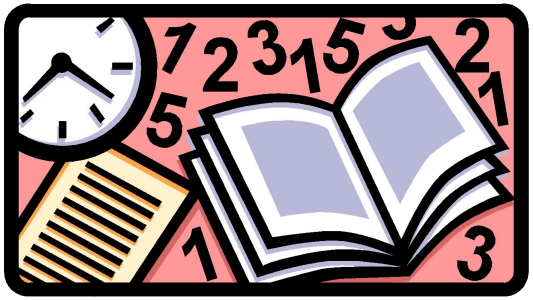
Lecture 3

National Accounts

Measuring Aggregate Output and Income

- Gross Domestic Product
- Approaches for Calculating GDP
- Other Variables of National Accounts
- Nominal and Real GDP
- Price Indexes
- Potential and Actual GDP. GDP Gaps



Major Variables of National Accounts

The main indicators of aggregate output and aggregate income in the economy can be found in the ***National Income and Product Accounts (NIPA) System***, proposed in the late 1920s by the group of U.S. economists from NBER, headed by Simon Kuznets (Nobel prize, 1971).

The major measures of aggregate output are:

- **Gross Domestic Product**
- **Gross National Product**
- **Net Domestic Product**
- **Net National Product**

The major measures of aggregate income are:

- **National Income**
- **Personal Income**
- **Disposable Personal Income**

Nobel Prize

Gross Domestic Product

The main measure of aggregate output is gross domestic product.

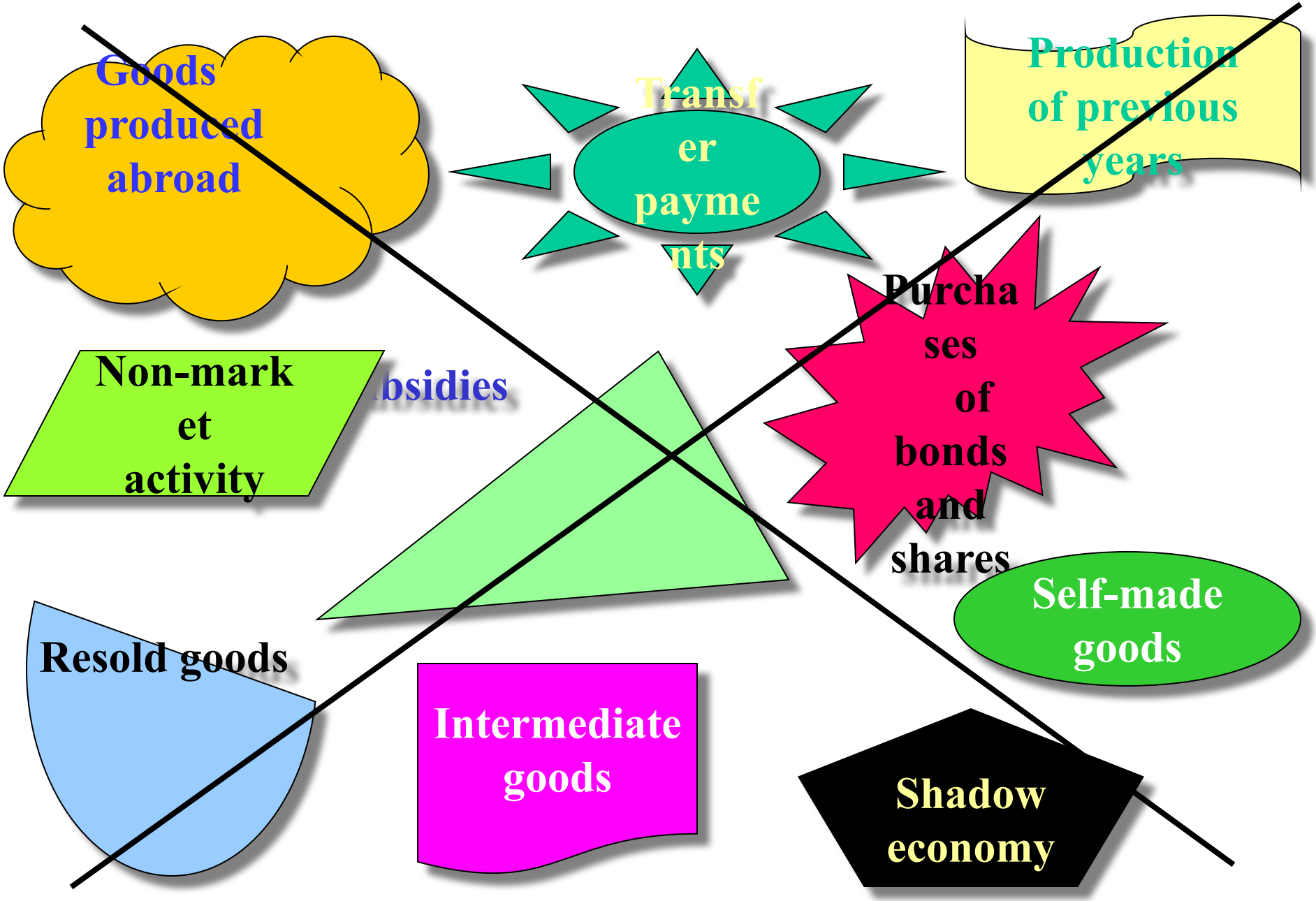
Gross Domestic Product (**GDP**) is the total market value of all final goods and services produced within the country (by domestic economy) during a one-year period.

- **total** ⇒ measures aggregate output;
- **market** ⇒ only official market transactions are included (self-made goods and shadow economy are excluded);
- **value** ⇒ measured in money (blns of pounds, dollars, rubles);
- all final **goods and services** ⇒ transfer payments (welfare benefits and subsidies) and financial transactions (purchases of bonds and shares) are excluded (because income is not created, but redistributed and nothing new is produced);

Gross Domestic Product

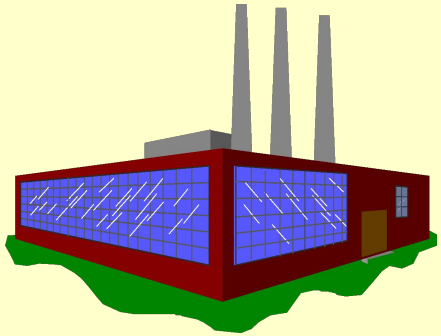
- **final** goods and services ⇒ in order to avoid double counting, *intermediate* goods (that form inputs for final product such as steel in car production or flour in baking bread) are excluded;
- **produced** ⇒ not redistributed or resold;
- **within** the country ⇒ i.e. *in the domestic economy,* no matter by what factors of production, either owned by the citizens of the country or by foreigners (goods and services produced by national factors abroad are excluded);
- during a **year** ⇒ only newly (currently) produced goods.

Items Excluded from Calculating GDP



How to Calculate GDP

Production



The theoretical base for measuring GDP is the model of circular flows, from which we learn that **aggregate output** is equal:

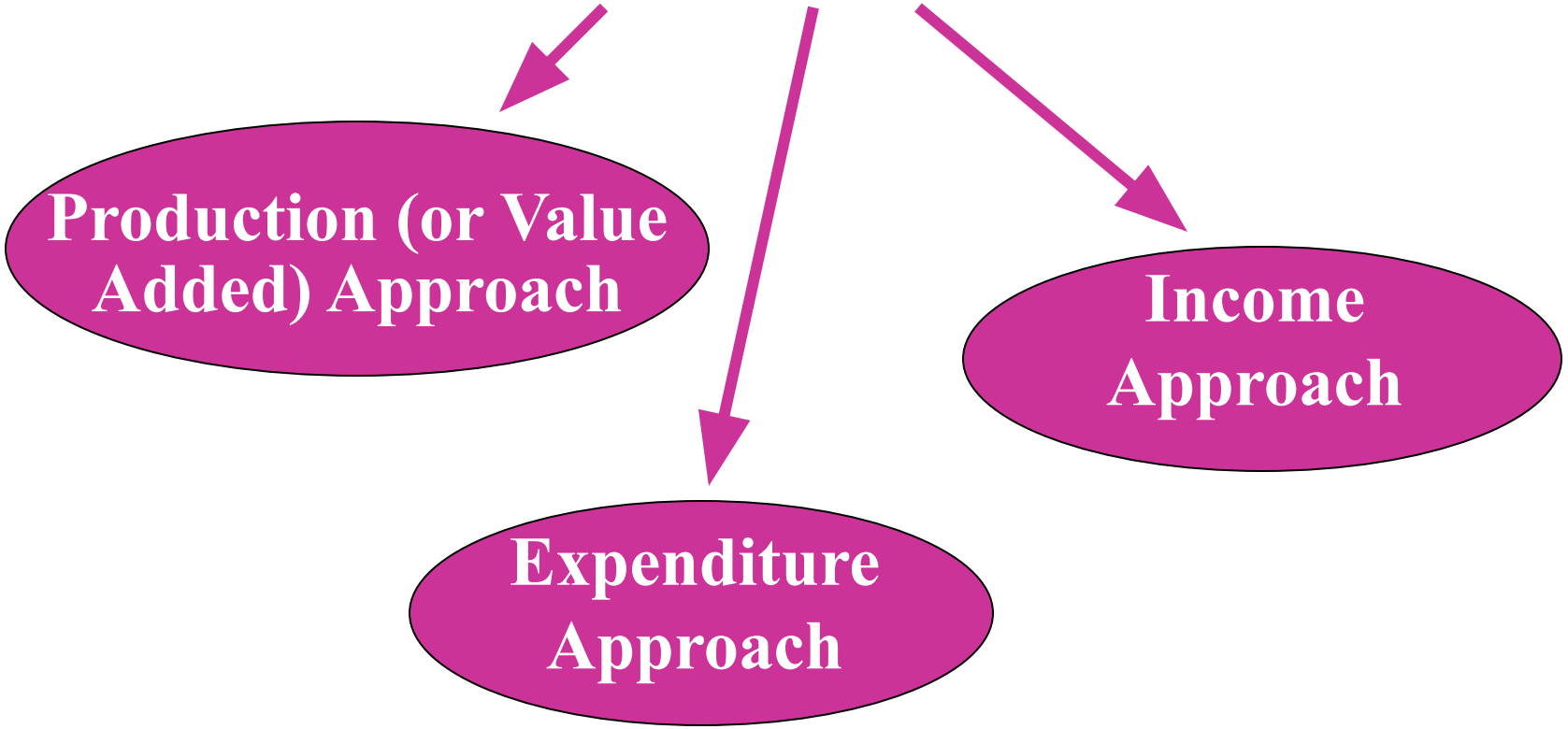
- to the ***sum of expenditures***;
- to the amount of ***aggregate income***;
- to the value of ***aggregate product***.

Incomes

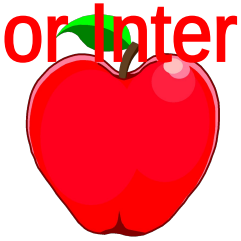
Expenditures

Methods for Calculating GDP

Thus there are ***three methods*** for calculating GDP:



Final or Intermediate?



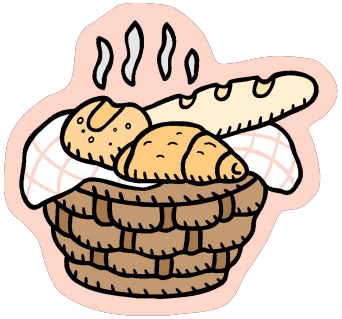
The Value Added

By definition GDP is the total value of ***final*** goods and services. But by appearance it is often impossible to judge if a good is final or intermediate (for example, apples bought by a person or apples bought by a firm producing juice).

Thus, to calculate the value of final product economists use the concept of ***value added***.

To learn what does value added mean and why it can be used to measure the value of final product, let's examine the production process (for example, of bread).

Receipts on Each Stage of Production



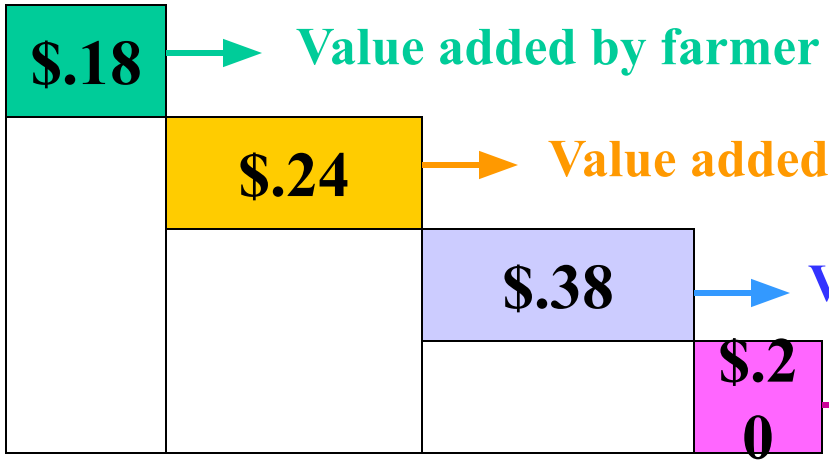
Receipts of farmer from miller — $.18

Receipts of miller from baker — $.18 + $.24 = $.42

Receipts of baker from grocer — $.18 + $.24 + $.38 = $.80

Receipts of grocer from consumer — $.18 + $.24 + $.38 + $.20 = $1.00 ← **Total consumer expenditure**

Value added (= income created) at each stage of production



Total value added =Total income created =Total consumer expenditure

The Value Added Approach

Thus, the value added of a particular firm can be calculated as:

Firm's value added = Revenue – Value of intermediate goods purchased from the other firms

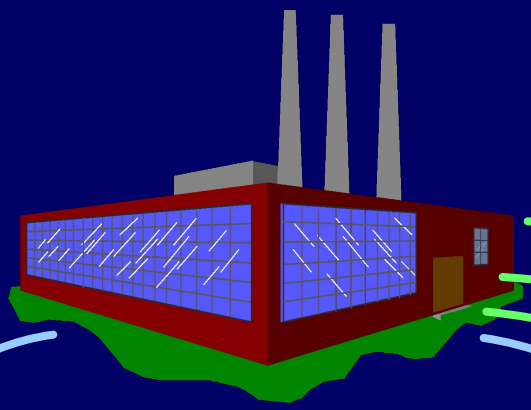
while the total value added in the economy as a whole is:

Total value added = Value of total output (total sales) – – Value of total intermediate product

As the value of final goods is always equal to the sum of values added on all stages of production process, GDP can be measured as the sum of values, added by all the firms in the economy or in all the branches or large sectors of the economy (such as industry, agriculture, construction, etc).

$$GDP = \Sigma \text{ values added}$$

The Circular Flow of Income and Expenditure



Export Expenditure (*Ex*)

Investment (*I*)

Government Expenditure (*G*)

Factor Payments

Consumption (C)

Financial Market

Govern ment

Foreign Sector

Saving (*S*)

Net Taxes (*T*)

Import Expenditure (*Im*)

The Expenditure Approach

The ***expenditure approach*** sums up spending of all macroeconomic agents:

- households – consumption spending ***C*** ;
- firms – investment spending ***I*** ;
- the government – government purchases of goods and services ***G*** ;
- the foreign sector – net exports ***NX*** :

$$GDP = C + I + G + \underbrace{(Ex - Im)}_{NX}$$

Consumption Spending

Consumption spending include expenditures made by households for:

- ***current consumption*** – purchases of non-durable goods (food, clothes, shoes, etc);



- ***consumption of durable goods*** (furniture, cars, refrigerators, TV-sets, etc) (except houses);

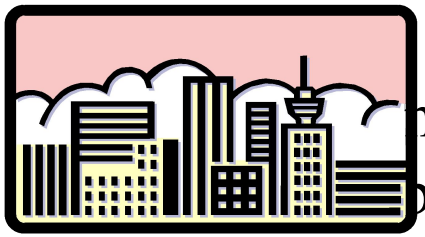




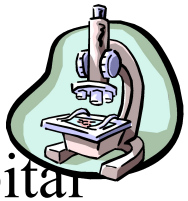
- ***payments for services*** (hair-cuts, entertainments, tourism, etc.).



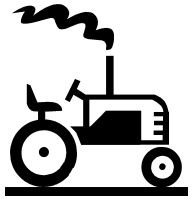

Investment Spending



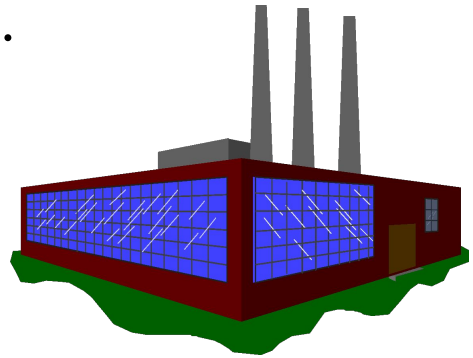
ment spending represent expenditures
usiness firms and households to buy capital goods. It is the sum of expenditures for:

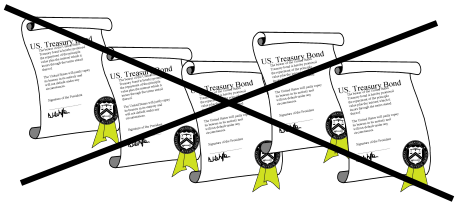


- purchases of ***new equipment, machinery and tools***;
- ***new nonresidential construction*** (buildings, offices, hotels, factories, other commercial real estate);
- ***new residential construction*** (houses, cottages, flats);
- ***inventory investment***.



Purchase of securities (bonds and shares) is not considered as investment spending, because represents redistribution, not creation of output).





Inventory Investment

Three first components of investment spending form domestic private ***fixed investment***.

Inventory investment (I_{inv}) represent the annual net changes in the stock of inventories.

Inventories, held by firms, include:

- ***raw materials***;
- ***parts*** (or semi-finished goods);
- ***unsold finished goods***.

Inventory investment =
= Production – Sales

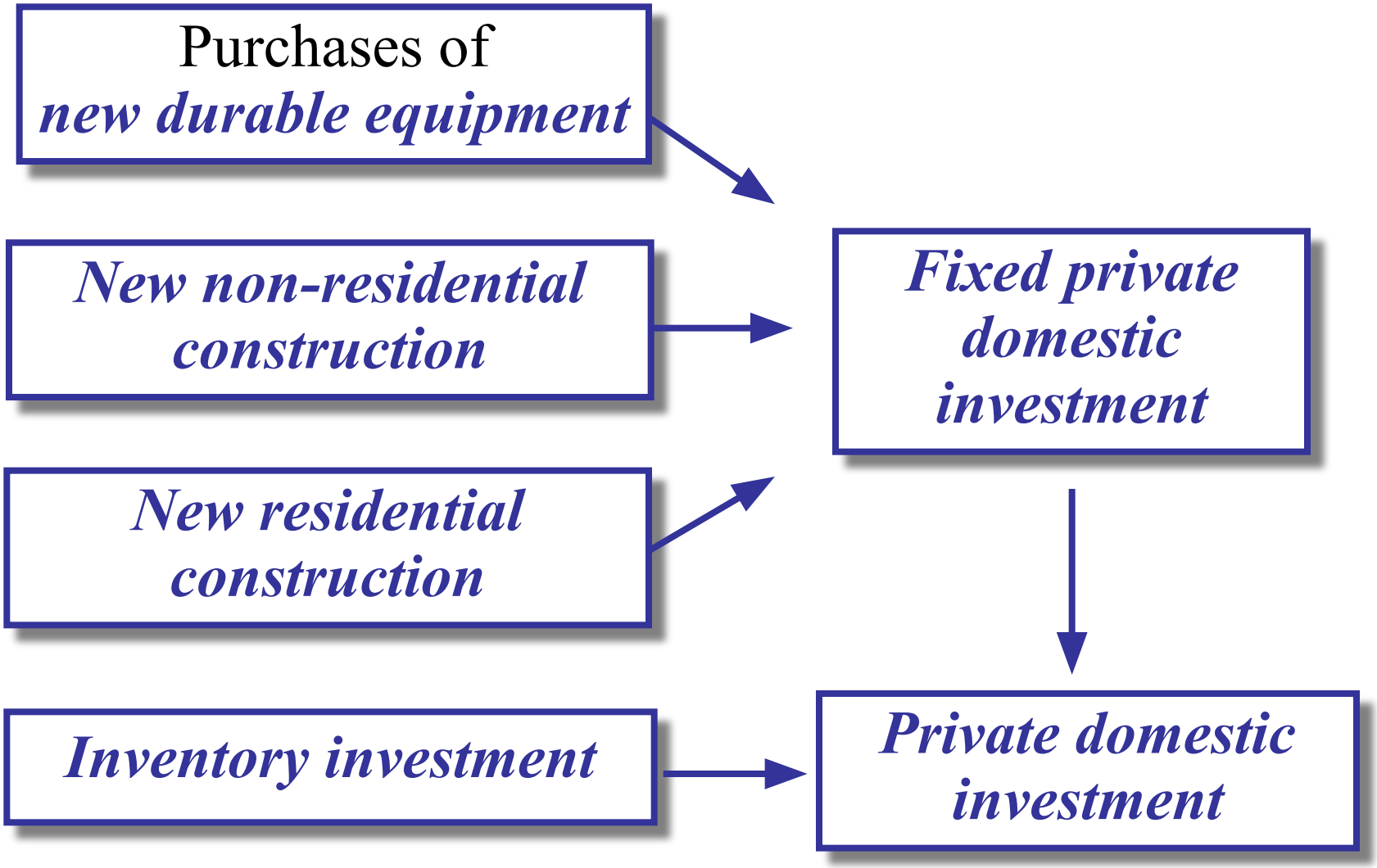
If the changes in inventories are ***positive*** $\Rightarrow I\uparrow \Rightarrow$ **GDP↑**.

If the changes in inventories are ***negative*** $\Rightarrow I\downarrow \Rightarrow$ **GDP↓**.

Example

Beginning of the year	*End of the year*	
\$100	\$120	$\Rightarrow$ $I_{inv} = +\$20 \Rightarrow$ **increase** in GDP by \$20
\$100	\$70	$\Rightarrow$ $I_{inv} = -\$30 \Rightarrow$ **decrease** in GDP by \$30

Composition of Investment Spending



Gross and Net Investment

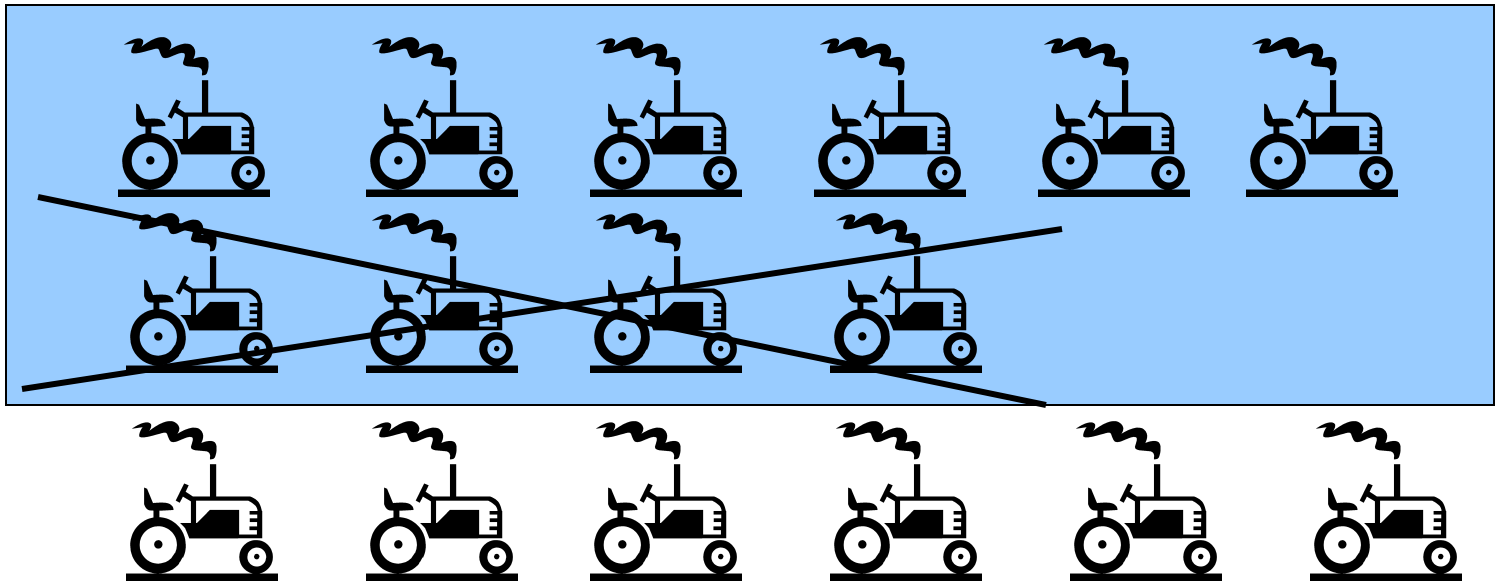
Investment spending are divided into:

- ***gross*** investment (I_{gross});
- ***replacement*** investment (= ***depreciation*** = ***capital consumption allowances*** ***A***): during production process capital wears out and must be replaced or repaired;
- ***net*** investment (I_{net}).

$$I_{gross} = A + I_{net}$$

Net investment is the base for increase in capital stock and thus in the productive possibilities of the economy.

The Role of Net Investment



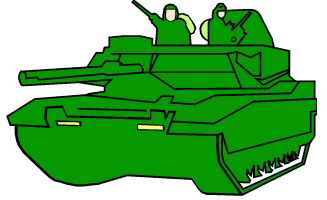
6
Gross Investment

4
Replacement Investment

2
Net Investment

Change in Capital Stock = + 2

Government Spending



Government spending consist of the government sector's purchase of goods and services. They **include** expenditures on:

- ***goods*** purchased to run government and the military (including purchase of investment goods for public enterprise and infrastructure and in order to produce public goods);
- ***payments to government employees*** (civil servants, teachers, firemen) and the military for their personal services;

and **exclude** transfer payments (welfare social benefits and subsidies, as they result from redistribution of previously received funds).

Government spending can be divided into:

- ***government consumption*** – the purchase of consumer goods and payments to government employees;
- ***government investment*** – the purchase of investment goods.








Imputed Value

It is a national accounting rule to calculate GDP by adding the market prices of all final goods and services, produced within the economy…

but there are some final goods and services, that are ***parts of total output***, but are not sold and bought in the market.

The value of items that ***have no market value*** and ***are not traded in the market***, but must be included in total output and income is called the ***imputed value***.

Examples:

- some government services that enter GDP at their costs;
- rental payments that are paid by house owners to themselves.

Net Exports

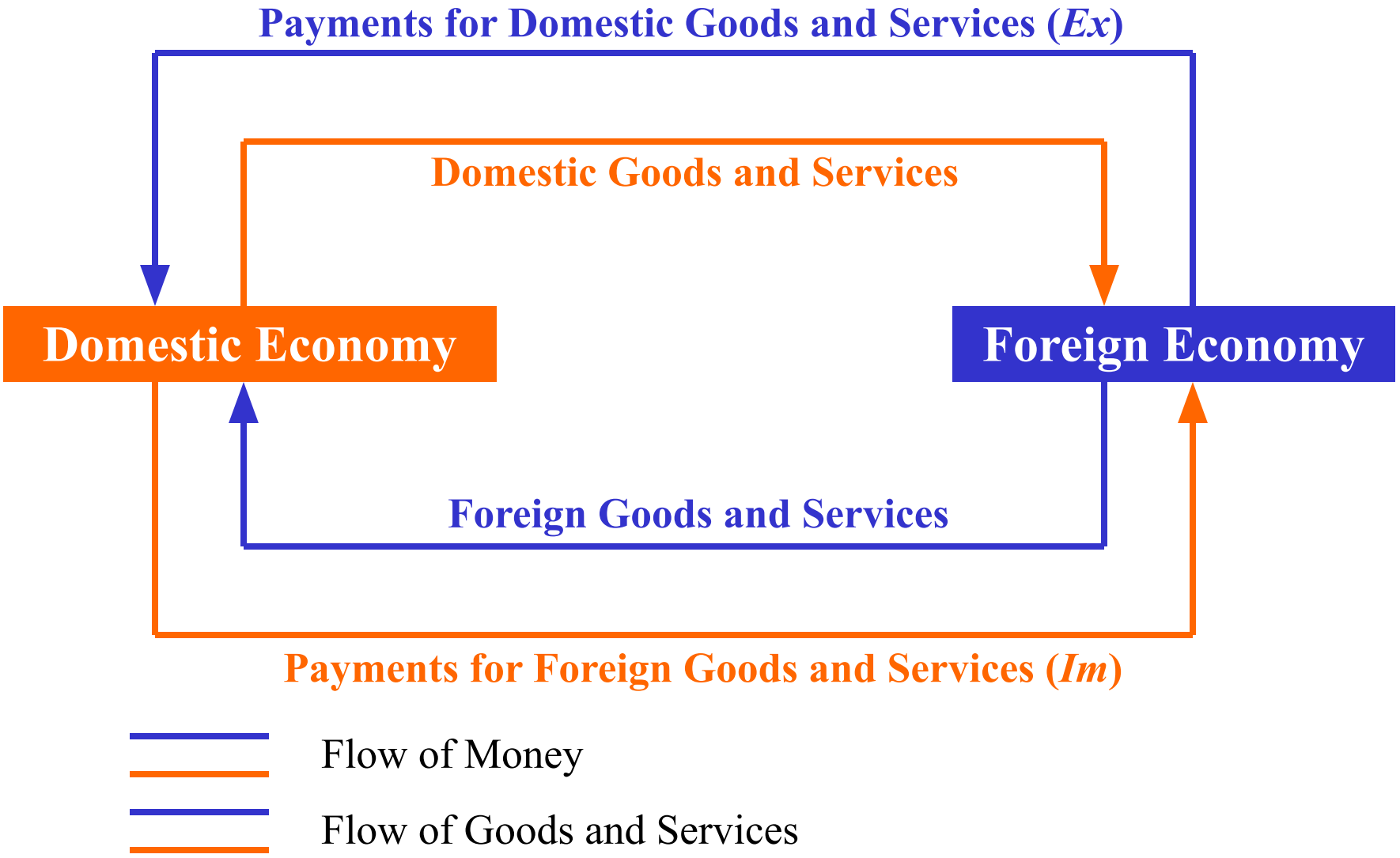
All the countries in our days are ***open economies***, i.e. economies transacting with other countries (with the rest of the world). One of the major links between economies is international trade. Countries sell (export) domestically produced goods and services to the foreign countries and buy (import) goods and services produced abroad.

The value of domestic production that is sold to other countries is called ***gross exports*** (*Ex*).

The value of foreign production that is purchased by the domestic economy is the country's ***gross imports*** (*Im*).

The balance between gross exports and gross imports is called ***net exports*** (*NX*).

The Diagram of Net Exports



How Imported Goods Are Registered

Goods and services produced abroad are bought by all domestic macroeconomic agents (households, firms and government), thus they are parts of correspondingly consumption spending *C*, investment spending *I* and government purchases of goods and services *G*). Hence:

$$C = C_D + C_F; \quad I = I_D + I_F \quad \text{and} \quad G = G_D + G_F.$$

Because gross domestic product includes the value of only domestically produced goods and services, then in order to calculate GDP, we must subtract the value of all imported goods and services, and add the value of all domestically produced production bought by foreigners:

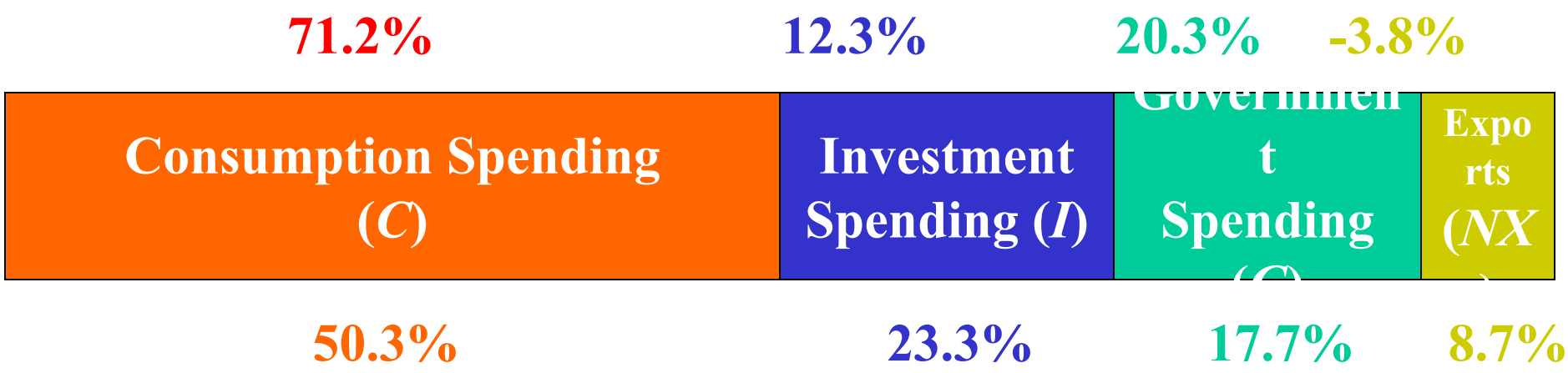
$$GDP = (C_D + C_F) + (I_D + I_F) + (G_D + G_F) + Ex - Im$$

Im

Therefore, imported production is ***excluded*** from the value of GDP, ***but*** in national accounts is ***registered twice***.

The Expenditure Approach

Structure of US GDP, 2011



Structure of Russian GDP, 2011

The Income Approach

The income approach makes use of the fact that expenditures on GDP ultimately become income.

Thus, GDP represents the total sum of factor incomes, earned by the owners of economic resources, i.e. households. It consists of:

- ***wages and salaries***, earned by workers of private firms;
- ***rental payments***, earned by land and estate owners (including imputed rental payments for housing services, enjoyed by house owners);
- ***interest payments***, earned by capital owners;
- ***profits***, earned by entrepreneurs and firms' owners.

The sum of income earned by the factors of production owned by a country's citizens is called **National Income** (*NI*) or National Income *at factor costs*:

$$NI = Wages + Rents + Interest + Profits$$

Interest Payments

According to U.S. national accounts
interest payments is called “net interest”.

Net interest = interest paid by firms – interest received by firms + interest received from the rest of the world – – interest paid to the rest of the world

%%

The Types of Profits

In accordance with the existing forms of business organization, national accounts distinguish two types of profits:

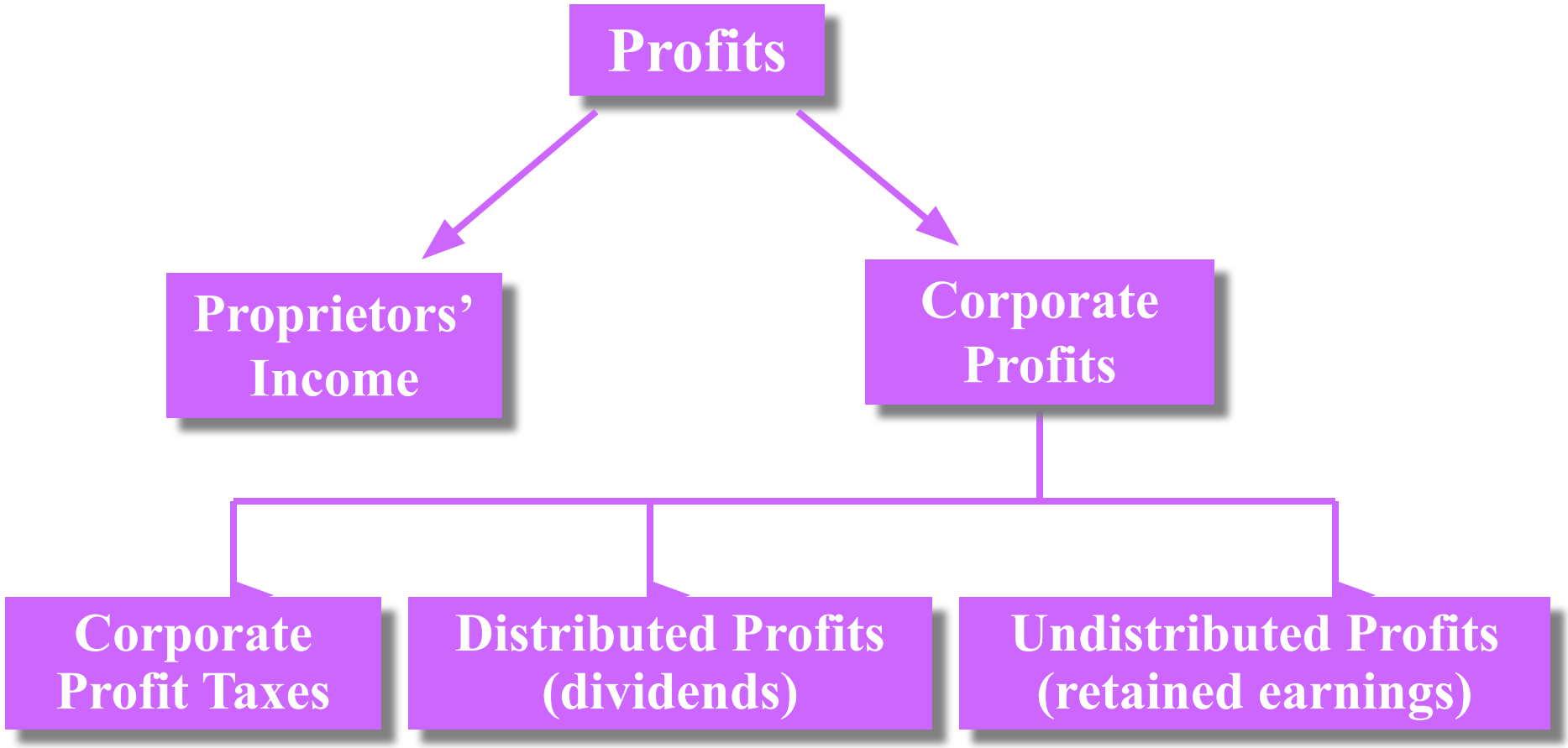
- ***proprietors' income***, i.e. profits of firms, possessed by one owner (single proprietorship) or several joint owners (partnership**),** who themselves manage the firm make all the decisions and are personally responsible for all of the firm's actions and debts;
- ***corporate profits***, i.e. profits of firms in which ownership and financial responsibility are divided, limited, and shared among any number of shareholders. Such type of firms is called *corporations*.

One part of corporate profits is paid to government in the form of corporate taxes, and the rest sum is divided into two parts:

✔***distributed profits*** – the part which is distributed to shareholders as dividends;

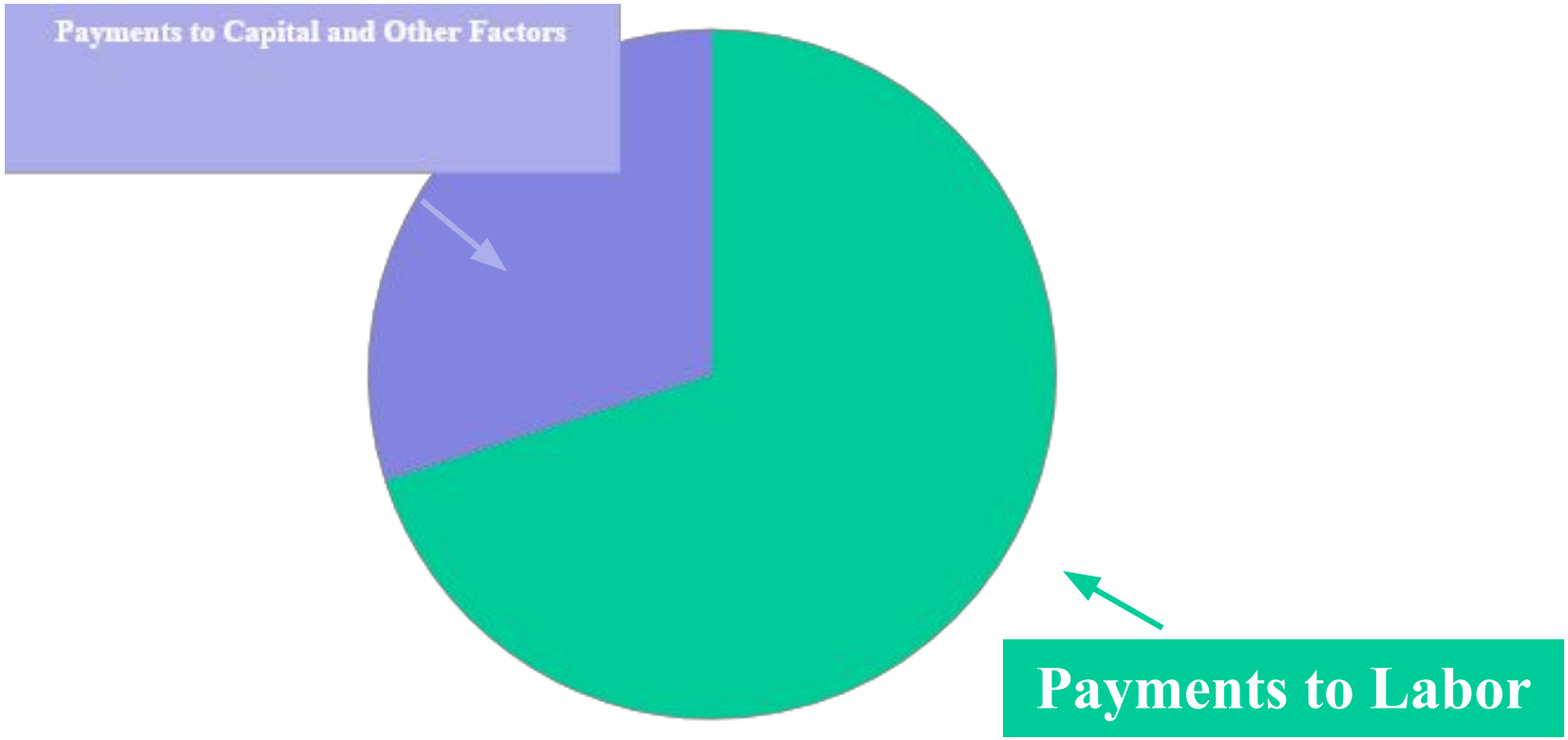
✔***undistributed profits*** – the part not distributed to shareholders and retained by the firm (also called ***retained earnings***).

The Structure of Profits



The Structure of Factor Payments

The dominant factor of production is labor. The share of **labor** income in National Income in industrialized countries occupies more than **2/3** of all factor payments (≈ 70% in the U.S.). Most of the remainder goes to pay **capital**. Only a small amount goes for other factors of production or true profits.



From National Income to GDP

National Income must be modified slightly to arrive at GDP.

We must add components that are necessary for calculating aggregate output, but not included in National Income as they do not become income for suppliers of productive resources:

- ***depreciation***, because these expenses capture the value of output needed to replace or repair worn out buildings and machinery;
- ***indirect taxes*** (sales taxes, value-added taxes, customs duties, license fees, and so on), because they are part of the expenditure on goods and services and are included in prices;
- ***factor income of foreigners*** received for the use of their economic resources in the country, whose GDP is calculated.

From National Income to GDP

At the same time we must subtract from NI elements that are not part of GDP:

- ***subsidy payments*** made by the government to firms (farmers, for example) that are part of the farmers' income but are not made in exchange for goods or services;
- ***factor income of the citizens of the country abroad***, because NI includes the income of all citizens everywhere whereas GDP includes the value of goods produced domestically by anyone.

The Factor Income from Abroad

Factor income includes:

- ***labor income*** (= compensation of employees);
- ***property and entrepreneurial income*** (= investment income from the ownership of financial assets, i.e. interest on short- and long-term capital, dividends, rent, etc).

Income of foreigners received within the country – **Income of the citizens of the country abroad** = **Net Foreign Factor Income**

Income of the citizens of the country abroad – **Income of foreigners received within the country** = **Net Factor Income from Abroad**

Net Foreign Factor Income = – **Net Factor Income from Abroad**

The Income Approach: A Summary

In summary,

GDP = NI + Depreciation + Indirect taxes - Subsidies -
- Net factor income from abroad

or

GDP = NI + Depreciation + Indirect taxes - Subsidies +
+ Net factor income of foreigners

All the approaches for calculating GDP
(expenditure, income and value added)
must give the same result.

Gross National Product

Gross National Product (**GNP**)

is the total market value of all final goods and services produced within a year *by factors of production owned by the citizens* of that country.

It doesn't matter where the output is actually produced: in the domestic economy or abroad.

GDP versus GNP

Italian worker

works in **Germany**

He adds to:

- Gross **Domestic** Product of **Germany**
- Gross **National** Product of **Italy**

Thus,

GNP* = *GDP* + *net factor income from abroad

or

GNP* = *GDP* - *net factor income of foreigners

Hence, GNP can be greater or less than GDP, depending on whether the citizens of the country earn more or less abroad than foreigners earn in this country.

Net Domestic and Net National Product

Net Domestic Product (NDP) = GDP – Depreciation

Net National Product (NNP) = GNP – Depreciation

or ***Net National Product = National Income + Net Indirect Taxes***

that is why *NNP* is often called national income *at market prices*.

NNP characterizes ***productive potential*** of the economy for the next year because it is free from depreciation and ***includes only net investment***.

National Income

***National Income* = *NNP – Net Indirect Taxes* =**

= *NNP – Indirect taxes + Subsidies*

National Income (*NI*) **(**or national income *at factor costs*) is the money income **earned** by households for the factor services. It is the sum of factor payments, made to households by private firms.

NI* = *Wages + Rents + Interest + Profits

Personal Income

Personal income (*PI*) is the money income **received** by households before personal income taxes are subtracted.

PI = NI – Contributions for social insurance –
– Corporate profits + Personal dividend income +
+ Government and business transfers – Net interest +
+ Personal interest income

(Not all national income is distributed to persons. Some of the corporate profits are retained by firms. Similarly, not all interest payments paid by firms go to persons: some go to banks, some go abroad.)

Disposable Income

Disposable income (*DI*) is the money income which is **at the disposal** of households and which they can use as they like. It is an after-tax personal income.

$$DI = PI - \text{Personal income taxes}$$

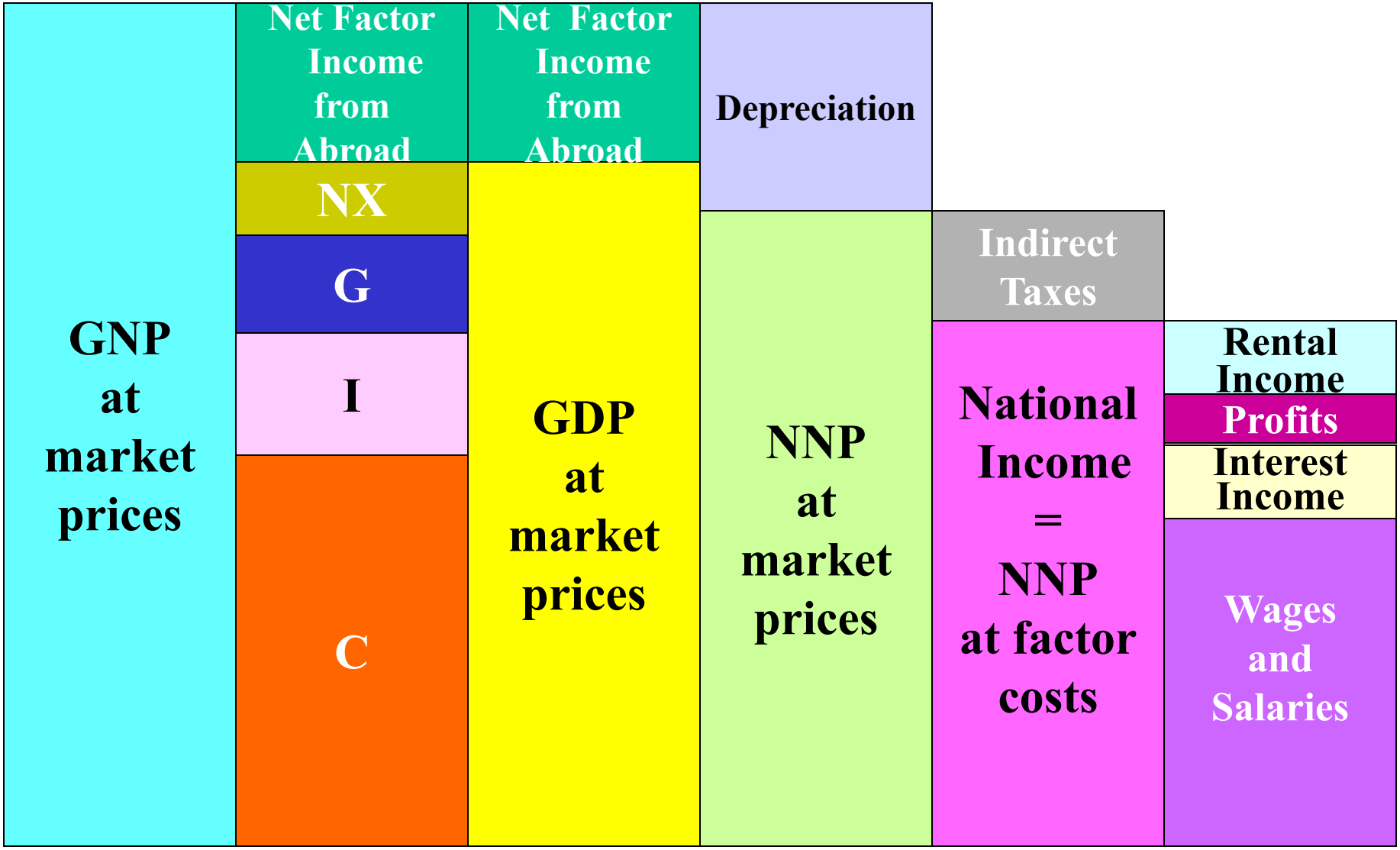
Disposable income is used by households for consumption spending (*C*) and saving (*S*):

$$DI = C + S$$

Part of the disposable income that is not spent for consumption is called ***personal*** (or ***household***) ***saving***:

$$S = DI - C$$

National Income Accounting: A Summary

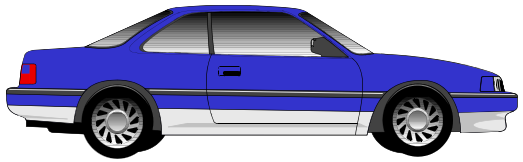


GDP as an Indicator of the True Level of National Output

Being the major measure of aggregate output, GDP can't serve the exact indicator of the actual level of production in the economy.

Official GDP statistics do not provide a complete accounting of economic activity, because do not include the value of:

- ***underground or illegal economic activities***;
- ***household work and production***;
- ***bartered goods***.



GDP as the Indicator of the Welfare and the Well-being

GDP and GNP can't serve the exact indicators of societal well-being.

An increase in these measures might reflect an increase in the standard of living, **but** GDP and GNP:

- ✔ also increase with expenditures on natural disasters, deadly epidemics, war, crime, and other detriments to society;
- ✔ do not include non-market activity and self-made production;
- ✔ do not reflect the impact of externalities, either positive ("goods") or negative ("bads"), such as deterioration of environment, changes in leisure time, the level of medical care and education, the length of life, the crime situation, noise, etc;
- ✔ do not capture the change in product quality.

Net Economic Welfare

This indicator to estimate
economic well-being was proposed
in **1972** by two prominent U.S. economists
James Tobin (Nobel prize,1981) and **William Nordhaus**.

Net Economic Welfare =

= GDP + Value of «Goods» – Value of «Bads»

Nominal GDP versus Real GDP

Nominal GDP is GDP measured at **current prices**. The size of nominal GDP is influenced by two factors:

- changes in the size of physical volume of production;
- changes in prices (level of inflation).

In order to measure the true change in output economists use real GDP.

Real GDP is GDP measured with **constant prices.**

Real GDP is nominal GDP corrected for inflation.

$$Real\ GDP = \frac{Nominal\ GDP}{Price\ level}$$

Example

Imagine, that the economy producers only bananas.

	Quantity (in tons) **Q**	**Price** (in dollars) **P**	**Nominal GDP** (in current prices)	**Real GDP** (in prices of 2010)
Year 2010	**100**	**150**	**150 × 100=15000**	**150 × 100= 15000**
Year 2011	**80**	**200**	**200 × 80 = 16000**	**150 × 80 = 12000**

In 2011 the ***real*** GDP ***decreased***

while the ***nominal*** GDP ***increased*** due to the increase in prices.

Nominal GDP versus Real GDP

If economy produces a great number of goods (n goods, for example), then the value of

***Nominal* GDP = current year prices × current year quantities**

$$= \sum_{i=1}^{n} P_i^t Q_i^t$$

the value of

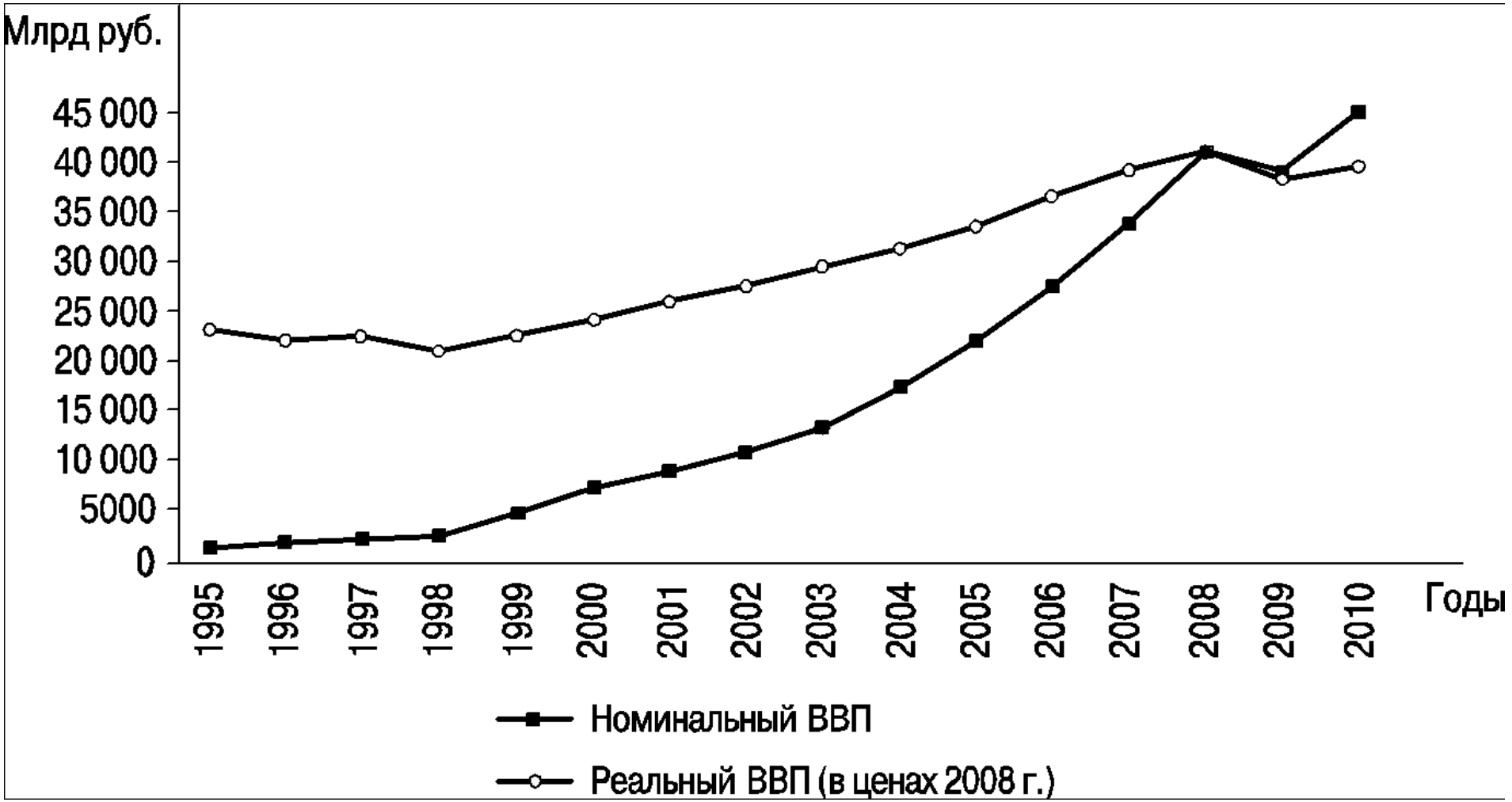
***Real* GDP = base year prices × current year quantities =**

$$= \sum_{i=1}^{n} P_i^0 Q_i^t$$

where P_i^t and P_i^0 are the prices for good i correspondingly in the current (t) year and in the base (0) year;

Q_i^t and Q_i^0 are the quantities of good i produced correspondingly in the current (t) year and in the base (0) year.

Nominal and Real GDP in Russia, 1995-2010



Source*: Goscomstat*

Price Indexes

The measures of general price level are:

- **Consumer Price Index – *CPI***;
- **Producer Price Index – *PPI***;
- **GDP Deflator**.

Price indices are used to measure inflation and adjust nominal values for inflation to find real values

The Consumer Price Index

- is based on the prices of items in a fixed representative "market basket" of hundreds of final goods and services used by typical urban consumers in a base year;
- is the government's gauge of inflation in the US;
- is considered to be the best measure of the cost of living;
- is used, for example, to adjust tax brackets and social security payments and wages for inflation (i.e. indexation);
- is calculated as **Laspeyres index**, i.e. fixed basket (base year) quantities index:

$$I = \frac{\textit{Current year prices} \times \textit{Base year quantities}}{\textit{Base year prices} \times \textit{Base year quantities}} \times 100 =$$

$$= \frac{\sum_{i=1}^{n} P_i^t Q_i^0}{\sum_{i=1}^{n} P_i^0 Q_i^0} \times 100$$

The Producer Price Index

- is based on the prices of items in a fixed "market basket" of hundreds of intermediate (or wholesale) goods (such as lumber and steel) used by producers during a production process in a base year;
- is calculated as **Laspeyres index**, i.e. fixed basket (base year) quantities index, so the PPI is similar in calculation to the CPI;
- differs from CPI, because:
  - includes raw materials and semifinished goods;
  - is designed to measure prices at an early stage of a distribution system;
  - is constructed from prices at the level of the first (not final) significant commercial transaction;

- the PPI is sometimes a good predictor of future inflation (since producers often pass their cost increases on to consumers).

The GDP Deflator

The **Gross Domestic Product Deflator** is an alternative general price index that reflects the importance of products in ***current*** market baskets (current year quantities), rather than in base year market baskets (base year quantities), which become less relevant over time.

$$\textit{GDP Deflator} = \frac{\textit{Current year prices} \times \textit{current year quantities}}{\textit{Base year prices} \times \textit{current year quantities}} \times 100$$

$$= \frac{\sum_{i=1}^{n} P_i^t Q_i^t}{\sum_{i=1}^{n} P_i^0 Q_i^t} \times 100$$

GDP deflator is calculated as **Paasche index**.

From Nominal GDP to Real GDP

In order to convert any year's nominal GDP
(or any other nominal figure)
into real GDP
(or any other corresponding real figure),
one must use the formula

$$\textit{Real GDP} = \frac{\textit{Nominal GDP}}{\textit{CPI (or GDP deflator) for the same year}}$$

CPI versus GDP deflator

	The Consumer Price Index	The GDP deflator
Type of Goods	Only Consumer Goods	All the Final Goods Included in GDP
Imported Goods	Includes	Excludes
Market Basket (Quantities)	Fixed (of the base year)	Changing (of the current year)
Price Index	Laspeyres	Paasche
Changes in Price Level	Overestimates	Underestimates
Substitution Effect	Doesn't reflect	Reflects
Quality Improvements	Excludes	Includes
Price Changes in New Products	Excludes	Includes

How to Measure Inflation

Inflation is a sustained increase in the **overall** price level. An increase in the price of one good or several goods is not necessarily inflation. There must be an increase in the general price level (P) between two years – current (t) and previous (t-1). The key measure is the rate of inflation (π):

The rate of inflation (π) = $$\frac{P_t - P_{t-1}}{P_{t-1}} \times 100\% = \left(\frac{P_t}{P_{t-1}} - 1\right) \times 100\%$$

The most frequently used measures of price level are *CPI* and the *GDP* deflator.

$$\pi = \frac{CPI_t - CPI_{t-1}}{CPI_{t-1}} \times 100\%$$

$$\pi = \frac{GDP\ deflator_t - GDP\ deflator_{t-1}}{GDP\ deflator_{t-1}} \times 100\%$$

Nominal GDP, Real GDP and Inflation

The GDP deflator implies a simple relation between *nominal GDP* (Y^N) and *real GDP* (Y^R) for each year (year t):

$$\textbf{GDP deflator}_t = \frac{\textbf{Nominal GDP}_t}{\textbf{Real GDP}_t} \quad \text{or} \quad P_t = \frac{Y_t^N}{Y_t^R}$$

Nominal GDP in year t = Price Level in year t × Real GDP in year t

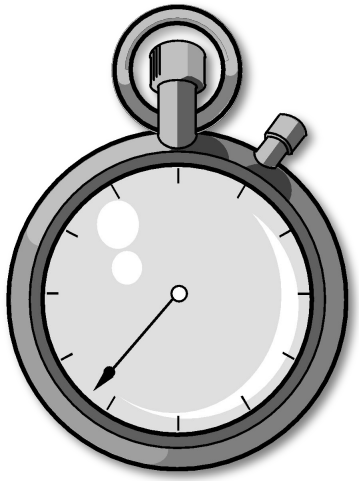
$$Y^N_t = P_t \times Y^R_t$$

If inflation is low (< 10%), the relationship between nominal GDP, real GDP, and the inflation rate (π) is:

Changes in Nominal GDP (in %) = Changes in Real GDP (in %) + Changes in the Overall Price Level (in %)

$$\Delta Y^N_t \text{ (in \%)} = Y^R_t \text{ (in \%)} + \pi_t$$

Example. Suppose during a year nominal GDP increased by 7%, while the rate of inflation by the end of the year appeared to be 4%.



Actual and **Potential** Real GDP

To measure changes in quantities, i.e. physical amount of output, only real GDP can be used.

But annual (**short-run**) output can deviate from output that can be produced if all the economic resources are fully employed (**long-run** output).

The first one is called ***actual*** *real GDP* and is used to measure the changes in real from year-to-year output (i.e. business cycle fluctuations).

The second one is called ***potential (or natural)*** *real GDP* and is used to to estimate the changes in productive possibilities of the economy (i.e. the trend of economic growth).

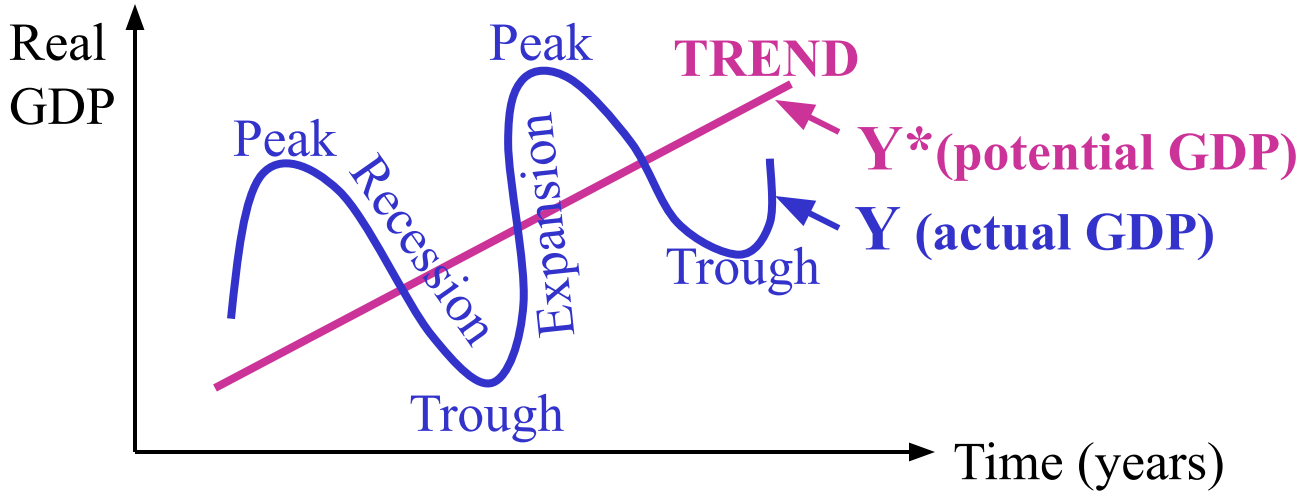
Actual versus Potential Real GDP

Actual real GDP (Y)

- Short run period.
- Measures changes in the annual (year-to-year) output.
- Is a characteristic of business cycle.
- The level is determined by the desire of economic agents to buy produced goods and services, i.e. by aggregate demand.

Potential real GDP (Y*)

- Long run period.
- Measures changes in the productive possibilities.
- Is a characteristic of economic growth.
- The level is determined by the amount and productivity of resources (labor and capital) and the existing technology, i.e. by production function.



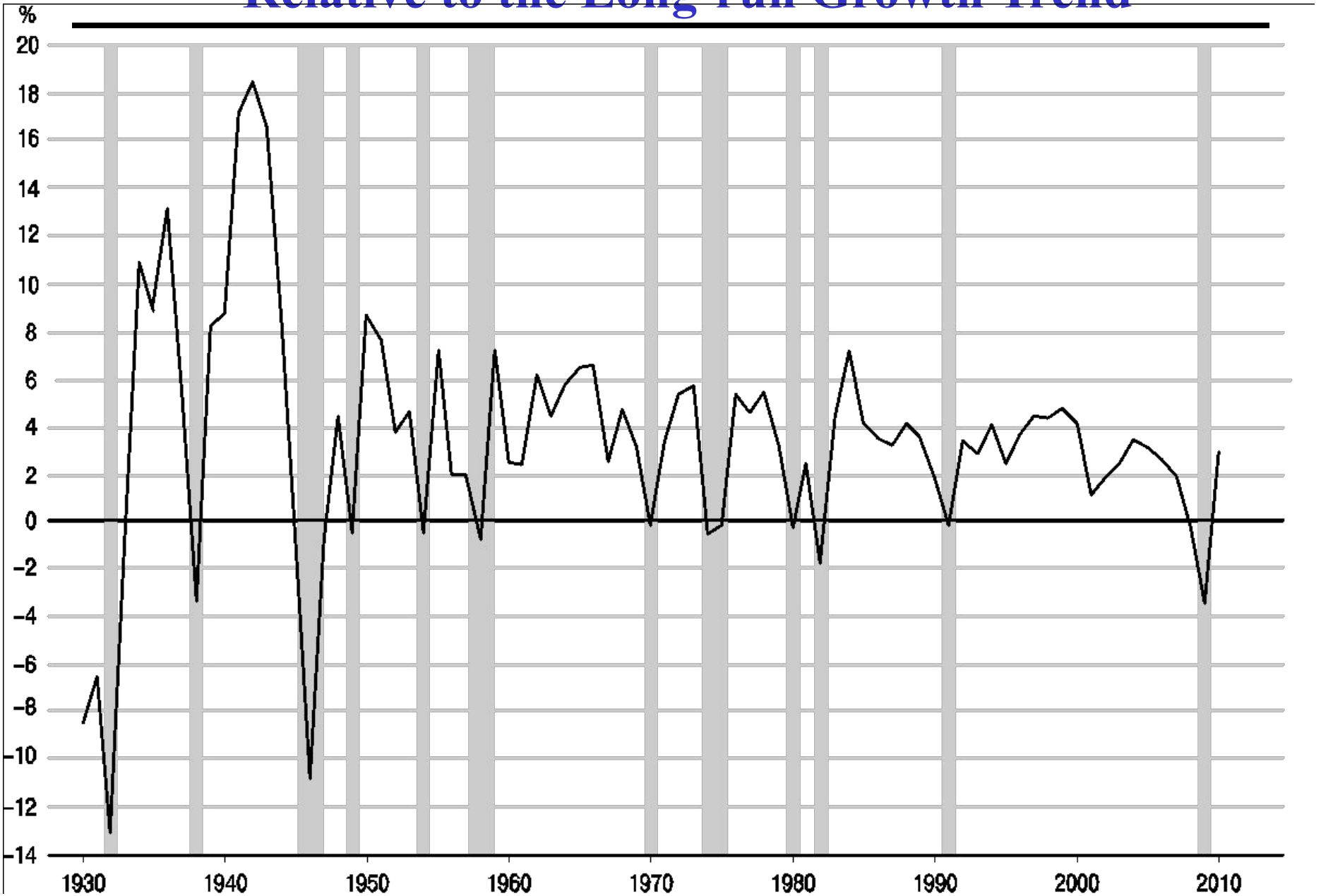
The Business Cycle

The ***business cycle*** is the fluctuations in the economic activity, the periodic rise and fall in real output.

In general, there are four phases of the business cycle.

- ***Expansion*** – a period where real GDP is growing.
- ***Peak*** – the top of the cycle where an expansion has run its course and is about to turn down.
- ***Contraction*** (or ***recession***) – a period where real GDP is falling. A prolonged and deep recession is called a ***depression***.
- ***Trough*** – the bottom of the cycle where a contraction has stopped and is about to turn up.

US Business Cycle: Fluctuations in Total Production Relative to the Long-run Growth Trend



The GDP Gap

The deviation of actual real GDP (Y) from its potential level (Y*) is known as the *GDP (or output) gap*.

GDP gap = Potential GDP – Actual GDP = Y* – Y

The GDP gap may be:

- ***positive***, when actual real GDP is below its potential level; it is the period of recession; this type of gap is called the ***recessionary*** *GDP gap;*
- ***negative***, when actual real GDP exceeds its potential level; it is the period of expansion (or boom); this type of gap is called the ***inflationary*** *GDP gap;* the economy in this case is called an *overheated economy*.

Recessionary versus Inflationary GDP Gap

	Recessionary GDP gap	Inflationary GDP gap
Level of output	$Y < Y^*$	$Y > Y^*$
Level of employment	Underemployment (less than full)	Overemployment (higher than full)
Major problem	Unemployment	Inflation
Situation	Crisis	Overheating

Behavior of Macroeconomic Variables During the Business Cycle

	Recession	*Expansion*
Real GDP (real output)	↓	↑
Incomes	↓	↑
Investment Spending	↓	↑
Inventories of Unsold Production	↑	↓
Firms' Profits	↓	↑
Unemployment Rate	↑	↓
Price Level (*according to the cause*)	↓ *or* ↑	↑ *or* ↓
Tax Revenues	↓	↑
Transfers	↑	↓
Imports	↓	↑

The Rate of Growth

The rate of growth (g) is an important macroeconomic variable that is used to measure the ***annual percentage changes*** in the level of economy's output, i.e. ***in actual real GDP*** (Y) in a given year (year 2 or more generally year t) relative to the previous year (year 1 or more generally $t-1$), that allows to estimate if economic activity is declining or expanding.

$$g = \frac{\textit{Real GDP of year}_2 - \textit{Real GDP of year}_1}{\textit{Real GDP of year}_1} \times 100\%$$

or more generally

$$g = \frac{Y_t - Y_{t-1}}{Y_{t-1}} \times 100\%$$

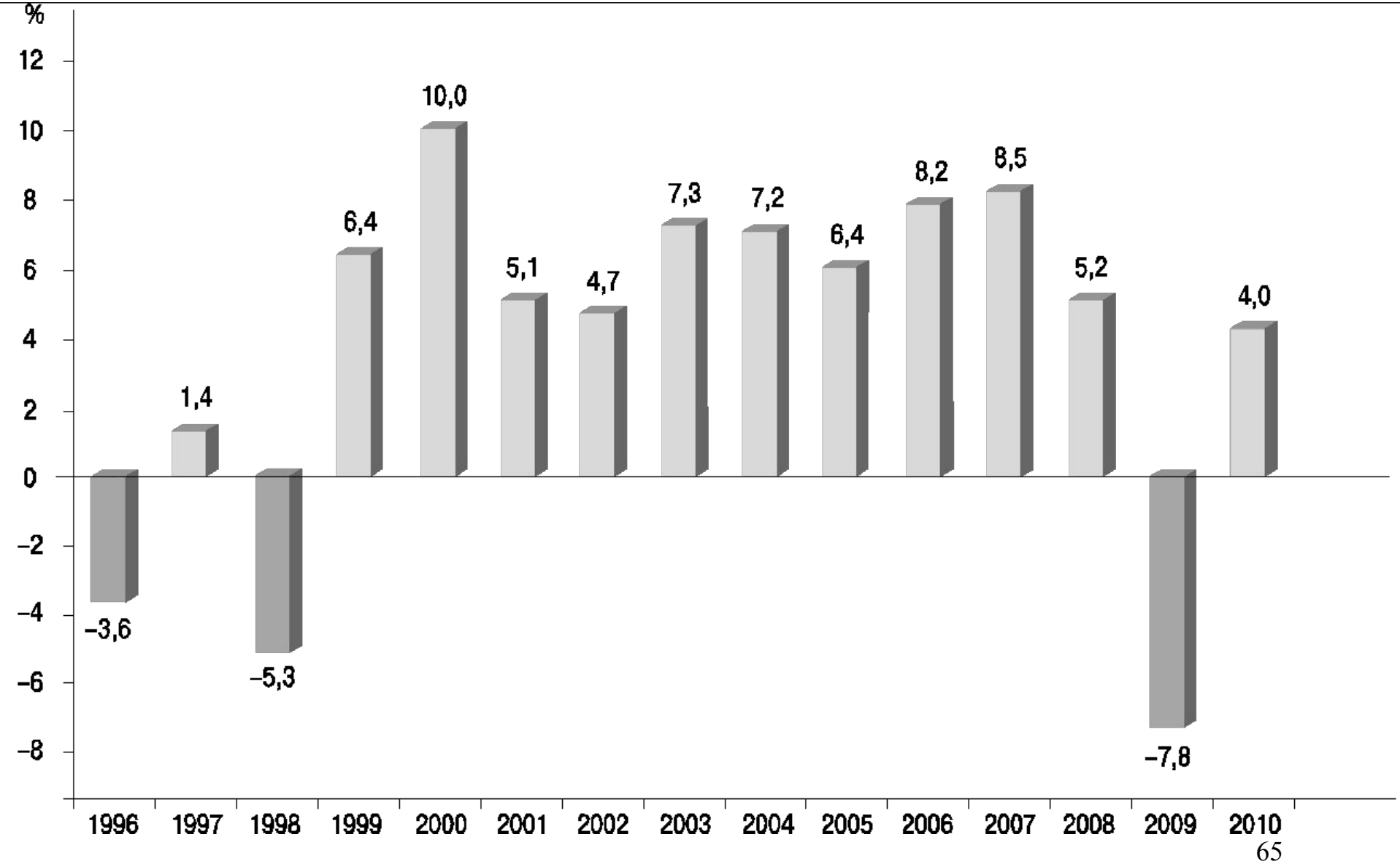
- Periods of positive GDP growth are called ***expansions***.
- Periods of negative GDP growth are called ***recessions***.

Growth Rates of Real GDP Across the Countries 2003-2010 (%)

Country	2003	2004	2005	2006	2007	2008	2009	2010
Russia	7,3	7,2	6,4	8,2	8,5	5,2	-7,9	3,7
Germany	-0,2	0,7	0,9	3,6	2,8	0,7	-4,7	3,5
Italy	0,1	1,4	0,8	2,1	1,4	-1,3	-5,1	1,0
Canada	1,9	3,1	3,0	2,8	2,2	0,5	-2,5	3,0
Great Britain	2,8	3,0	2,2	2,8	2,7	-0,1	-5,0	1,8
United States	2,5	3,6	3,1	2,7	1,9	0,0	-2,6	2,7
France	1,1	2,3	2,0	2,4	2,3	0,1	-2,5	1,6
Japan	1,4	2,7	1,9	2,0	2,4	-1,2	-5,2	3,7
China	10,0	10,1	11,3	12,7	14,2	9,6	9,1	10,5

Source: *World Bank and OECD Economic Outlook*

Growth Rates of Real GDP in Russia, 1996-2010



Source*: Goscomstat*

How to Measure the Standard of Living

The best measure for the **productive potential** of the economy is **real GDP**.

But it is not the exact variable to estimate the living standard and the well-being of each citizen, because the population growth rate may be higher than that of real GDP.

So the best measure for the **standard of living** is thought to be **real GDP per capita**.

$$Real\ GDP\ per\ capita = \frac{Real\ GDP}{Size\ of\ Population}$$

But real GDP per capita is not the ideal measure of personal economic well-being, because it doesn't include the changes:

- in the distribution of income;
- in leisure time enjoyed by the typical person;
- in the impact of externalities;
- in product quality, etc.

Standards of Living Worldwide, 2010

Country	GDP per Capita ($) by PPP	Rank	Country	GDP per Capita ($) by PPP	Rank
Qatar	145 300	1	Japan	34 200	38
Liechtenstein	122 100	2	France	33 300	39
Luxembourg	81 800	3	Italy	30 700	43
Bermuda	69 900	4	Czech Republic	25 600	53
Norway	59 100	5	Cyprus	21 000	62
Singapore	57 200	6	Estonia	19 000	63
United States	47 400	10	Poland	18 800	65
Switzerland	42 900	16	Puerto Rico	16 300	69
Australia	41 300	18	Russia	15 900	71
Netherland	40 500	19	Chile	15 500	72
Canada	39 600	23	China	7 400	127
Sweden	39 000	24	Ukraine	6 700	133
Germany	35 900	31	Georgia	4 800	152
United Kingdom	35 100	35	Burundi	300	228

Source: *CIA – The World Factbook*

Human Development Index, 2010

Country	Rank	HDI Values	Life Expectancy (number of years)	GDP per Capita (PPP in US$ of 2008)
Norway	1	0,938	81,0	58 810
Australia	2	0,937	81,9	38 692
New Zealand	3	0,907	80,6	25 438
США	4	0,902	79,6	47 094
Ireland	5	0,895	80,3	33 078
Liechtenstein	6	0,891	79,6	81 011
Netherland	7	0,890	80,3	40 658
Canada	8	0,888	81,0	38 668
Sweden	9	0,885	81,3	36 936
Germany	10	0,885	80,2	35 308
Russia	65	0,719	67,2	15 258

Source: *United Nations Organization*