EC1B5 | Macroeconomics

Chapter 5

The Wealth of Nations: Defining and Measuring Macroeconomic Aggregates

Additional Practice Questions:

Book Question 1

Which of the following would be considered a final good in the calculation of Armenian GDP? Explain your answers.

a. All the actors and members of staff employed for a popular TV show, produced by Armenia TV, are citizens of the country.
b. The Armenian government approved a stimulus package in March 2020 for those who were negatively impacted by the COVID-19 pandemic.
c. Lavash bread, which in 2014 was placed on UNESCO's list of Intangible Cultural Heritage, is produced in Armenia but is sold globally.

Answer:

a. The TV series is an all-Armenian final good, so it would be included in the GDP estimates of Armenia.
b. While this is government expenditure, since it is aid money, it is considered a transfer payment. Transfer payments are not to be included in the computation of GDP.
c. Lavash bread would be included in the computation of Armenia's GDP as it is produced in the country. If it is sold in Armenia, it will be considered under the *consumption* category and if sold abroad, it will be considered as an *export*.

Book Question 2

By how much would GDP change as a result of each of the following changes? Briefly explain your answers.

a. A couple decides that their child should visit a private language tutor as opposed to attending a language school. The cost of the private language teacher is €10 per session, whereas the language school costs €8 per session. If the private language tutor does not report the income to the tax authorities, what would be the impact on the calculation of GDP?
b. A couple moves to the countryside from Rome, Italy, for health reasons. They have a small garden, where they grow vegetables for home use. While they were living in Rome, they spent €2,000 annually on vegetables, but now they spend only €500.
c. Part of a bridge built by the South Korean government collapsed in the same year it was constructed. The total cost of building the bridge was ₩4,458,400,000 (approximately $4 million), and then it costs ₩ 2,229,200,000 (approximately $2 million) to repair it.

d. India produced 8 million tons of rice in a particular year. Of this, 0.5 million tons had to be discarded due to a pest infestation.

Answer:

a. Attending the language school would add €8 to GDP. Since the child has a private tutor who does not declare this "produced service" to the tax authorities, the service produced would not manifest itself in the production-based GDP. Therefore, the GDP would decrease by €8 because of the increase in the underground economy.

b. In this case, Italy's GDP would decrease by €1,500 as the couple is no longer buying vegetables worth €2,000 from the supermarket and instead only spending €500 on what they cannot grow themselves.

c. South Korea's GDP would increase by ₩2,229,200,000.

d. India's GDP would remain unchanged. The quantity of rice that was discarded would not affect the calculation of GDP as depreciation is not included in the calculation of GDP.

Book Question 4

Suppose there are two neighboring countries in a multi-country world: Plastakia and Recylopia. Both countries have the same currency, Bogs. Plastakia's GDP per capita is 5,380 Bogs, its GDP is 400 million Bogs, and its GNP is 432 million Bogs. Recyclopia has a population of 40,000 people and its GNP is 350 million Bogs. Use this information to calculate Recyclopia's GDP. What is the Plastakia's population and what is Recyclopia GNP per capita?

Answer:

Since there are more than two countries, the total GDP of the two countries cannot be equal to their total GNP. In addition, the problem does not specify the components of either countries' GDP or the value of the final goods produced in Recyclopia. Thus, we cannot calculate Recyclopia's GDP.

Plastakia's GDP per capita = GDP / Plastakia's population

So Plastakia's population = GDP / Plastakia's GDP per capita = 400,000,000 Bogs / 5,380 Bogs = 74,349.44 people

Recyclopia's GNP per capita = 350,000,000 Bogs / 40,000 people = 8,750 Bogs.

Book Question 5

The following table gives data for a small country, Barboras.

Component	Expenditure (in thousands)
Interest paid on government debt	£180
Depreciation	£25
Households purchase of stocks and bonds	£280
Net private investment	£525
Gross private investment	£550
Exports	£230
Households' consumption of domestic produce	£100
Imports	£290
Salaries earned by foreigners working in Barboras	£185
Household consumption	£1,000
Purchases of raw materials	£205

Government purchases	£800
Capital income	£310
Salaries earned by Barborasians working abroad	£420

a. Use the data to calculate GDP for this economy using the expenditure method.
b. Calculate the value of Barboras' GNP. Does Barboras' GDP differ from its GNP? Why or why not?

Answer:

a. According to the expenditure approach, GDP = $C + G + I + (X - M)$. Here, C represents household consumption expenditure (excluding purchases of stocks and bonds and consumption of home production), G represents government expenditure on goods and services (excluding transfer payments and interest on public debt), I represents investment (gross not net), and $(X - M)$ represents net exports. The value of Barboras' GDP = household consumption + gross private investment + government purchases + (exports – imports).

   Barboras' GDP = 1,000,000 + 550,000 + 800,000 + (230,000 – 290,000) = £2,290,000.

b. Gross National Product (GNP) is the market value of production generated by the factors of production – both capital and labor − possessed or owned by the citizens of a particular nation. Therefore, Barboras' GNP = Barboras' GDP + salaries earned by Barborasians working abroad – salaries earned by foreigners working in Barboras

   Barboras' GNP = 2,290,000 + 420,000 – 475,000 = £2,235,000.

   Barboras' GNP is slightly lower than its GDP because the production of goods in Barboras exceeds the production of Barborasian factors of production within the borders of foreign countries.

Book Question 8

With the rise of globalization, supply chains are spread across the world. Suppose the following are the stages of producing pencils in Germany:

- A German-based pencil company develops the designs for the pencil. It's a ground-breaking design that is ergonomic, easy to carry, and doesn't roll when left on a table.
- Graphite, which is the writing core of the pencil, is a mineral mined in Brazil and €10 billion worth of graphite is sold to China.
- Softwood, which encases the graphite, is imported from South Africa to China where a Chinese plant manufactures the body of the pencils along with the graphite inside. These are then exported to Kazakhstan for €16 billion.
- Kazakhstan produces a non-toxic paint. A factory in Kazakhstan paints the pencils and sells them to Germany for €18 billion.
- The rubber that is used to produce the eraser on top of the pencil is derived from tropical plants grown in Malaysia.
- The aluminum that goes into the production of the ferrule that encases the eraser is produced in Mozambique.
- The German company imports rubber and graphite for a total of €7 billion and manufactures the eraser tips, which it then adds to the rest of the pencil.
- The company sells the finished pencils to German retailers for €33 billion.
- The retailers sell the pencils within Germany, for a total of €39 billion in revenue.

a. Calculate how much this process contributes to German GDP. Explain your calculation.

b. What sources of value might not be captured in your calculation in part (a)?

Answer:

a. To calculate this number, we have to look at the value added by the German firm. The German firms buy the pencils bodies for €18 billion and the rubber and aluminum for €7 billion and produce €33 billion worth of value = €8 billion of value added. Finally, the German retailers buy €33 billion worth of pencils and sell €39 billion = €6 billion of value added. Total value added = 8 + 6 = €14 billion in value added to German GDP.

b. Primarily, we're missing any added value from the ground-breaking design creation. Ideally, this should have been captured in the GDP.

Book Question 9

The country of Francania produces and consumes only three goods: lemonade, croissants, and blouses. The quantity produced and price of each good in 2020 and 2021 are given in the following table:

	2020		**2021**	
	Quantity	**Price**	**Quantity**	**Price**
Blouses	90	€30	120	€35
Lemonade (bottles)	650	€1.5	500	€2.50
Croissant	1,200	€1.5	800	€3

a. Calculate nominal GDP for 2020 and 2021.

b. Using 2018 as the base year, calculate real GDP for 2020 and 2021.

c. Based on your answer from part (b), by what percentage did real GDP grow between 2020 and 2021?

d. Now calculate real GDP for 2020 and 2021 using 2021 as the base year.

e. Based on your answer from part (d), by what percentage did real GDP grow between 2020 and 2021?

f. Using 2020 as the base year, what was the GDP deflator in 2020 and 2021?

g. Based on your answer from part (f), by what percentage did prices change between 2020 and 2021?

Answer:

a. For 2020:

Nominal GDP = (90 blouses) × (€30) + (650 bottles of lemonade) × (€1.5) + (1,200 croissants) × (€1.5) = €5,475

For 2021:

Nominal GDP = (120 blouses) × (€35) + (500 bottles of lemonade) × (€2.50) + (800 croissants) × (€3) = €7,850

b. Base year = 2020

For 2020:

Real GDP = (90 blouses) × (€30) + (650 bottles of lemonade) × (€1.5) + (1,200 croissants) × (€1.5) = €5,475

= 2020 Nominal GDP (because 2020 is the base year)

For 2021:

Real GDP = (120 blouses) × (€30) + (500 bottles of lemonade) × (€1.50) + (800 croissants) × (€1.5) = €5,550

c. To calculate the percentage change, or growth rate, between 2020 and 2021, we simply take:

[(Real GDP in 2021 – Real GDP in 2020) / Real GDP in 2020] × 100 = [(€5,550 − €5,475)/ €5,475] × 100 = 1.37 percent

So, real GDP grew by 1.37 percent from 2020 to 2021.

d. For this exercise, the base year has been switched. Now, the real GDP calculation for 2021 is simply the calculation of 2021 nominal GDP, which is €7,850.

The calculation of 2020 real GDP, using 2021 as a base, is as follows:

Base year = 2021

For 2020:

Real GDP = (90 blouses) × (€35) + (650 bottles of lemonade) × (€2.5) + (1,200 croissants) × (€3) = € 8,375

For 2021:

Real GDP = (120 blouses) × (€35) + (500 bottles of lemonade) × (€2.50) + (800 croissants) × (€3) = €7,850

= 2021 nominal GDP (because 2021 is the base year)

Notice how sensitive these calculations are to what year is chosen as the base.

e. The calculation is now:

[(Real GDP in 2021 – Real GDP in 2020) / Real GDP in 2020] × 100 = [(€7,850 - €8,375)/ €8,375] × 100 = −6.27 percent

Because the base year on which our calculations are based has changed, we get a very different picture of the performance of Francania's economy between 2020 and 2021.

f. The GDP deflator is calculated as follows:

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

Thus, the deflator for 2020 is:

Nominal GDP in 2020 / Real GDP in 2020 (using 2020 as base) = €5,475 / €5,475 = 1 × 100 = 100

(This will always be the case when calculating the deflator for the base year, i.e., the deflator will always be 100.)

The GDP deflator for 2021 is:

$$\frac{Nominal\ GDP\ in\ 2021}{Real\ GDP\ in\ 2021\ (using\ 2020\ as\ a\ base)} = \frac{€7{,}850}{€5{,}550} \times 100 = 141.44$$

g. The percentage change in prices between 2020 and 2021 can be calculated just like any other percentage change:

$$\frac{Deflator\ in\ 2021 - Deflator\ in\ 2020}{Deflator\ in\ 2020} = \frac{141.44-100}{100} = 0.4144 = 41.44 \text{ percent}$$

Hence, prices changed by 41.44 percent from 2020 to 2021. This is one measure of the inflation rate over the year.

Book Question 12

As of September 25, 2020, Jeff Bezos (the CEO of Amazon) had an estimated net worth of $182 billion (https://www.forbes.com/billionaires/). But does this make Bezos the richest person who ever lived? John D. Rockefeller, the founder of Standard Oil, is often credited with this distinction. At the time of his death in 1937, Rockefeller had an estimated net worth of $1.4 billion.

a. Go to the U.S. Bureau of Labor Statistics CPI site at http://data.bls.gov/cgi-bin/surveymost?cu. Under "Consumer Price Index—All Urban Consumers," select "US All Items, 1982 - 84 = 100," and click the "Retrieve data" button at the bottom of the page. Adjust the years to retrieve data from 1937 through 2020. Use the data under the "Annual" column to calculate Bezos's net worth measured in 1937 dollars. You should find that Bezos's wealth does have more buying power than Rockefeller's wealth did.

b. Some analysts say that Rockefeller's net worth was economically equivalent to over $250 billion today. However, this figure is arrived at in a particular way. First, his net worth in 1937 is calculated as a percentage of total U.S. GDP in 1937. That percentage is then multiplied by the current level of GDP to arrive at the equivalent figure in current dollars. See if you can approximate the $250 billion figure. You can find the relevant GDP figures at http://research.stlouisfed. org/fred2/data/GDPA.txt.

c. What are the pros and cons of the two different methods of adjusting Rockefeller's net worth to make it comparable to the wealth of business leaders today?

Answer:

a. Bezos' net worth = $182B in 2020. 1937 CPI = 14.4. March 2020 CPI = 258.115.

Adjustment factor = 14.4/258.115 = 0.056. So, Bezos' 2020 fortune in 1937 = $182B × 0.056 = $10.2B.

b. Rockefeller's net worth in 1937 = $1.4B. 1937 GDP = $93B. Percentage of GDP represented by Rockefeller's net worth = 1.4/93 × 100 = 0.015 = 1.5%. 2020 GDP was equal to $20,937 billion. 1.5% of $20,937 billion is $314 billion. So, if Rockefeller was alive in 2020, and his net worth was 1.5% of 2020 GDP, he would be worth $314 billion.

c. The main advantage to this method of updating Rockefeller's net worth is that it expresses it relative to the economy as a whole. In other words, given that Rockefeller's wealth was 1.5 percent of 1937 GDP, a net worth today that represented an equivalent percentage of GDP would be around $314 billion.

However, a disadvantage is that this method might actually overstate Rockefeller's standard of living in 1937 compared to the present. Even someone with his resources did not have such modern essentials as air conditioning, computers, the Internet, or a host of life-saving drugs and medical procedures. So while his net worth was extraordinary when translated to a comparable contemporary figure, it is important to remember that people's lives have been transformed by the progress of technology unavailable even to the wealthiest individuals in Rockefeller's time. This is not accounted for in a simple numerical calculation of dollar values.