

Practice Set 7

Macroeconomic Aggregates & Global Inequality

This set contains problems for your own practice. Do not just read the provided solutions — try to solve the problems first, and use the solutions only when you are stuck. Reading solutions without attempting the problems first has the same value for your preparation as watching someone else run a marathon and then expecting to be able to run it yourself. If you are unable to comprehend the solution of a problem even after reading the instructional answer key, you have most likely missed the relevant part of the material underlying this problem. Direct any questions about this problem set to your section's teaching assistant.

1. A dentist performed a root canal and charged \$460. The patient paid \$50 and the patient's health insurance paid \$410. The dentist paid his nurse \$80, \$60 in sales taxes, and \$100 for surgical materials. How is this service counted in GDP?
2. Firm A imports raw materials valued at \$2,000 and produces goods valued at \$7,000. Firm B buys those goods, processes them, and sells them to firm C for \$13,000. Firm C retails the goods for \$15,000. How much GDP was produced in this scenario?
3. A Singaporean consumer orders a vacuum cleaner from China and pays a total of \$40. The Chinese seller pays a Singaporean company \$5 for handling the online sale and the delivery in Singapore.
 - (a) How will this transaction affect Singapore's national income accounts of *production*?
 - (b) How will this transaction affect Singapore's national income accounts of *expenditure*?
 - (c) How will this transaction affect Singapore's national income accounts of *income*?
4. In 2017, Mr. Chung bought a brand-new Toyota Corolla for \$170,000. In 2025, he sold it directly to Ms. Ong — a woman from his church — for \$32,000. How did this transaction affect the GDP of 2025?
5. The table below shows how price and quantity evolved over the years in an economy that produces only one good.

Year	2015	2016	2017	2018
Price	\$10	\$11	\$14	\$12
Quantity	100	105	95	122

- (a) Calculate *real GDP* for all 4 years using 2015 as the base year.
 - (b) Calculate real GDP for all 4 years using 2018 as the base year.
 - (c) Calculate percentage change in *nominal GDP* from 2015 to 2016.
 - (d) Calculate percentage change in *real GDP* (base year 2015) from 2015 to 2016.
 - (e) Compare your results in (c) and (d) and explain the reason for the difference.
6. Explain how a positive externality may reduce GDP.

Answer Key

Macroeconomic Aggregates & Global Inequality

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1. A dentist performed a root canal and charged \$460. The patient paid \$50 and the patient's health insurance paid \$410. The dentist paid his nurse \$80, \$60 in sales taxes, and \$100 for surgical materials. How is this service counted in GDP?

*From the **production** side, one root canal valued at \$460 is counted.*

*From the **expenditure** side, \$50 paid by the patient and \$410 paid by the insurance company total \$460.*

*From the **income** side, \$80 went to the nurse, \$60 to the government in taxes, \$100 to the suppliers of surgical materials, and the remaining \$220 was the dentist's profit — totaling \$460.*

2. Firm A imports raw materials valued at \$2,000 and produces goods valued at \$7,000. Firm B buys those goods, processes them, and sells them to firm C for \$13,000. Firm C retails the goods for \$15,000. How much GDP was produced in this scenario?

There are two ways to approach this question:

1. Consider only the **final goods** sold by firm C (\$15,000) and subtract the value of imported materials (\$2,000) because those were not produced domestically.

$$GDP = \$15,000 - \$2,000 = \$13,000.$$

2. Calculate the **value added** by each firm:

- Value added by firm A: $\$7,000 - \$2,000 = \$5,000.$

- Value added by firm B: $\$13,000 - \$7,000 = \$6,000.$

- Value added by firm C: $\$15,000 - \$13,000 = \$2,000.$

Total value added: $\$5,000 + \$6,000 + \$2,000 = \$13,000.$

Both methods yield the same result because GDP measures the value created within the economy — double-counting intermediate goods or foreign inputs would overstate it.

3. A Singaporean consumer orders a vacuum cleaner from China and pays a total of \$40. The Chinese seller pays a Singaporean company \$5 for handling the online sale and the delivery in Singapore.

- (a) How will this transaction affect Singapore's national income accounts of *production*?

The vacuum cleaner costs $\$40 - \$5 = \$35$ and the sale and delivery service is worth \$5. Only the latter was produced in Singapore. Singapore's GDP increases by \$5 from the production side.

- (b) How will this transaction affect Singapore's national income accounts of *expenditure*?

The consumer spent \$40 in total, so consumption (C) increases by \$40. Singapore imports the vacuum cleaner from China, so imports (M) increase by \$35. Singapore's GDP from the expenditure side increases by $\$40 - \$35 = \$5$ (we subtract the \$35 because imports enter the expenditure equation with a negative sign).

- (c) How will this transaction affect Singapore's national income accounts of *income*?

The sale and delivery service generated \$5 of income in Singapore. This may take the form of wages, profit, or other payments to factors of production — but regardless of how it is distributed, \$5 of income was created domestically, consistent with the \$5 increase in GDP from the production and expenditure sides.

4. In 2017, Mr. Chung bought a brand-new Toyota Corolla for \$170,000. In 2025, he sold it directly to Ms. Ong — a woman from his church — for \$32,000. How did this transaction affect the GDP of 2025?

This transaction does not affect GDP in 2025 because no new good or service was produced. The car was counted in GDP in 2017 when it was manufactured. In 2025, a preexisting car and existing money simply changed hands. Note, however, that if a used-car dealer or online platform had facilitated the transaction for a fee, that fee alone would be counted in GDP in 2025.

5. The table below shows how price and quantity evolved over the years in an economy that produces only one good.

Year	2015	2016	2017	2018
Price	\$10	\$11	\$14	\$12
Quantity	100	105	95	122

- (a) Calculate *real GDP* for all 4 years using 2015 as the base year.

- The real GDP in 2015 (2015 base year) is: $\$10 \cdot 100 = \$1,000$.
- The real GDP in 2016 (2015 base year) is: $\$10 \cdot 105 = \$1,050$.
- The real GDP in 2017 (2015 base year) is: $\$10 \cdot 95 = \950 .
- The real GDP in 2018 (2015 base year) is: $\$10 \cdot 122 = \$1,220$.

- (b) Calculate real GDP for all 4 years using 2018 as the base year.

- The real GDP in 2015 (2018 base year) is: $\$12 \cdot 100 = \$1,200$.
- The real GDP in 2016 (2018 base year) is: $\$12 \cdot 105 = \$1,260$.
- The real GDP in 2017 (2018 base year) is: $\$12 \cdot 95 = \$1,140$.
- The real GDP in 2018 (2018 base year) is: $\$12 \cdot 122 = \$1,464$.

- (c) Calculate percentage change in *nominal GDP* from 2015 to 2016.

- The nominal GDP in 2015 is $\$10 \cdot 100 = \$1,000$.
- The nominal GDP in 2016 is $\$11 \cdot 105 = \$1,155$.

The percentage change is $\frac{\$1,155 - \$1,000}{\$1,000} = 15.5\%$.

- (d) Calculate percentage change in *real GDP* (base year 2015) from 2015 to 2016.

- The real GDP in 2015 is $\$10 \cdot 100 = \$1,000$.
- The real GDP in 2016 is $\$10 \cdot 105 = \$1,050$.

The percentage change is $\frac{\$1,050 - \$1,000}{\$1,000} = 5\%$.

- (e) Compare your results in (c) and (d) and explain the reason for the difference.

*The result in (c) is **nominal** GDP growth — it reflects changes in both output and prices. The result in (d) is **real** GDP growth — it holds prices constant at the 2015 level, isolating the change in actual output. Between 2015 and 2016, both output and prices rose, which is why nominal growth (15.5%) exceeds real growth (5%).*

6. Explain how a positive externality may reduce GDP.

A positive externality generates benefits outside the market, which can reduce demand for related market goods or services — and since GDP only counts market transactions, this leads to a lower GDP figure. A classic example is fluoride added to municipal water supplies. Fluoride also benefits oral health, reducing residents' need for dental care. Fewer dental visits mean less spending on oral healthcare — a real benefit to society that paradoxically shows up as a decline in GDP.