

The Data of Macroeconomics

National Income Accounting and Macroeconomic Aggregates



EVROPSKÁ UNIE
Evropské strukturální a investiční fondy
Operační program Výzkum, vývoj a vzdělávání

**MS
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MLÁDEŽE A TĚLOVÝCHOVY

Gross Domestic Product (GDP)

- The performance of the economy is measured by the Gross domestic product.
- Two ways to view this statistic:
 - GDP is *the total income in the economy*.

Gross Domestic Product (GDP)

- GDP is *the total expenditure on the economy's output of goods and services.*


Gross Domestic Product (GDP)

- These two ways of computing GDP must be equal:
 - The expenditure of buyers on products is income to the sellers of these outputs.
 - When Joe paints Jane's house for \$1,000, that \$1,000 is income to Joe and expenditure of Jane.

Gross Domestic Product (GDP)

- The third point of view gives us a more precise definition:
 - *GDP is the market value of all final goods and services produced within an economy in a given period of time.*
 - The service of painting the house for \$1,000.

Adding Apples and Oranges

- Suppose that the economy produces four apples and three oranges.
- What is the GDP in 2017?
- $4 + 3 = 7$ (???) 

Adding Apples and Oranges

- $GDP = (\text{Price of Apples} \times \text{Quantity of Apples}) + (\text{Price of Oranges} \times \text{Quantity of Oranges})$
- If apples cost \$0.50 each and oranges cost \$1.00 each, GDP would be:
- $GDP = (\$0.50 \times 4) + (\$1.00 \times 3) = \$5.00$

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

Real GDP Versus Nominal GDP

- {See the BB}
- Nominal GDP_2018 = (2018 Price of Apples × 2018 Quantity of Apples) + (2018 Price of Oranges × 2018 Quantity of Oranges)
- Nominal GDP_2018 = (\$1.00 × 4) + (\$2.00 × 3) = \$10.00
- Increase by 100%

$$GDP_t^{nom} = \sum_{i=1}^n P_{i,t} Q_{i,t}$$

Real GDP Versus Nominal GDP

- We construct real GDP:
 - Economy's output of goods and services that would not be influenced by changes in prices.
 - Value of goods and services measured using a constant set of prices.
 - $\text{Real GDP}_{2018} = (\text{2017 Price of Apples} \times \text{2018 Quantity of Apples}) + (\text{2017 Price of Oranges} \times \text{2018 Quantity of Oranges})$
 - $\text{Real GDP}_{2018} = (\$0.50 \times 4) + (\$1.00 \times 3) = \5.00
 - Increase by 0 %

$$GDP_t,real = \sum_{i=1}^n P_{i,base} Q_{i,t}$$

Real GDP Versus Nominal GDP

- HW:
 - 2018 Price of Apples = \$1.00 (i.e. increase by 100 %)
 - 2018 Quantity of Apples = 5 (i.e. increase by 25 %)
 - 2018 Price of Oranges = \$2.00 (i.e. increase by 100 %)
 - 2018 Quantity of Oranges = 4 (i.e. increase by 33 %)
- What is the nominal and real GDP in 2018?
- $GDP_{nom} = \$13$ ($13/5=2.6$)
- $GDP_{real} = \$6.5$ ($6.5/5=1.3$); 2017 is the base year

GDP deflator

- As a by-product, we can derive a statistic to measure the total change in prices:
- GDPdefl. = Nominal GDP/Real GDP
- In problem 1:
 - Nominal GDP_2018 = \$10; Real GDP_2018 = \$5
 - GDPdefl._2018 = 10/5 = 2 (i.e. increase in prices by 100 %)
- In HW:
 - GDPdefl._2018 = 13/6.5 = 2
- HW2: What is the GDP deflator in the base year?

$$\text{deflGDP} = \frac{\sum_{i=1}^n P_{i,t} Q_{i,t}}{\sum_{i=1}^n P_{i,\text{base}} Q_{i,t}} = \frac{\sum_{i=1}^n P_{i,t} Q_{i,t}}{\sum_{i=1}^n \frac{P_{i,\text{base}}}{P_{i,t}} P_{i,t} Q_{i,t}}$$

Real GDP Versus Nominal GDP

- *Nominal GDP measures the current dollar value of the output of the economy.*
- *Real GDP measures output valued at constant prices.*
- *The GDP deflator measures the price of output relative to its price in the base year.*

Real GDP Versus Nominal GDP

- $\text{GDPdefl.} = \text{Nominal GDP} / \text{Real GDP}$
 $\Rightarrow \text{Real GDP} = \text{Nominal GDP} / \text{GDPdefl.}$
- HW3: Mankiw, 39/Pr.6
- HW4: Chain-Weighted Measures of Real GDP (p. 23)

Problem of Used Goods

- GDP measures the value of currently produced goods and services, not used goods.
- If you buy a new car in 2018, it is included in this year GDP.
- If you sell this car to your friend in 2019, it will NOT be a part of the GDP in 2019, as it measures only the value of currently produced goods and services.

Intermediate Goods and Value Added

- Many goods are produced in stages.
- E.g. raw materials are processed into intermediate goods by one firm and then sold to another firm for final production.
- How should we deal with such products when computing GDP?

Intermediate Goods and Value Added

- Mankiw (2003): Macroeconomics, 5th ed., p. 38, Pr.2)
- A farmer grows wheat and sells it to a miller for \$1.00.
- The miller makes flour and sells it to a baker for \$3.00.
- The baker bakes a loaf of bread and sells it to the consumer for \$6.00.
- The consumer eats the bread.
- What is the GDP?
- $1+3+6 = \$10$???

Intermediate Goods and Value Added

- By no means !!!
- GDP includes only the value of final goods. => GDP is \$6.
- Adding the intermediate goods to the final goods would be double counting!
- E.g. wheat would be counted threetimes (as wheat itself, as a part of flour, and as a part of bread); flour would be counted twice.

Intermediate Goods and Value Added

- Another way to compute the value of all final goods is to add up the value added at each stage of production.
- Value added = value of firm's output less the value of intermediate goods the firm purchases.
- VA of farmer = \$1.00 (wheat)
- VA of miller = \$3.00 (flour) - \$1.00 = \$2.00
- VA of baker = \$6.00 (bread) - \$3.00 = \$3.00
- Total VA = GDP = \$1.00 + \$2.00 + \$3.00 = \$6.00 = Value of the final good (bread)

Gross Domestic Product (GDP)

- We have now seen that GDP measures:
 - Total income (of factors of production)
 - Total output (of final goods and services)
 - Total expenditure (on final goods and services)
 - The sum of value-added at all stages in the production process

The Expenditure Components of GDP

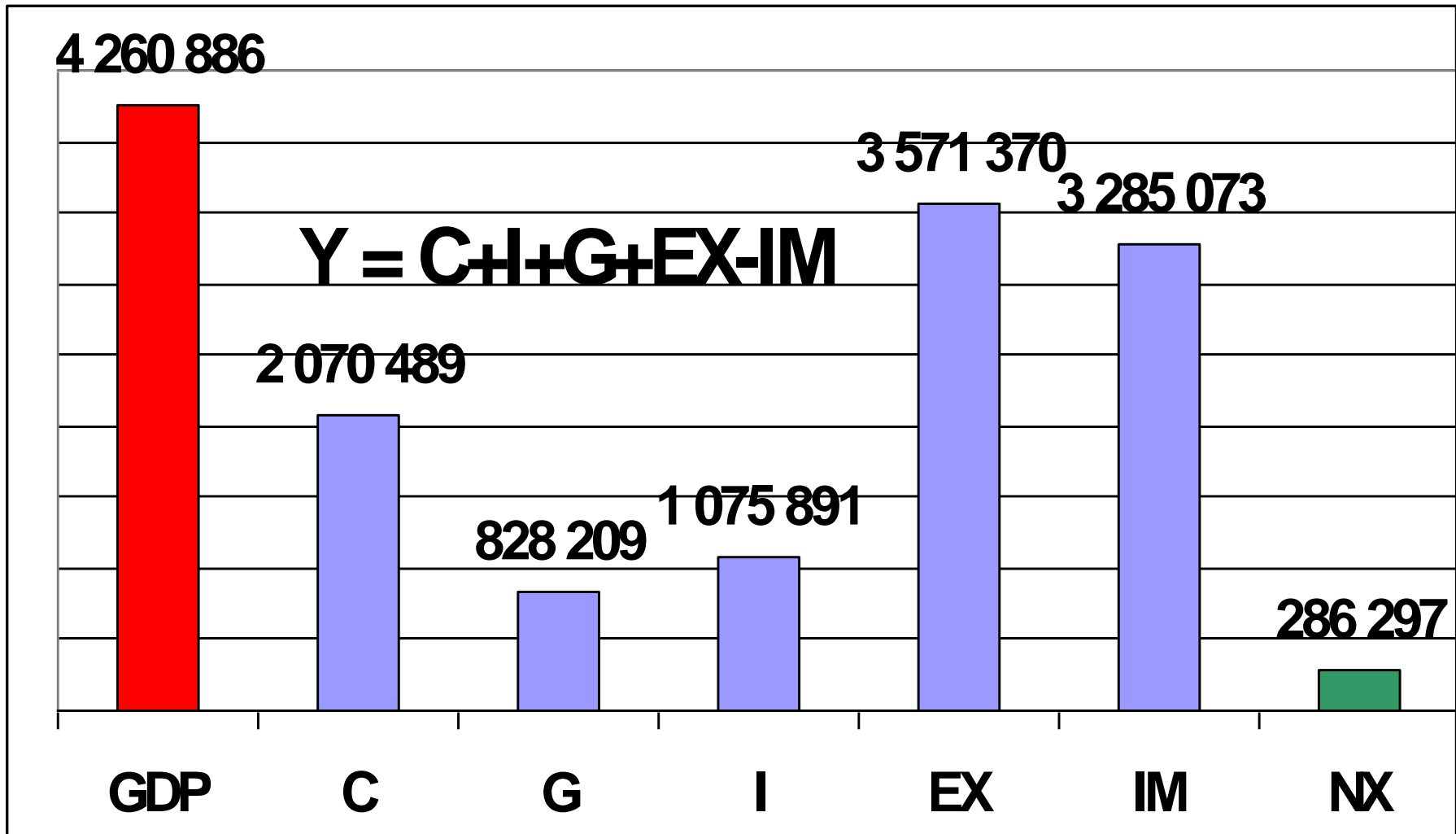
- Recall: GDP is total spending.
- Four components:
 - Consumption (**C**) Novak family having lunch at a restaurant
 - Investment (**I**) Skoda building a new car factory in Mlada Boleslav
 - Government Purchases (**G**) Local government building a new street
 - Net Exports (**NX**) Budvar is selling beer to Canada (X), Apple is selling iPhones in the CR
(M);; NX = X - M
- These components add up to GDP (denoted **Y**):

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

Identity

GDP in the CR in 2014 in mil. CZK (expenditure method)

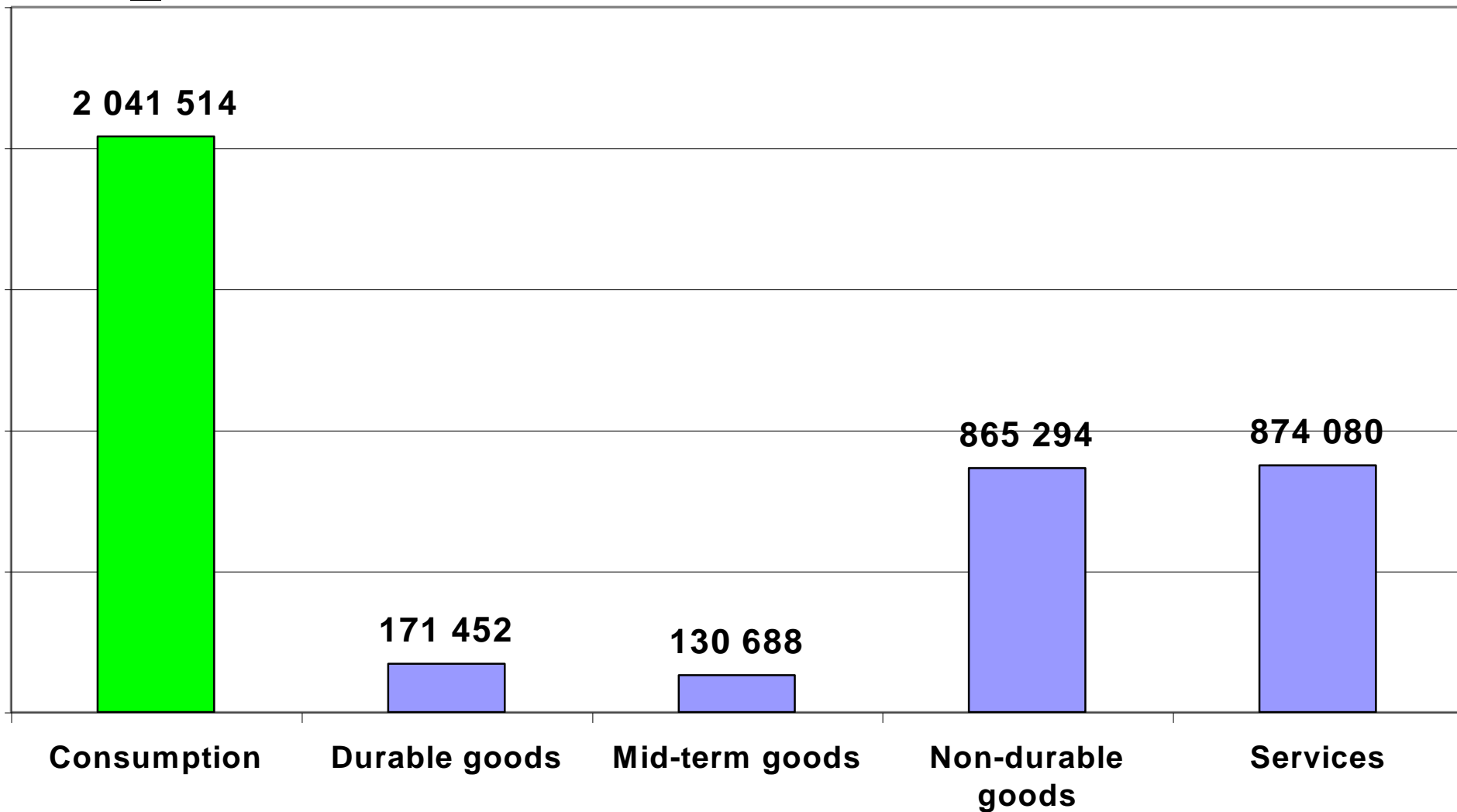
(data source: www.czso.cz)



The expenditure components of GDP

- **Consumption (C)** - goods and services bought by households.
 - Nondurable goods – e.g. food, clothing
 - Durable goods - e.g. cars, laptops
 - Services – e.g. haircuts, doctor visits

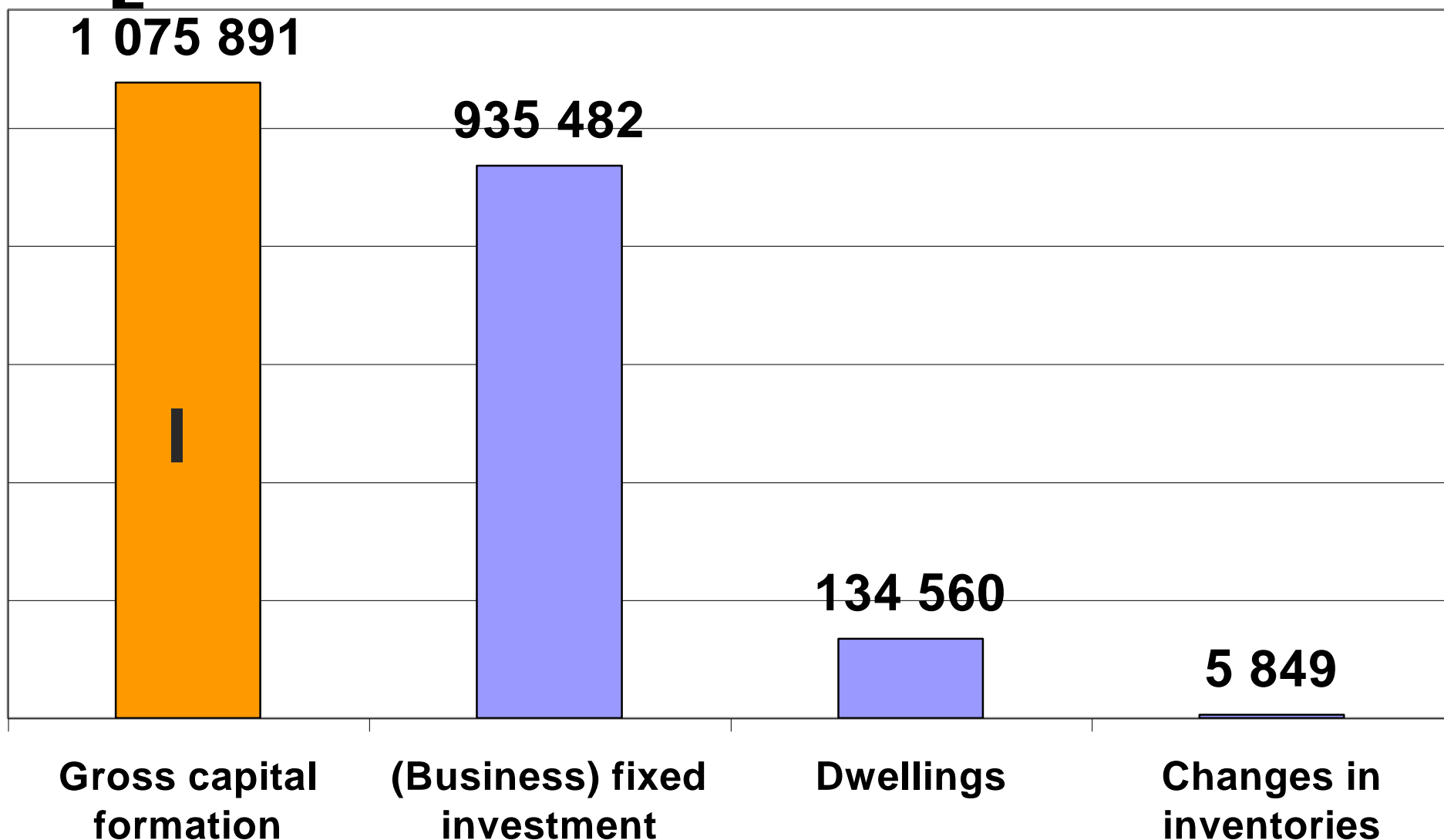
Consumption (without non-profit orgs), Czech Rep., 2014, in mil CZK



The expenditure components of GDP

- **Investment (I)** - spending on goods bought for the creation of future goods:
 - *Business fixed investment*
 - *Residential fixed investment*
 - *Inventory investment*

Gross Investment, Czech Rep., 2014, in mil CZK



The expenditure components of GDP

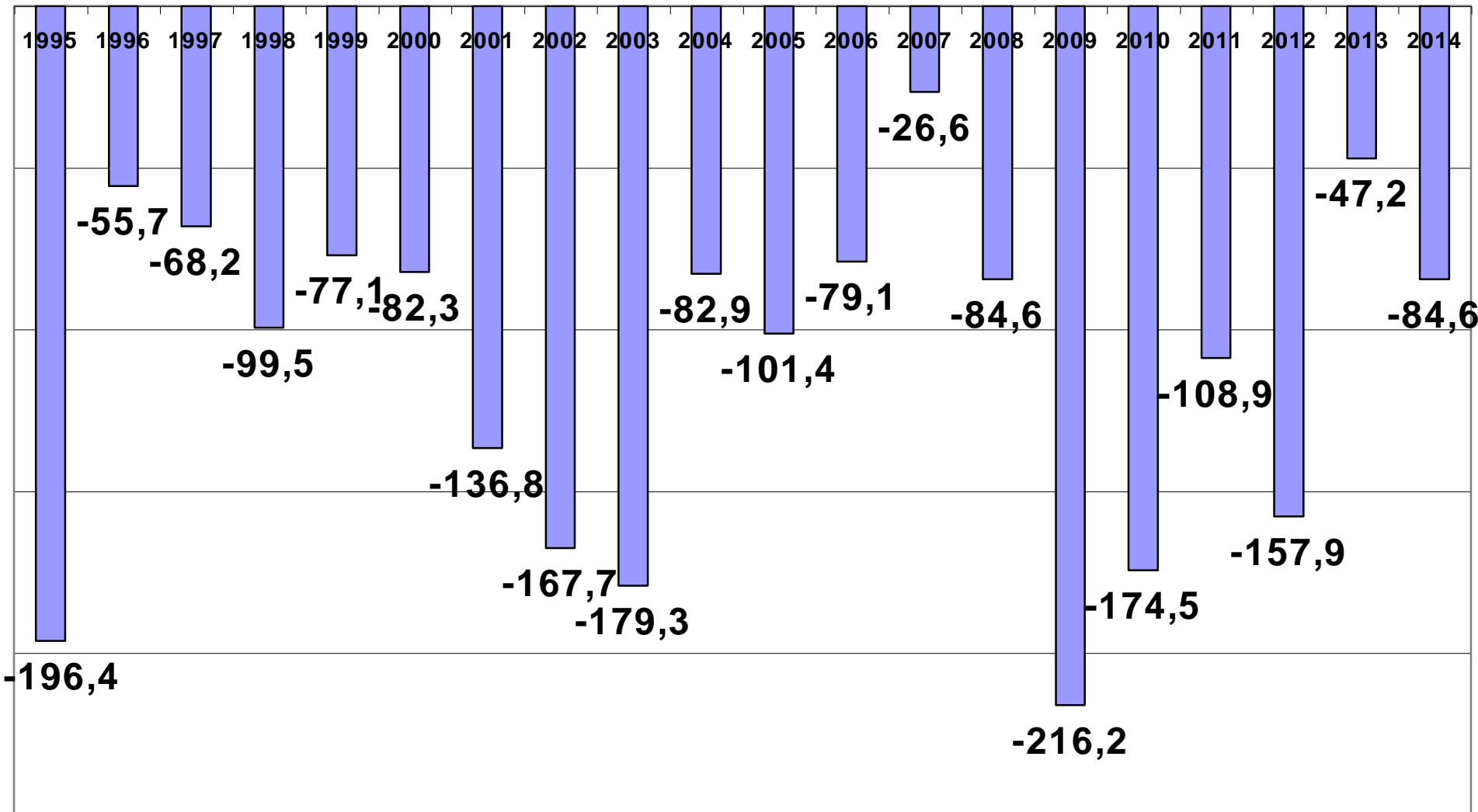
■ Government purchases (G)

- Goods and services bought by the government (federal, state, local)
- It includes military equipment, highways, services that government workers provide...
- It does not include transfer payments (TR) to individuals, such as Social Security and welfare. (TR only reallocate existing income!)

The expenditure components of GDP

- **Government Purchases (G):**
- The government buys guns, missiles, library books, it builds schools, hires teachers etc.
- Public saving(BS)= $TA - TR - G$
- $BS > 0$... gov. runs a budget surplus
- $BS = 0$... gov. has a balanced budget
- $BS < 0$...gov. runs a budget deficit

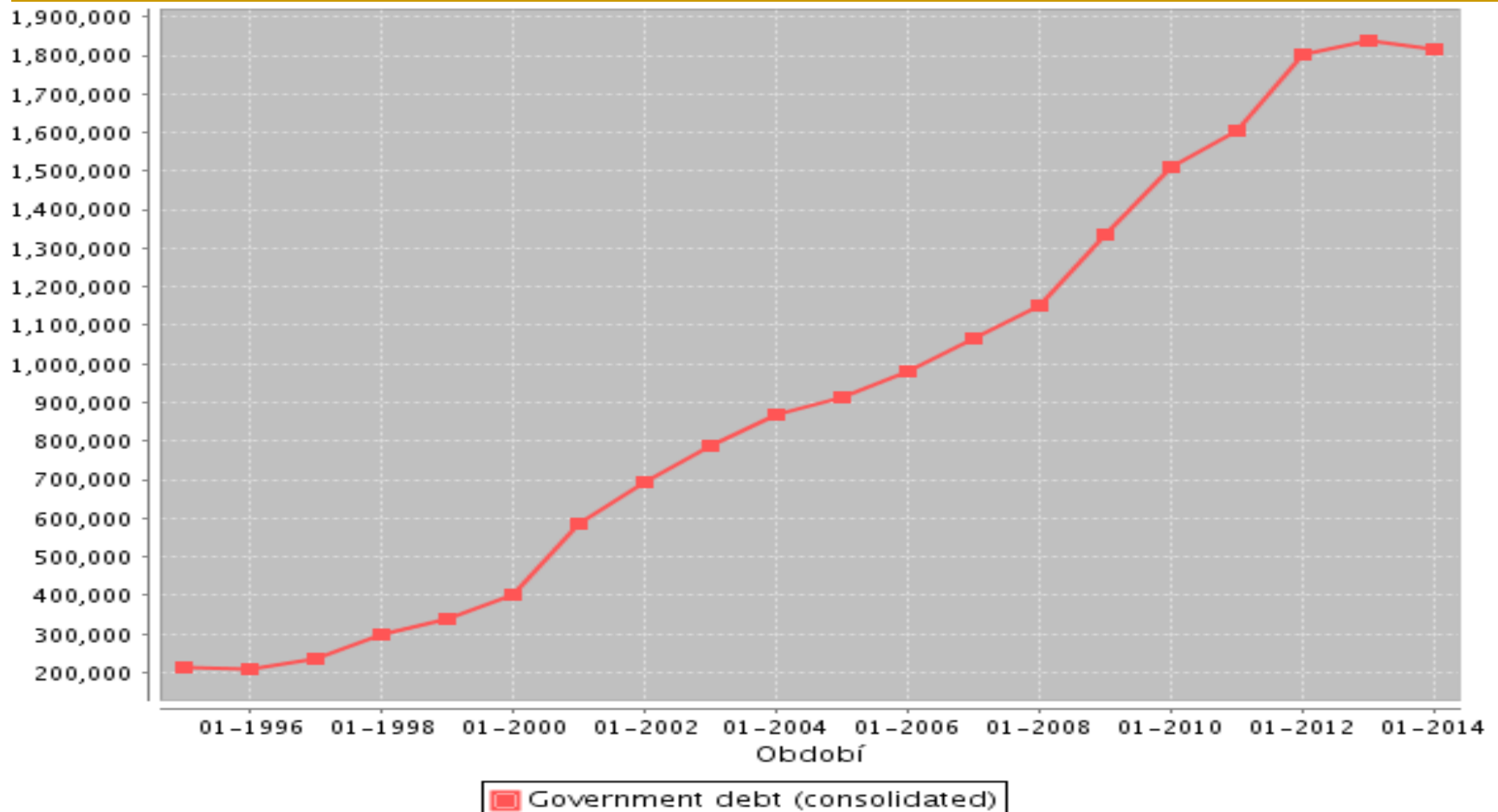
Budget Deficit in the Czech Republic in bln. (10⁹) CZK



Public Debt in the Czech Republic in bln. CZK

(data source: www.cnb.cz)

$$Debt = \sum Deficits$$



The expenditure components of GDP

- **Net exports (NX)** (of goods and services)
 - The value of goods and services exported to other countries (X) minus the value of goods and services imported from abroad (M).

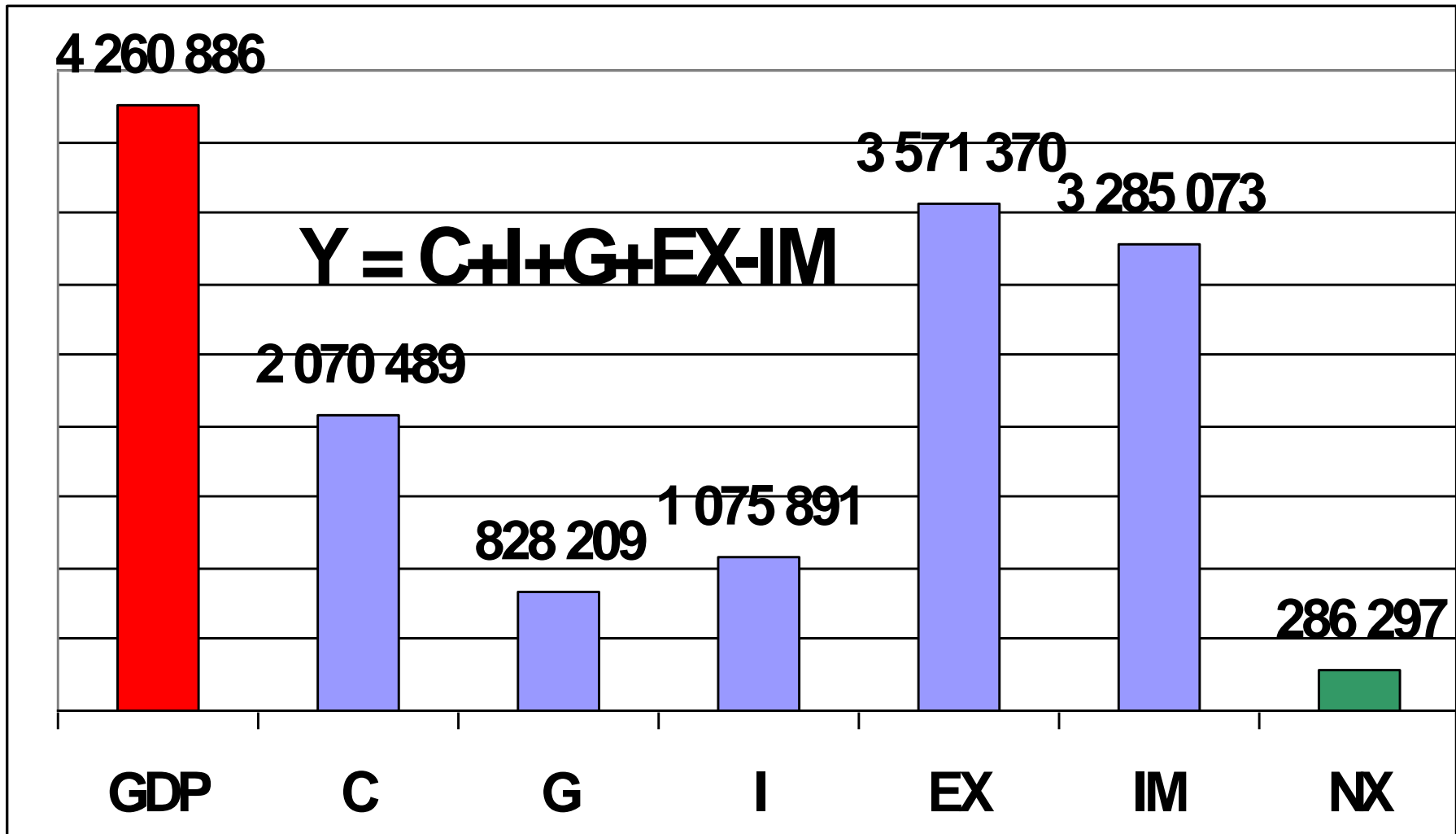


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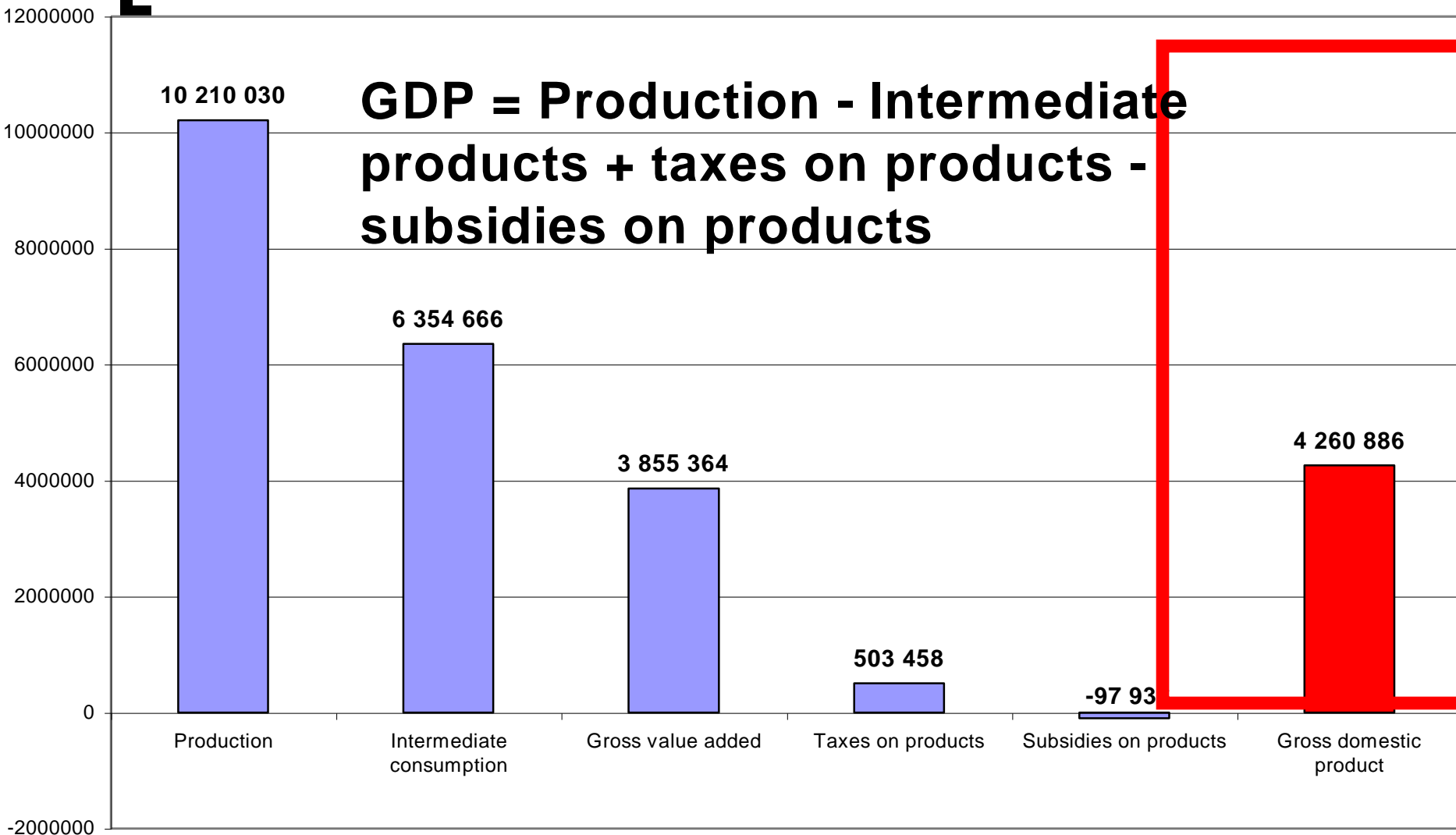


= NX

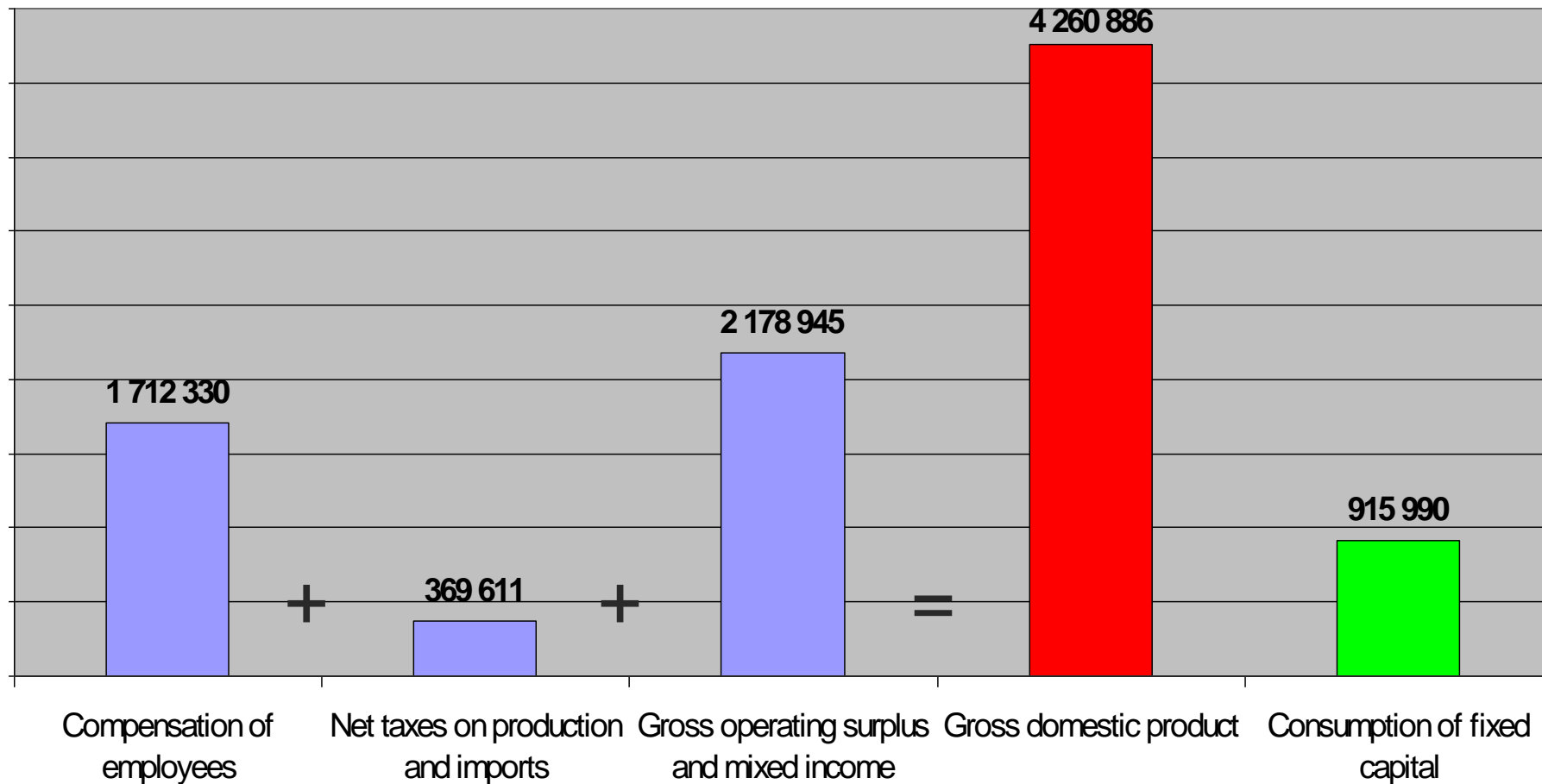
GDP in the CR in 2014 in mil. CZK (expenditure method)



GDP in the CR in 2014 in mil. CZK (value added method)



GDP in the CR in 2014 in mil. CZK (income method)



Other Measures of Income

- **Gross National Product (GNP):**
Total income earned by the nation's factors of production, no matter of their location.
- **Gross Domestic Product (GDP):**
Total income earned by factors of production located domestically, regardless of their nationality.

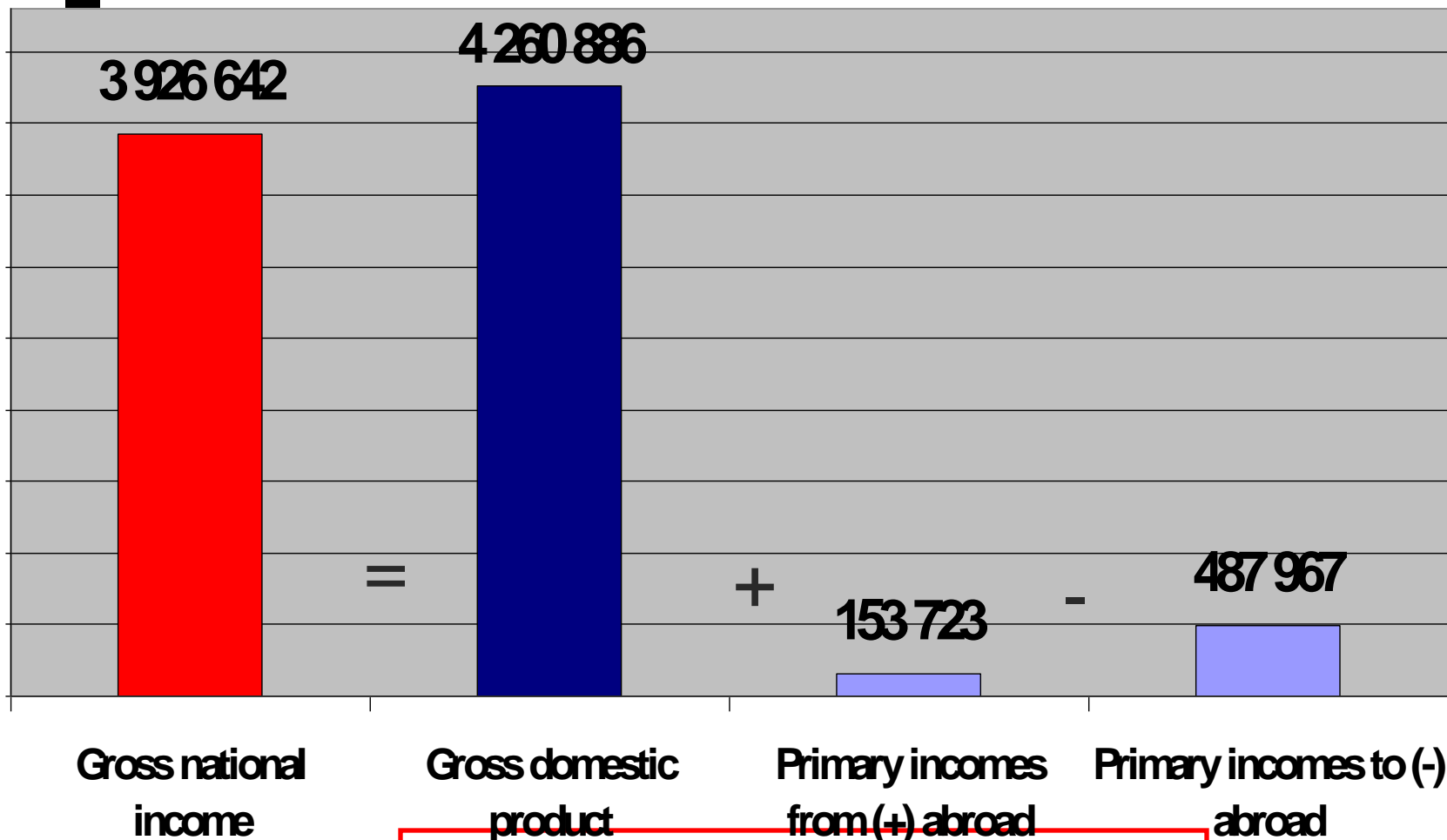
Other Measures of Income

- Suppose that a German resident owns an apartment building in Prague.
- The rental income she earns is part of the Czech **GDP**, not German **GDP**.
(location = Czech Republic)
- However, it is not the part of the Czech **GNP**, but of German **GNP**. (nationality = German)

Other Measures of Income

- **GNP** (_{GNI}) = **GDP** + Factor Payments From Abroad – Factor Payments to Abroad.
- Factor Payments = wages, profits, rents...
- Net Factor Payments (n.f.p.) = Factor Payments From Abroad – Factor Payments to Abroad

GNP (GNI) in the CR in 2014 in mil. CZK

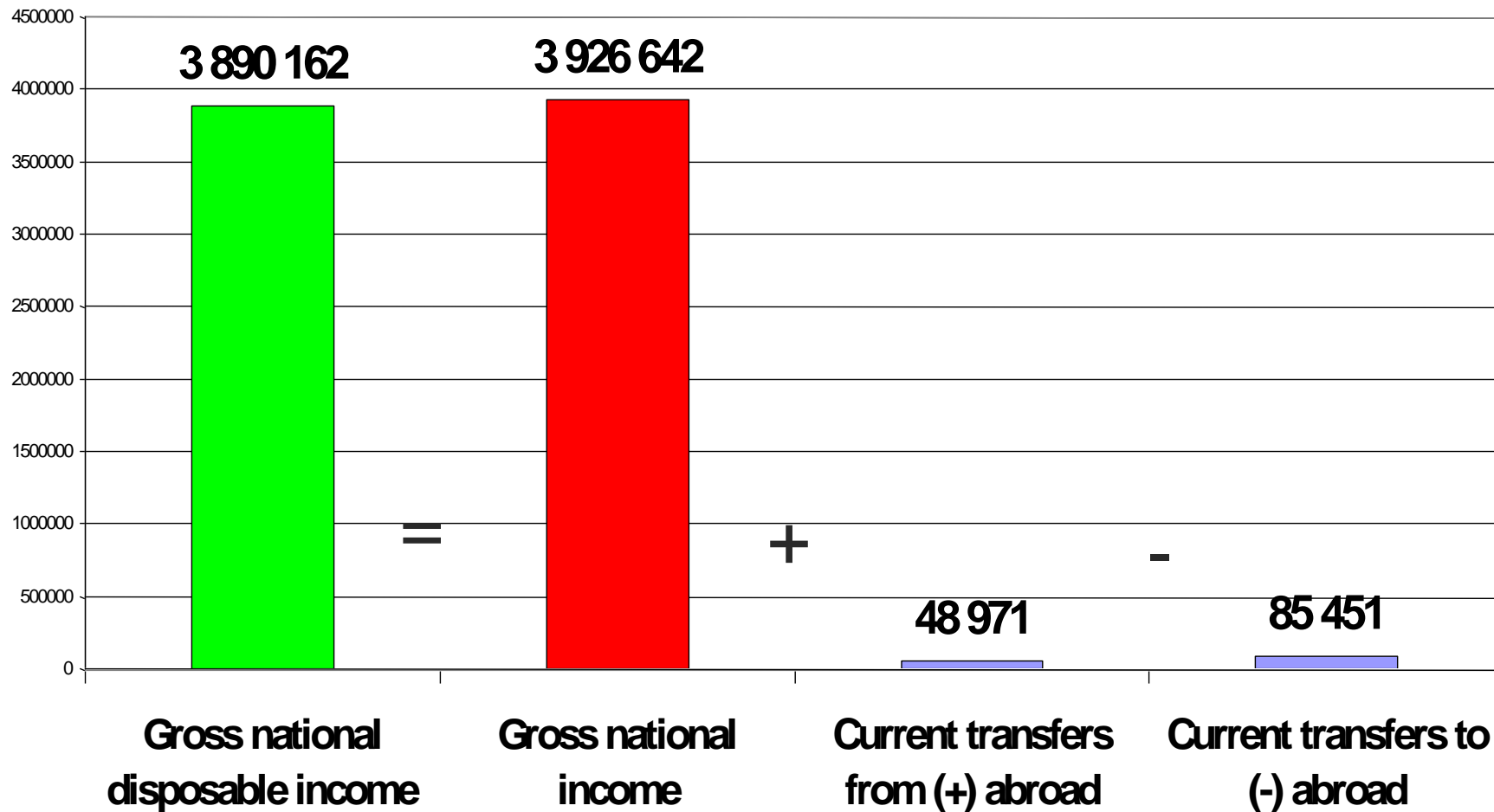


$$(GNP-GDP)/GDP = - 7.8 \%$$

Other Measures of Income*

- **Gross National Disposable Income** =
GNP + Net Foreign Transfers
- Net Foreign Transfers (n.f.t.) = Transfer Payments from Abroad - Transfer Payments to Abroad
- Transfer Payments from Abroad – e.g. current (not capital) transfers from Brussels (E.U.)
- Transfer Payments to Abroad - e.g. gifts to abroad (help for Africa), retirement pensions sent to Slovakia...

GNDI in the CR in 2014 in mil. CZK*



Other Measures of Income

- Net National Product (NNP) = GNP - Depreciation
- Depreciation - the amount of the capital stock that wears out during the period of time (e.g. year).



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