

Chapter 2 Measurement

Measuring GDP

- three approaches:
 1. product approach
 2. expenditure approach
 3. income approach
- Key concepts:
 1. **intermediate good** : a good that is produced and then used as an input to another production process
 2. **income-expenditure identity** :
Y as the aggregate income, and C+I+G+NX as the sum of the components of aggregate expenditure

$$Y = C + I + G + NX$$

First example:

An island economy where there is a coconut producer, a restaurant, consumers and a government.
Government collects taxes to provide national defense.

Coconut Producer

Total Revenue	\$20million
Wages	\$5 million
Interest on Loan	\$0.5million
Taxes	\$1.5million

Restaurant

Total Revenue	\$30 million
Cost of Coconuts	\$12 million
Wages	\$4 million
Taxes	\$3 million

Government

Tax Revenue	\$ 5.5 million
Wages	\$ 5.5 million

Consumers

Consumers

Wage Income	\$ 14.5million
Interest Income	\$0.5 million
Taxes	\$1 million
Profits Distributed from Producers	\$ 24 million
### Product Approach	

Product approach: taken as the following two steps

- add the value of all goods and services produced in the economy
- subtract the value of all intermediate goods used in production

Analysis using the example:

- *all goods produced*: coconut producer — \$ 20 million, restaurant — \$ 30 million, govenment — \$ 5.5 million.
- *intermediate goods*: 12 million
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$$GDP = 20 + 30 + 5.5 - 12 = 43.5$$

Expenditure Approach

Expenditure Approach: calculate GDP as total spending on all final goods and services production in the economy.

attention: don't count spending on intermediate goods

$$Total \text{ expenditure} = C + I + G + NX$$

- C : expenditure on consumption
- I : investment expenditure
- G : government expenditure
- NX : net exports (**total exports of goods and services minus total imports**)

In this example:

C- \$ 8 million on coconuts and \$ 30 million at the restaurant

\rightarrow

C= \$ 38 million

I=0, G=\$5.5 million \rightarrow

$$GDP = 38 + 5.5 = 43.5$$

Income Approach

Income approach: add up all income received by economic agents contributing to production.

Includes:

- profits made by firms
- compensation of employees(wages,salaries and benifits)
- proprietor's income(self-employed firm owners)
- rental income
- net interest
- depreciation(consumption of fixed capital):represents the value of productive capital that wears out during the period we are considering.

In this example:

1. wage income of consumer: \$14.5 million
2. profits of producers after tax: \$24 million
3. net interest of consumers: \$0.5 million
4. government income: \$4.5 million (**we don't count the tax paid by the consumer because it's already contained in the wage income of consumer**)

What GDP Leaves Out

- Does not take into account the income distribution among the population.
- Leaves out all nonmarket activity.
- Underground economy.

Components of Aggregate Expenditure

- *Consumption*
- *Investment*: the expenditure on goods that are produced during the current period but not consumed during the current period.
 1. *Fixed investment*: production of capital
 2. *inventory investment*: goods that are essentially put into storage.
- *Net Exports*
- *Government expenditure*

Nominal and Real GDP and Price Indices

Nominal and Real GDP

- *Nominal GDP*: calculate GDP in a given year by the price of the given year.
- *Real GDP*: calculate GDP using base year prices.
- g_i : ratio of year 2 to year 1 using year i as the base year.
- *chain-weighting*: chain-weighted ratio of real GDP in year 2 to real GDP in year 1 equals

$$g_c = \sqrt{g_1 \times g_2}$$

Price Level

- *Implicit GDP price deflator*:

$$\text{Implicit GDP Price deflator} = \frac{\text{Nominal GDP}}{\text{Real GDP}} \times 100$$

The result depends on our choice of the base year.

- *Consumer price index (CPI)*:

Includes only goods and services that are purchased by consumers.

$$\text{Current year CPI} = \frac{\text{Cost of base year quantities at current prices}}{\text{Cost of base year quantities at base-year prices}} \times 100$$

Note: CPI tends to be more volatile than the GDP deflator inflation rate

Savings, Wealth, and Capital

- Private Disposable Income:
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$$Y^d = Y + NFP + TR + INT - T$$

Y-GDP

NFP- net factor payments from abroad to U.S residents

TR— transfers from the government to the private sector

INT- interest on the government debt

T- taxes

- private sector saving:
What the private sector saves is simply what it has available to spend minus what it consumes

$$S^P = Y^d - C = Y + NFP + TR + INT - T - C$$

- government saving: also the government surplus

$$S^g = T - TR - INT - G$$

- nation saving:

$$S = S^P + S^g = Y + NFP - C - G = GNP - C - G$$

$$Y = C + I + G + NX(\text{expenditure approach}) \Rightarrow$$

$$S = I + NX + NFP$$

Define current account surplus $CA = NX + NFP$

- What we get:
 1. Any domestic savings not absorbed by domestic investment must be shipped outside the country in the form of goods and services
 2. Wealth is accumulated in two ways:
 - through investment I, which is additions to the nation's capital stock.
 - through current account surpluses CA.

Labor Market Measurement

- unemployment rate:

$$\text{Unemployment rate} = \frac{\text{Number unemployed}}{\text{Labor force}}$$

- participation rate:

$$\frac{\text{Labor force}}{\text{Total working-age population}}$$

- Employment/Population ratio:

$$\frac{\textit{Total employment}}{\textit{Total working - age population}}$$