percent.
 The rate of inflation between 1985 and 1990 equals $100 \times (\text{LN}(81.6/69.7)/5) = 3.15$ percent.
 The rate of inflation between 1990 and 1995 equals $100 \times (\text{LN}(92.1/81.6)/5) = 2.42$ percent.
 The rate of inflation between 1995 and 2000 equals $100 \times (\text{LN}(100.0/92.1)/5) = 1.65$ percent.
 The rate of inflation between 2000 and 2005 equals $100 \times (\text{LN}(113.0/100.0)/5) = 2.44$ percent.
 The rate of inflation was highest between 1975 and 1980 and lowest between 1995 and 2000. In addition, there was a steady decline in the rate of inflation over the last quarter of the twentieth century. The rate of inflation then started to increase in the first half of the current decade.
 - c. The annual growth rate of real GDP from the second quarter of 2005 through the second quarter of 2006 equals $100 \times (\text{LN}(11,306.7/10,954.1)) = 3.17$ percent.
 The annual growth rate of real GDP between the second and third quarters of 2006 equals $100 \times 100 \times (\text{LN}(11,336.7/11,306.7)/.25) = 1.06$ percent.
 These results indicate that on an annual basis, real GDP rose only one-third as fast between the second and third quarters of 2006 than it did between the second quarters of 2005 and 2006.
9. From the general formula to calculate the percentage annual growth rate (see Box: "How to Calculate Inflation, Real GDP Growth, or Any Other Growth Rate"), the growth rate is $x_t = 100 \text{ LN}(X_t/X_{t-s})/s$, where X_{t-s} is initial real GDP and X_t is final real GDP. Hence, the number of years is $s_t = 100 \text{ LN}(X_t/X_{t-s})/x_t$.
 The doubling of real GDP means $X_t/X_{t-s} = 2$ and $100 \text{ LN}(2) = 69.31$ approximately.
 - a. $s = 69.31/4 = 17.3$ or 18 years
 - b. $s = 69.31/6 = 11.6$ or 12 years
 - c. $s = 69.31/8 = 8.7$ or 9 years
10. The formula for the unemployment rate is given by the formula on page 77. In 2006, the unemployment rate was $7,001,000/(144,427,000 + 7,001,000) \times 100 = 4.6$ percent.