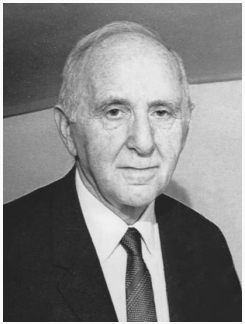
Gross Domestic Product

Javier Tasso

Introduction



Simon Kuznets

- Measure national income and production.
- In the US. National Income and Product Accounts (NIPA) from the Bureau of Economic Analysis (BEA).
- International counterpart: System of National Accounts. Coordinated by the United Nations.

Gross Domestic Product, Defined

Gross Domestic Product (GDP): The market value of all goods, services, and structures produced by the economy in a given period.

- Market value. GDP is in monetary units. Helps with aggregation.
- By the economy. A country, a state, a region.
- In a given period. A year, a quarter.

Three Methods for Calculating GDP

One can arrive at GDP by three separate means:

1. As the sum of goods and services sold to final users.
2. As the sum of income payments and other costs incurred in the production of goods and services.
3. As of the value added at each stage of production.

These are conceptually the same. Their calculation may not result in identical estimates for GDP because of differences in data sources, timing, and estimation techniques.

Expenditure Approach: $\text{GDP} = \text{C} + \text{I} + \text{G} + \text{NX}$

Sum the following **final** expenditure components:

- Personal consumption expenditures (C). The value of goods and services purchased by households.
- Gross investment (I):
  - Gross private fixed investment: Additions and replacements to the stock of private fixed assets without deduction of depreciation.
  - Change in private inventories.
- Gov't consumption expenditure and gross investment (G).
- Net exports of goods and services (NX).

Income Approach: Gross Domestic Income (GDI)

Examine the purchasing power of households and the financial status of businesses:

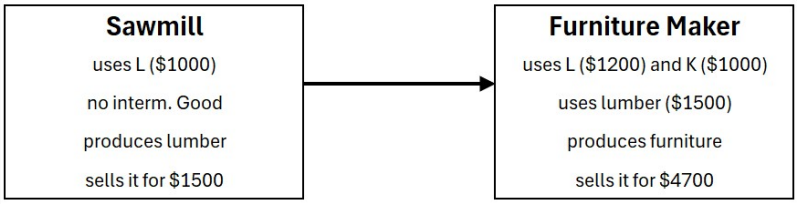
- Compensation of employees: Wages and supplements.
- Taxes on production net of subsidies.
- Net operating surplus: Profits-like measure before deducting any interest charges and rent.
- Consumption of fixed capital: Depreciation.

Value Added or Production Approach

Value Added: The difference between an industry's gross output and its intermediate inputs.

- When value added is aggregated across all industries (including gov't industries) in the economy, it is equal to GDP measured using the expenditure and income approaches.
- Intermediate input vs factor of production.

Example



- Three approaches.
- Profit.
- Value added.

GDP in the US

$$\text{Nominal GDP in } 2024 = 29,825,200,000,000$$

$$\text{Population Estimate} = 340,110,988$$

$$\text{Per Capita GDP} \simeq \$87,000 \text{ on average per person.}$$

GDP in the US II

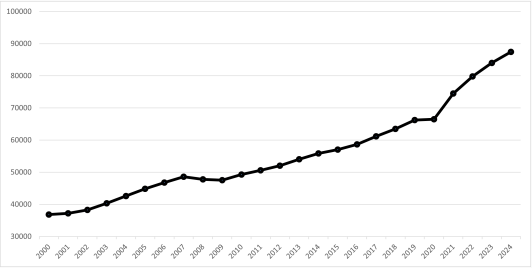
Table 1: GDP in 2024 (in billions of current dollars)

Gross domestic product	29825.2
Personal consumption expenditures	20351.3
Gross private domestic investment	5261.8
Net exports of goods and services	-938.7
Government consumption expenditures and ...	5150.7

Other Aggregate NIPA Measures

- Net Domestic Product: Subtract the consumption of fixed capital (depreciation) from GDP.
  - Gross includes depreciation, net doesn't.
- Gross National Product: Subtract income payments to the rest of the world and add income receipts from the rest of the world.
  - Domestic refers to where production happens, and national refers to who produces it.

Compare Across Time



nGDP PC Over Time

- $85k a year don't buy the same in 2024 than in earlier years.
- Want an aggregate measure of goods & services produced.
- Valuating them in current dollars distorts comparisons across time.

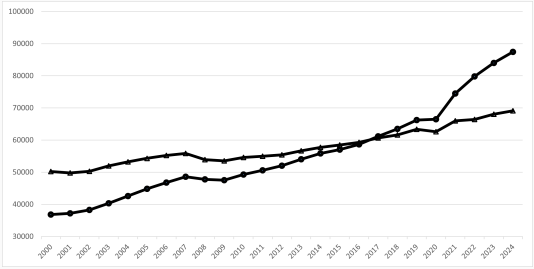
Nominal vs Real GDP

- **Nominal GDP**: The production of goods & services valued at current prices.
- **Real GDP**: The production of goods & services valued at constant prices.
  - Removes the effect of price changes.
  - Isolates the increase (or decrease) of quantities (on average).
  - Uses prices of a base year. Fixed weight type of index (before 1996).
- Example.

Chain Weighted Method

- Fundamental problem when adjusting GDP for inflation: There's not a single inflation number. There's a wide range of goods & services with prices that are changing.
- Best solution: Chained index.
  - The 2024-2025 change in real GDP uses prices for 2024 and 2025 as weights.
  - And these annual changes are chained (multiplied) together.
- Example.

Compare Across Time II



rGDP PC Over Time

- In chained 2017 dollars.
- Now we can make comparisons across time.
- The movement of real GDP is driven solely by changes in the quantities of goods & services, averaged using prices.

Compare Across Countries

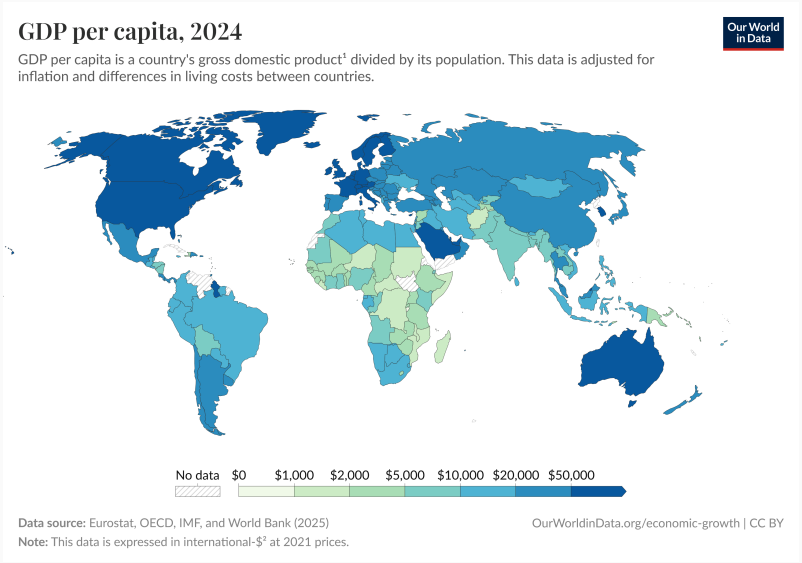
- Each country GDP is measured in its own currency.
- Translate the GDP to US dollars using nominal exchange rates.
  - Exchange rates fluctuate.
  - The cost of non-tradable goods is likely to differ across countries.
- World bank uses an exchange rate adjusted for Purchasing Power Parity (PPP).

Purchasing Power Parity (PPP)

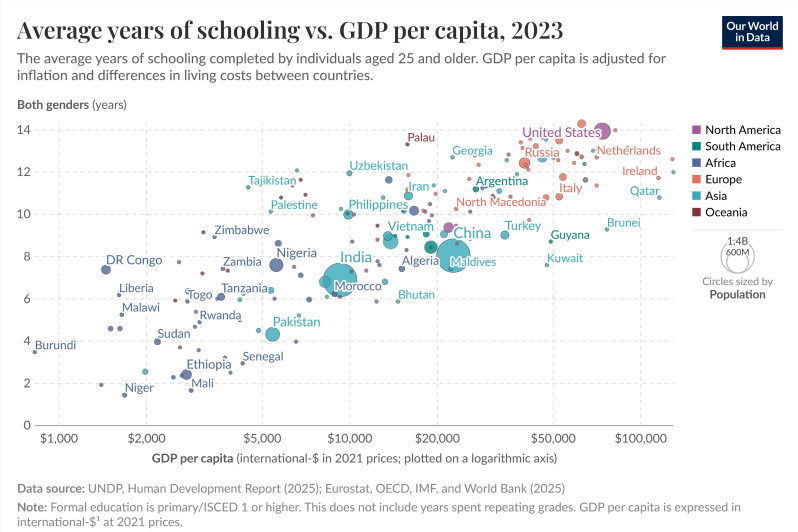
Purchasing Power Parity (PPP): A form of exchange rate based upon a comparison of prices between countries.

- Simplest example: Big Mac index. This is based on a single consumption item.
- In reality the world bank uses a large number of goods & services.
- Create PPP-adjusted GDP to make international comparisons.

Compare Across Countries II



Real GDP Per Capita Correlates With...



Data source: UNDP, Human Development Report (2025); Eurostat, OECD, IMF, and World Bank (2025)

Note: Formal education is primary/ISCED 1 or higher. This does not include years spent repeating grades. GDP per capita is expressed in international-$[1] at 2021 prices.

Growth Rates

$$g_Y(t-1,t) = \frac{Y_t - Y_{t-1}}{Y_{t-1}}$$

- Relative to $t-1$, but you can define others.
- Growth rate of real GDP.
- Growth rate of real GDP per capita.
- What's the average growth rate of real GDP over the last 10 years?