Principles of Economics
Discussion Session 8: GDP

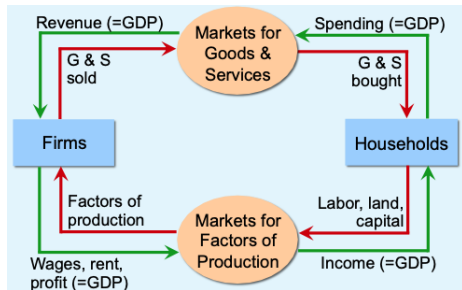Joe Wilske and Yuzhi Yao

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Introduction to Macroeconomics

- Microeconomics studies individual markets and agents.

  - The effect of a targeted tax on a particular good.
  - The effect of a minimum wage on a city's employment rate.

- Macroeconomics studies *aggregated* markets and agents.

  - The effect of an income tax on an entire country's *aggregate* demand.
  - The effect of new money creation on a country's *aggregated* production.

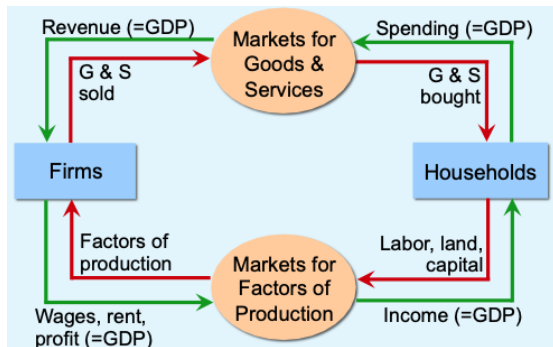- This requires new tools and types of models...

Circular Flow Diagram

- In micro, we tend to isolate a single direction of flow.
  - Firms sell goods to people, *OR* people sell labor to firms.
  - "Partial Equilibrium"

- In macro, we care about both directions of flow.
  - Firms sell goods to people, *AND* people sell labor to firms.
  - "General Equilibrium"

Circular Flow Diagram and GDP

- Gross Domestic Product (GDP) is the value of everything produced in a country in a given time period – usually a year.
- "Circular Flow" of the economy implies that we can calculate this in multiple ways:
  - **By income:** Add all wages, rents, interest, and profits earned within the country.
  - **By expenditure:** Add all expenditures made by people in the country.

GDP Calculation

- The **expenditures** approach is the most common:

$$GDP = C + I + G + NX, \quad \text{where}$$

$C =$ consumption

$I =$ investment (includes change in inventories)

$G =$ government (does not include transfer payments)

$NX =$ net exports $=$ exports $-$ imports

Exercise 1: GDP Components

Suppose a country's expenditures are recorded as follows:

- Households' spending on consumption = \$150 bn
- Firms' spending on capital goods = \$15 bn
- Firms' addition to inventories = \$8 bn
- Government spending on services = \$20 bn
- Government spending on social security = \$10 bn
- Exports = \$10 bn
- Imports = \$12 bn

What is the correct estimate of GDP?

Exercise 1:GDP Components

Solution:

$$
\begin{aligned}
C &= 150 \\
I &= 15 + 8 = 23 \\
G &= 20 \\
NX &= 10 - 12 = -2 \\
GDP &= 150 + 23 + 20 - 2 = 191
\end{aligned}
$$

Exercise 2: Calculate GDP

In May 2024, Michael in the US ordered a water bottle from an Italian seller's website. This bottle was made in Italy in 2023. How will this transaction affect:

- Italy GDP in 2023;
- Italy GDP in 2024;
- US GDP in 2023;
- US GDP in 2024.

Exercise 2: Calculate GDP

Solution:

- Italy GDP in 2023: inventory increased
- Italy GDP in 2024: inventory decreased, export increased $\rightarrow$ not affected
- US GDP in 2023: not affected
- US GDP in 2024: import increased, consumption increased $\rightarrow$ not affected

Suppose an American clothing company imports machines from Japan for $5,000. This company sells t-shirts they produced in the US for $10,000 to their US customers. How much did the GDP of the US increase as a result of these transactions?

Exercise 3: Calculate GDP

Solution:

$$I = 5000$$
$$NX = 0 - 5000 = -5000$$
$$C = 10000$$
$$GDP = 5000 - 5000 + 10000 = 10000$$

Accounting for Inflation

- As the supply of money in the economy increases, so do the prices of goods.
  - Can loosely model this with supply and demand curves for dollars:
    $S \uparrow$ means $P_{\text{dollar}} \downarrow$ means $P_{\text{goods}} \uparrow$

- Makes inter-year GDP comparisons difficult.

- Did production increase, or did prices increase?

The GDP Deflator

- Choose a base year, 2020

- Choose a year to compare, 2021

- **Nominal GDP** of 2021 is the raw GDP calculation for the year ($C + I + G + NX$).
  - Use 2021 quantities and 2021 prices.

- **Real GDP** of 2021 is the inflation-adjusted GDP calculation.
  - Use 2021 quantities and 2020 prices.

- The **GDP Deflator** benchmarks the difference between **nominal** and **real** GDP:

$$\text{Deflator 2020} = 100, \qquad \text{Deflator 2021} = \frac{\text{Nominal 2021}}{\text{Real 2021}} \times 100$$

- The **inflation rate** – the rate of price increase – is the percent change in the deflator from the previous year:

$$\text{Inflation 2021} = \frac{\text{Deflator 2021} - \text{Deflator 2020}}{\text{Deflator 2020}} \times 100\%$$

Suppose an economy produces only green eggs and ham. Quantities and prices of these goods for the last several years are shown in the following table. The base year is 2015.

Price	Eggs		Ham	
	Price	Quantity	Price	Quantity
2015	3	200	6	150
2016	3	250	7	200
2017	4	300	8	220
2018	5	350	7	120

1. Calculate the GDP deflator in 2018.
2. Calculate the inflation rate in 2018.

Exercise 4: GDP Deflator, CPI, and Inflation Rate

Solution:

1. GDP deflator in 2018 is 146.33

2. GDP deflator in 2017 is 133.33; inflation rate in 2018 is 9.75%.