

COURSE 2 (Chapter 21)**MEASURING NATIONAL OUTPUT
AND NATIONAL INCOME**

Outline of today's lecture:

1. Gross Domestic Product
2. Calculating GDP
 - A) Expenditure Approach
 - B) Income Approach
 - C) Output Approach
3. Nominal versus Real GDP

national income and product accounts Data collected and published by the government describing the various components of national income and output in the economy.

**(1) GROSS DOMESTIC PRODUCT¹**

gross domestic product (GDP) Total market value of all final goods and services produced within a given period by factors of production located within a country.

- GDP is the total market value of a country's output.

final goods and services² Goods and services produced for final use.

intermediate goods³ Goods that are produced by one firm for use in further processing by another firm.

¹ Gayri Safi Yurtiçi Hasıla, GSYİH (in Turkish).

² Nihai mallar ve hizmetler (in Turkish)

³ Ara mallar (in Turkish)

value added⁴ Difference between the value of goods as they leave a stage of production and the cost of the goods as they entered that stage.



- Tires mounted on the wheels of the new car before it is sold are considered intermediate goods to the auto producer.
- Tires to replace tires on your old car are considered final goods.
- If, in calculating GDP, we included
 - 200 \$, value of the tires (an intermediate good) on new cars and
 - 24,000 \$, value of new cars (including the tires), we would be double counting.
 - The final price of the car already reflects the value of all its components.

TABLE 6.1 Value Added in the Production of a Gallon of Gasoline (Hypothetical Numbers)

STAGE OF PRODUCTION	VALUE OF SALES	VALUE ADDED
(1) Oil drilling	\$ 1.00	\$1.00
(2) Refining	1.30	0.30
(3) Shipping	1.60	0.30
(4) Retail sale	2.00	0.40
Total value added		\$2.00

⁴ Katma değer (in Turkish)

- In calculating GDP, we can either sum up the value added at each stage of production or we can take the value of final sales.
- We do not use the value of total sales in an economy to measure how much output has been produced.
- **Exclusion of used goods and paper transactions**
 - **Attention!** GDP is concerned only with new, or current, production.
 - **GDP** ignores all transactions in which money or goods change hands but in which no new goods and services are produced.
- **Exclusion of Output Produced Abroad by Domestically Owned Factors of Production**
 - **Attention!** GDP is the value of output produced by factors of production *located within a country*.
 - **Gross National Product (GNP)**⁵ *Total market value of all final goods and services produced within a given period by factors of production owned by a country's citizens, regardless of where the output is produced.*



(2) CALCULATING GDP

expenditure approach⁶ A method of computing GDP that measures the amount spent on all final goods during a given period.

income approach⁷ A method of computing GDP that measures the income—wages, rents, interest, and profits—received by all factors of production in producing final goods.

output approach - the sum total of the *value added* by every firm in the economy is calculated.

⁵ Gayri Safi Milli Hasıla, GSMH (in Turkish).

⁶ Harcamalar Yaklaşımı (in Turkish)

⁷ Gelir Yaklaşımı (in Turkish)

A) Expenditure Approach

There are four main categories of expenditure:

- *Personal consumption expenditures (C)*: household spending on consumer goods
 - *Gross private domestic investment (I)*: spending by firms and households on new capital, i.e., plant, equipment, inventory, and new residential structures
 - *Government consumption and gross investment (G)*
 - *Net exports (X - M)*: net spending by the rest of the world, or exports (X) minus imports (M)
- Calculation of GDP by expenditure approach:

$$\circ \mathbf{GDP = C + I + G + (X - M)}$$

TABLE 6.2a Components of U.S. GDP, 2004: The Expenditure Approach

	BILLIONS OF DOLLARS	PERCENTAGE OF GDP
<i>Personal consumption expenditures (C)</i>	8,214.3	70.0
Durable goods	987.8	8.4
Nondurable goods	2,368.3	20.2
Services	4,858.2	41.4
<i>Gross private domestic investment (I)</i>	1,928.1	16.4
Nonresidential	1,198.8	10.2
Residential	673.8	5.7
Change in business inventories	55.4	0.5
<i>Government consumption and gross investment (G)</i>	2,215.9	18.9
Federal	827.6	7.1
State and local	1,388.3	11.8
<i>Net exports (EX - IM)</i>	-624.0	- 5.3
Exports (EX)	1,173.8	10.0
Imports (IM)	1,797.8	15.3
<i>Gross domestic product (GDP)</i>	<u>11,734.3</u>	<u>100.0</u>

Note: Numbers may not add exactly because of rounding.

Source: U.S. Department of Commerce, Bureau of Economic Analysis.

TABLE 6.2b Components of Turkish GDP, 2006: The Expenditure Approach

	BILLIONS OF DOLLARS	PERCENTAGE OF GDP
<i>Personal consumption expenditures (C)</i>	267.5	66.4
Durable goods	43.1	10.7
Nondurable goods	193.5	48.0
Services	30.9	7.7
<i>Gross private domestic investment (I)</i>	78.8	19.6
Nonresidential	37.4	9.3
Residential	29.9	7.4
Change in business inventories	11.5	2.9
<i>Government consumption and gross investment (G)</i>	70.2	17.4
<i>Net exports (EX – IM)</i>	-30.8	- 7.7
Exports (EX)	113.6	28.2
Imports (IM)	144.5	35.9
<i>Statistical discrepancy</i>	17.1	4.2
<i>Gross domestic product (GDP)</i>	<u>402.7</u>	<u>100.0</u>
<i>Plus: Receipts of factor income from the row</i>	10.7	
<i>Less: Payments of factor income to the row</i>	11.0	
<i>Equals: GNP</i>	<u>402.3</u>	
<i>Real GDP (at 1987 prices)</i>	<u>182.6</u>	
<i>Per Capita Real GDP (at 1987 prices)</i>	<u>2,502 \$</u>	

Note: Numbers may not add exactly because of rounding.
Source: Turkish Statistical Institute.

I. Personal consumption expenditures (C) A major component of GDP: expenditures by consumers on goods and services.

- There are three main categories of consumer expenditures: durable goods, nondurable goods, and services.
 - **durable goods** Goods that last a relatively long time, such as cars and household appliances.
 - **nondurable goods** Goods that are used up fairly quickly, such as food and clothing.
 - **services** The things we buy that do not involve the production of physical things, such as legal and medical services and education.

II. Gross private domestic investment (I) Total investment in capital—that is, the purchase of new housing, plants, equipment, and inventory by the private (or nongovernment) sector.

nonresidential investment Expenditures by firms for machines, tools, plants, and so on.

residential investment Expenditures by households and firms on new houses and apartment buildings.

change in business inventories The amount by which firms' inventories change during a period. Inventories are the goods that firms produce now but intend to sell later.

$$GDP = \text{final sales} + \text{change in business inventories}$$

depreciation The amount by which an asset's value falls in a given period.

gross investment The total value of all newly produced capital goods (plant, equipment, housing, and inventory) produced in a given period.

net investment Gross investment minus depreciation.

$$\begin{aligned} \text{Net Investment} &= \text{Gross Investment} - \text{Depreciation} \\ \text{Capital}_{\text{end of period}} &= \text{capital}_{\text{beginning of period}} + \text{net investment} \end{aligned}$$

III. Government Consumption and Gross Investment (G)

government consumption and gross investment (G) Expenditures by government for final goods and services.

IV. Net exports (X-M) Difference between exports and imports. The figure can be positive or negative.

B) Income Approach

TABLE 6.3 National Income, 2004

	BILLIONS OF DOLLARS	PERCENTAGE OF NATIONAL INCOME
National Income	10,275.9	100.0
Compensation of employees	6,687.6	65.1
Proprietors' income	889.6	8.7
Corporate profits	134.2	1.3
Net interest	1,161.5	11.3
Rental income	505.5	4.9
Indirect taxes minus subsidies	809.3	7.9
Net business transfer payments	91.1	0.9
Surplus of government enterprises	-3.0	-0.0

Source: See Table 6.2.

compensation of employees Includes wages, salaries, and various supplements—employer contributions to social insurance and pension funds, for example—paid to households by firms and by the government.

proprietors' income The income of unincorporated businesses.

rental income The income received by property owners in the form of rent.

corporate profits The income of corporate businesses.

net interest The interest paid by business.

indirect taxes minus subsidies Taxes such as sales taxes, customs duties, and license fees, less subsidies that the government pays for which it receives no goods or services in return.

net business transfer payments Net transfer payments by businesses to others.

surplus of government enterprises Income of government enterprises.

TABLE 6.4 GDP, GNP, NNP and National Income, 2004

	DOLLARS (BILLIONS)
GDP	11,734.3
Plus: Receipts of factor income from the rest of the world	+ 415.4
Less: Payments of factor income to the rest of the world	<u>- 361.7</u>
Equals: GNP	11,788.0
Less: Depreciation	<u>- 1,435.3</u>
Equals: Net national product (NNP)	10,352.8
Less: Statistical discrepancy	<u>- 76.9</u>
Equals: National income	10,275.9

Source: See Table 6.2.

net national product (NNP) Gross national product minus depreciation; a nation's total product minus what is required to maintain the value of its capital stock.

TABLE 6.5 National Income, Personal Income, Disposable Personal Income, and Personal Saving, 2004

	DOLLARS (BILLIONS)
National income	10,275.9
Less: Amount of national income not going to households	<u>- 562.6</u>
Equals: Personal income	9,713.3
Less: Personal income taxes	<u>- 1,049.1</u>
Equals: Disposable personal income	8,664.2
Personal consumption expenditures	- 8,214.3
Personal interest payments	- 186.7
Transfer payments made by households	<u>- 111.5</u>
Equals: Personal saving	151.8
Personal saving as a percentage of disposable personal income:	1.8%

Source: See Table 6.2.

statistical discrepancy Data measurement error.

personal income The total income of households before paying personal income taxes.

disposable personal income or **after-tax income** Personal income minus personal income taxes. The amount that households have to spend or save.

personal saving The amount of disposable income that is left after total personal spending in a given period.

personal saving rate The percentage of disposable personal income that is saved. If the personal saving rate is low, households are spending a large amount relative to their incomes; if it is high, households are spending cautiously.

C) Output Approach

This is the main calculation method used in Turkey.

It is the sum total of the *value added* by every firm (then, sector) in the economy.

See Table 6.1, as well.

GDP and GNP of Turkey (Billion USD)	
Output Approach	
Sectors	2006
Agriculture Total	37.1
Industrial Total	102.9
Construction Industry	21.4
Commerce Total	82.2
Transportation and Communications	56.5
Financial Institutions	18.7
Ownership of Dwellings	19.2
Professions and Services	14.0
(Less) Relative Banking Services	10.3
Sectors Total	341.7
Government Services	38.4
Non-profit private services	3.3
Total	383.4
Import Tax	19.2
Gross Domestic Product (GDP)	402.7
Net Factor Income from Abroad	-0.4
Gross National Product GNP	402.3

Source: TURKSTAT



3) NOMINAL VERSUS REAL GDP

GDP in Constant Prices

- If we first choose a base year, and use the prices of that year to compute GDP in all subsequent years, this is called GDP in constant prices or real GDP⁸.

Example:

- Suppose there are 3 final goods in the economy: x, y, z

	Year 1		Year 2		Year 3	
	Quantity	Price	Quantity	Price	Quantity	Price
x	100	10	105	12	104	14
y	110	15	111	18	115	20
z	90	20	93	25	95	30
GDP in current prices	(100x10) +(110x15) +(90x20) =4450		(105x12) +(111x18) +(93x25) =5583		(104x14) +(115x20) +(95x30) =6606	
GDP in constant Year 1 prices	=4450		(105x10) +(111x15) +(93x20) =4575		(104x10) +(115x15) +(95x20) =4665	

- $P = \text{Implicit GDP deflator in period } t = \frac{\text{Nominal GDP in } t}{\text{Real GDP in } t}$
 - Implicit GDP Deflator is a price index.
 - There are some other price indices:
 - CPI
 - WPI
- Growth rate in period $t = \frac{GDP_{t-1} - GDP_t}{GDP_t} \cdot 100$
where GDP can be real or nominal.

⁸ In Turkish: Reel GSYİH

- Inflation rate = $\frac{P_{t-1} - P_t}{P_t} \cdot 100$
where P can be GDP Deflator, CPI or WPI.
- \$GDP in period t = $\frac{\text{Nominal } GDP_t \text{ (YTL)}}{\text{Nominal Exchange Rate}_t \text{ (YTL/\$)}}$
- Per capita GDP in period t = $\frac{GDP_t}{\text{Population}_t}$,

where GDP can be real or nominal.

underground economy The part of the economy in which transactions take place and in which income is generated that is unreported and therefore not counted in GDP.