# ICEF MACROECONOMICS - 1

Lecture 01

# GDP

Motivation to study macroeconomics
How the Bank of Russia makes decisions?
Income or happiness?

Handouts 01

National accounts
Circular flow model
Macroeconomic indices

# ILOs: Topic 1 / Block 11 / Ch.17

By the end of **Topic 1. Block 11** you should be able to:

- describe the nature of macroeconomics as the study of the whole economy
- discuss internally consistent national accounts; **why** measuring GDP by income, by expenditure or by output produces the same result?
- recognise and understand the identity $Y \equiv C + I + G + NX$
- identify nominal versus real measures of national income and output and their more comprehensive measures
- describe the shortcomings of GDP as a measure of economic activity and wellbeing

# Subject Guide / Block 11

## Macroeconomics

| Block | Title | BVFD Chapter |
|---|---|---|
| 11 | Introduction to macroeconomics | 17 |
| 12 | Supply-side economics and economic growth | 18 |
| 13 | Output and aggregate demand | 19, 20 |
| 14 | Money and banking; interest rates and monetary transmission | 21 (except Maths 21.2, 22 (except Maths 22.1) |
| 15 | Monetary and fiscal policy | 23 (except 23.6 and the appendix) |
| 16 | Aggregate demand and aggregate supply | 24 |
| 17 | Inflation | 25 (except 25.1) |
| 18 | Unemployment | 26 (except Maths 26.1) |
| 19 | Exchange rates and the balance of payments | 27(except Maths A27.1) |
| 20 | Open economy macroeconomics | 28 (except Maths 28.1) |

Mc Graw Hill

Because learning changes everything.®

# Chapter 17

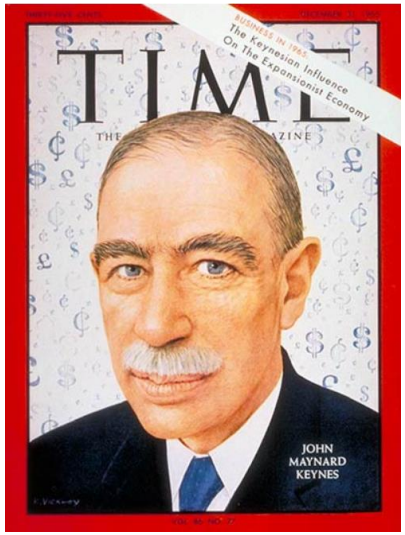
## Introduction to macroeconomics

- **Economics, 12e**

# Motivation to study macroeconomics

# Missing motivation in macroeconomics

**Macroeconomics changed between the early 1960s and the late 1970s**




- The macroeconomics of the early 1960s was avowedly Kéynesian
  - This was manifested in the textbooks of the time, which showed a remarkable unity from the introductory through the graduate levels
- The decline of the old-style Keynesian economics was due in part to the simultaneous rise in inflation and unemployment in the late 1960s and early 1970s
  - That occurrence was impossible to reconcile with the **simple** nonaccelerationist Phillips curve (1958) - a mixture of **light theory** and **statistical analysis** in his estimation of the relation between wage inflation and unemployment

# Missing motivation in macroeconomics

**Macroeconomics methodology became microfounded**

- The Keynesians had emphasized the dependence of consumption on disposable income and, similarly, of investment on current profits and current cash flow
- New Classical critics claimed that macroeconomic relationships should be derived from profit-maximizing by firms and from utility maximizing by consumers with economic arguments in their utility functions

**Robert Lucas** (1937-2023)

*Economists "have an image of practicality and worldliness but we are basically storytellers, creators of make-believe economic systems"*

# Missing motivation in macroeconomics

**FIVE neutrality results of the New Classics**

1. The independence of consumption and current income (the life-cycle permanent income hypothesis)
2. The irrelevance of current profits to investment spending (the Modigliani-Miller theorem)
3. The long-run independence of inflation and unemployment (natural rate theory)
4. The inability of monetary policy to stabilize output (the rational expectations hypothesis)
5. The irrelevance of taxes and budget deficits to consumption (Ricardian equivalence)

# Missing motivation in macroeconomics

**FIVE neutrality results of the New Classics**

1. The independence of consumption and current income (the life-cycle permanent income hypothesis)
2. The irrelevance of current profits to investment spending (the Modigliani-Miller theorem)
3. The long-run independence of inflation and unemployment (natural rate theory)
4. The inability of monetary policy to stabilize output (the rational expectations hypothesis)
5. The irrelevance of taxes and budget deficits to consumption (Ricardian equivalence)

These radically anti-Keynesian conclusions were the logical outcome of such seemingly innocuous maximizing assumptions

# Missing motivation in macroeconomics

## The New Keynesians

- accepted the methodological dictums of the New Classical
  - as long as preferences of economic agents correspond to economists' typical descriptions of them
- added frictions to the New Classical model including:
  - credit constraints
  - market imperfections
  - information failures
  - tax distortions
  - staggered contracts
  - uncertainty
  - menu costs
  - bounded rationality

# Missing motivation in macroeconomics

**The empirical view and behavioural norms**

- The very construction of FIVE neutralities denies the possibility that peoples' decisions might be influenced by their views regarding how they, and how others, should behave
- Empirical evidence shows that these neutralities are systematically violated!
  - either due to frictions (myopia, credit constraints, etc.)
  - or due to norms (habits, preferences, ideology, etc.)
- Old Keynesians' views of macroeconomics were also reflective of reality, since they were based on experience (intuition) and observation (primitive statistics)

# How the Bank of Russia makes decisions?

# How the Bank of Russia makes decisions



## Структура модели КПМ

- Основана на приведенной форме логлинаеризованной простой новокейнсианской DSGE-модели для малой открытой экономики
- Каркас модели – четыре поведенческих уравнения:
  1. кривая агрегированного спроса (уравнение Эйлера) и процентной ставки
  2. кривая агрегированного предложения (кривая Филлипса) – взаимосвязь инфляции и выпуска
  3. правило денежно-кредитной политики (правило Тейлора)
  4. условие отсутствия арбитража на финансовых рынках (уравнение непокрытого паритета)

# How the Bank of Russia makes decisions



## Выпуск и агрегированный спрос (1)

Выпуск = потенциальный выпуск + разрыв выпуска:

$$y_t = \bar{y}_t + \hat{y}_t$$

Темпы прироста потенциального выпуска:

$$\Delta\bar{y}_t = \rho\Delta\bar{y}_{t-1} + (1 - \rho)\Delta\bar{y}_t^{lr} + \varepsilon_t^{\Delta\bar{y}_t}$$

# How the Bank of Russia makes decisions



## Выпуск и агрегированный спрос (2)

### Кривая агрегированного спроса (уравнение Эйлера):

$$\hat{y}_t = \beta_{fwd}\mathbb{E}_t\hat{y}_{t+1} + \beta_{lag}\hat{y}_{t-1} - \beta_r\hat{r}^m_{t-1} + \beta_z\hat{z}_{t-1} + \beta_f\hat{y}^f_t + \beta_q\hat{q}^{oil}_t + \chi_t + \varepsilon^{\hat{y}}_t,$$

где

$\rho, \beta_{fwd}, \beta_{lag}, \beta_r, \beta_z, \beta_f, \beta_q$ - коэффициенты модели полученные из калибровки/оценки на исторических данных,

$\Delta\bar{y}^{lr}_t$ - долгосрочный прирост тренда, соответствует равновесному приросту выпуска в текущем деловом цикле,

$\mathbb{E}_t\hat{y}_{t+1}$ - ожидаемый разрыв выпуска через 1 квартал,

$\hat{r}^m_{t-1}$ - лаг разрыва реальной рыночной процентной ставки сроком до года,

$\hat{z}_{t-1}$ - лаг разрыва реального курса (рост означает ослабление),

$\hat{y}^f_t$ - разрыв внешнего спроса (аппроксимируется взвешенным средним разрывов ВВП США и Еврозоны с весами бивалютной корзины),

$\hat{q}^{oil}_t$ - разрыв реальной цены на нефть,

$\chi_t$ - бюджетной стимул,

$\varepsilon^{\Delta\bar{y}_t}_t$, $\varepsilon^{\hat{y}}_t$ - шоки (персистентность моделируется с помощью AR1 процесса)

# How the Bank of Russia makes decisions



## Кривая Филлипса (предложение, цены)

$$\pi_t^k = \alpha_1^k \cdot E_t^w \pi 4_{t+4}^k + \left(1 - \alpha_1^k\right) \cdot \pi 4_{t-1}^k + \alpha_2^k \cdot \hat{y}_{t-1} + \alpha_3^k \cdot \Delta \hat{z}_t - \alpha_4^k \cdot \hat{\vartheta}_t + \varepsilon_t^{\pi^k},$$

где

$\pi_t^k$ - аннуализированная инфляция кв/кв компоненты k,

$E_t^w$- оператор взвешенных ожиданий,

$\hat{y}_t$ - разрыв выпуска,

$\Delta \hat{z}_t$ - изменение разрыва реального курса,

$\hat{\vartheta}_t$ - разрыв относительной цены компоненты инфляции k,

$\varepsilon_t^{\pi^k}$ - шок издержек

$k \in$ {продовольственные товары, непродовольственные товары, услуги без ЖКУ}

# How the Bank of Russia makes decisions



## Правило денежно-кредитной политики (правило Тейлора)

$$i_t = \rho_i i_{t-1} + (1-\rho_i)\cdot\left(i_t^n + \varphi_\pi\left(E_t^{w^{mp}}\pi 4_{t+3}^{xu} - E_t\overline{\pi}4_{t+3}^{xu}\right) + \varphi_y\hat{y}_t\right) + \varepsilon_t^i,$$

$$i_t^n = \bar{r}_t + E_t^{w^{mp}}\pi 4_{t+3}^{xu},$$

где

$i_t$ - номинальная процентная ставка на рынке МБК,

$i_t^n$ - номинальная нейтральная процентная ставка,

$E_t^{w^{mp}}\pi 4_{t+3}^{xu}$ - ожидаемый регулятором уровень общей инфляции с исключением ЖКУ г/г через 3 квартала,

$E_t\overline{\pi}4_{t+3}^{xu}$ - целевой уровень общей инфляции с исключением ЖКУ г/г через 3 квартала,

$\hat{y}_t$ - разрыв выпуска,

$\varepsilon_t^i$ - шок ДКП,

$\bar{r}_t$ - равновесная реальная процентная ставка

# How the Bank of Russia makes decisions



## Динамика обменного курса

Гипотеза **непокрытого паритета процентных ставок**:

$$s_t = \mathbb{E}'_t s_{t+1} - \frac{\left(i_t - i_t^f - \vartheta_t\right)}{4} + \frac{\varepsilon_t^s}{4},$$

где

$s_t$ - уровень номинального курса,

$\mathbb{E}'_t s_{t+1}$- ожидаемый уровень номинального курса из взвешенного среднего рациональных ожиданий и прошлого значения курса с поправкой на фундаментальное изменение валютного курса,

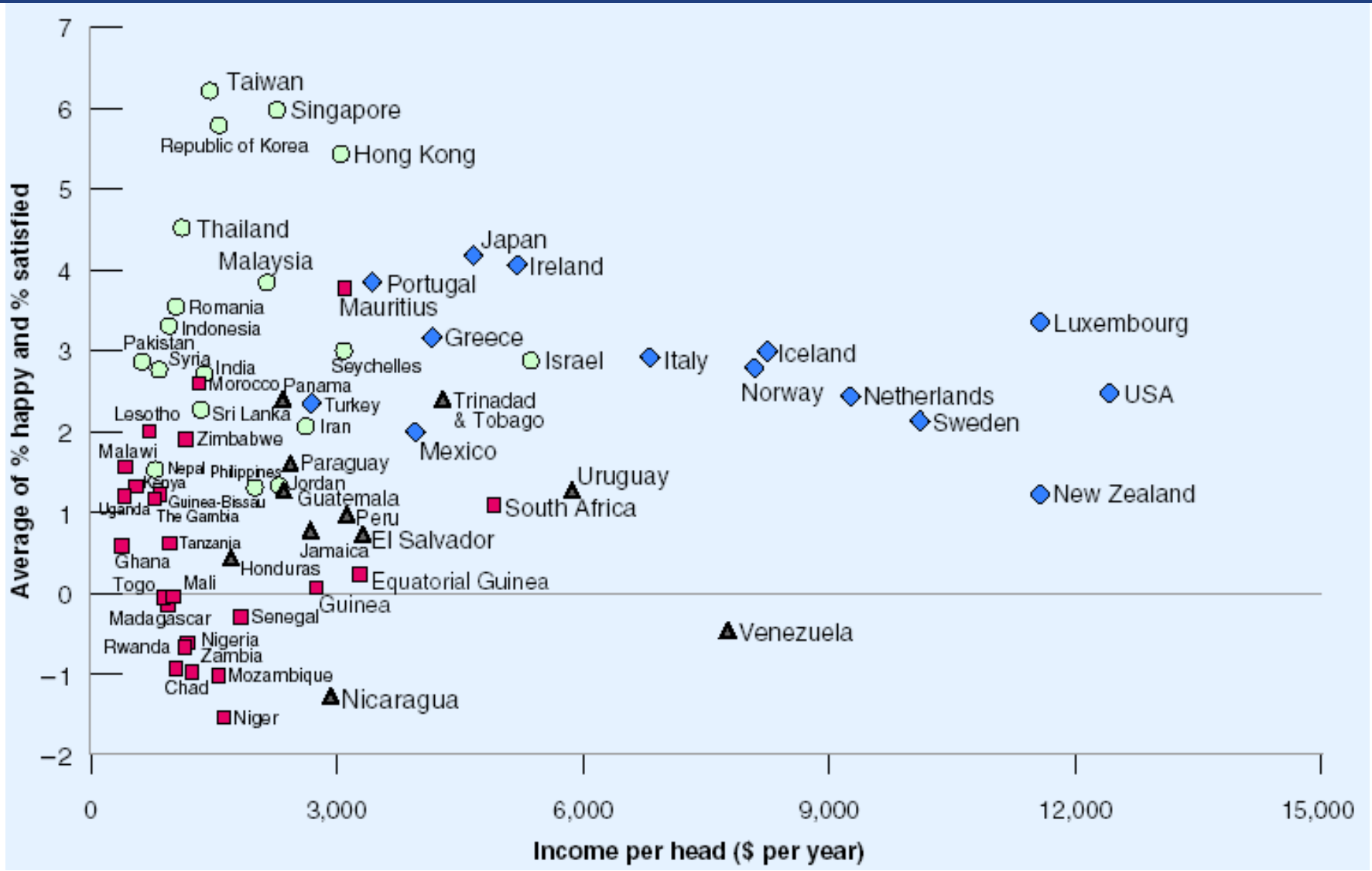
$i_t$ - номинальная процентная ставка,

$i_t^f$ - зарубежная номинальная процентная ставка,

$\vartheta_t$ - уровень страновой премии за риск

# Income or happiness?

# Happiness vs income per person



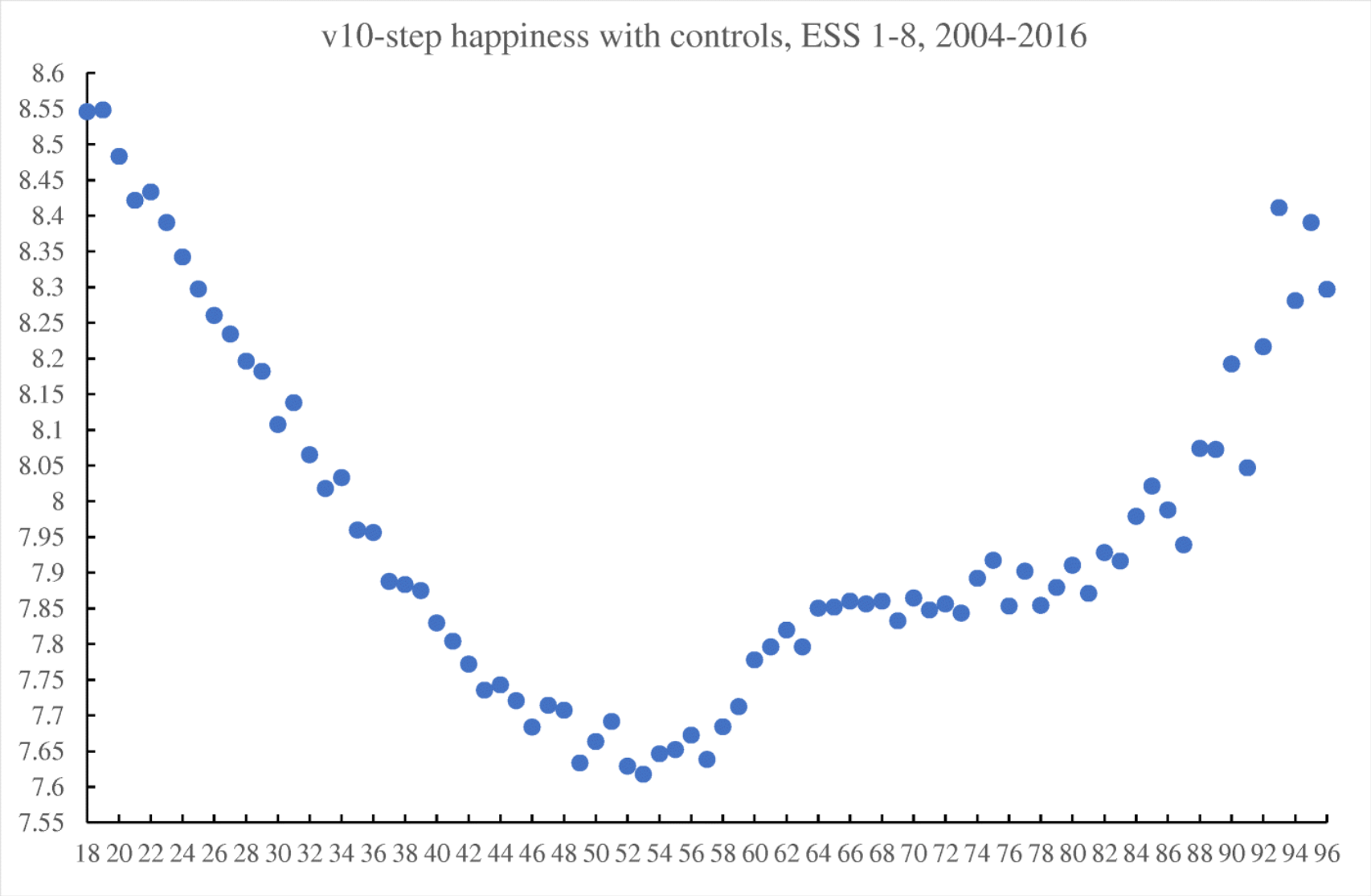
# Happiness or subjective well-being (SWB)

How to best measure the concept of subjective well-being in a standardised way, based on a rigorous review of the evidence base?

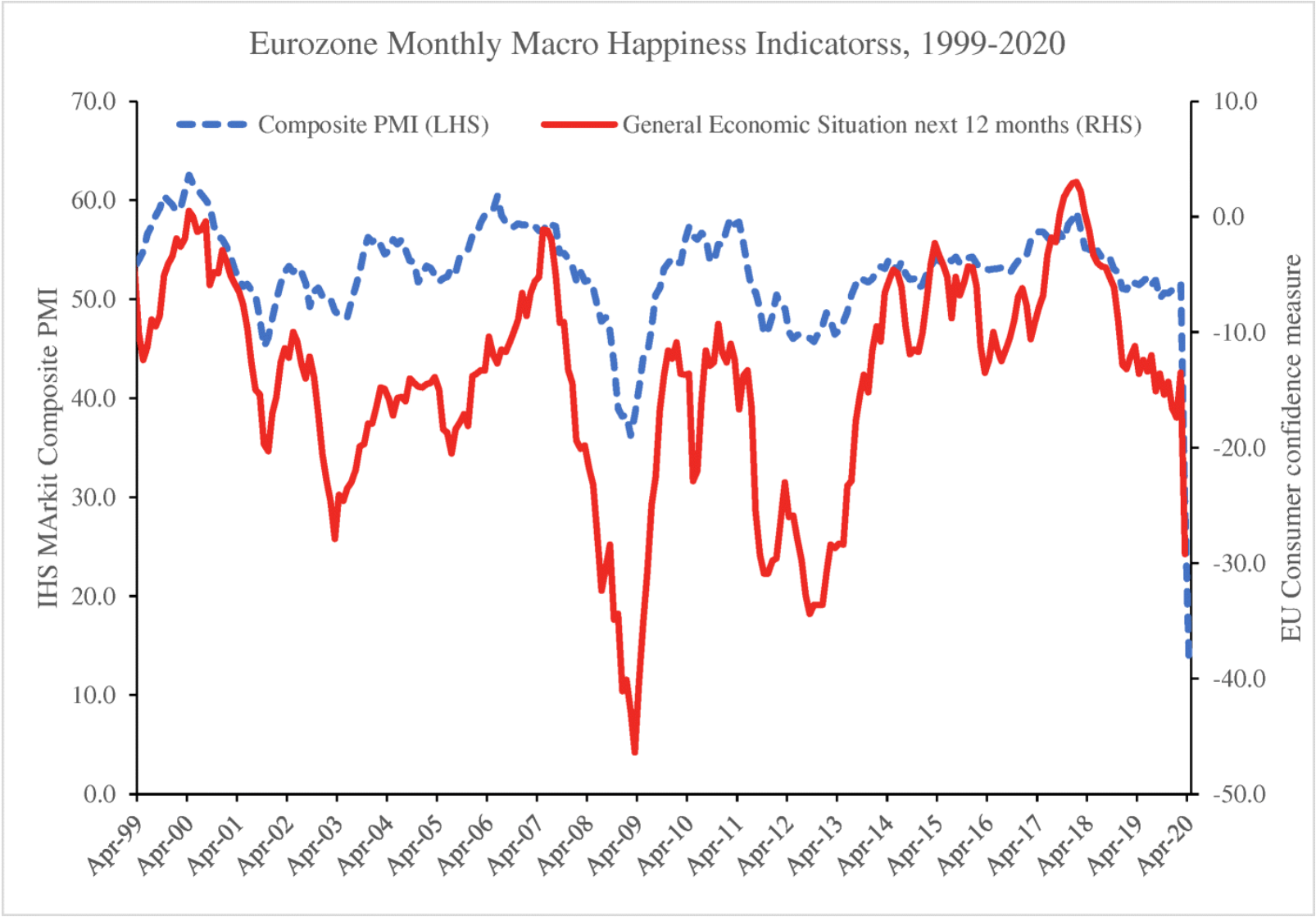
- The influential report by Stigliz-Sen-Fitoussi Commission (2009) made a clear case for the need to **move beyond GDP** when measuring societal progress
- It emphasised the importance of measuring economic, environmental and social dimensions of well-being

We need a multidimensional well-being framework incorporating the key outcomes that matter most to people

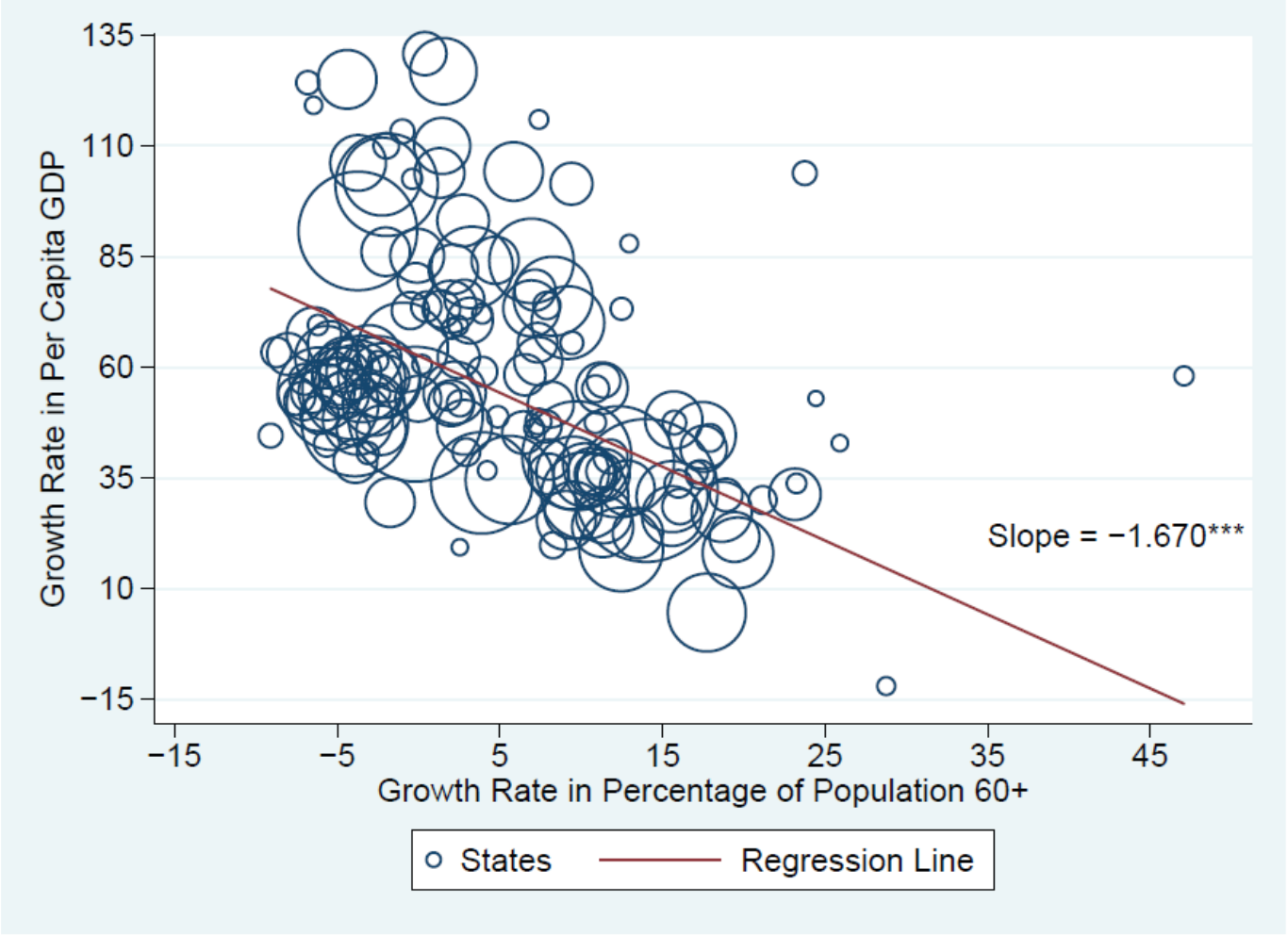
# SWB and age in 145 countries



# SWB and happiness vs PMI



# Aging in USA and GDP per capita growth




Notes: Size of bubbles reflects state population size.

# Aggregate output

## Economic growth

is the steady increase in aggregate output over time

- How to measure aggregate output?

We need **national accounts to proxy** our **subjective well-being** by some objective measures!

Why aggregate output and its measures (GDP, GNP, NNI, GNI per capita) should be taken in real terms and adjusted for PPP? What is PPP?

# Aggregate output vs well-being

**GDP, the value of goods and services in an economy,**

- **remains** a central measurement (proxy) of well-being
- critical in informing macroeconomic analysis and policy

But…

- though hailed as a giant conquest of 20th-century economics
- has come under increasing fire in the 21st

Why?

In response, new indicators have been developed to supplement GDP, and the measurement of GDP itself has undergone many improvements by national statistical and inter-governmental agencies

# GDP vs GNP

**Gross domestic product (GDP)**

measures the output produced by factors of production located in the domestic economy

**Gross national product (GNP)**

measures the total income earned by domestic citizens. It account for the Net ncome from abroad (NYA):

$$GNP = GDP + NYA$$

# GNP

**Gross national product** is the total sum of values added

$$GNP = GDP + NYA = \Sigma(Value\ Added) = \Sigma(Sales\ - PF)$$

But it also has to be equal to national income

$$\Sigma(Sales\ -\ PF)\ =\ \Sigma(W + Rent + Profits + DP)$$

Where purchases from other firms ($PF$),
labour income ($W$),
capital/land income and royalties ($Rent$),
profits ($Profits$) and
Depreciation ($DP$)

If we now transfer $DP$ to the other side, we get:

$$\Sigma(Sales\ -\ PF\ -\ DP)\ =\ \Sigma(W\ + Rent\ +\ Profits)$$

$$NNP = GNP\ -\ \Sigma DP\ =\ \Sigma(W\ + Rent\ +\ Profits)$$

In the short run capital is fixed and not depreciated!

# NNP and GNP

$$NNP = GNP - \Sigma DP = \Sigma(W + Rent + Profits) = NI$$

We call the expression on the left of the last equation **net national product** ($NNP$)

On the right-hand side we have all possible ways of earning an income, or **National Income** ($NI$), which we normally denote by the letter $Y$

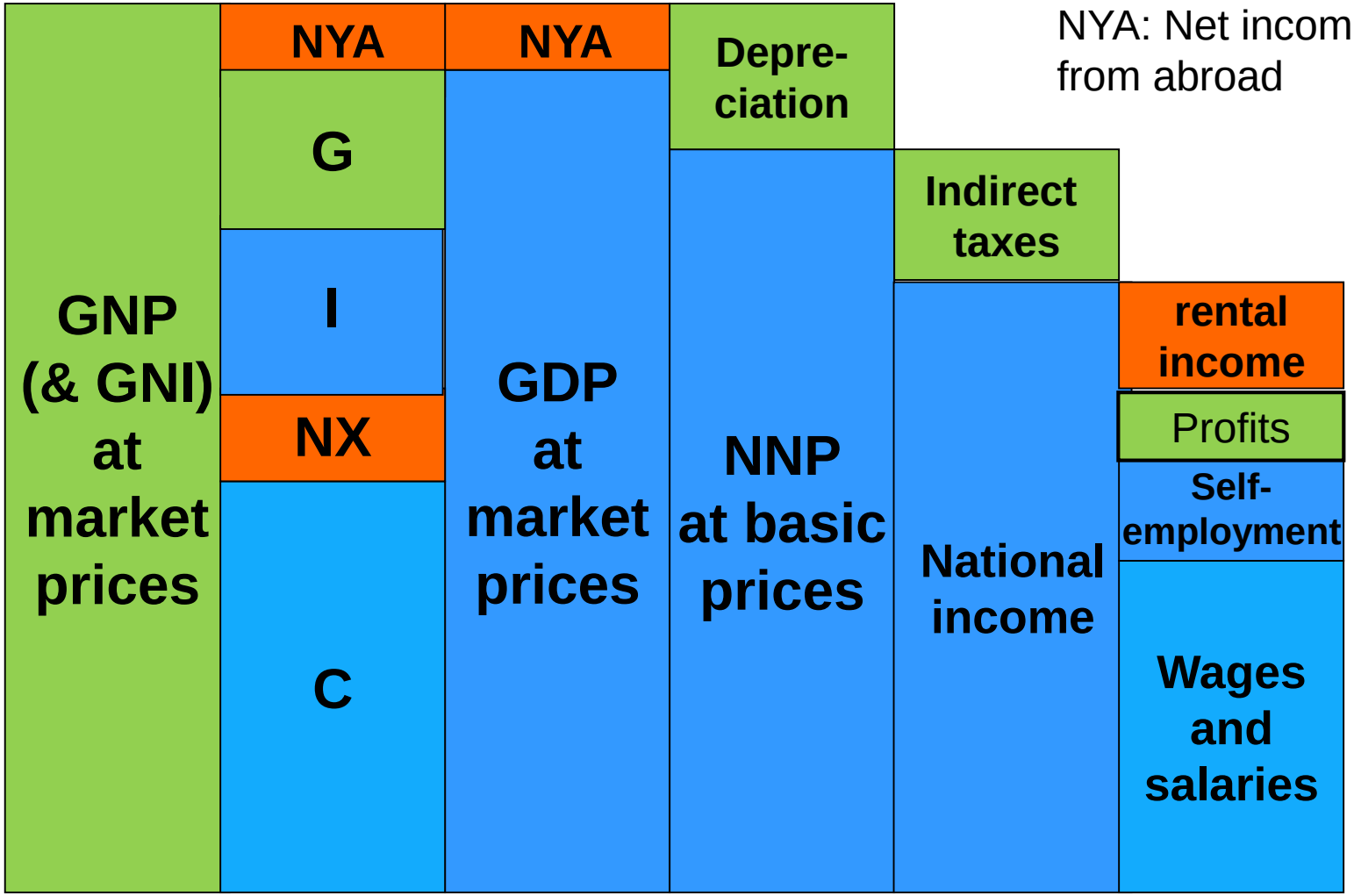
Hence, we have the following relationship:

$$GNP - \Sigma DP = NNP = Y$$

For the closed economy in the short run (fixed capital)

$$GDP = Y$$

# National income accounting: an open economy



# GDP components by expenditure Russia, Q3/23 https://minfin.gov.ru/en/policy_issues/macroeconomics/national_summary/

| | |
|---|---|
| **GDP in current prices, bln. rubles** | **43 121,5** |
| Final consumption | 29 664,8 |
| Household consumption expenditure | 21 620,3 |
| Government consumption expenditure | 7 811,7 |
| Non-profit institutions serving household | 232,8 |
| Gross accumulation | 11 206,8 |
| Gross fixed capital formation[1] | 9 537,1 |
| Changes in inventories | 1 669,7 |
| Net exports | 2 249,9 |
| Exports of goods and services | 11 191,4 |
| Imports of goods and services | 8 941,5 |
| Statistical discrepancy | 1 029,8 |

# GDP at market and basic prices

Assume $NYA = 0$. Then the identity

$$Y \equiv C + I + G + NX$$

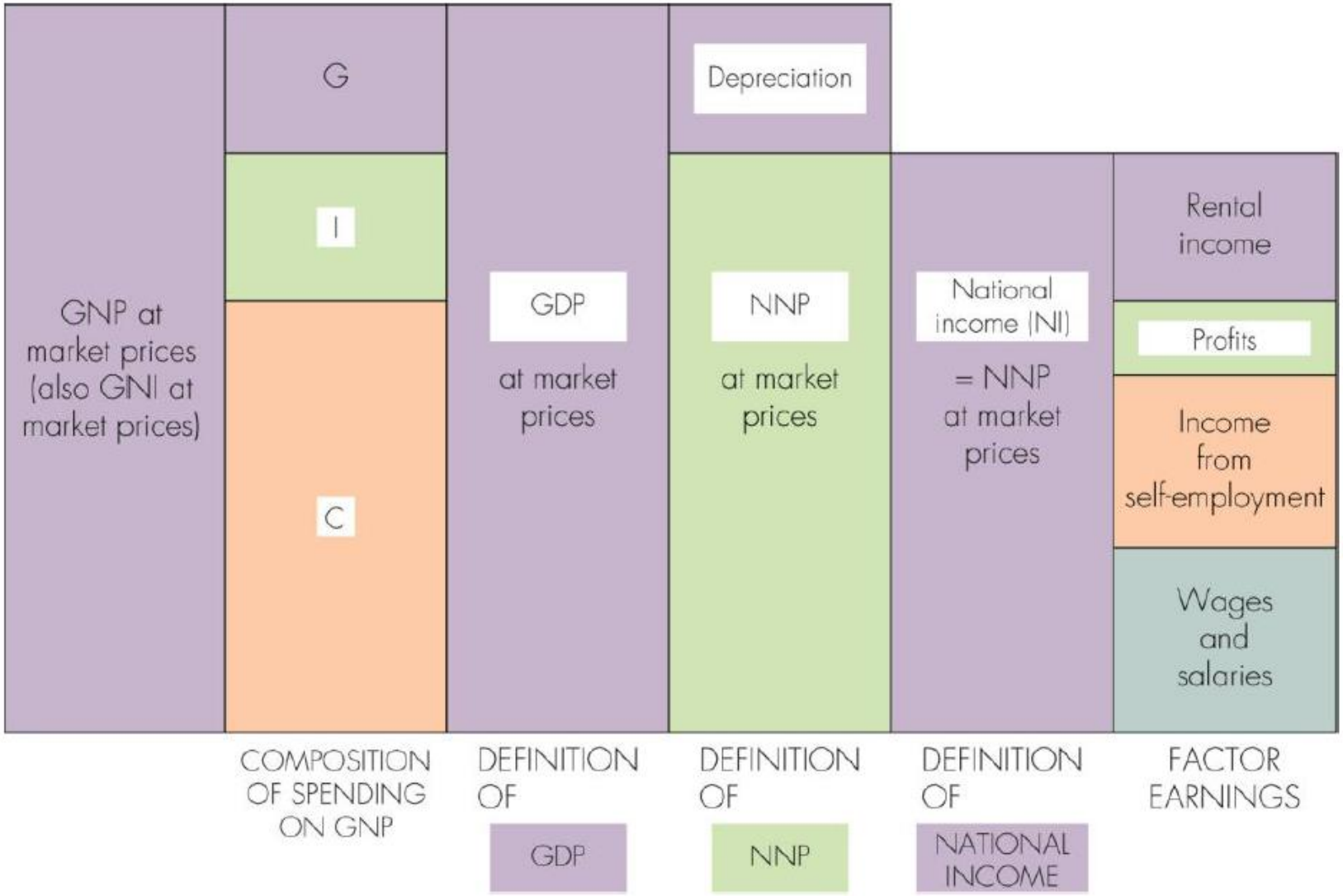
represents GDP at **market prices**, which equals consumption plus investment plus government spending plus net exports

We can extend the formula so it represents GDP at **basic prices** by subtracting indirect taxes ($T_e$)

It would then be:

$$Y \equiv C + I + G + NX - T_e$$

# National income accounting: a closed economy



# ICEF MACROECONOMICS - 1

Handouts 01

# GDP

National accounts
Circular flow model
Macroeconomic indices

# National accounts

# Gross Domestic Product (GDP)

**GDP:**

is the value of the final goods and services produced in the economy during a given period

- A final good is a good that is destined for final consumption
- An intermediate good is a good used in the production of another good

Rosstat Methodology

GDP characterizes the final result of production activities of resident economic units, measured by the value of goods and services produced by these units for final use

# GDP (1) – Income approach

**GDP:**

is the value of the final goods and services produced in the economy during a given period

- A final good is a good that is destined for final consumption
- An intermediate good is a good used in the production of another good

Rosstat Methodology

GDP by expenditure, calculated using the income approach, is the sum of expenditures of all institutional sectors on final consumption, gross accumulation and net exports

# GDP (2) – Sum of value added

**GDP:**

is the sum of value added in the economy during a given period

- Value added equals the value of a firm's production minus the value of the intermediate goods it uses in production

Rosstat Methodology

**Produced GDP**, calculated by the **production approach**, is the sum of the gross value added of all industries or institutional sectors at basic prices and net taxes on products

# GDP (3) – Sum of incomes

**GDP:**

**is the sum of the incomes in the economy during a given period**

- Value added equals the value of a firm's production minus the value of the intermediate goods it uses in production

| The Composition of GDP by Type of Income, 1960 and 2003 | | |
|---|---|---|
| | 1960 | 2003 |
| Labor income | 66% | 64% |
| Capital income | 26% | 28% |
| Indirect taxes | 8% | 8% |

# GDP measures

The three equivalent ways of measuring the total economic activity in the economy, namely the:

**Expenditure -** the sum of expenditures in the economy

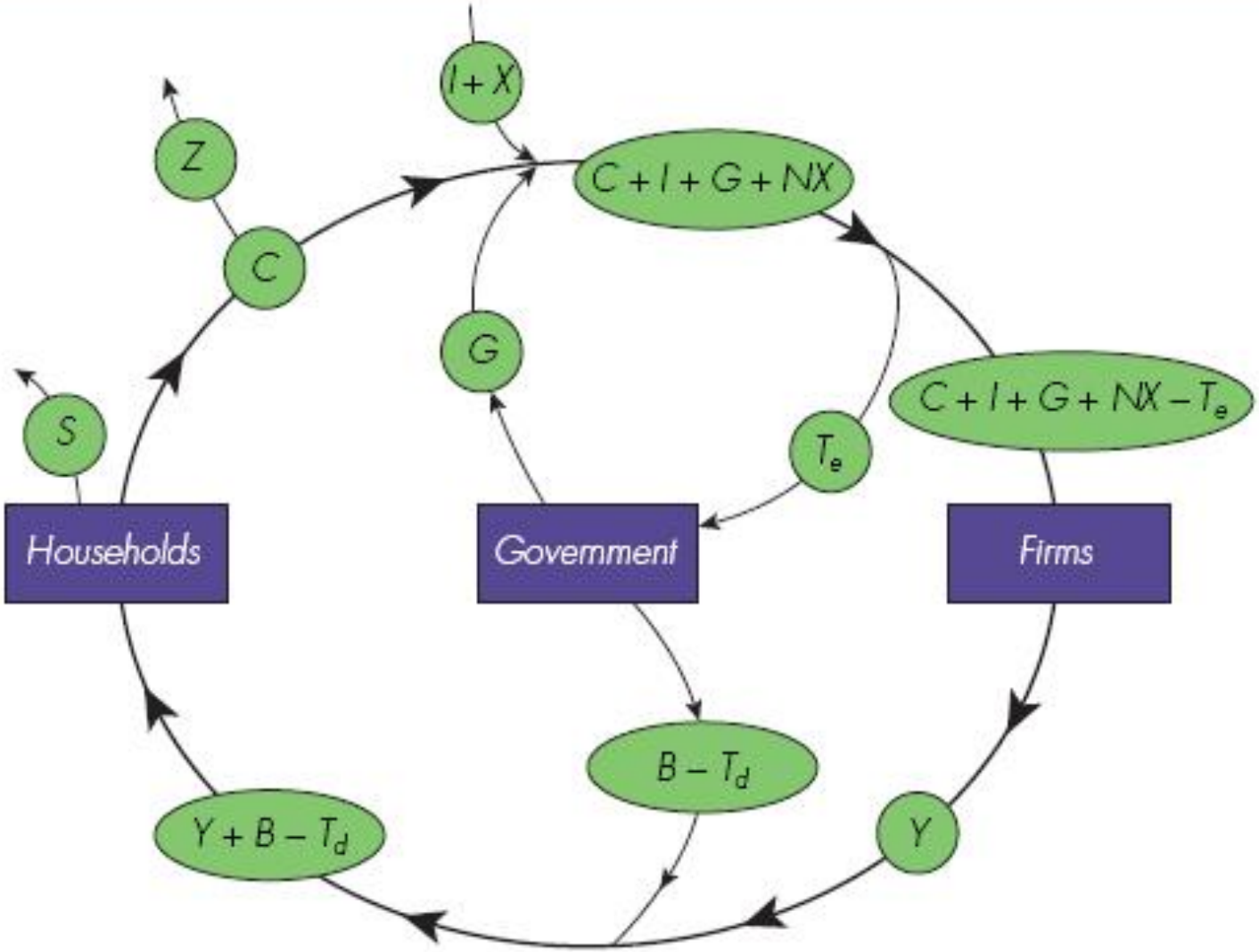
$$Y = C + I + G + X - Z$$

**Output -** the sum of output (value added) produced in the economy

**Income -** total value of earnings arising from the factor services supplied = the sum of incomes paid for factor services

- wages, rents, profits, royalties, indirect taxes, etc.

# Circular flow model




The figure extends the circular flow between households and firms to include the government and foreign sectors. Firms make factor payments $Y$ to households. Disposable income $Y + B - T_d$ also includes transfer payments $B$ less direct taxes $T_d$. Disposable income goes on saving $S$ or consumption $C$. This spending is augmented by injections of government spending $G$ on goods and services and by investment spending $I$ and by exports $X$, but is reduced by the additional leakage $Z$ into imports. From $C + I + G + NX$ or GDP at market prices, we must subtract the leakage of indirect taxes $T_e$ to get GDP at basic prices $Y$ which firms pay out to households.

# Basic macroeconomic identities

## What is the demand for domestic output?

- $Y$ – real income, domestic output, total product, GDP
- $AE$ – aggregate expenditure

$$Y = AE \equiv C + I + G + NX$$

- $C$ – private consumption, including imports
- $I$ – private investment, including inventories
- $G$ – government purchases
- $NX \equiv X - Z$ – net exports ($X$ – exports and $Z$ – imports)

# Basic macroeconomic identities

## How can households spend their incomes?

$$Y = S + C + NT$$

- $C$ – private consumption, including imports
- $S$ – private saving
- $Y^d \equiv Y - NT$ – disposable income
- $NT \equiv T - B$ – net taxes
- $T$ – taxes (levied on income, also direct taxes, $T^d$)
- $B$ – transfer payments, unemployment benefits, etc.

# Macroeconomic indices

# Nominal and Real GDP

**Nominal GDP:**

**is the sum of the quantities of final goods produced times their current price**

Nominal GDP **increases** over time because:

- The production of most goods **increases** over time
- The prices of most goods also increase over time

**Real GDP:**

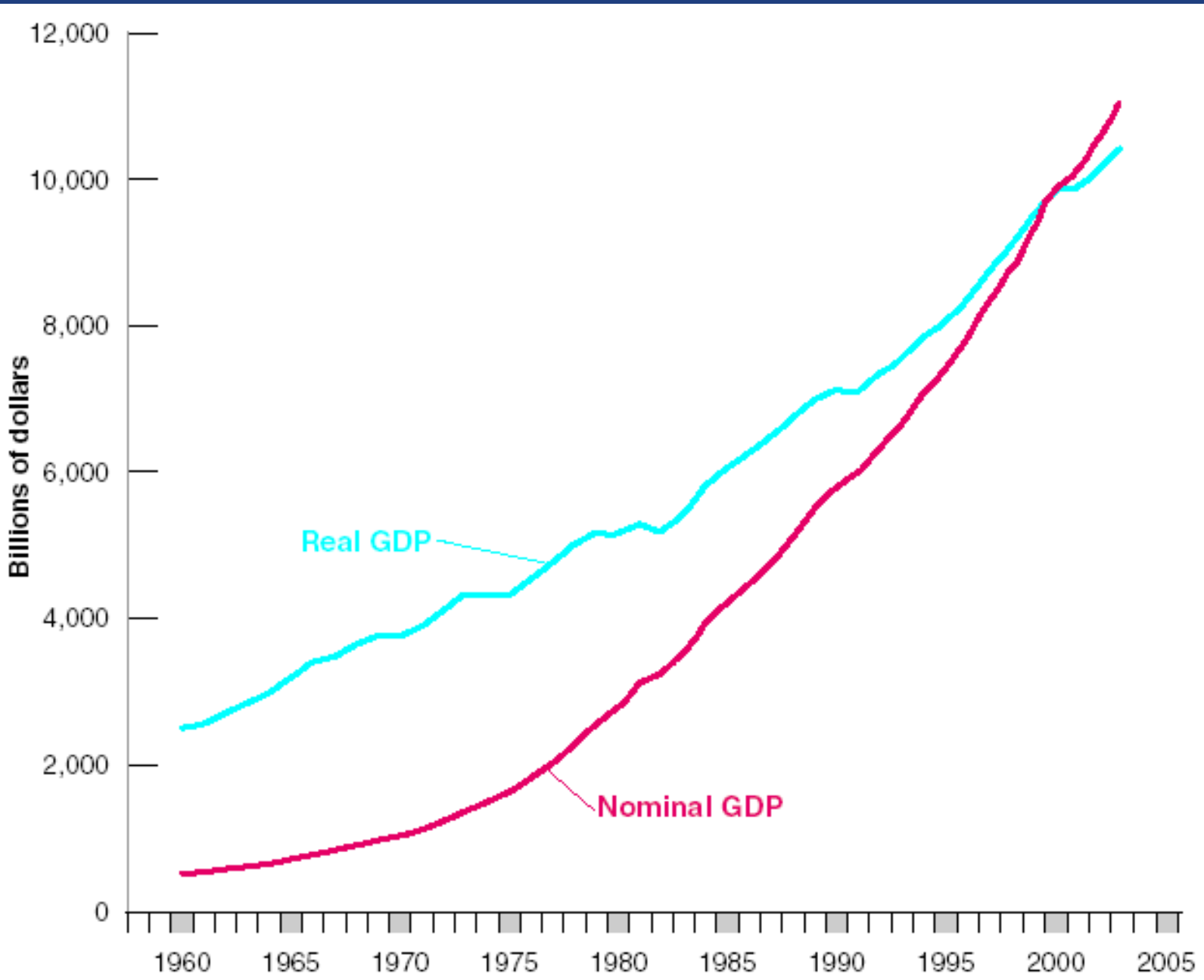
**is constructed as the sum of the quantities of final goods times constant (rather than current) prices**

# Nominal and Real GDP

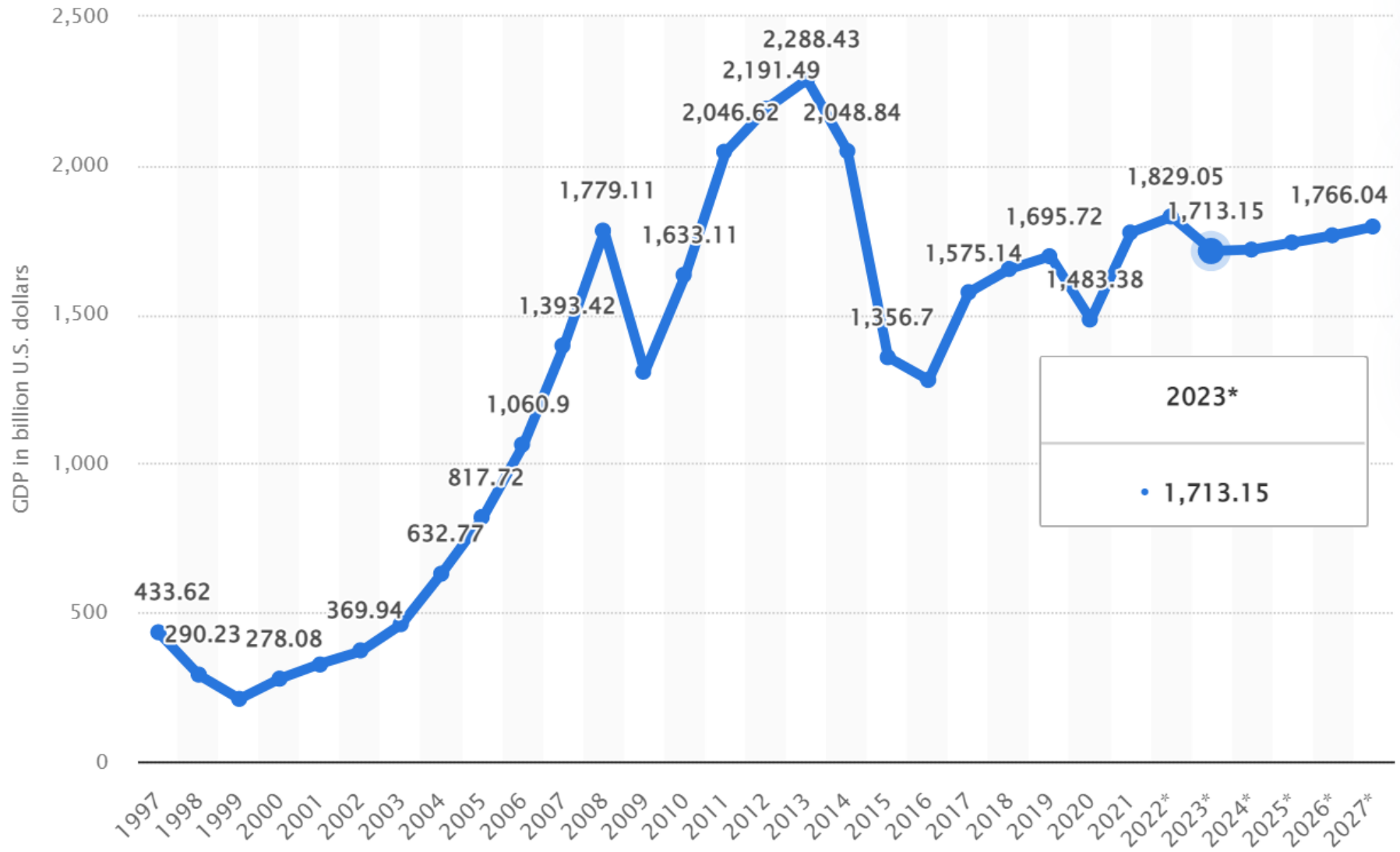
| Year | Quantity of Cars | Price of cars | Nominal GDP | Real GDP (in 2000 $) |
|---|---|---|---|---|
| 1999 | 10 | $20,000 | $200,000 | $240,000 |
| 2000 | 12 | $24,000 | $288,000 | $288,000 |
| 2001 | 13 | $26,000 | $338,000 | $312,000 |

To construct real GDP, multiply the number of cars in each year by a common price

- Suppose we use the price of the car in 2000 as the common price
- This approach gives us, in effect, real GDP in 2000 dollars


12,000
10,000
8,000
6,000
4,000
2,000
0
Billions of dollars
Real GDP
Nominal GDP
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005

# Russia's GDP in US$: Nominal or Real?



# Russia’s GNP in US$: Nominal or Real?

## Russia's Gross National Product (GNP) from 2011 to 2022

# Output indices

Nominal GDP in period $t$ (in current prices of period $t$)

$$\$Y_t \equiv \sum p_t q_t$$

Nominal GDP index (in current prices of period $t$ vs prices of period $0$)

$$\mathbb{I}_{\$Yt} \equiv \frac{\$Y_t}{\$Y_0} \equiv \frac{\$Y_t}{Y_t} = \frac{\sum p_t q_t}{\sum p_0 q_0}$$

Real GDP in period $t$ (in constant prices of period $0$)

$$Y_t \equiv \sum p_0 q_t$$

Real GDP index (in constant prices of period $0$)

$$\mathbb{I}_{Yt} \equiv \frac{Y_t}{Y_0} = \frac{\sum p_0 q_t}{\sum p_0 q_0}$$

# GDP growth measures

**Real GDP per capita, $\frac{Y_t}{N_t}$:**

- is the ratio of real GDP, $Y_t$ in period $t$ to the total population of the country, $N_t$

**Real GDP growth (factor):** $\frac{Y_t}{Y_{t-1}} \equiv 1 + g_Y$

**Real GDP growth rate:** $g_Y \equiv \frac{Y_t}{Y_{t-1}} - 1$ or $\left(\frac{Y_t - Y_{t-1}}{Y_{t-1}}\right) \cdot 100\%$

**GDP growth in logarithms:**

$$\Delta log Y_t \equiv log Y_t - log Y_{t-1} \approx \frac{Y_t - Y_{t-1}}{Y_{t-1}}$$

# GDP growth measures

- The substantial growth of inequalities within countries (in contrast to the decline between countries) has highlighted the reality that GDP growth per capita may be very unequally shared.
- Median per capita household income is an obvious and important additional focal measure to highlight

# Price indices

**GDP deflator** in period $t$ (in constant prices of period $0$)

$$P_t \equiv \frac{Nominal\ GDP}{Real\ GDP} \equiv \frac{\$Y_t}{Y_t} = \frac{\sum p_t q_t}{\sum p_0 q_t}$$

**CPI** (Consumer Price Index) in period $t$ (in constant prices of period $0$)

$$CPI_t \equiv \frac{\sum p^i{}_t q^i{}_0}{\sum p^i{}_0 q^i{}_0}$$

is based on consumer basket of the base year

- Overestimates rising inflation and underestimates disinflation

# Measures of inflation

**Inflation** (as a phenomenon) is a **sustained** rise in the general level of prices - the price level

**Inflation** is commonly measured as the inflation rate at which the **price level** increases

- Do you know the current price level in Russia?

Conversely, **deflation** is a sustained decline in the price level. It corresponds to a negative inflation rate

- Deflation is rare, but it does happen. Japan has experienced deflation since the late 1990s

Ideally, we need an analytical tool that deals with the inflation rate rather than (too abstract) price level

# Measures of inflation: CPI

## Consumer price index (CPI)

measures the average price of consumption, or equivalently, the cost of living

The CPI gives the cost in dollars of a specific **list of goods** and services over time, which **represent** the consumption basket of a typical **urban** consumer

The set of goods produced in the economy is not the same as the set of goods purchased by consumers:

- Some of the goods are sold to firms, the government, or to foreigners
- Some of the goods are not produced domestically but are imported from abroad

# Measures of inflation: GDP deflator

## GDP deflator

in year $t$, $P_t$, is defined as the ratio of nominal GDP to real GDP in year $t$:

$$P_t \equiv \frac{\text{nomial } GDP_t}{\text{real } GDP_t} = \frac{\$Y_t}{Y_t}$$

The GDP deflator is what is called an index number—set equal to 100 in the base year

The rate of change in the GDP deflator measures the rate of inflation:

$$\pi_t \equiv \frac{P_t - P_{t-1}}{P_{t-1}}$$