Macroeconomics - Theory and Applications 1st edition Lester Solutions Manual

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Instructor Manual

Robert Lester, Macroeconomics: Theory and Applications 2024, 9780357723449; Chapter 1: Defining and Measuring GDP

TABLE OF CONTENTS

Purpose and Perspective of the Chapter 2
Chapter Objectives 2
Key Terms 2
Chapter Outline 3
Answers to End of Chapter Questions 5

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Purpose and Perspective of the Chapter

The purpose of this chapter is to understand one of the primary macroeconomic variables: gross domestic product (GDP). GDP measures production within a country and across time. GDP per capita gives a measure of the average income per person and is used as a proxy for the average standard of living of a country's citizens. GDP is not a perfect measure of well-being, but it is correlated with several quality-of-life variables. Accurate GDP measurements show how production changes over time and enable cross-country comparisons of production and income. Furthermore, GDP can inform policymakers and help them make decisions that improve a country's economic performance.

Chapter Objectives

The following objectives are addressed in this chapter:

1.1 Calculate GDP using the income, expenditure, and value-added approaches.

1.2 Distinguish between real and nominal GDP and calculate the GDP deflator.

1.3 Explain the concept of purchasing power parity and how that affects measured cross-country income differences.

1.4 List the stylized facts of economic growth.

1.5 Critically evaluate GDP per person as an accurate measure of living standards.

Key Terms

Capital good: A machine, piece of equipment, or physical operating space used by a business.

Depreciation: The decline in value of capital goods associated with physical deterioration and obsolescence.

Durable good: A good that physically persists despite being used. The BEA defines a durable good as a good with an average useful life of at least three years.

GDP deflator: A country's nominal GDP divided by its real GDP.

GDP per capita: GDP divided by a country's population.

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GDP per worker: GDP divided by a country's workforce.

Gross domestic product (GDP): The current dollar value of all final goods and services produced in a country in a year.

Gross national income (GNI): The sum of all forms of income earned by a nation's citizens.

Inflation: An increase in the average price level.

Intermediate good: A good that is not yet ready for final consumption or investment.

Nominal GDP: A country's GDP calculated using current-year prices.

Purchasing power parity exchange rate: Exchange rate that corrects for differences in price levels across countries.

Real GDP: A country's GDP calculated using constant prices.

Rule of 70: An equation used to determine how long it takes an economy to double its income per capita.

Transfer payment: Moving money or resources from one person to another without anything being produced.

[return to top]

CHAPTER OUTLINE

The following outline organizes content (including any activities in the PowerPoints) by topic and learning objective.

I. Introduction (PPT Slides 1-4)
   a. **Icebreaker Activity: 20 minutes total.** Present the Icebreaker slide. Have students work in pairs or small groups to answer the questions. Ask volunteers to share their answers and discuss some of these as a class.
   b. Chapter Objectives

II. Gross domestic product (GDP) is the current dollar value of all final goods and services produced in a country in a year. (PPT Slides 5-11)
   a. Ideally, GDP would include the value of all production. In practice, goods and services for which no transaction is recorded are omitted from GDP, such as household production.
   b. **Knowledge Check Activity: 10 minutes total.** Present Knowledge Check 1-1. You can ask students to work on this question individually or in pairs or small groups. Share and discuss the answers.

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c. **Think, Pair, Share Activity: 20 minutes total**. Present the activity slide. Have students brainstorm potential shortcomings to GDP. Use this as a transition to discuss Application 1.1.

III. There are three approaches to calculate GDP: the value-added approach, the income approach, and the expenditure approach. (LO 1.1, PPT Slides 12-28)
   a. The value-added approach sums the increase in value associated with each stage of production.
   b. The income approach sums the total payments going to each input. The total is gross national income (GNI). The income approach divides income into
      i. Compensation to employees,
      ii. Taxes on production and imports less subsidies,
      iii. Consumption of fixed capital, and
      iv. Net operating surplus.
   c. The expenditure approach divides income into
      i. Private consumption,
      ii. Private investment,
      iii. Government consumption and investment, and
      iv. Net exports.
   d. The accounting identity states that total value added, total income, and total expenditure are always equal.
   e. **Knowledge Check Activity: 10 minutes total.** Present Knowledge Check 1-2. You can ask students to work on this question individually or in pairs or small groups. Share and discuss the answers.

IV. GDP can increase because the production of goods and services increases or because prices increase. (LO 1.2, PPT Slides 29-36)
   a. Nominal GDP measures production using current-year prices.
   b. Real GDP measures how the quantity of goods and services produced changes from year to year holding prices fixed.
   c. The GDP deflator is the ratio of a country's nominal GDP to real GDP. It provides a measure of the overall price level and can be used to calculate inflation.
   d. **Knowledge Check Activity: 10 minutes total.** Present Knowledge Check 1-3. You can ask students to work on this question individually or in pairs or small groups. Share and discuss the answers.

V. Purchasing power parity exchange rates correct for differences in prices of the same goods and services across countries. (LO 1.3, PPT Slides 37-38)

VI. There is wide variation in GDP levels and GDP growth rates across countries and across time. (LO 1.4, PPT Slides 39-47)

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a. **Explore Your World Activity: 30 minutes total.** Present the activity slides or distribute these as handouts. Have students complete the tables. Share and discuss the completed tables with students. (You can also have students complete the tables before class and reserve class time for discussion. This would decrease the in-class time for this activity to 10-15 minutes.)
b. There are certain stylized facts of economic growth, including:
    i. GDP per capita varies widely across countries.
    ii. The growth rate of GDP per capita varies widely across time.
    iii. There were growth miracles over the past 70 years.
c. Small changes in growth rates have large effects over time. The rule of 70 is an equation used to determine how long it takes an economy to double its income per capita.

VII. GDP is not a perfect measure of well-being, but it is a good proxy for it. (LO 1.5, PPT Slides 48-50)
a. GDP is positively correlated with life expectancy, consumption, and carbon dioxide emissions. GDP is negatively correlated with infant mortality.
b. Overall, the evidence shows that the quality and quantity of life are higher in rich countries.

VIII. Summary (PPT Slide 51)

[return to top]

Answers to End of Chapter Questions

Questions for Review:

1. Taking your car to the carwash is a service that is counted in GDP. Washing your car by yourself is also a service, but it is not recorded in GDP. The reason is that no transaction is recorded.
2. GDP would decrease. This does not mean people are worse off.
3. The first reason is that prices may have increased over the last year. This would raise nominal GDP but not affect living standards. The second reason is that population may have increased. A bigger population would produce more output but leave output per person the same.
4. GDP measures domestic production. Consumption, investment, and government spending include goods and services produced domestically and abroad. Subtracting imports isolates the value of goods and services produced domestically.

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5. Real GDP per capita is highly correlated with other metrics of living standards such as consumption and life expectancy. Some forms of pollution are higher in countries with high per capita GDP. By and large, GDP per capita is a good measure of living standards.

Problems:

1. Refer to the table in the problem.

   a. Use the equations for NGDP, RGDP, and the GDP deflator:

$$\begin{aligned} NGDP_{2021} &= p_{avocado,21}q_{avocago,21} + p_{peppers,21}q_{peppers,21} \\ &= \$0.90 * 2{,}500 + \$1.40 * 3{,}000 \\ &= \$6{,}450 \end{aligned}$$

$$\begin{aligned} NGDP_{2022} &= p_{avocado,22}q_{avocago,22} + p_{peppers,22}q_{peppers,22} \\ &= \$1.05 * 2{,}750 + \$1.45 * 3{,}400 \\ &= \$7{,}8157.5 \end{aligned}$$

$$\begin{aligned} NGDP_{2023} &= p_{avocado,23}q_{avocago,23} + p_{peppers,23}q_{peppers,23} \\ &= \$1.20 * 2{,}800 + \$1.70 * 3{,}600 \\ &= \$9{,}480 \end{aligned}$$

$$\begin{aligned} RGDP_{2021} &= p_{avocado,22}q_{avocago,21} + p_{peppers,22}q_{peppers,21} \\ &= \$1.05 * 2{,}500 + \$1.45 * 3{,}000 \\ &= \$6{,}975 \end{aligned}$$

$$\begin{aligned} RGDP_{2022} &= p_{avocado,22}q_{avocago,22} + p_{peppers,22}q_{peppers,22} \\ &= \$1.05 * 2{,}750 + \$1.45 * 3{,}400 \\ &= \$7{,}8157.5 \end{aligned}$$

$$\begin{aligned} RGDP_{2023} &= p_{avocado,22}q_{avocago,23} + p_{peppers,22}q_{peppers,23} \\ &= \$1.05 * 2{,}800 + \$1.45 * 3{,}600 \\ &= \$8{,}160 \end{aligned}$$

$$\begin{aligned} GDP\ Deflator_{2021} &= \frac{NGDP_{2021}}{RGDP_{2021}} * 100 \\ &= 92.47 \end{aligned}$$

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$$GDP\ Deflator_{2022} = \frac{NGDP_{2022}}{RGDP_{2022}} * 100$$
$$= 100$$

$$GDP\ Deflator_{2023} = \frac{NGDP_{2023}}{RGDP_{2023}} * 100$$
$$= 116.18$$

b. The percent change in nominal GDP is 21.20%. The percent change in real GDP is 12.08%. The percent change in the GDP deflator is 8.14%.

c. Real GDP growth between 2022 and 2023 was 4.38%. Because population is constant across all three years, we can infer that GDP per capita increased by more (both in percent terms and in total) in 2022. If you believe GDP per capita is a good measure of economic well-being, then well-being increased more in 2022.

2. The value added of the peach industry is \$2 * (2,000 + 1,000) = \$6,000. Net operating surplus is the difference between value added and wages and consumption of fixed capital. So, net operating surplus is \$6,000 - \$4,000 - \$500 = \$1,500. Value added in the pie industry is the difference between revenue and intermediate inputs, or \$12,000 - \$2,000 = \$10,000. Net operating surplus is the difference between value added, wages, and consumption of fixed capital. So, net operating surplus is \$10,000 - \$6,000 - \$1,000 = \$3,000.

	Peaches (in pounds)	Peach pies
Price per unit	\$2	\$12
Quantity sold to final users	2,000	1,000
Quantity sold as intermediate goods	1,000	0
Wages	\$4,000	\$6,000
Consumption of fixed capital	\$500	\$1,000
Net operating surplus	\$1,500	\$3,000

GDP is the sum of value added in the peach and pie industry, or \$6,000 + \$10,000 = \$16,000. You can also derive GDP by summing wages, consumption of fixed capital, and net operating surplus across industries: \$4,000 + \$6,000 + \$500 + \$1,000 + \$2,500 + \$3,000 = \$16,000.

3. The sale of new residential houses counts as residential fixed investment. The sale of new factories counts as nonresidential fixed investment. The

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contribution of new residential houses to GDP is 25,000 * $400,000 = $10,000,000,000. The contribution of new factories to GDP is 20,000 * $1,500,000 = 30,000,000,000. The realtor fees for the used houses and factories get counted toward GDP. The contribution is 25,000 * $8,000 = 200,000,000 for residential houses and 20,000 * $15,000 = 300,000,000. Note that the realtor fees for the new houses and factories do **not** count towards GDP because that would be double counting.

4. Refer to the table in the problem.

   a. Median income in any year can be calculated as $\$60{,}000 * (1 + 0.03)^{t-2023}$. Using this formula, we can fill in the second row of the table.

	2023	2033	2043	2053
10th percentile	$30,000	$40,317	$54,183	$72,818
Median	$60,000	$80,635	$108,367	$145,636

   b. Median income in any year can be calculated as $\$60{,}000 * (1 + 0.01)^{t-2023}$. Using this formula, we can fill in the second row of the table.

	2023	2033	2043	2053
10th percentile	$54,000	$59,649	$65,890	$72,784
Median	$60,000	$66,277	$73,211	$80,871

   c. It's close, but the economy in part (a) has a higher level of income at the 10th percentile.

   d. The formula is:

$$\begin{aligned} \$30{,}000 * 1.03^t &= \$54{,}000 * 1.01^t \\ \Leftrightarrow 1.02^t &= 1.8 \\ \Leftrightarrow t \ln(1.02) &= \ln(1.8) \\ \Leftrightarrow t &\approx 29.7. \end{aligned}$$

   So, just short of 30 years.

5. Refer to the table in the problem.

   a. Value added is the difference between gross output and intermediate inputs.

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Construction	2022	2023
Gross output	$712	$760
Intermediate inputs	$204	$226
Value added	$508	$534
Industry deflator	105	107
Manufacturing		
Gross output	$1,240	$1,310
Intermediate inputs	$260	$308
Value added	$980	$1,002
Industry deflator	103	99

b. Real GDPs in for construction and manufacturing in 2022 are $508/1.05 = $484 and $980/1.03 = $951. Real GDP for the economy is 2022 is $1,435. Real GDPs in for construction and manufacturing in 2023 are $534/1.07 = $499 and $1,002/99 = $1,012. Real GDP for the economy in 2023 is $1,511.

[return to top]

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