Universidad de Valladolid

ECO - UVa

Topic 5

Macroeconomic Aggregates

Prof. David A. Sánchez-Páez

Outline

1. An overview.

2. Gross Domestic Product (GDP).
   - Real GDP and nominal GDP: consumer price index and inflation.

3. Labor market.

Outline

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A global vision

- The objective of the study of **macroeconomics** is the behavior of the economy as a whole.

- Topics addressed by macroeconomics:

    - Fluctuations in **production** and **employment**.
    - Variations in **price levels**: **inflation**.
    - **Economic growth**.
    - **International trade**.

A global vision

- The **whole** is **more** than the **sum** of the **parts**.
- Paradox of thrift:
  - When families and firms are worried about the possibility of hard economic times ahead, they prepare **by cutting back on spending**.
  - This **reduction in spending depresses the economy**, as consumers spend less and firms react by laying off workers.
  - As a result, **families** and **firms may end up worse off** than if they had not tried to act responsibly by cutting spending.

Macroeconomics: the big picture

1930

Macroeconomics: the big picture

1930

The economy is self-regulating:

Problems such as unemployment are solved without government help.

Invisible hand.

Macroeconomics: the big picture

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Macroeconomics: the big picture

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Great Depression 1929

Macroeconomics: the big picture

1930

The economy is self-regulating:

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Invisible hand.

Great Depression 1929

Keynesian economics:

Economic slumps are caused by inadequate spending.

Government steps in to mitigate economic slumps.

Macroeconomics: the big picture

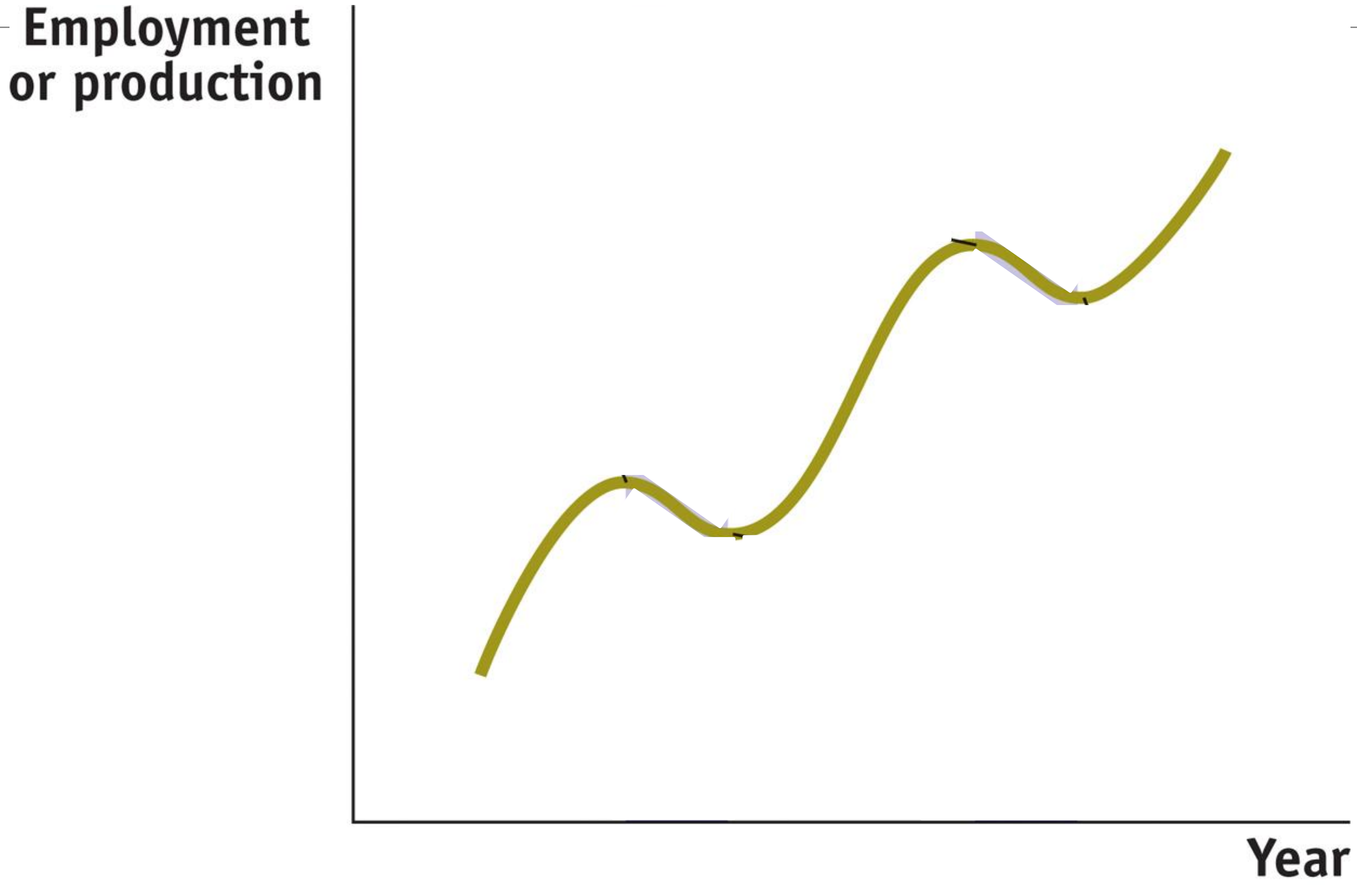
How does the government intervene?

- **Monetary policy**: variations in the quantity of money to change the interest rate and affect overall spending.
- **Fiscal policy**: variations in government spending and taxes to affect overall spending.
  - Subsidies.

The business cycle

- A **business cycle** is the short-run alternation between **recessions** and **expansions**.

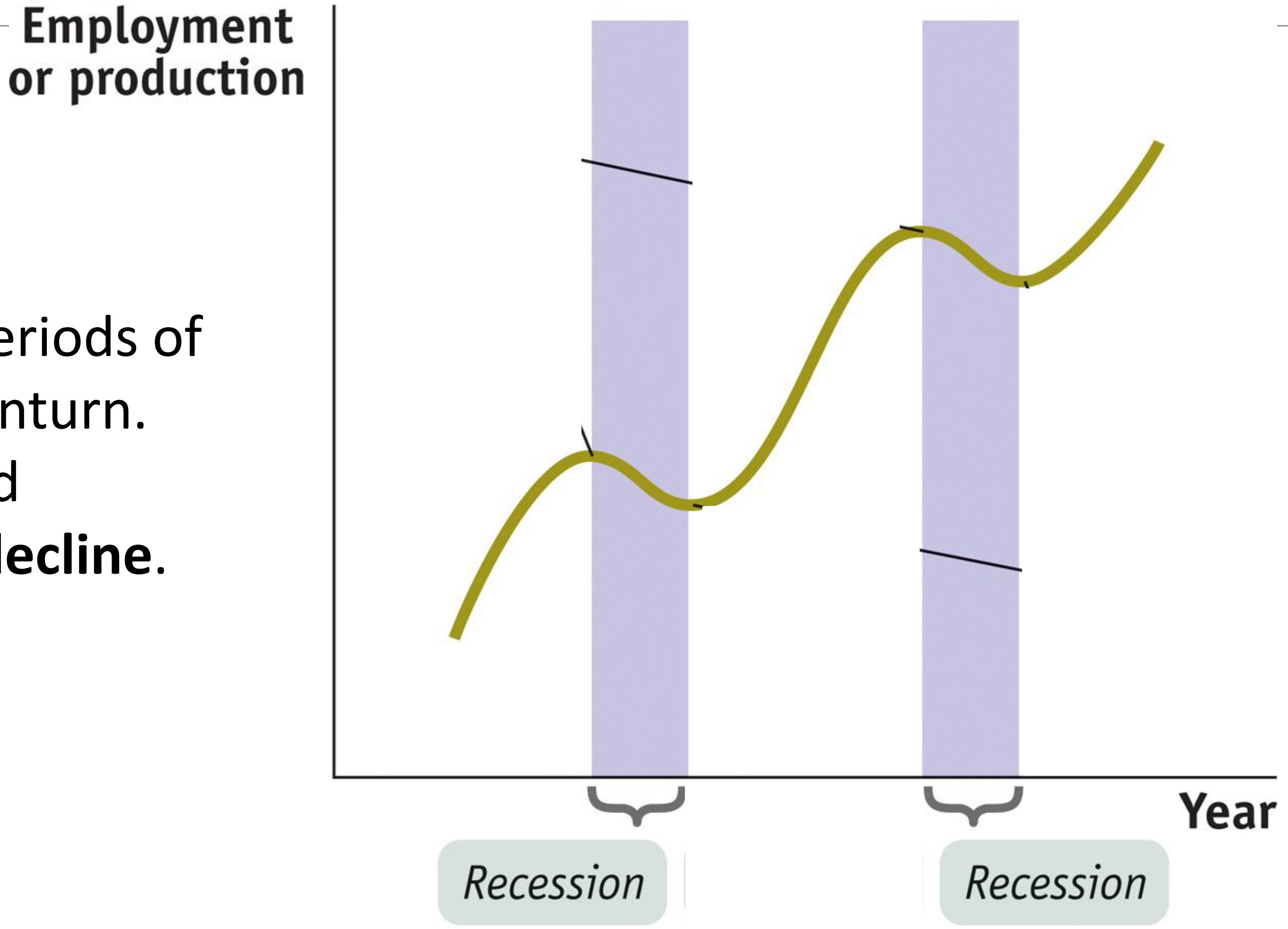
The business cycle



Source: Krugman and Wells (2023)

The business cycle

Recession or contraction: periods of economic downturn. **Production** and **employment decline**.



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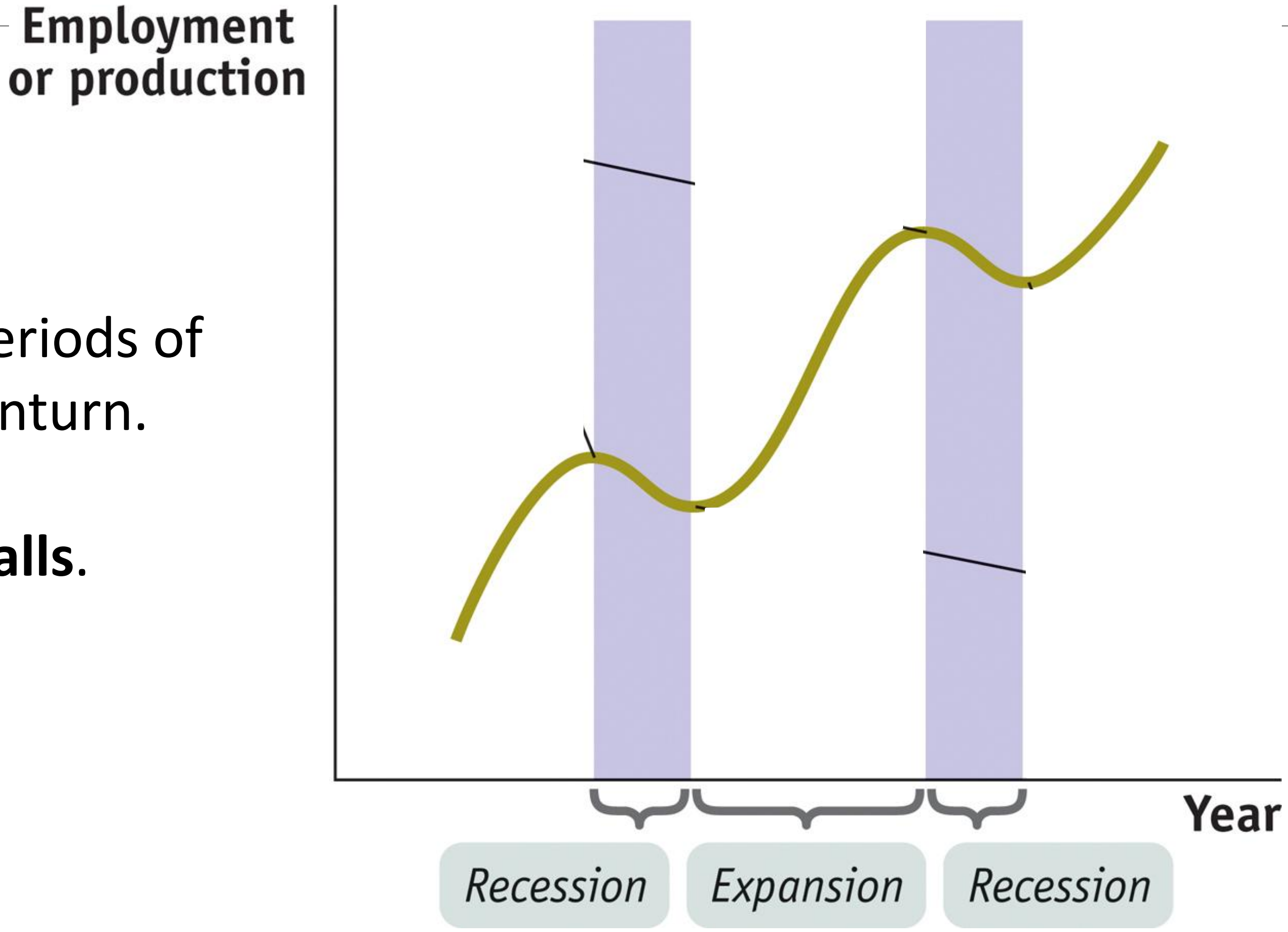
The business cycle

Recession or contraction: periods of economic downturn. **Output** and **employment falls**.

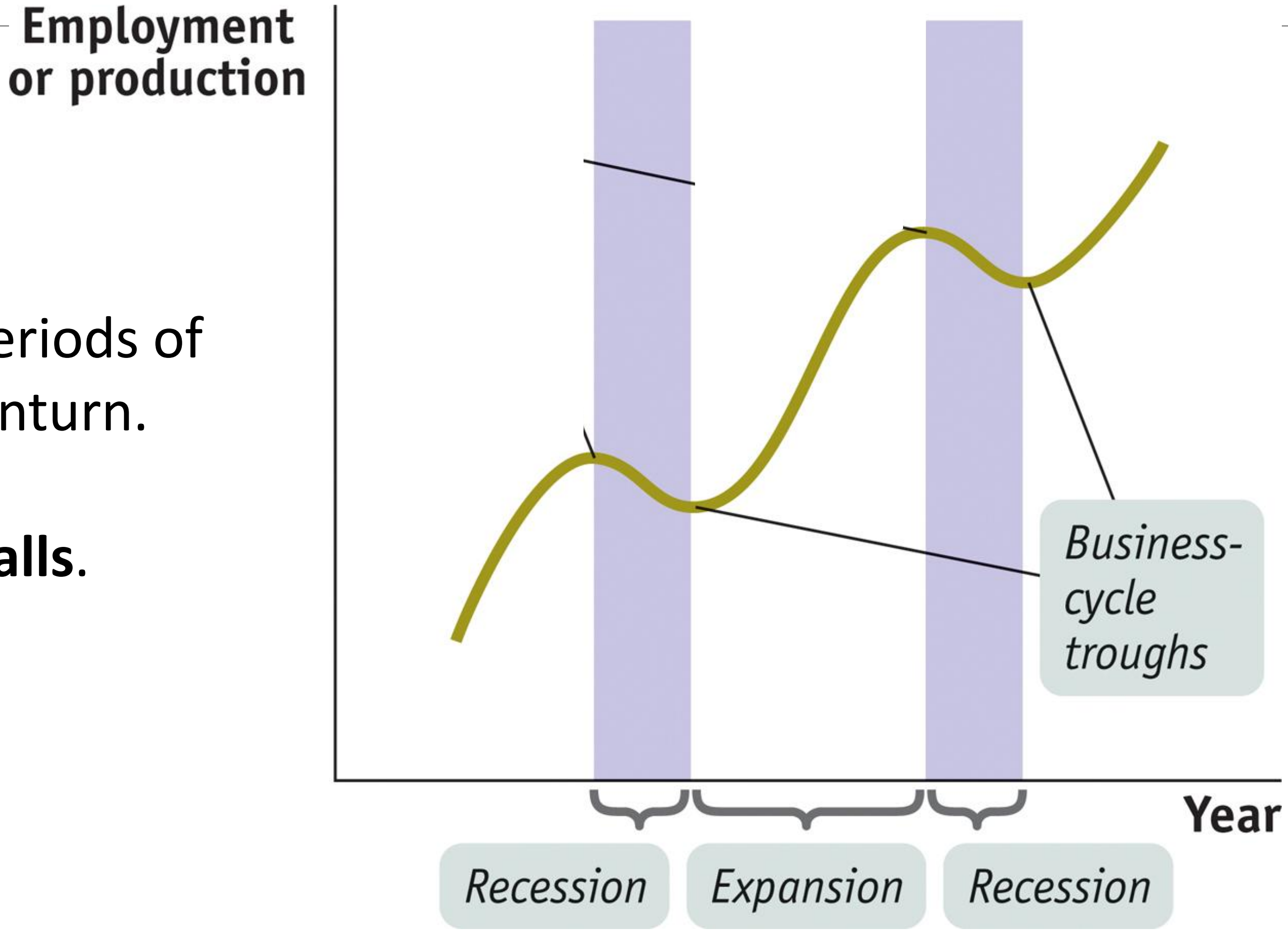


Expansion or recoveries: Periods of economic upturn. **Output** and **employment rise**.

Source: Krugman and Wells (2023)

The business cycle

Recession or contraction: periods of economic downturn. **Output** and **employment falls**.



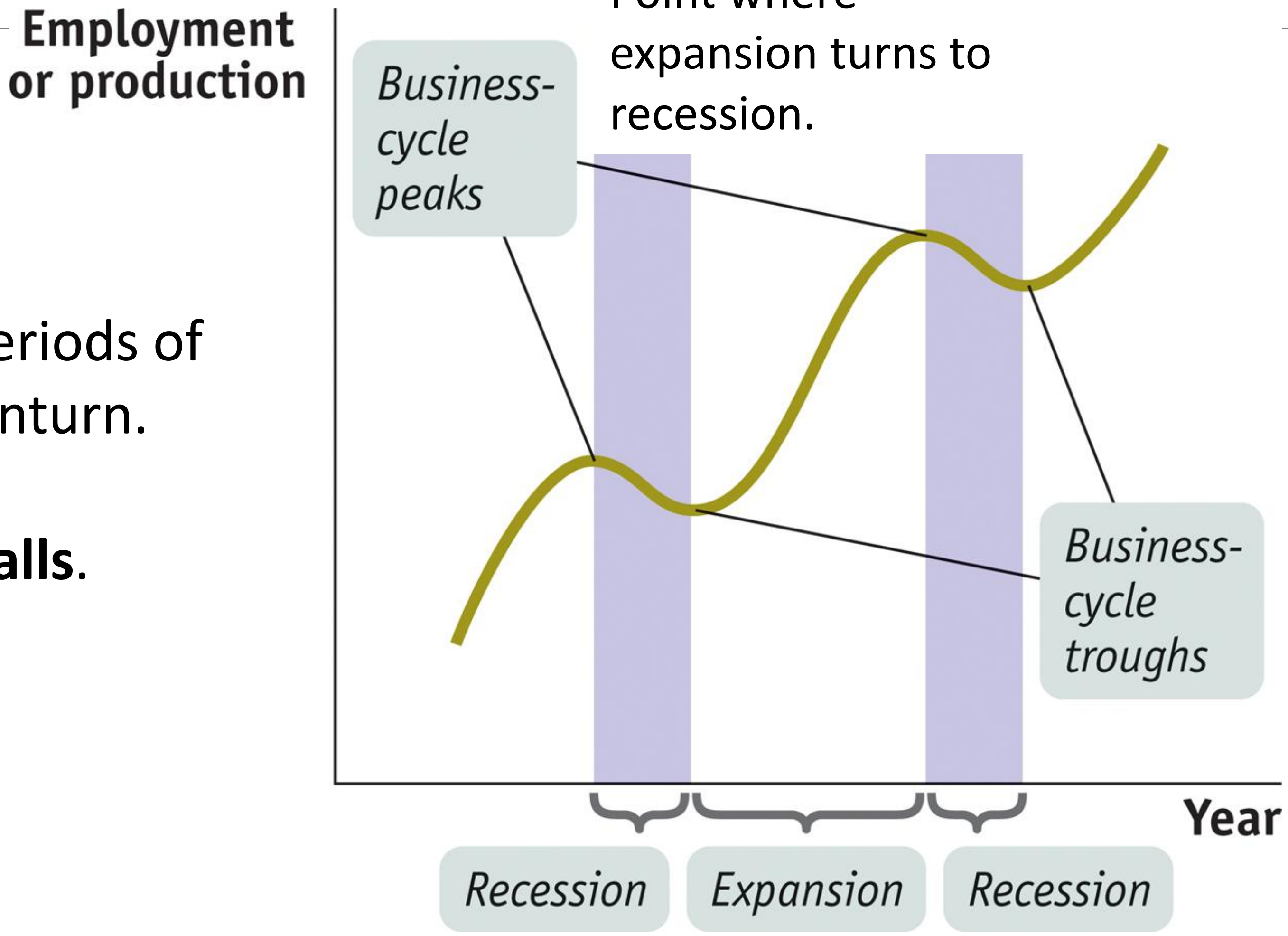
Expansion or recoveries: Periods of economic upturn. **Output** and **employment rise**.

Point where recession turns into expansion.

Source: Krugman and Wells (2023)

The business cycle

Recession or contraction: periods of economic downturn. **Output** and **employment falls**.



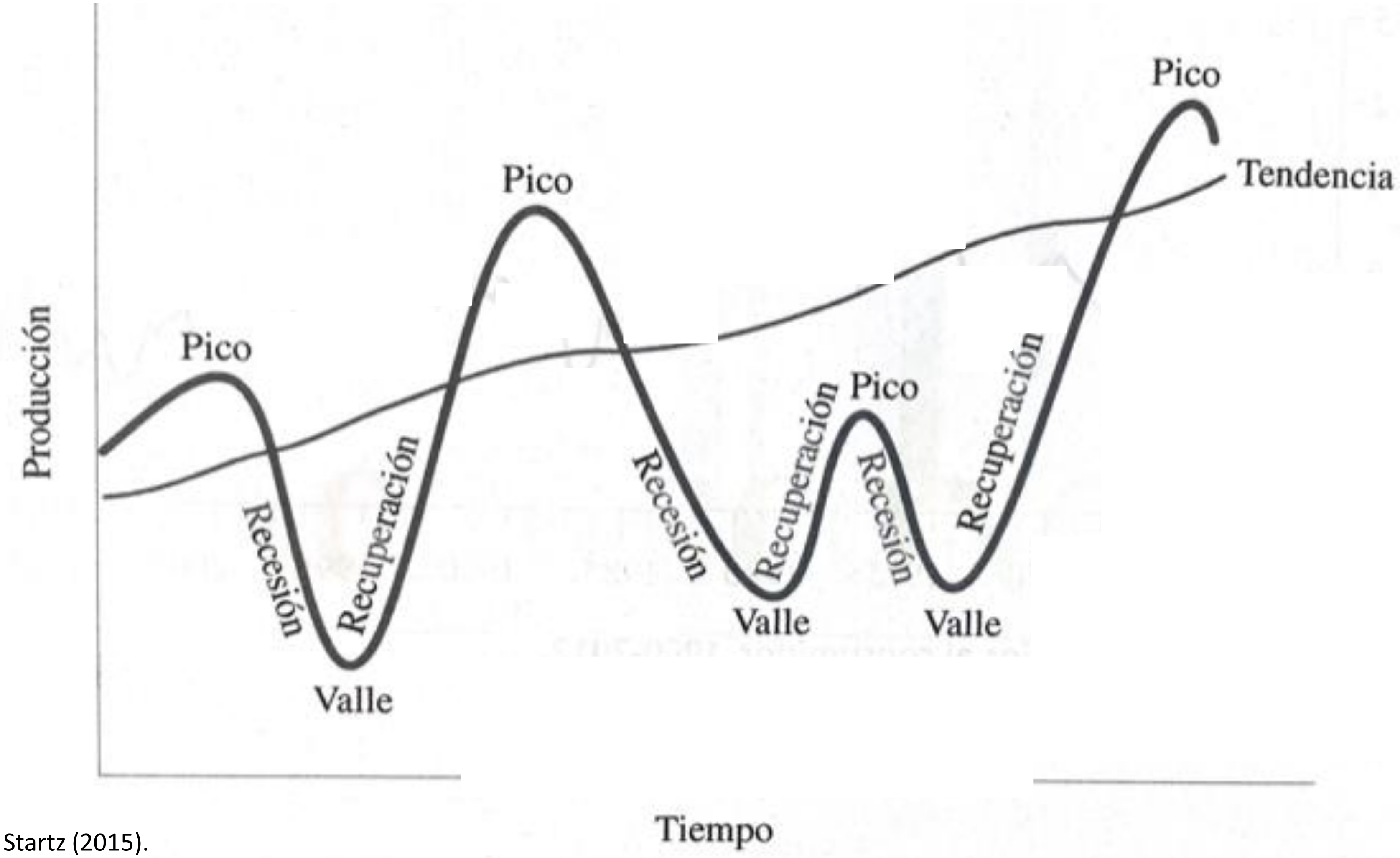
Point where expansion turns to recession.

Expansion or recoveries: Periods of economic upturn. **Output** and **employment rise**.

Point where recession turns into expansion.

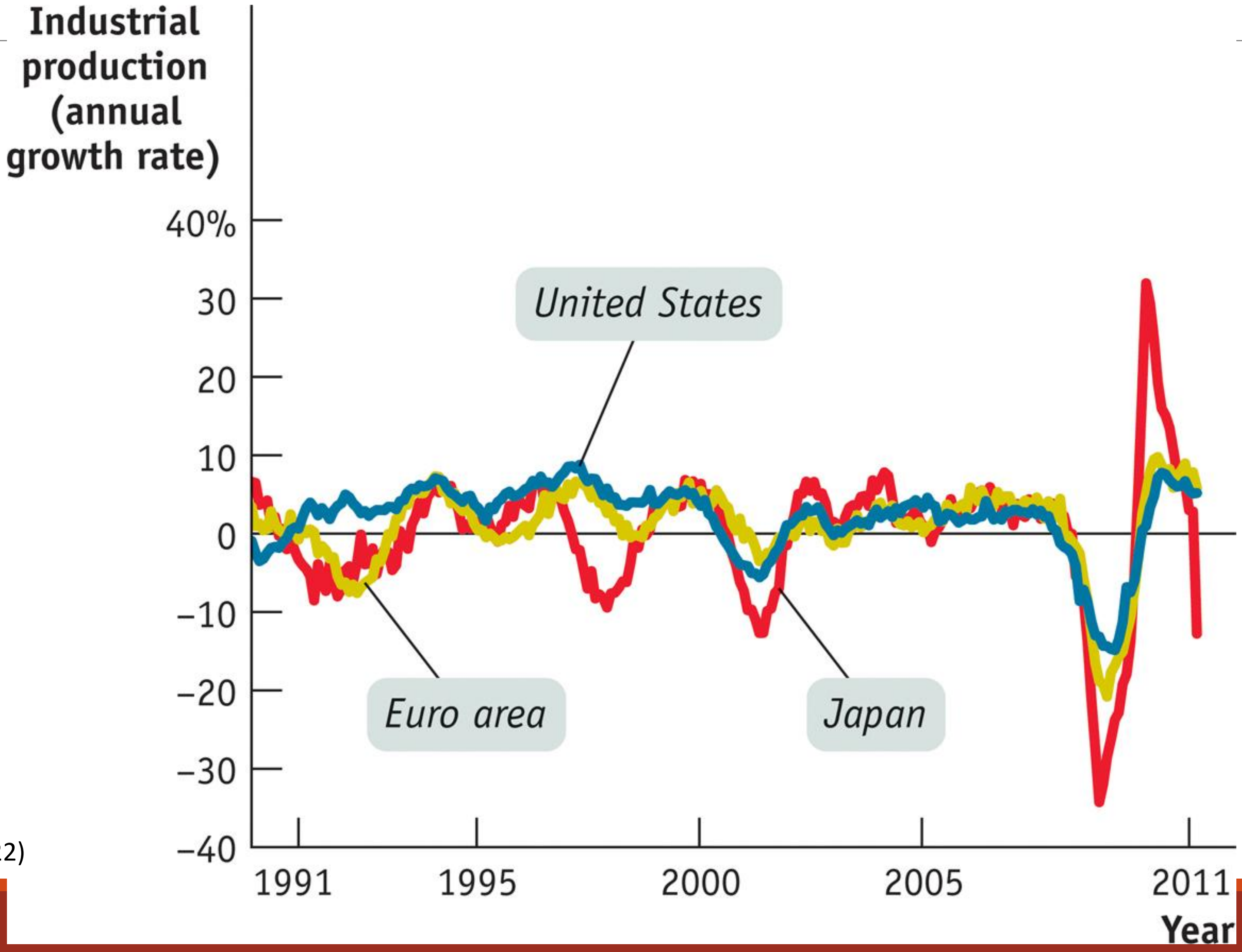
Source: Krugman and Wells (2023)

The business cycle



Source: Dornbusch, Fischer and Startz (2015).

Recessions: global comparison



Source: Krugman and Wells (2022)

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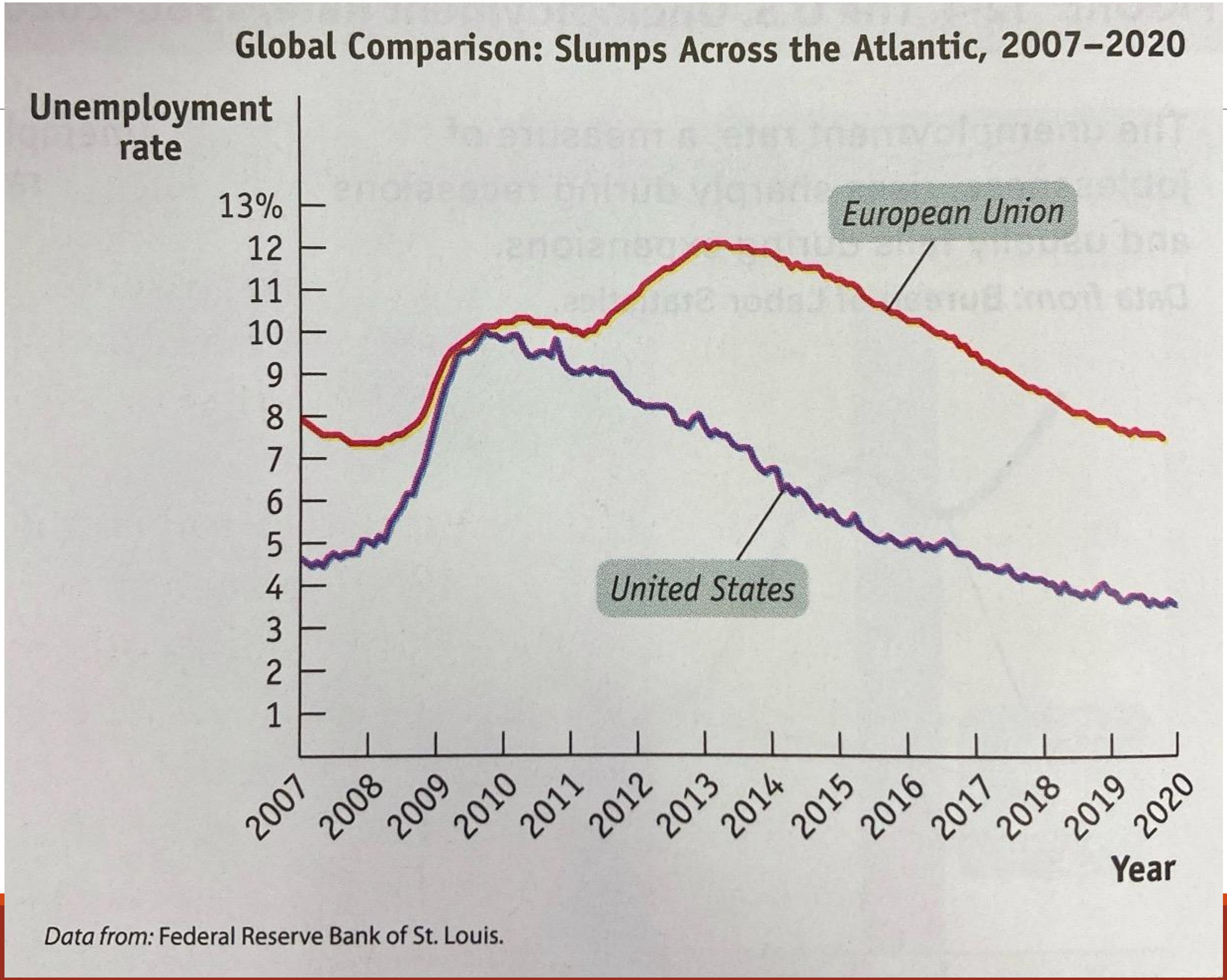

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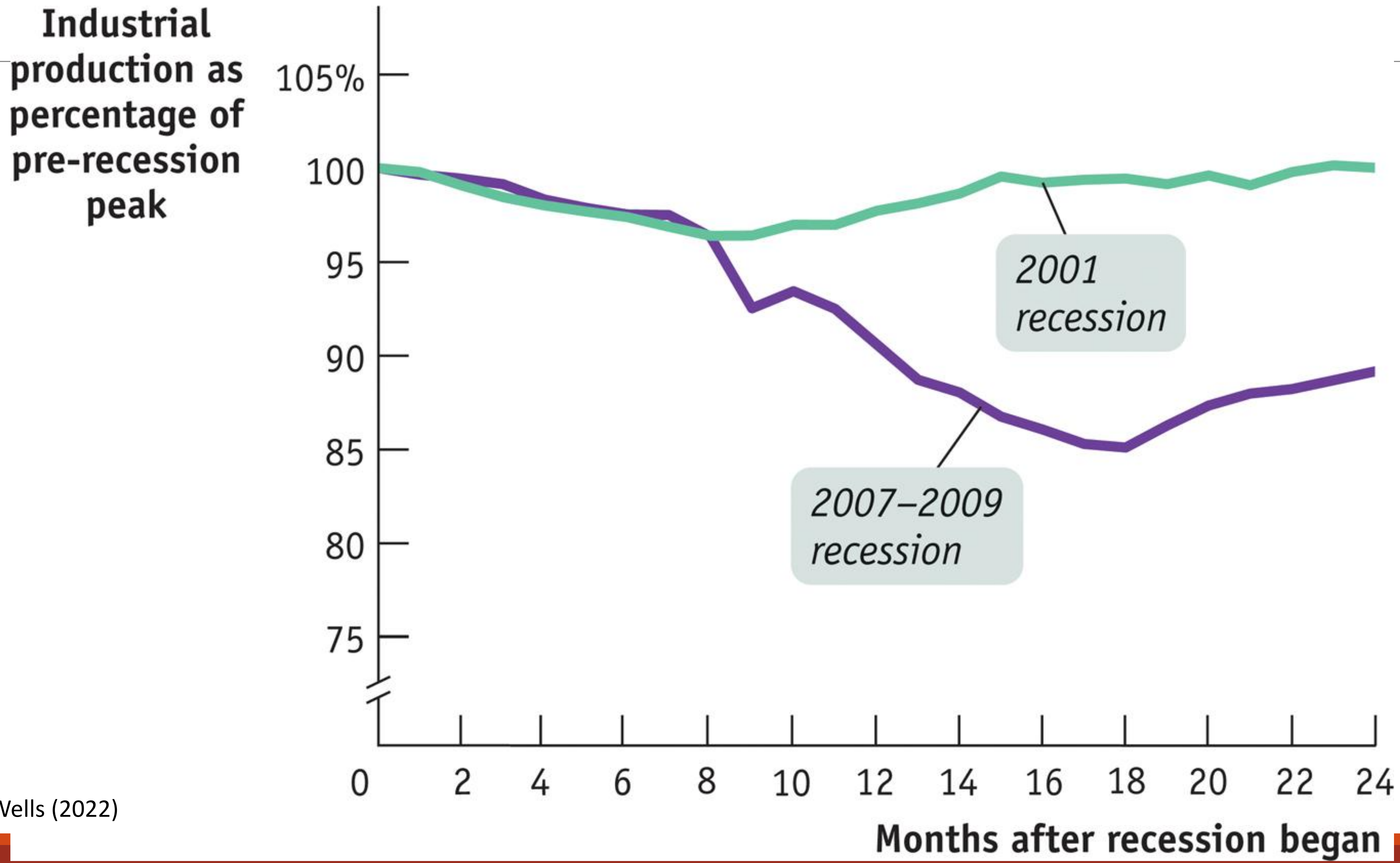

Source: Krugman and Wells (2022)

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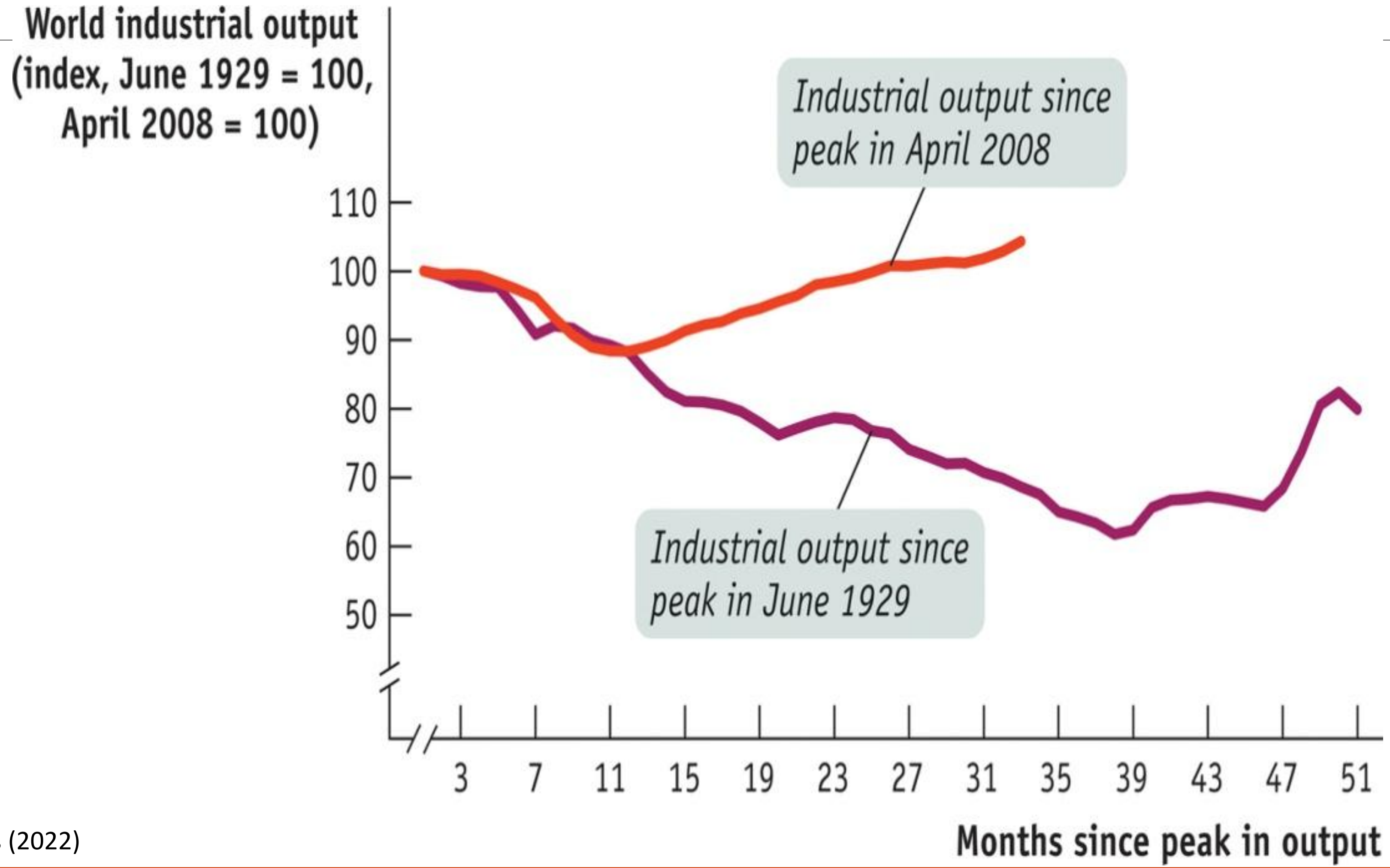

Source: Krugman and Wells (2022)

Outline

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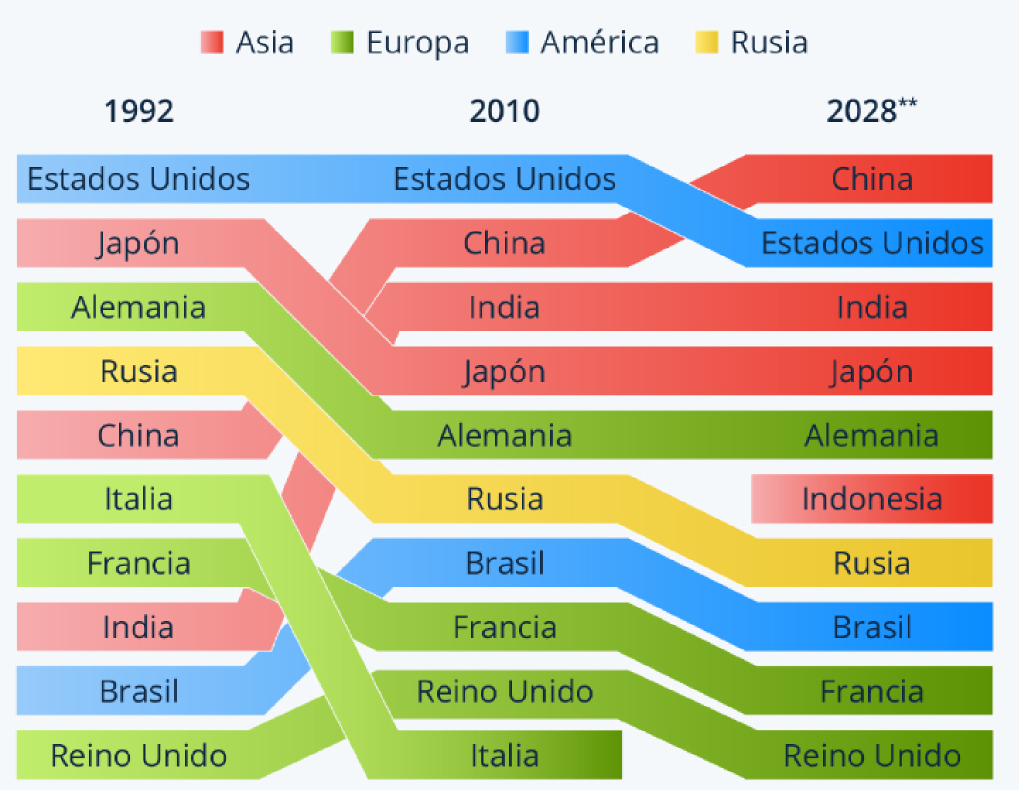
Measuring the economy

The world's largest economies over time

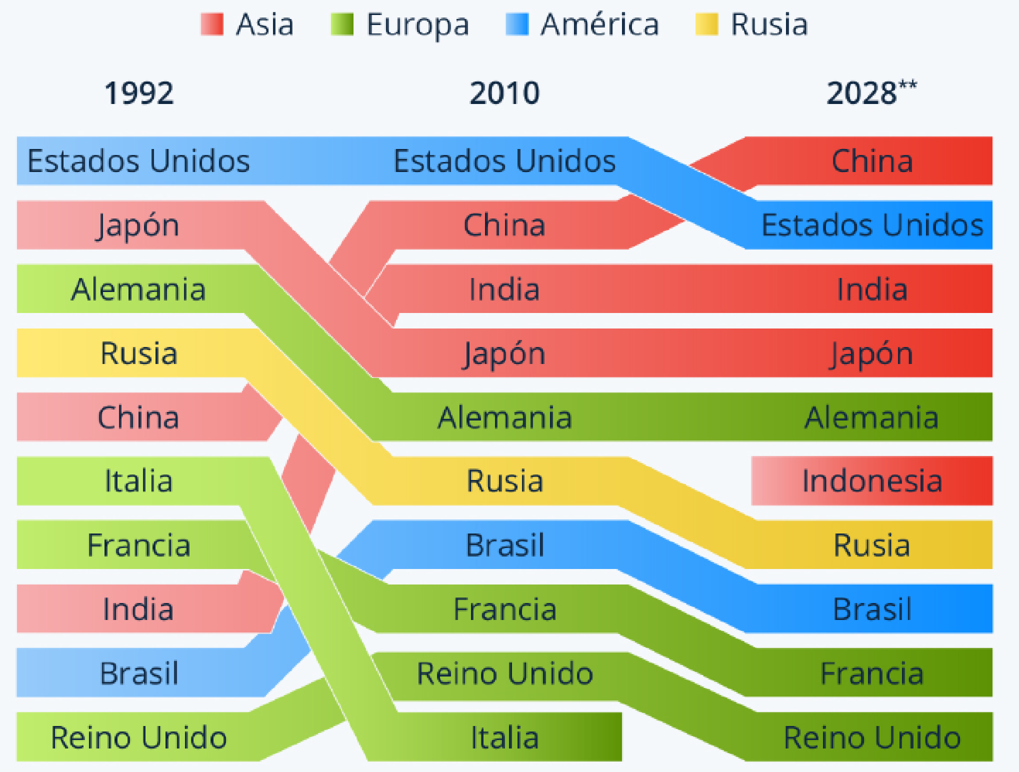


How can you compare if they produce different things?

Measuring the economy

The world's largest economies over time

Countries with the largest GDP in 1992, 2010 and 2028



Through the
Gross Domestic Product (GDP)

Measuring the economy

- **GDP** is the most important and common way to estimate the **size of the economy**.

- GDP measures the ***value*** of a country's output.

Measuring the economy

- Almost all countries have a system of **national accounts**.

- National accounts **track** the **flows of money** between different sectors of the economy.
  - Income accounts.
  - Product accounts.

- National accounts are used to calculate the **total market value of goods and services** produced **in the economy**.

National accounts

- **National accounts** owe their creation to the Great Depression. **Before that, only scattered statistics existed**: railroad carloads, stock prices and incomplete indices of industrial production.
- Simon Kuznets developed the system of national accounts in 1937.
- He won the Nobel Prize in Economics for this work.

National accounts

- **Money flows** that involve spending on goods and services:

  - **Government purchase of goods and services**: total expenditures on goods and services by federal, state and local governments.

  - **Consumer spending**: household spending on goods and services.

  - **Investment spending**: spending on productive physical capital and on changes to inventories.

  - **Rest of the world**: goods and services sold to other countries (**exports**) and purchased from other countries (**imports**).

Gross Domestic Product (GDP)

- **Gross Domestic Product** or **GDP** is the total value of **all *final*** goods and services produced in the economy during a given year.
  - It does not include ***intermediate*** goods and services.

- **Final goods and services** are sold to the final, or end, user.

- **Intermediate goods**: are inputs to produce final goods.

Gross Domestic Product (GDP)

- What does GDP tell us?
  - Size of the economy.
  - Comparison of economic performance from year to year.
  - Comparison of economic performance from country to country.
  - **Aggregate spending**: the sum of consumer spending, investment spending, government purchases of goods and services, and export minus imports.

Gross Domestic Product (GDP)

- GDP can be measured in 3 ways:

1. **Value of production of final goods and services**: adding up the value of all final goods and services produced in the economy.

Gross Domestic Product (GDP)

	Iron producer	Steel producer	Engine producer	Factor income
Sales	4,200	9,000	21,500	
Intermediate goods	0	4,200	9,000	
Wages	2,000	3,700	10,000	15,700
Interest payments	1,000	600	1,000	2,600
Rent	200	300	500	1,000
Profit	1,000	200	1,000	2,200
Total expenditure	4,200	9,000	21,500	
Value added	4,200	4,800	12,500	

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Value added = Sales – Intermediate costs	**4,200 = 4,200 – 0**	**4,800 = 9,000 – 4,200**	**12,500 = 21,500 – 9,000**	**21,500**

Gross Domestic Product (GDP)

- GDP can be measured in 3 ways:

1. **Value of production of final goods and services**: adding up the value of all final goods and services produced in the economy.

2. **Factor income earned from firms**: adding up <u>total income</u> earned in the economy.

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Gross Domestic Product (GDP)

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1. **Value of production of final goods and services**: adding up the value of all final goods and services produced in the economy.

2. **Factor income earned from firms**: adding up total income earned in the economy.

3. **Aggregate spending**: adding up aggregate spending on domestically produced final goods and services.

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Aggregate spending	4,200 – 4,200	9,000 – 9,000	21,500	

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Aggregate spending	4,200 – 4,200 +	9,000 – 9,000 +	21,500 =	**21,500**

Gross Domestic Product (GDP)

- GDP can be measured in 3 ways:

1. **Value of production of final goods and services**.
2. **Factor income earned from firms**.
3. **Aggregate spending**.

Why are they equivalent?

Gross Domestic Product (GDP)

- **Aggregate spending**:

$$GDP = C + I + G + X - IM$$

  - C: consumer spending.
  - I: investment spending.
  - G: government spending.
  - X: exports.
  - IM: imports.

National accounts

- **Gross National Product (GNP)**: total value of income received by national residents in a given period of time.
  - **GNP = GDP + NPF**
- **Net Factor Payments** (**NFP**): income of domestic residents from foreign earnings, foreign loans and workers' remittances ***minus*** foreign income in the domestic economy.
- In a closed economy: GDP = GNP.

National accounts

- **Net Domestic Product (NDP)**: the value of GDP net of the depreciation of the capital stock.
  - **NDP = GDP – depreciation**
  - Depreciation: the systematic reduction in the value of an asset over its useful life due to wear and tear, obsolescence, or age.

- **Domestic Income (DI)**: is the sum of labor income and capital income.
  - **DI = GDP – indirect tax collection**

Nominal GDP vs. real GDP

- We need to be able to track the **aggregate output** over time: total quantity of final goods and services the economy produces.

- **Nominal GDP**: value of all final goods and services produced in the economy during a given year, calculated using the **prices current in the year in which the output is produced**.

- **Real GDP**: total value of all final goods and services produced in the economy during a given year, calculated using the **prices of a selected base year**.

- **Real GDP shows the <u>real growth</u> of the economy**.

Calculation of nominal and real GDP

	Year 1	Year 2
Quantity of apples (billions)	2,000	2,200
Price of apple	$0.25	$0.30
Quantity of oranges (billions)	1,000	1,200
Price of orange	$0.50	$0.70

Source: Krugman and Wells (2023)

Calculation of nominal and real GDP

$$\text{Nominal GDP in year 1} = (2{,}000\text{b} \times \$0.25) + (1{,}000\text{b} \times \$0.50) = \$1{,}000 \text{ billion}$$

$$\text{Nominal GDP in year 2} = (2{,}200\text{b} \times \$0.30) + (1{,}200\text{b} \times \$0.70) = \$1{,}500 \text{ billion}$$

Calculation of nominal and real GDP

	Year 1	Year 2
Quantity of apples (billions)	2,000	2,200
Price of apple	$0.25	$0.30
Quantity of oranges (billions)	1,000	1,200
Price of orange	$0.50	$0.70
GDP (billions of dollars)	$1,000	$1,500

Source: Krugman and Wells (2023)

Calculation of nominal and real GDP

First, determine the **base year**. In this case, we will say it is year 1.

$$\text{Real GDP in year 1} = \textbf{nominal GDP} = \$1{,}000 \text{ billion}$$

$$\text{Real GDP in year 2 } (\boldsymbol{prices}\ \textbf{from year 1}) = (2{,}200\text{b} \times \$0.25) + (1{,}200 \times \$0.50) = \$1{,}150 \text{ billion}$$

Calculation of nominal and real GDP

	Year 1	Year 2
Quantity of apples (billions)	2,000	2,200
Price of apple	$0.25	$0.30
Quantity of oranges (billions)	1,000	1,200
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GDP (billions of dollars)	$1,000	$1,500

X

Source: Krugman and Wells (2023)

Calculation of nominal and real GDP

	Year 1		Year 2
Quantity of apples (billions)	2,000	X	2,200
Price of apple	$0.25	+	$0.30
Quantity of oranges (billions)	1,000		1,200
Price of orange	$0.50		$0.70
GDP (billions of dollars)	$1,000		$1,500

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Calculation of nominal and real GDP.

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GDP (billions of dollars)	$1,000	$1,500
Real GDP (billions of year 1 dollars)	$1,000	$1,150

<u>Except in the base year</u>, **real GDP ≠ nominal GDP**.

Source: Krugman and Wells (2023)

Calculation of nominal and real GDP

	Year 1	Year 2
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Price of apple	$0.25	$0.30
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Price of orange	$0.50	$0.70
GDP (billions of dollars)	$1,000	$1,500
Real GDP (billions of year 1 dollars)	$1,000	$1,150

Economic growth = $\dfrac{1{,}150 - 1{,}000}{1{,}000}$ = 15%

Source: Krugman and Wells (2023)

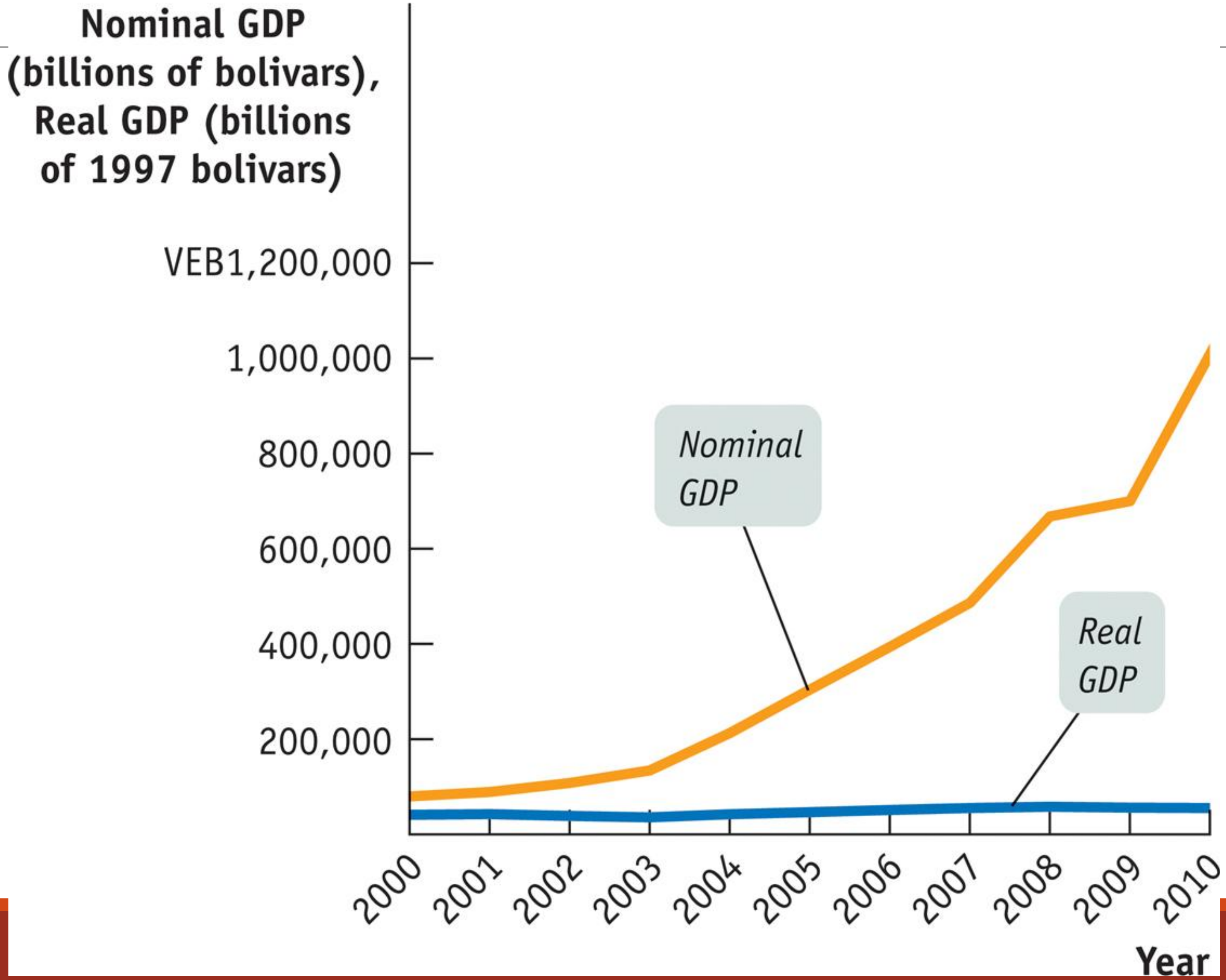
Calculation of nominal and real GDP

- Alternatively, the GDP deflator can be used:

$$GDP_R = \frac{GDP_N}{D}$$

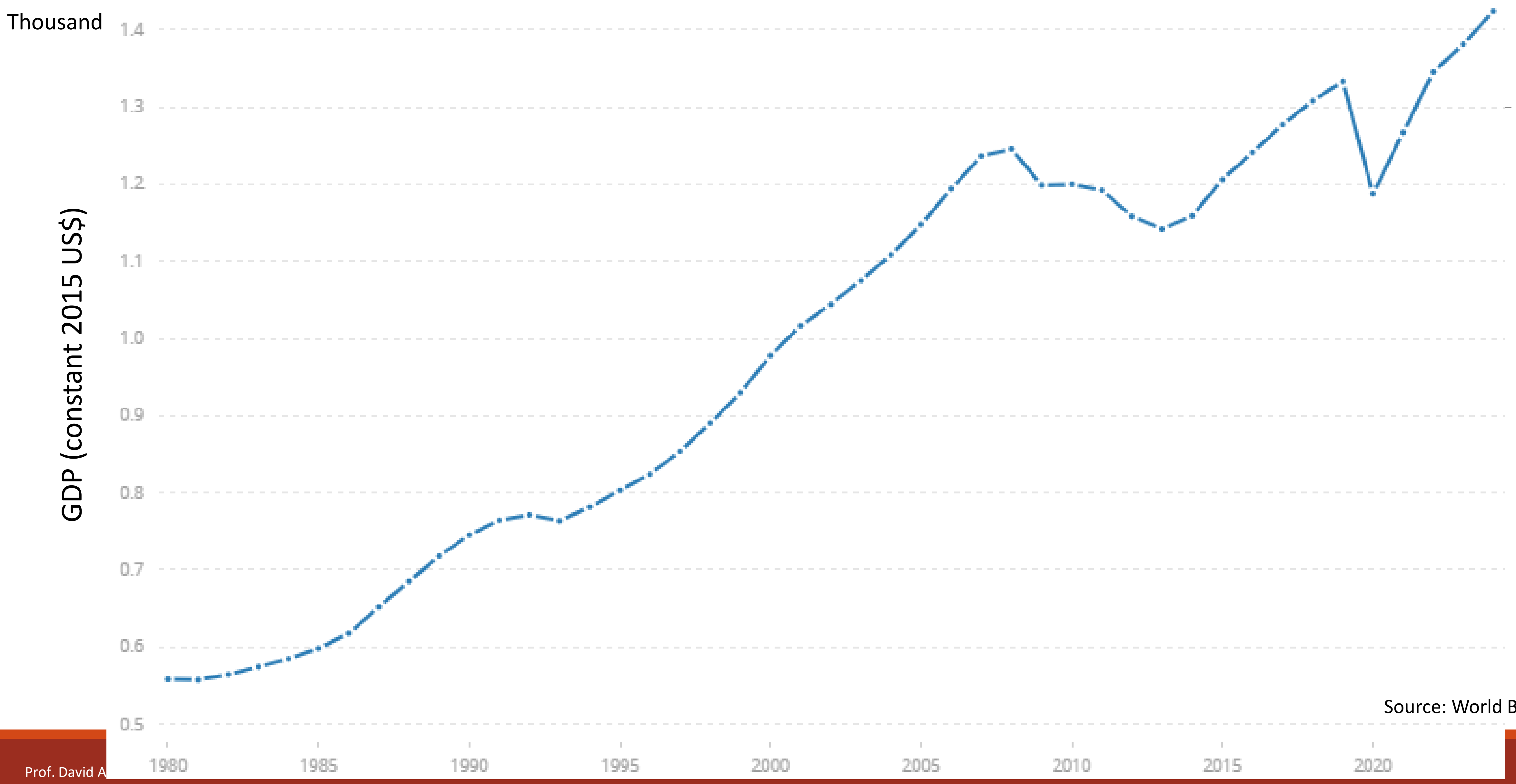
- **GDP deflator (D)**: a price index that measures the change in prices of all goods and services produced in an economy in a given period.

The miracle of Venezuela… ?



Source: Krugman and Wells (2023)

Real GDP in Spain



Source: World Bank (2024)

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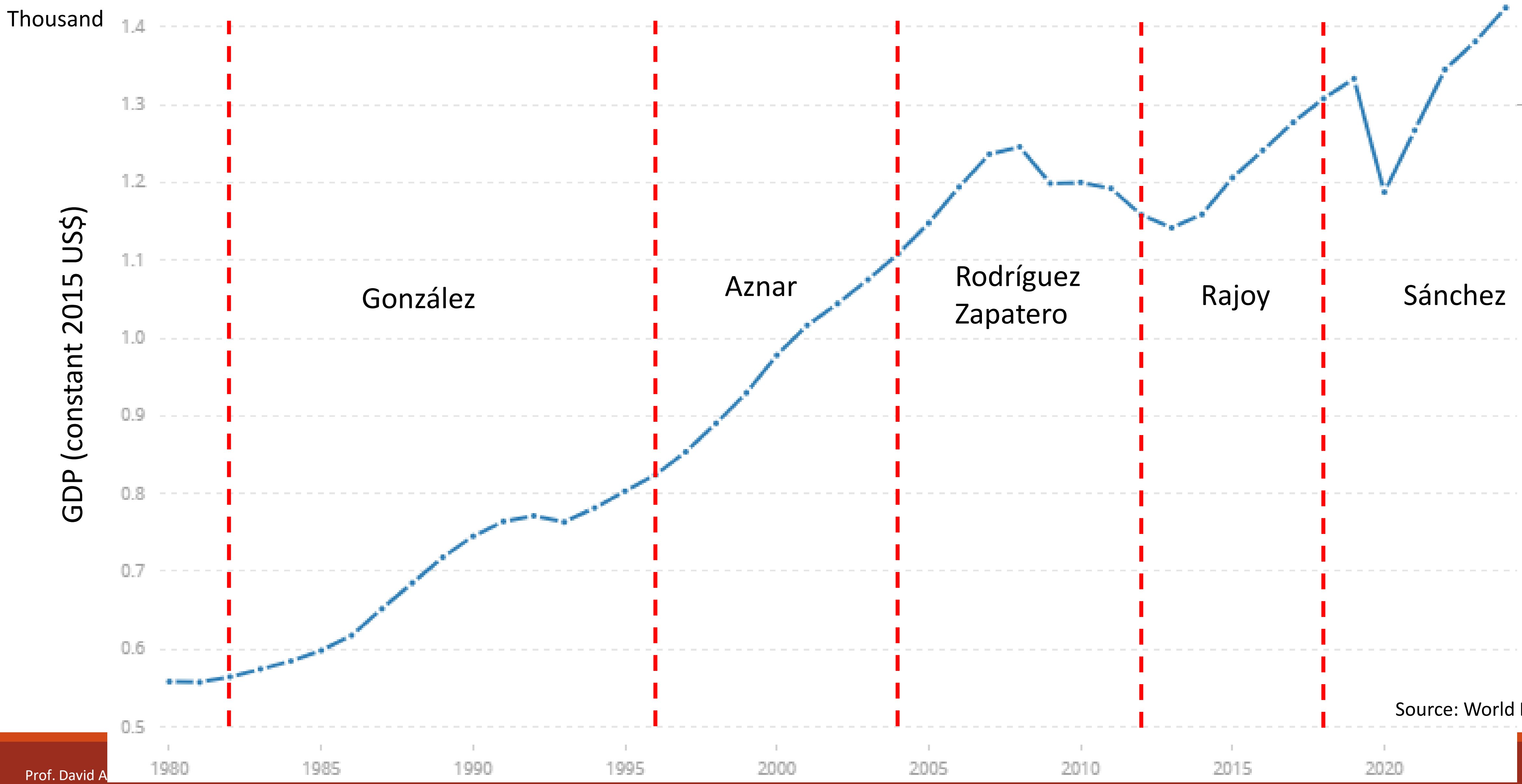


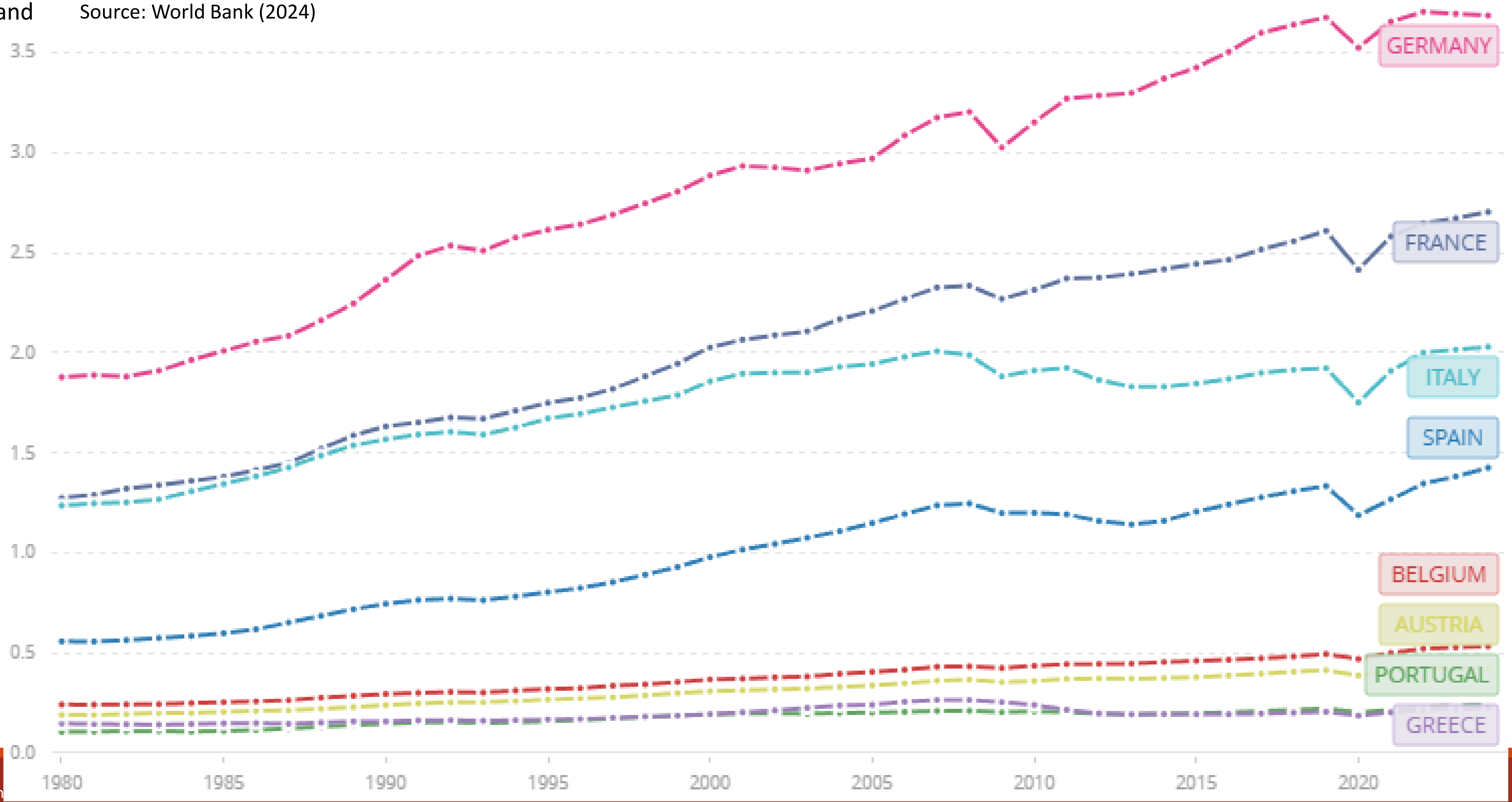
Source: World Bank (2024)

Real GDP in Europe

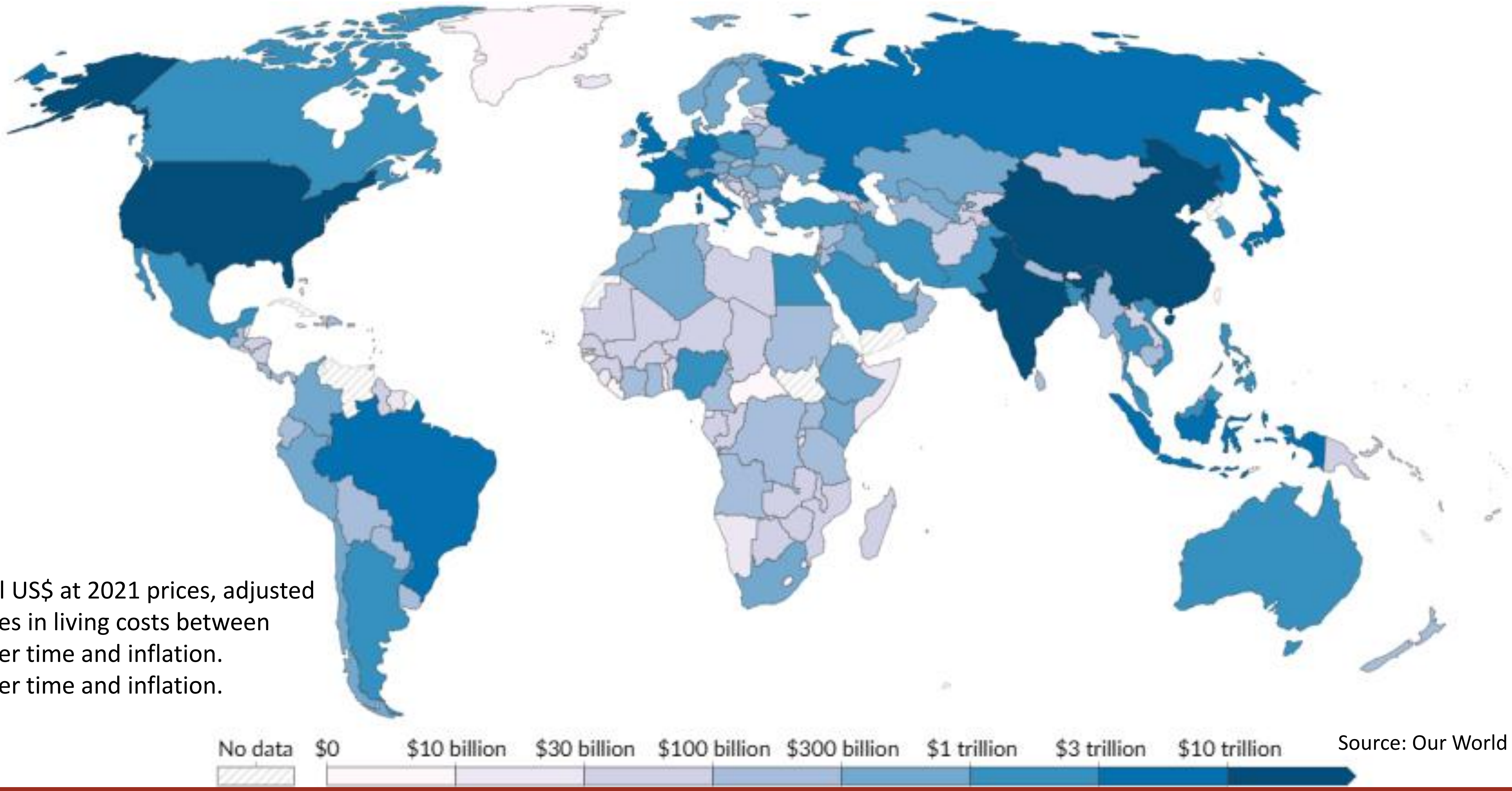
Thousand

Source: World Bank (2024)

GDP (constant 2015 US$)



Real GDP in the world



International US$ at 2021 prices, adjusted for differences in living costs between countries over time and inflation.
countries over time and inflation.

Source: Our World in Data (2023)

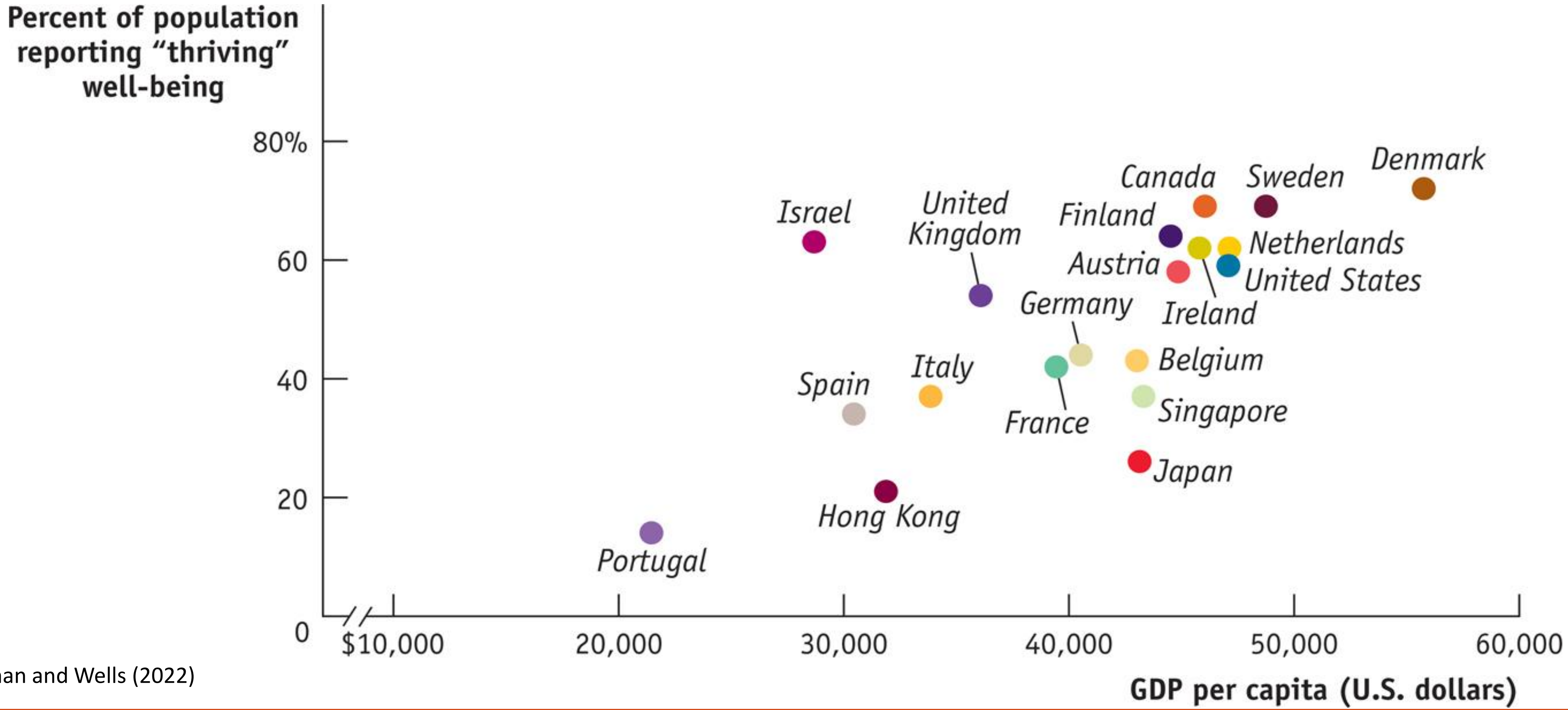
GDP per capita

- **GDP per capita**: **GDP divided by** the size of the **population**.

- It is interpreted as the **average income per person** living in a country.

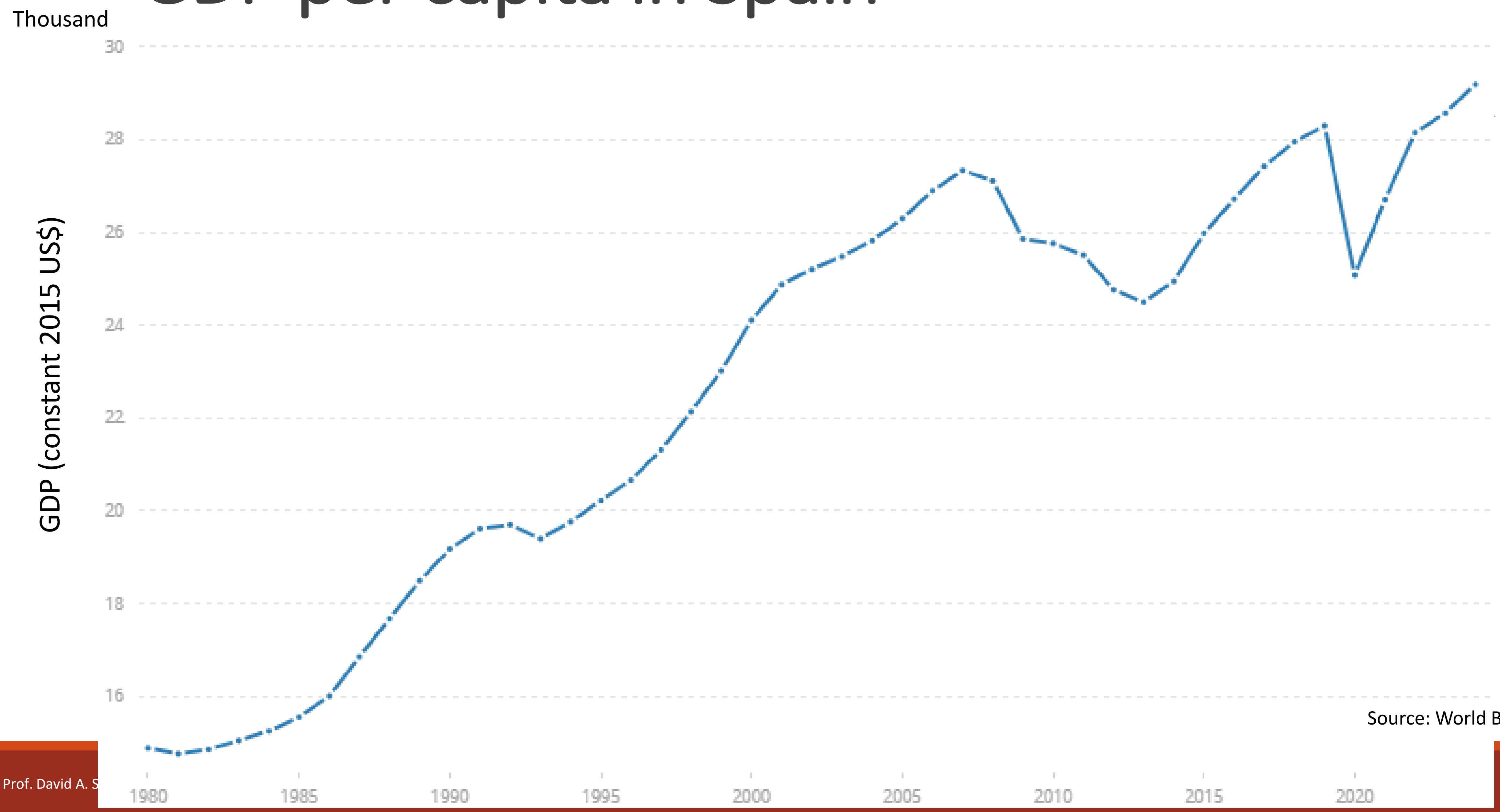
- It is used as a **measure of well-being**, although it is not as accurate as it **does not consider equity**.

GDP per capita



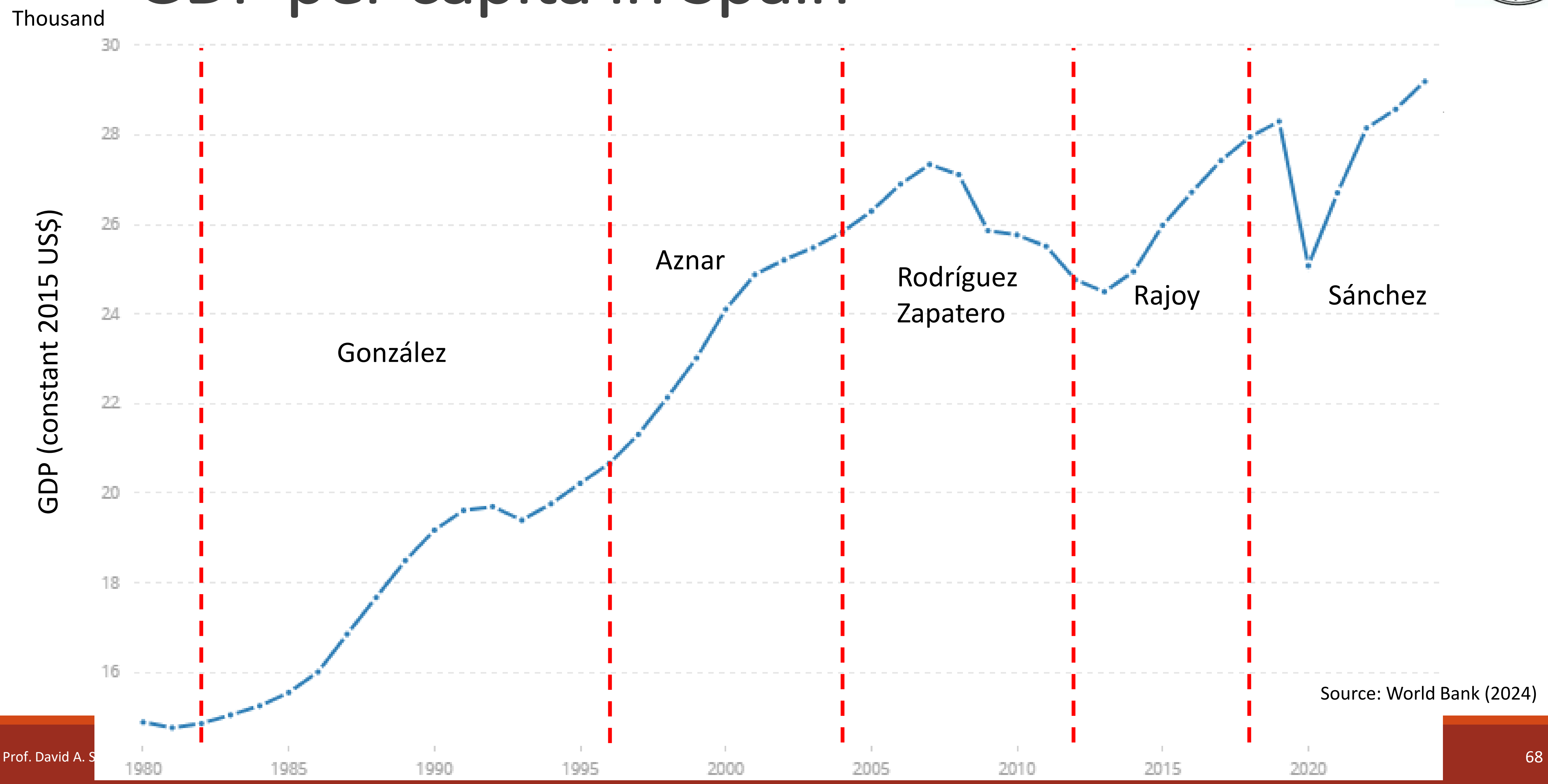
Source: Krugman and Wells (2022)

GDP per capita in Spain

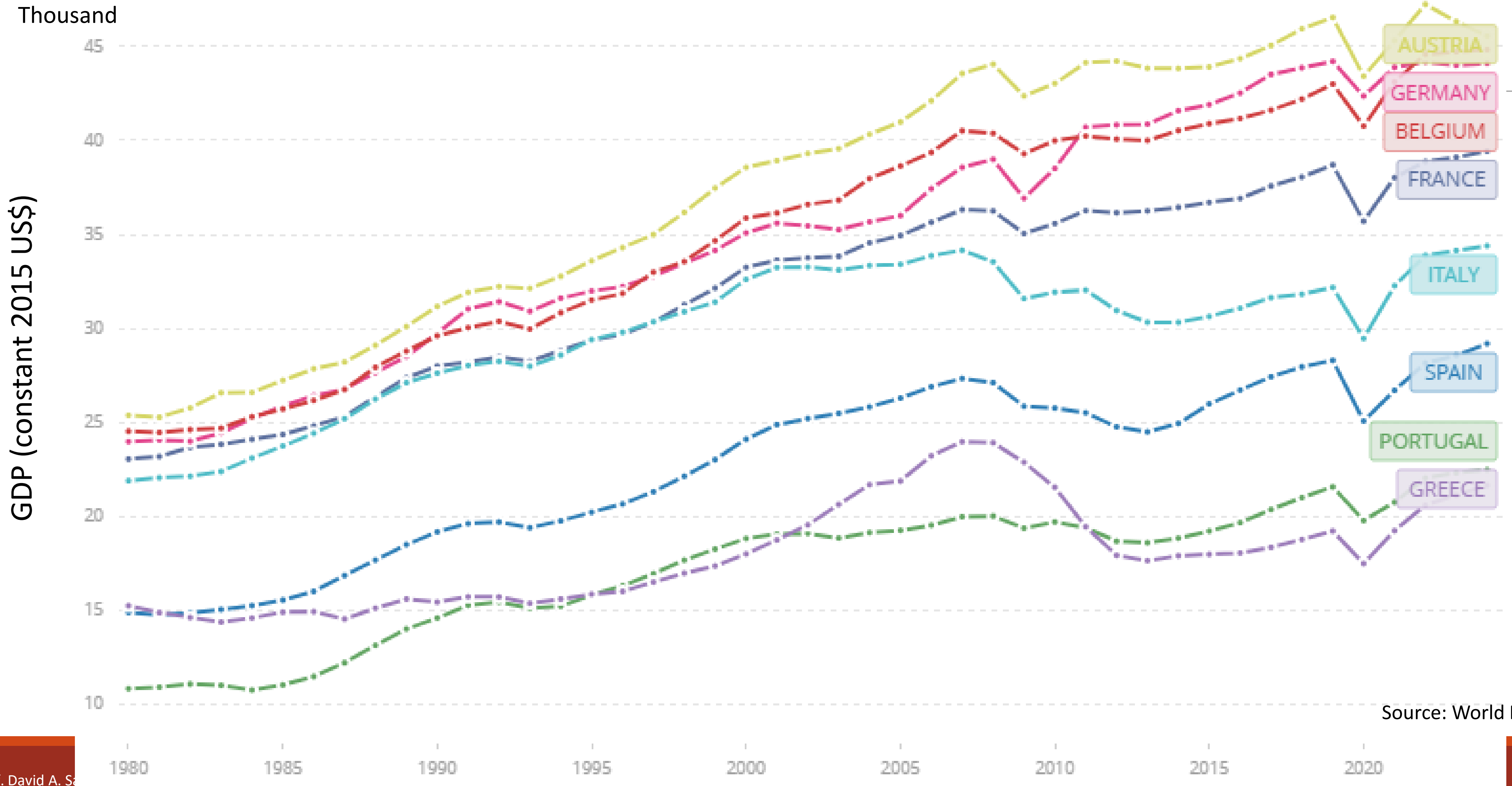


Source: World Bank (2024)

GDP per capita in Spain

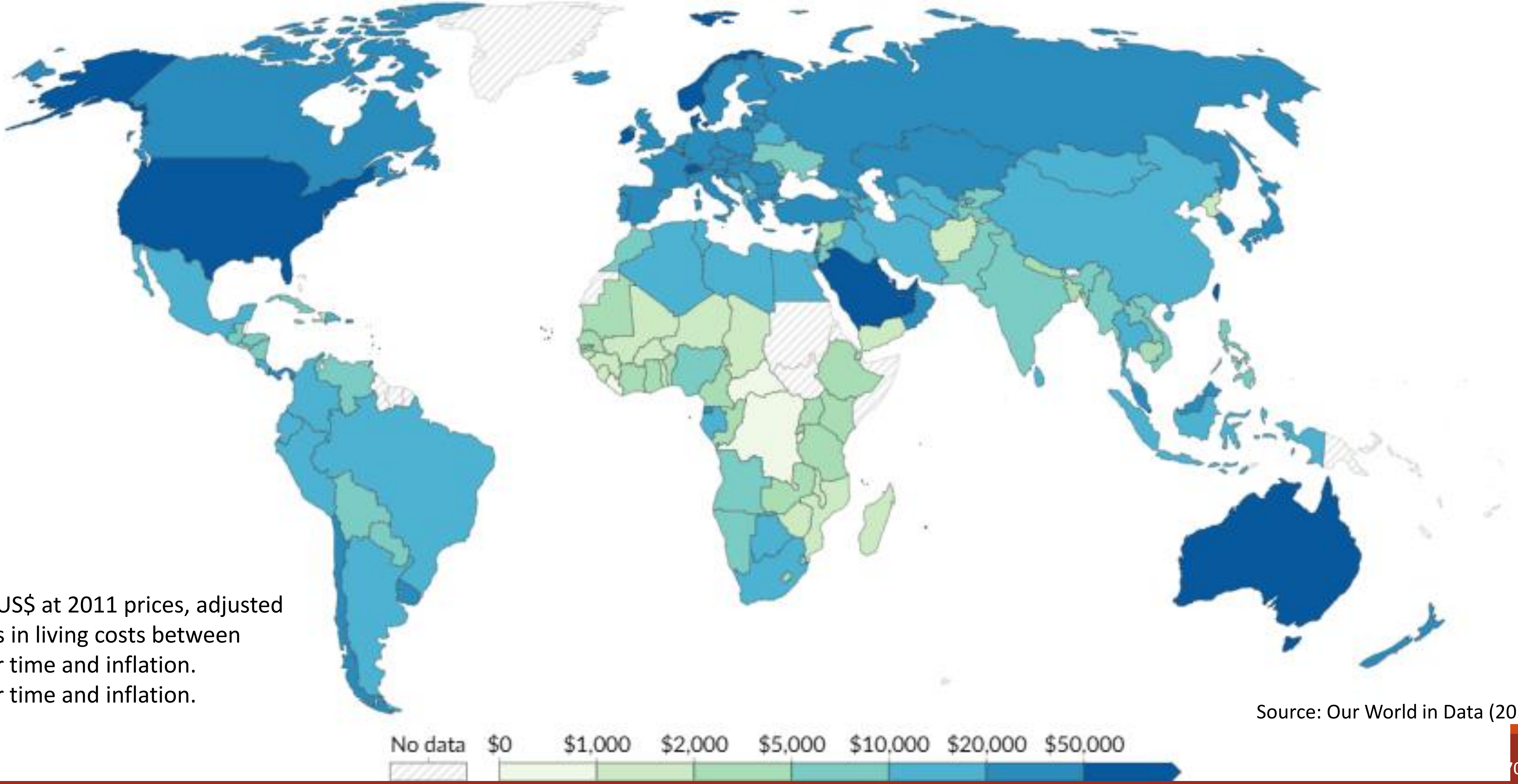


GDP per capita in Europe



Source: World Bank (2024)

GDP per capita in the world



International US$ at 2011 prices, adjusted for differences in living costs between countries over time and inflation.
countries over time and inflation.

Source: Our World in Data (2022)

GDP and GNP per capita

The Richest Countries IN 2025

Europe · N. America · Asia · Oceania

Rank	GDP Per capita, 2025		GNI Per capita, 2024		Median Wealth Per adult, 2024	
1	Luxembourg	$140,941	Bermuda	$140,280	Luxembourg	$395,340
2	Ireland	$108,919	Norway	$98,280	Australia	$268,424
3	Switzerland	$104,896	Switzerland	$95,900	Belgium	$253,539
4	Singapore	$92,932	Luxembourg	$91,470	SAR Hong Kong	$222,015
5	Iceland	$90,284	U.S.	$83,660	Denmark	$216,098
6	Norway	$89,694	Iceland	$78,480	New Zealand	$207,707
7	U.S.	$89,105	Ireland	$77,920	Switzerland	$182,248
8	Macao	$76,314	Qatar	$76,720	UK	$176,370
9	Denmark	$74,969	Singapore	$74,750	Canada	$151,910
10	Qatar	$71,653	Denmark	$73,790	France	$146,017
11	Netherlands	$70,480	Netherlands	$62,840	Norway	$142,501
12	Australia	$64,547	Australia	$62,550	Netherlands	$131,896
13	San Marino	$59,603	Sweden	$58,820	Spain	$126,290
14	Austria	$58,192	SAR Hong Kong	$57,100	Italy	$124,473
15	Sweden	$58,100	Germany	$54,960	U.S.	$124,041
16	Belgium	$57,772	Belgium	$54,840	Malta	$120,875
17	Israel	$57,760	Austria	$54,160	Taiwan	$114,871
18	SAR Hong Kong	$56,031	Canada	$53,340	Singapore	$113,976
19	Germany	$55,911	Israel	$52,940	Ireland	$105,626
20	UK	$54,949	Finland	$51,710	South Korea	$104,067
21	Finland	$54,163	UAE	$49,500	Japan	$102,198
22	Canada	$53,558	Andorra	$48,870	Qatar	$102,178
23	UAE	$49,498	UK	$48,610	Finland	$94,794
24	France	$46,792	New Zealand	$46,280	Sweden	$89,430
25	New Zealand	$46,126	France	$45,180	Israel	$88,866

GDP per capita: the total economic activity within the country divided by the population in a single year. GNI per capita: income accrued to residents instead of what is produced within the country. Median wealth per adult: an average resident's total net worth. Figures rounded. All data in current USD for the year. Includes overseas territories and special administrative regions. ***Source:*** *International Monetary Fund, World Bank, UBS Wealth Report*

VISUAL CAPITALIST

Source: IMF (2025)

Price indexes and aggregate price level

- **Aggregate price level**: is a measure of the overall level of prices in the economy.
- To measure the aggregate price level, the cost of purchasing a **market basket** is calculated.
- **Market basket**: a hypothetical set of goods and services purchased by a consumer.

Price indexes and aggregate price level

- **Price index**: measures the cost of purchasing a given market basket in a given year, where that cost is **normalized** so that it is equal to 100 in the selected base year.

- It is the **ratio** of the **current cost** of a market basket to the **cost in the base year** multiplied by 100:

$$\text{Price index in a given year} = \frac{(\text{Cost of market basket in a given year})}{(\text{Cost of market basket in base year})} \times 100$$

Price indexes and aggregate price level

	Year 1	Year 2
Price of oranges	0.20	0.40
Quantity of oranges	200	200
Price of apples	0.60	1.00
Quantity of apples	50	50
Price of lemons	0.25	0.45
Quantity of lemons	100	100
Cost of market basket	(200 x 0.20) + (50 x 0.60) + (100 x 0.25) = **95.00**	(200 x 0.40) + (50 x 1.00) + (100 x 0.45) = **175.00**

Price indexes and aggregate price level

- If year 1 is the base year:

$$\text{Price index in year 2} = \frac{175.00}{95.00} \times 100 = 1.842$$

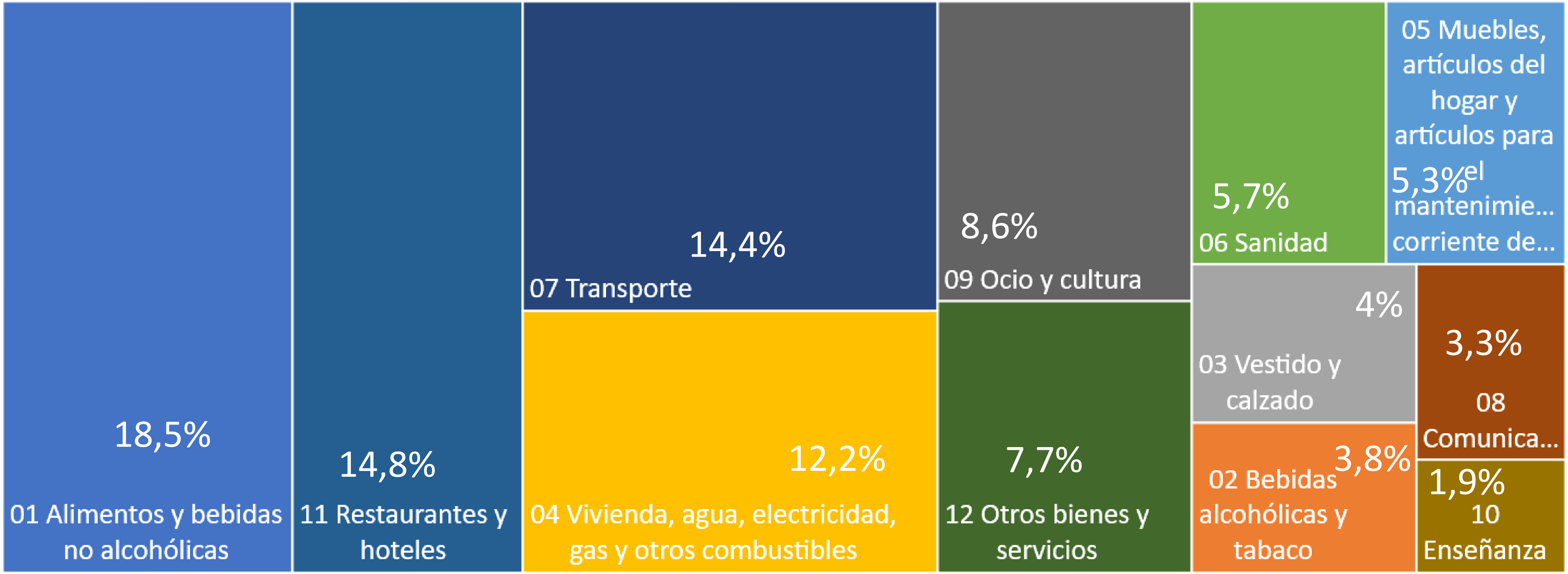
- Prices have risen 84.2%.

Price indexes and aggregate price level

- **Consumer Price Index** (**CPI**): measures the cost of the market basket of a typical family.
    - In Spain: Base 2021.

Consumer Price Index (CPI)

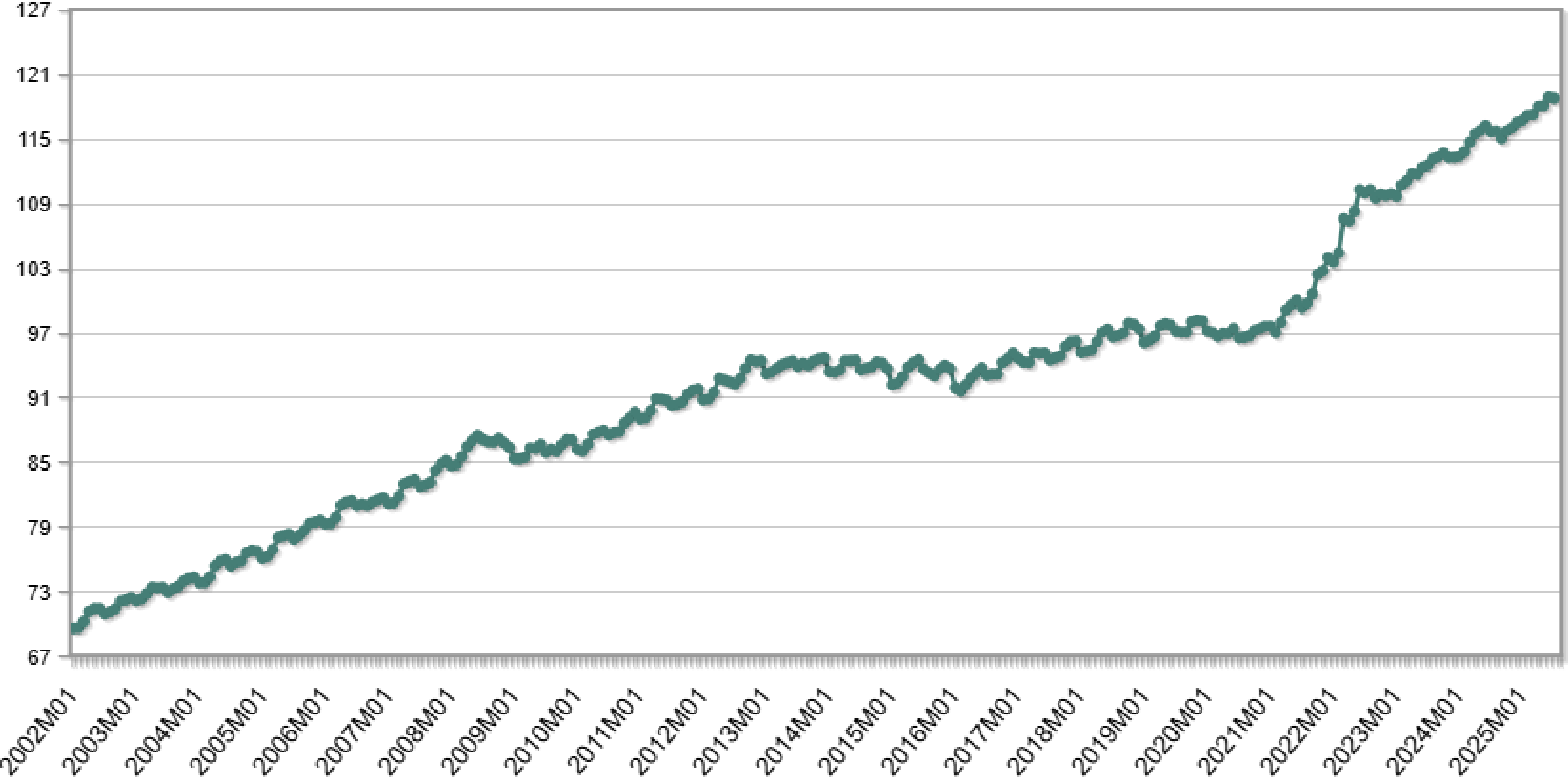
CPI weights as of July 2025



Source: INE (2025)

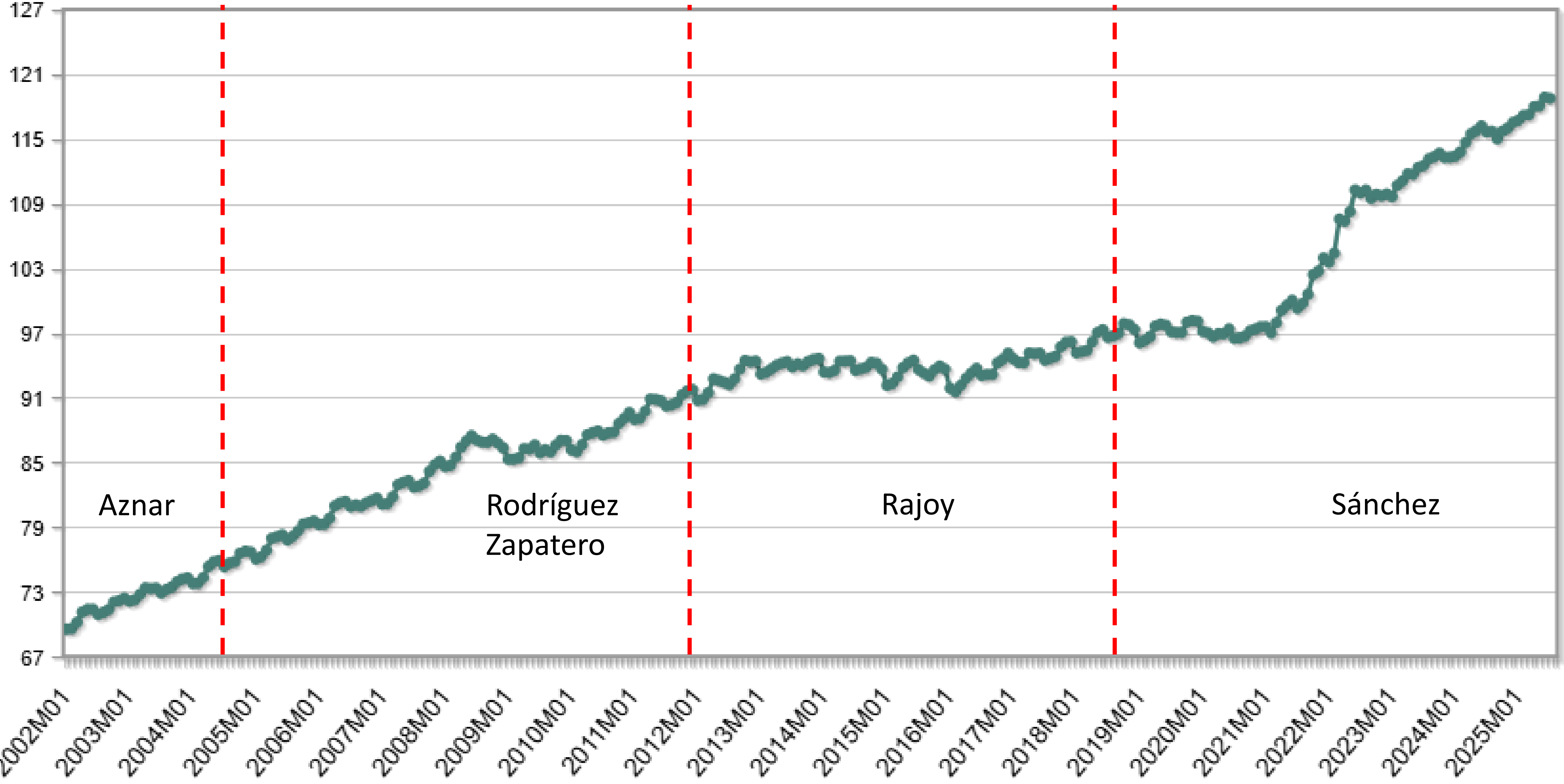
Consumer Price Index (CPI)

Source: INE (2025)



Consumer Price Index (CPI)

Source: INE (2025)



Price indexes and aggregate price level

- **Producer price index** (**PPI**): measures changes in the prices of goods and services purchased by producers.

- **GDP deflator** for a given year is 100 times the ratio of nominal GDP to real GDP in that year.

- The GDP deflator is also used to measure the aggregate price level. The price index is often used as a GDP deflator.

Inflation and CPI

- **Inflation rate**: percent change in a price index, tipically the consumer price index.

$$\text{Inflation rate} = \frac{\text{CPI in t2} - \text{CPI in t1}}{\text{CPI in t1}} \times 100$$

Inflation and CPI

Year - month	CPI
2025M07	118.777
2025M06	118.867
2025M05	118.077
2025M04	117.997
2025M03	117.260
2025M02	117.191
2025M01	116.733
2024M12	116.534
2024M11	116.010
2024M10	115.726
2024M09	115.009
2024M08	115.707
2024M07	115.660

Source: INE (2025)

Inflation and CPI

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Source: INE (2025)

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2024M08	115.707
2024M07	**115.660**

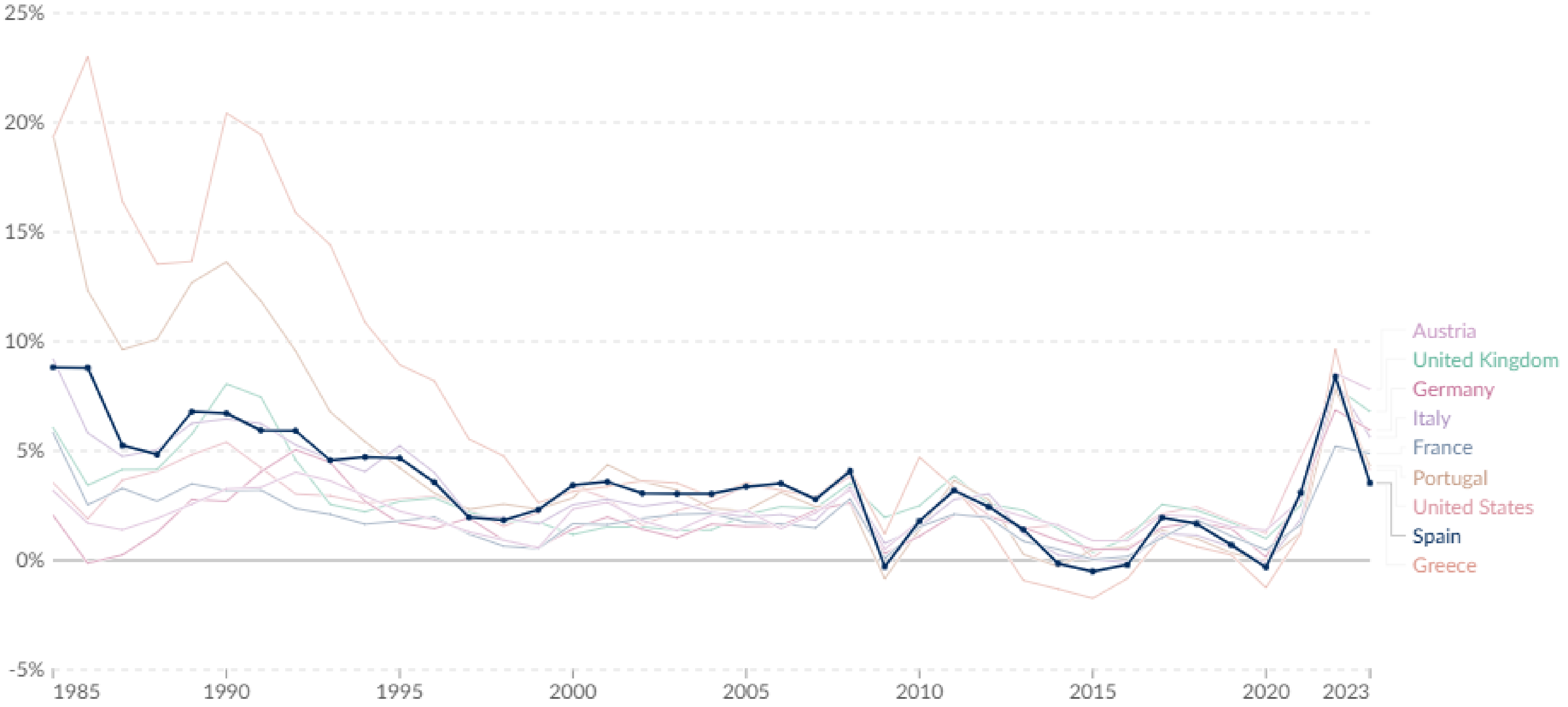
$$\text{Inflation} = \frac{\text{CPI in t2} - \text{CPI in t1}}{\text{CPI in t1}} \times 100$$

$$\text{Inflation} = \frac{118.777 - 115.660}{115.660} \times 100$$

$$\text{Inflation} = 2.7\%$$

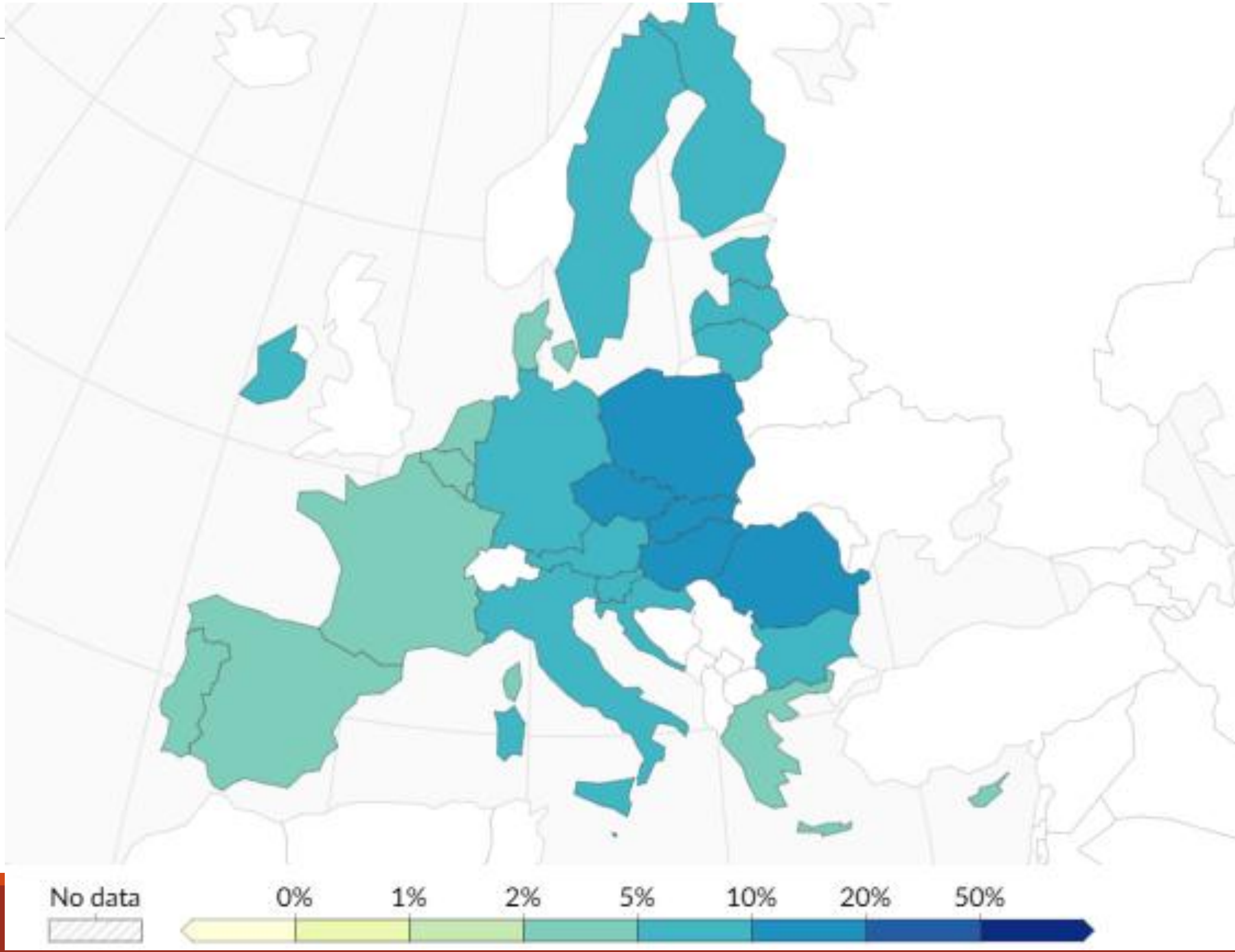
Source: INE (2025)

Inflation rate in the world



Source: Our World in Data (2023)

Inflation rate in the European Union



Source: Our World in Data (2023)

Outline

1. An overview.

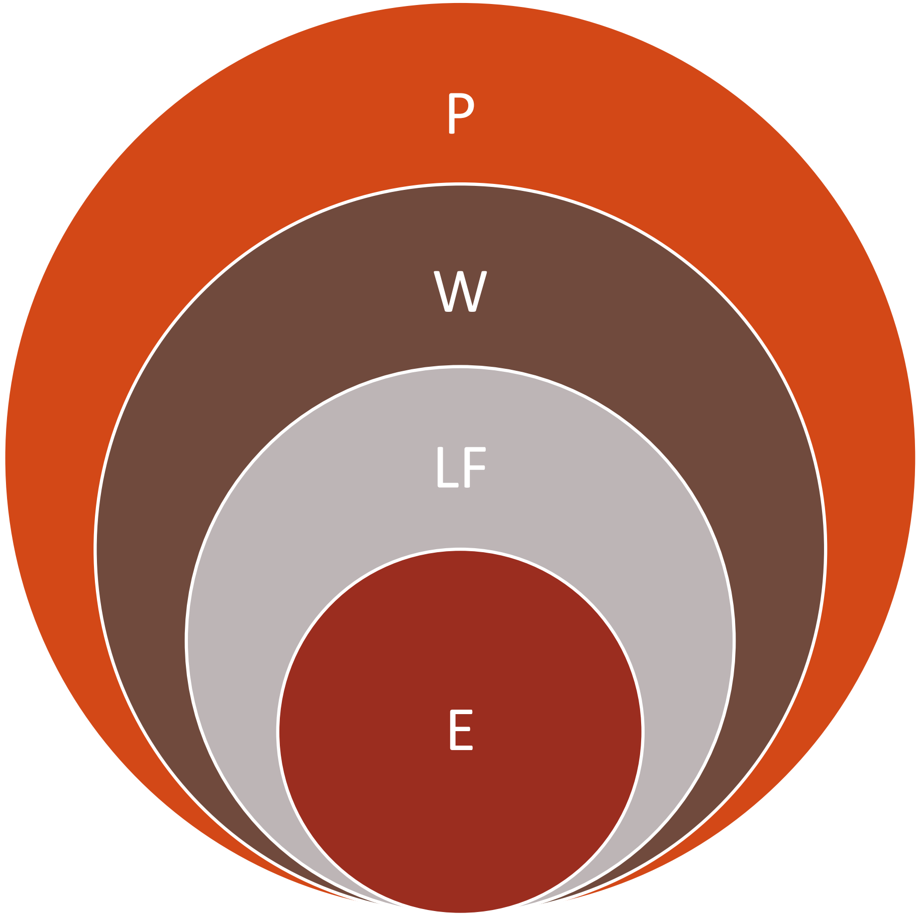
2. Gross Domestic Product (GDP).
   - Real GDP and nominal GDP: consumer price index and inflation.

3. Labor market.

Unemployment rate

- **Employment** is the number of people currently employed in the economy, either full-time or part-time.
- **Unemployment** is the number of people who are actively seeking work but are not currently employed.
- **Labor force (LF)** is equal to the sum of employment and unemployment.
- **Labor force participation rate** (**LFPR**): percentage of the population aged 15 (16) or older that is in the LF.

The "different" populations



- P = Total population
- W = Working-age population (15 years and over)
- LF = Labor force
- E = Employed

Source: ILOSTAT (2025)

Unemployment rate

- LFPR:

$$\mathrm{LFPR} = \frac{\mathrm{LF}}{\mathrm{W}} \times 100$$

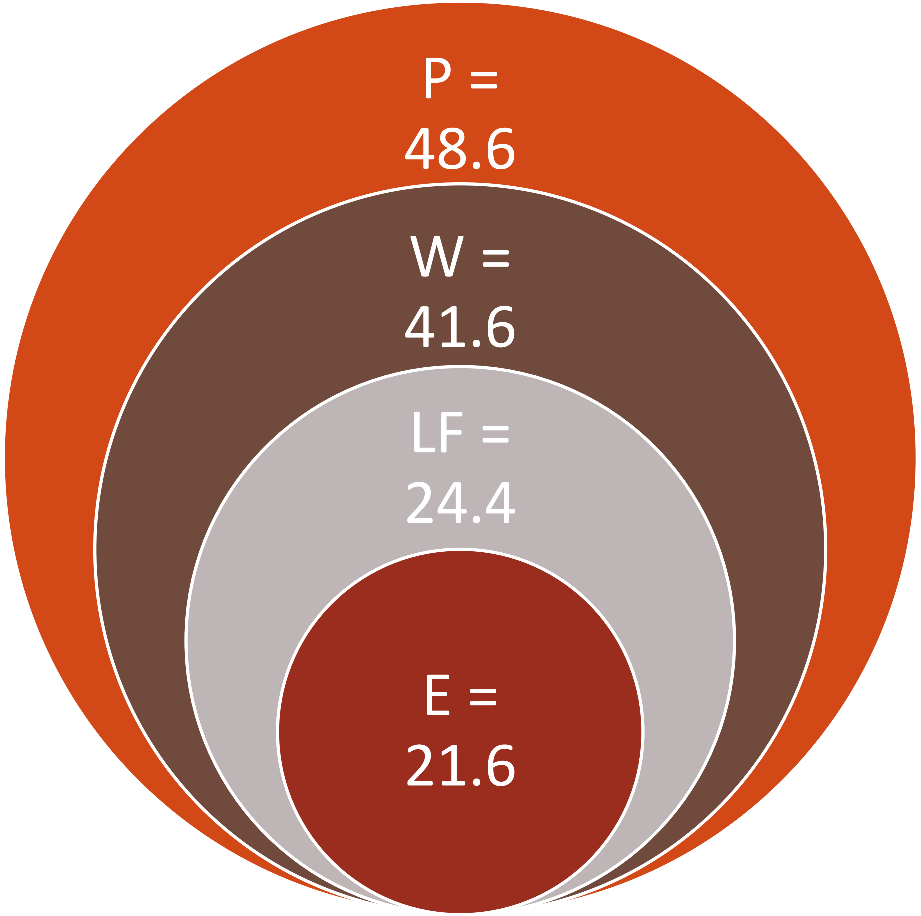
- **Unemployment rate**: percentage of the total number of people in the LF who are unemployed.

$$\text{Unemployment rate} = \frac{\text{Unemployed workers}}{\mathrm{LF}} \times 100$$

The "different" populations: Spain

W in Spain: 16 years and older

Data: 2024 (million people)

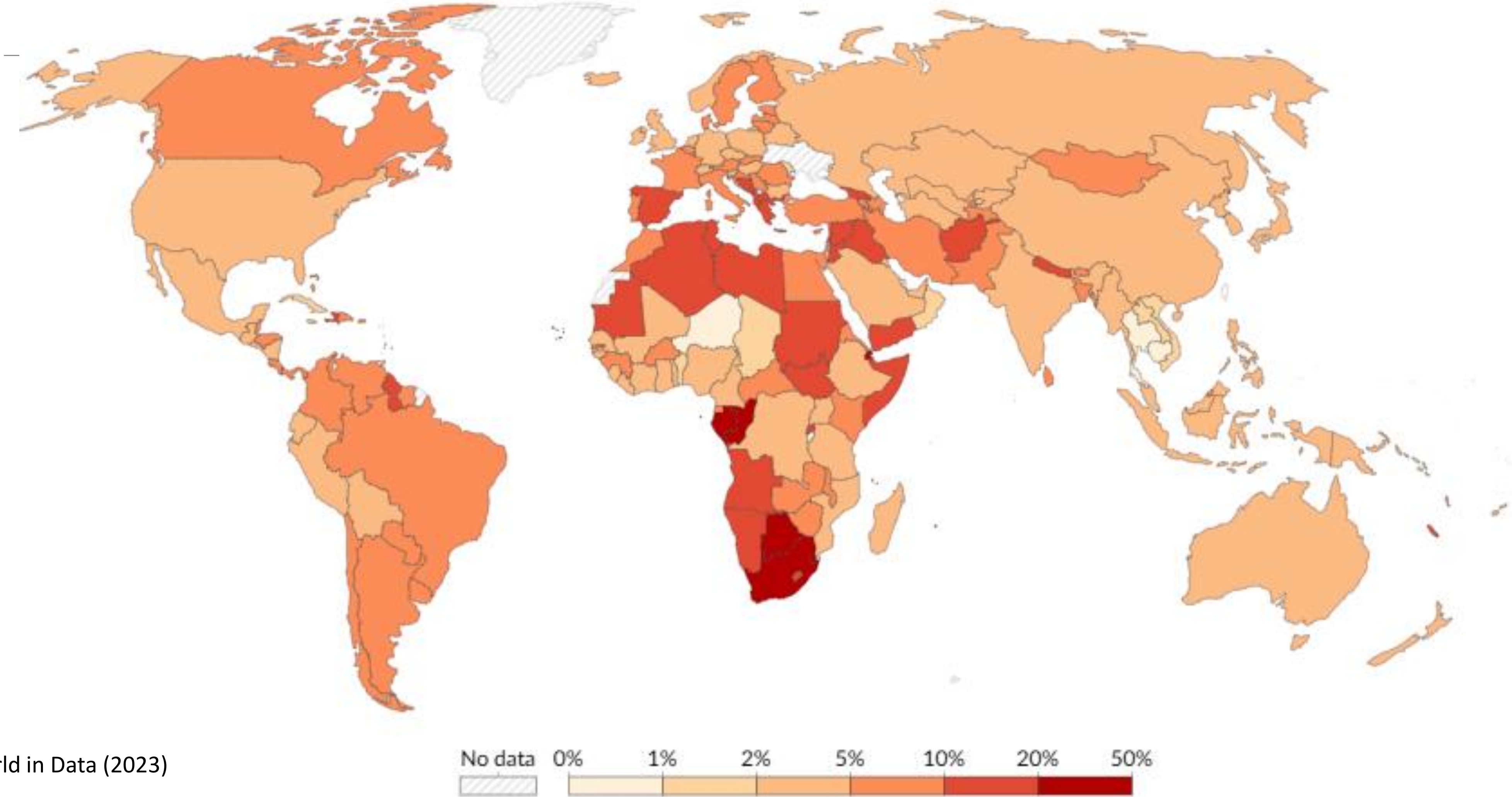


LFPR = 58.7%

Unemployment rate = 11.3%

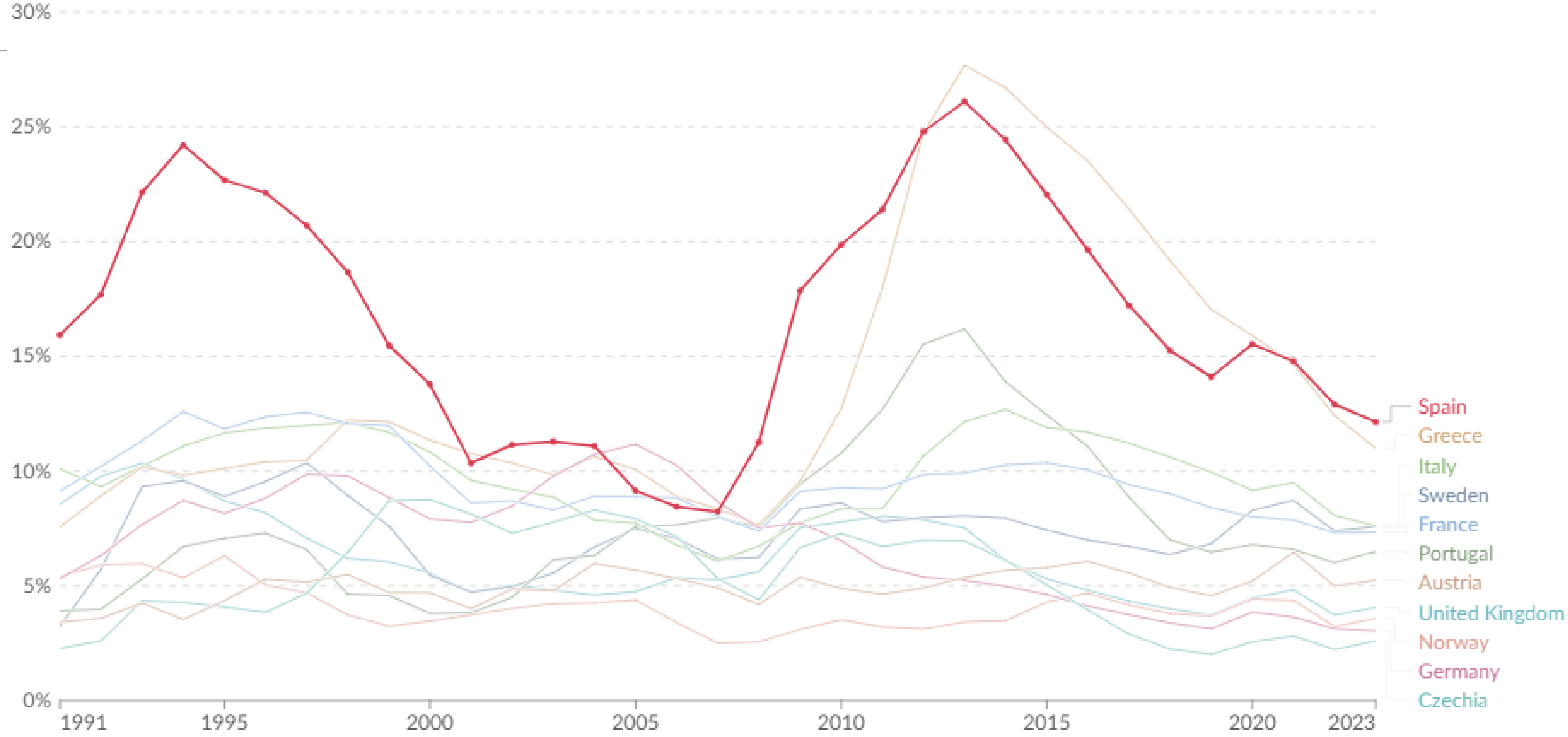
Source: INE (2024)

Unemployment rate in the world



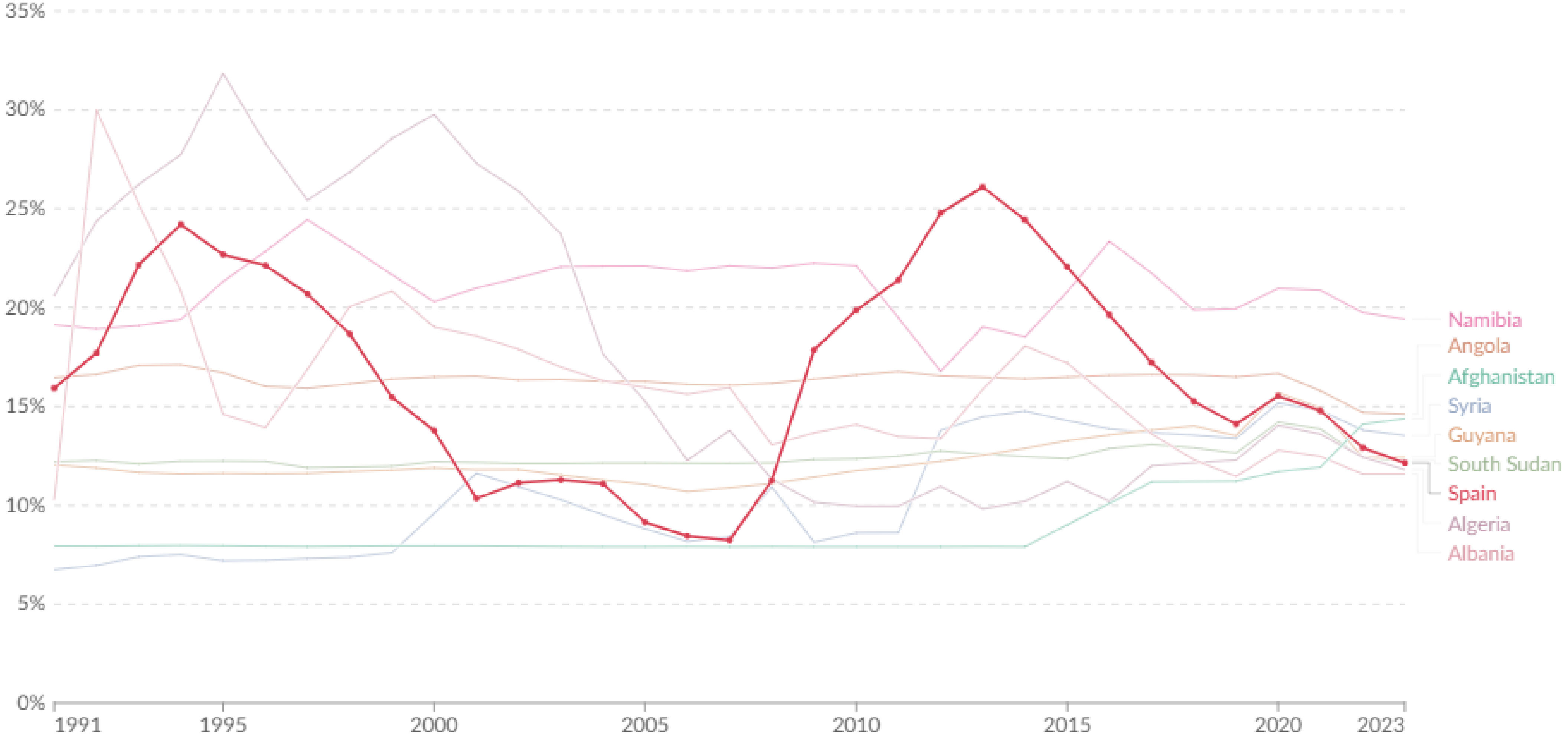
Source: Our World in Data (2023)

Unemployment rate in Europe



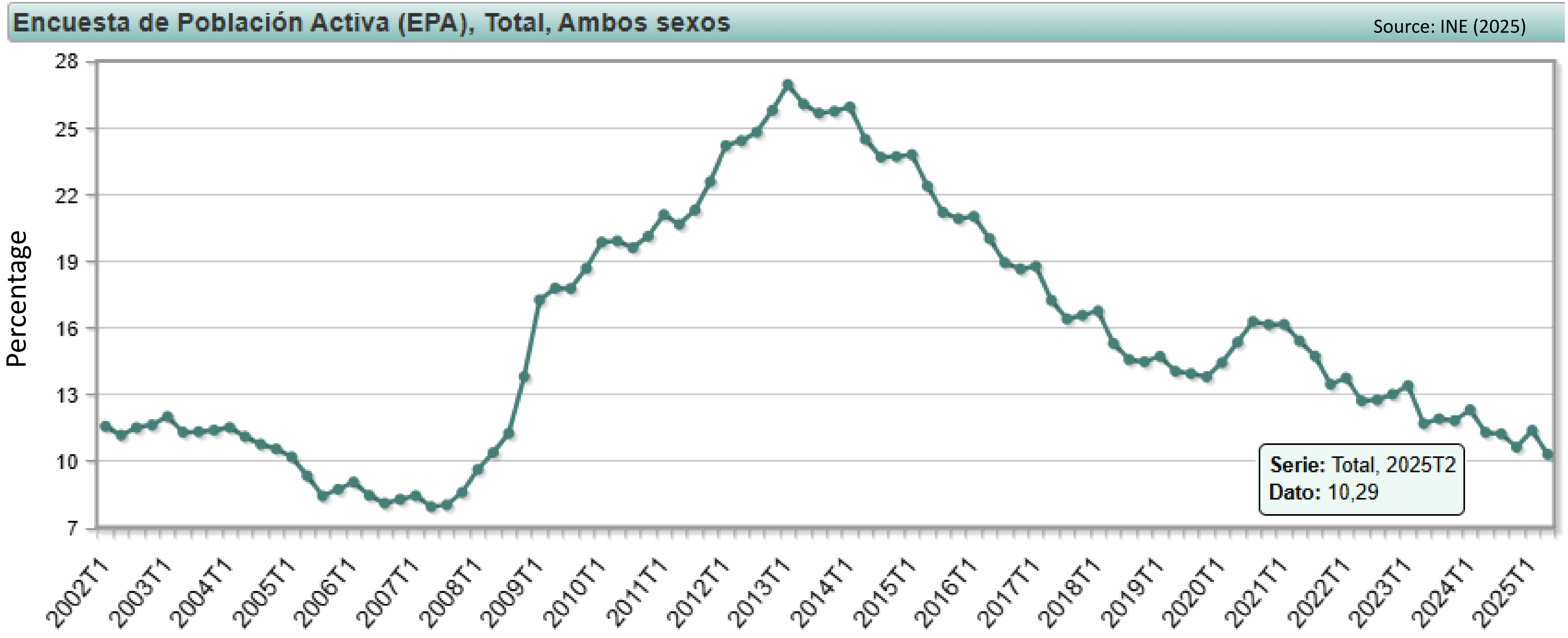
Source: Our World in Data (2023)

Unemployment rate in Spain in context

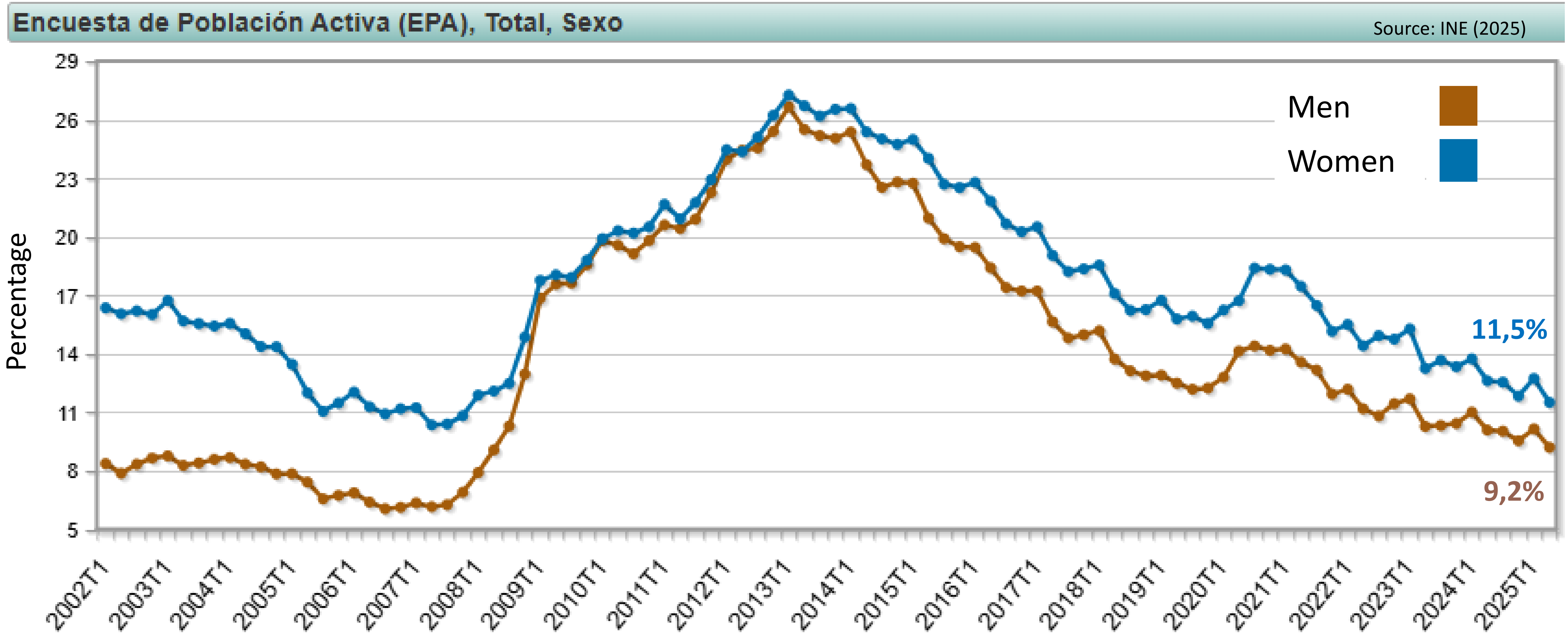


Source: Our World in Data (2023)

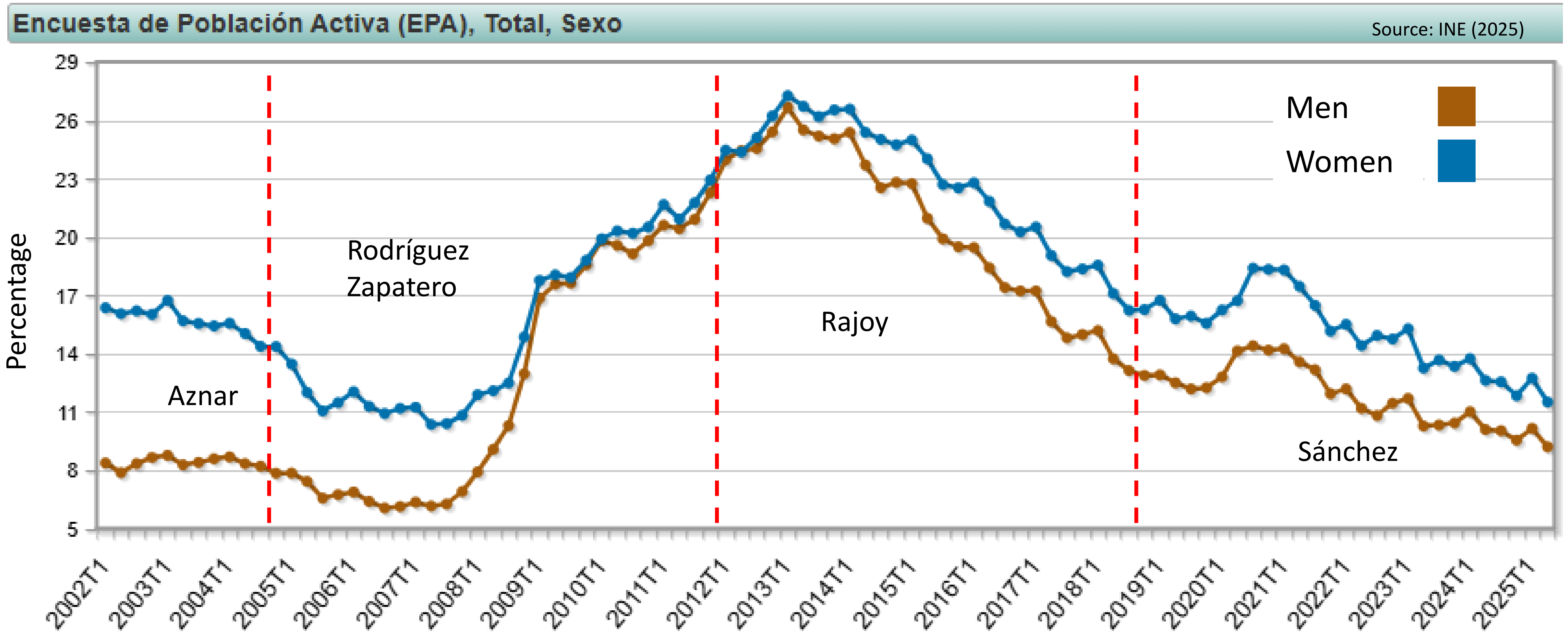
Unemployment rate in Spain



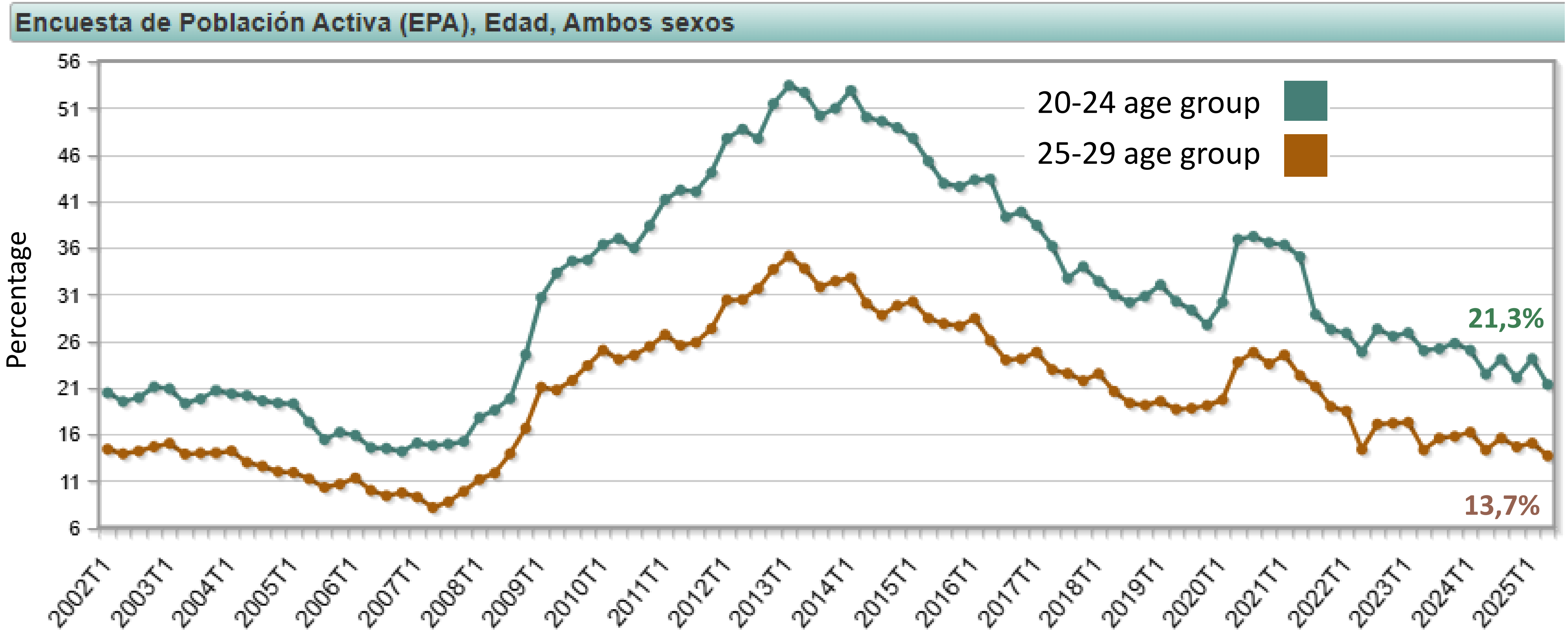
Unemployment rate in Spain



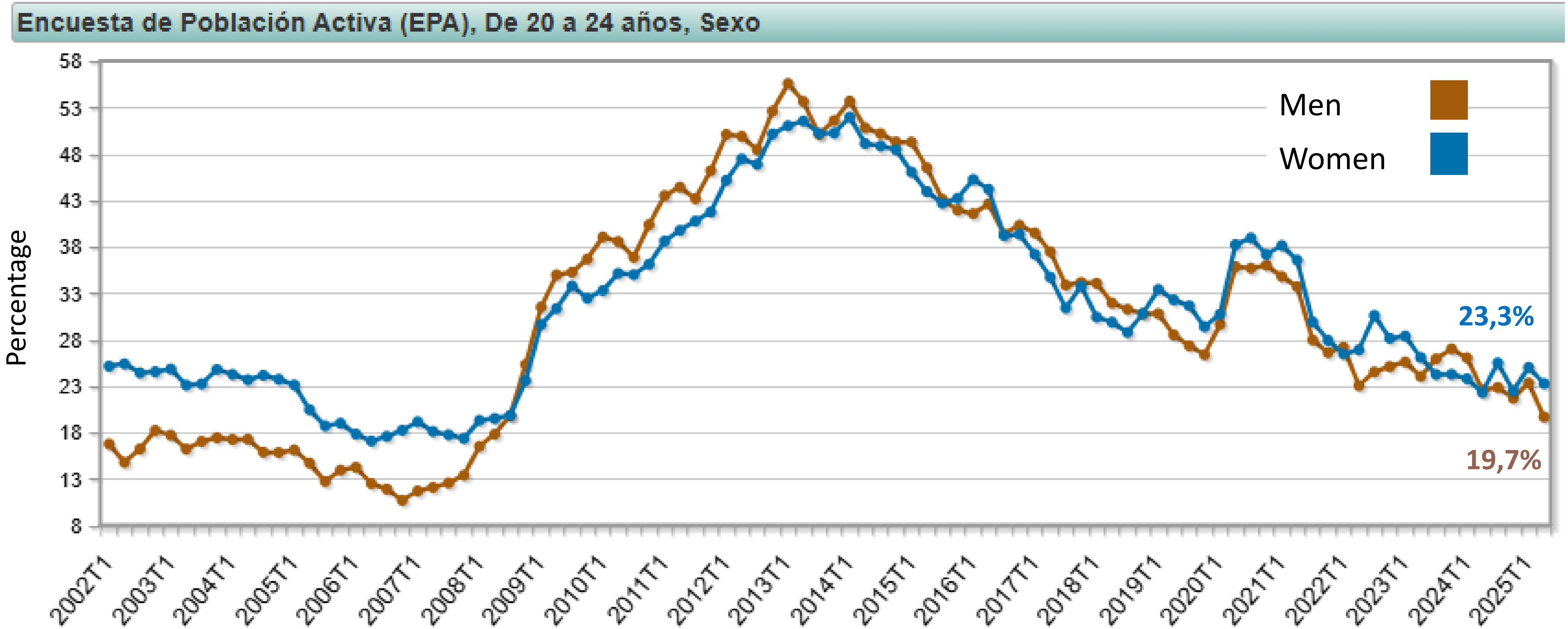
Unemployment rate in Spain



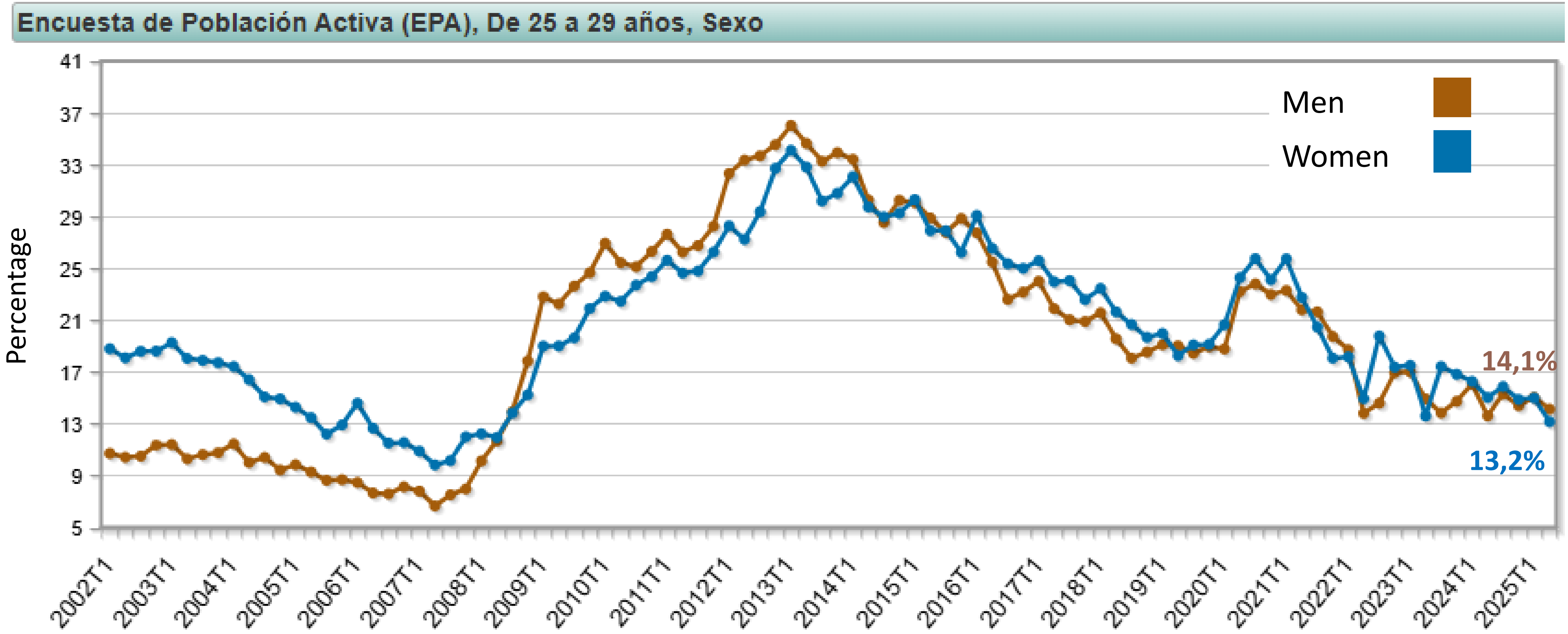
Youth unemployment rate in Spain



Youth unemployment rate in Spain



Youth unemployment rate in Spain



Unemployment rate

- The unemployment rate is a **good indicator** of how easy or difficult it is to find a job given the **current state of the economy**.

- The unemployment rate can **overstate** the true value of unemployment:

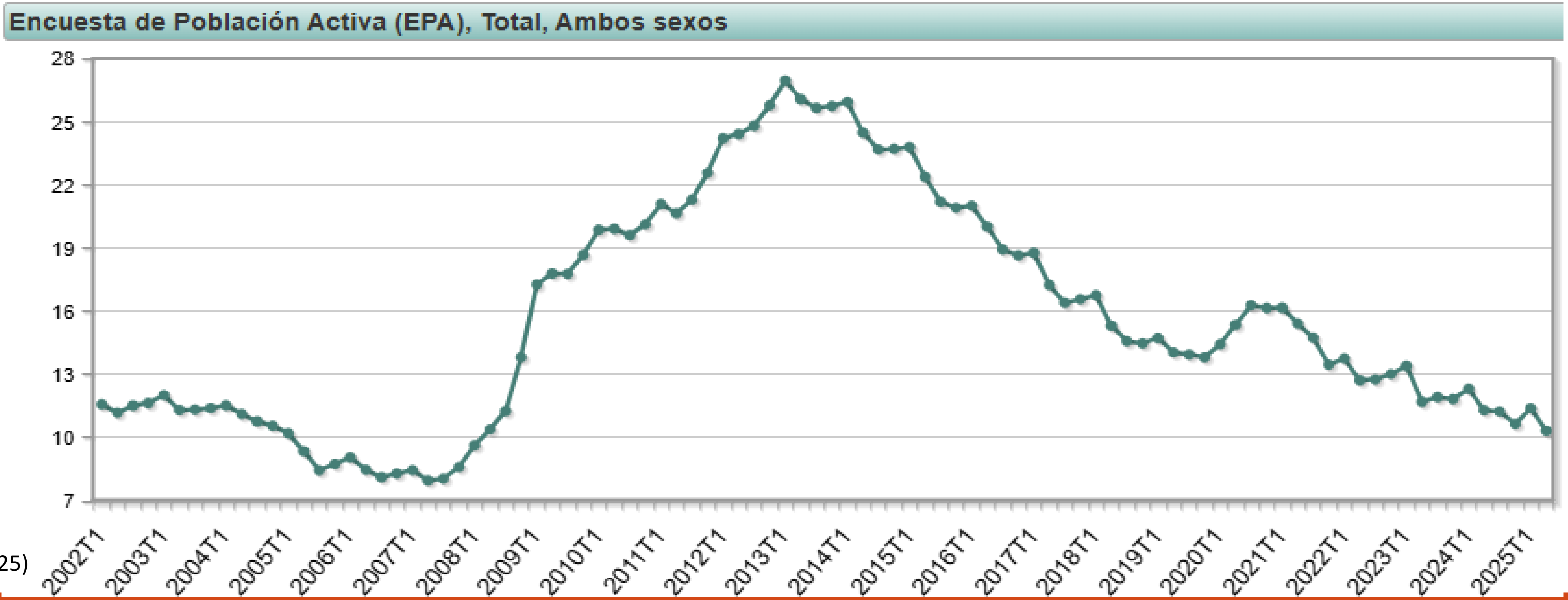
  - Even if the labor market is healthy, it takes time to find the right job. (In the meantime, you are "unemployed").

The unemployment rate

- The unemployment rate may **understate** the true value of unemployment:
  - **Discouraged workers**: non-working people who are capable of working, but have given up looking for a job given the state of the job market.
  - **Marginally attached workers**: would like to be employed and have looked for a job in the recent past, but are not currently looking for work (e.g., have looked for work in the last 12 months, but NOT in the last 4 weeks).
  - **Underemployed workers**: people who are working part-time because they cannot find full-time jobs.

Economic growth and unemployment

- **Unemployment** usually **increases** in recession and **decreases** in expansion.



Source: INE (2025)

Economic growth and unemployment

- **Unemployment** usually **increases** in recession and **decreases** in expansion.

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Economic growth and unemployment

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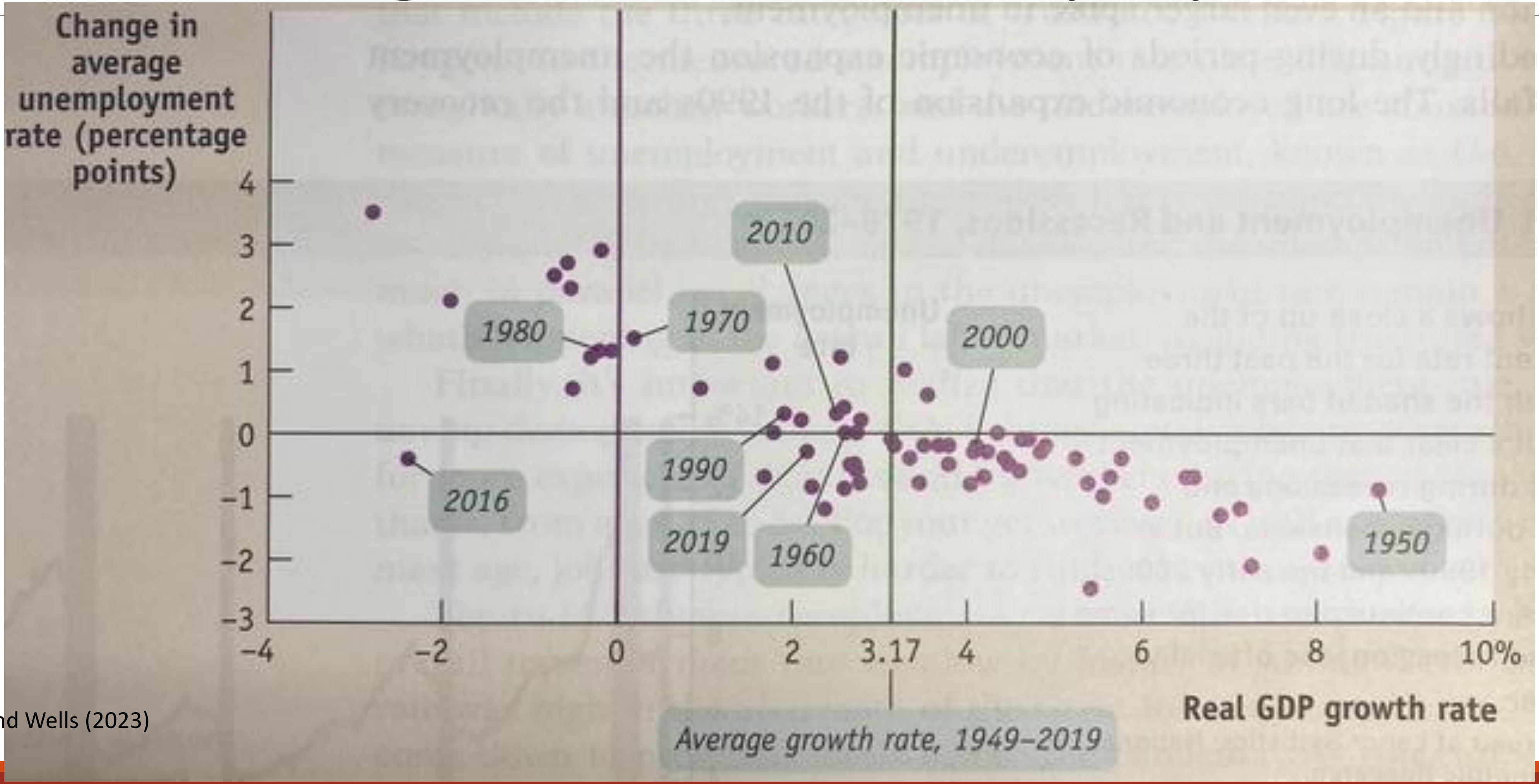
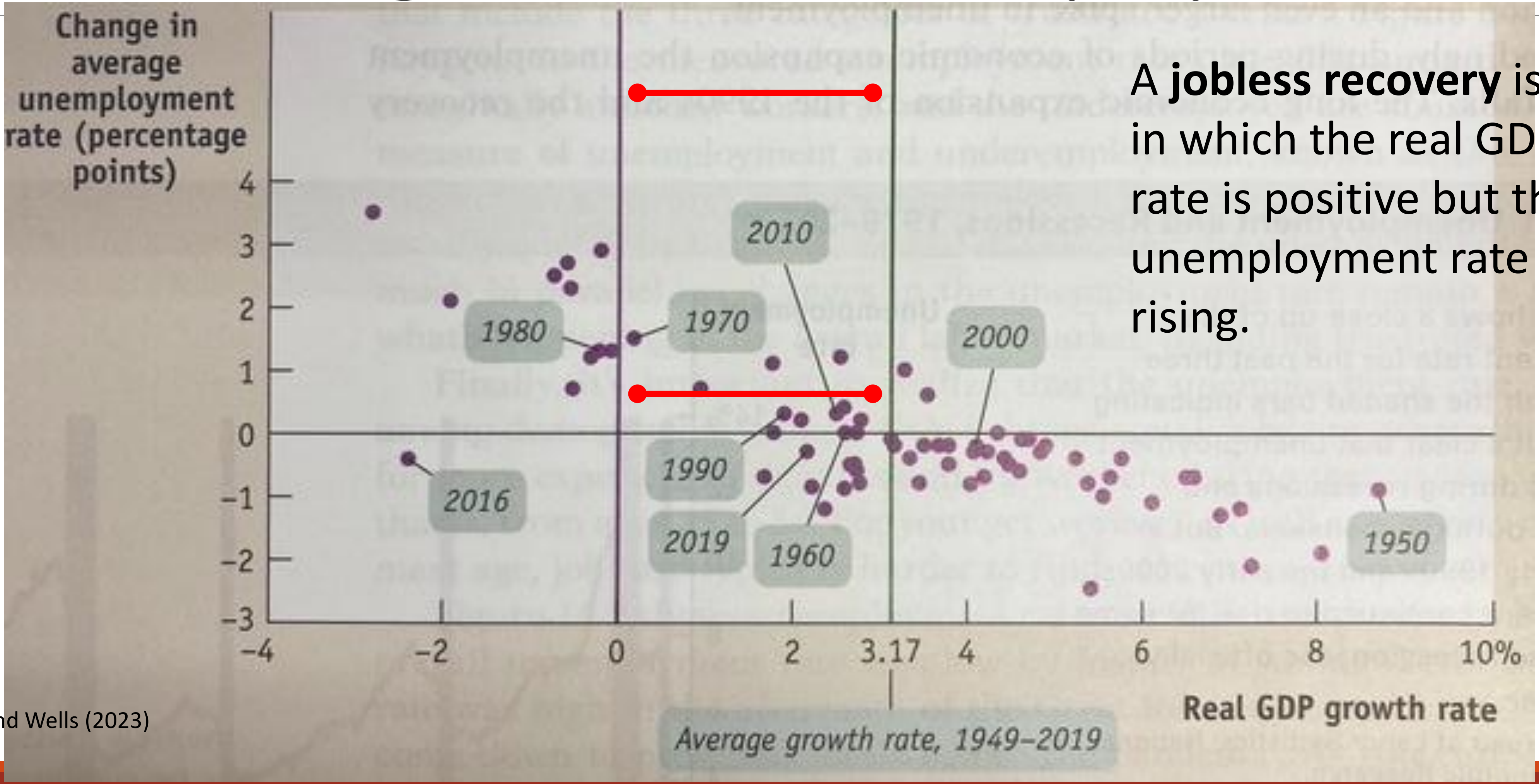
Economic growth and unemployment



Source: Krugman and Wells (2023)

Economic growth and unemployment



A **jobless recovery** is a period in which the real GDP growth rate is positive but the unemployment rate is still rising.

Source: Krugman and Wells (2023)

Natural rate of unemployment

- Even in an economic boom, unemployment is observed.

- **Natural rate of unemployment**: unemployment rate that arises from the effects of frictional plus structural unemployment.

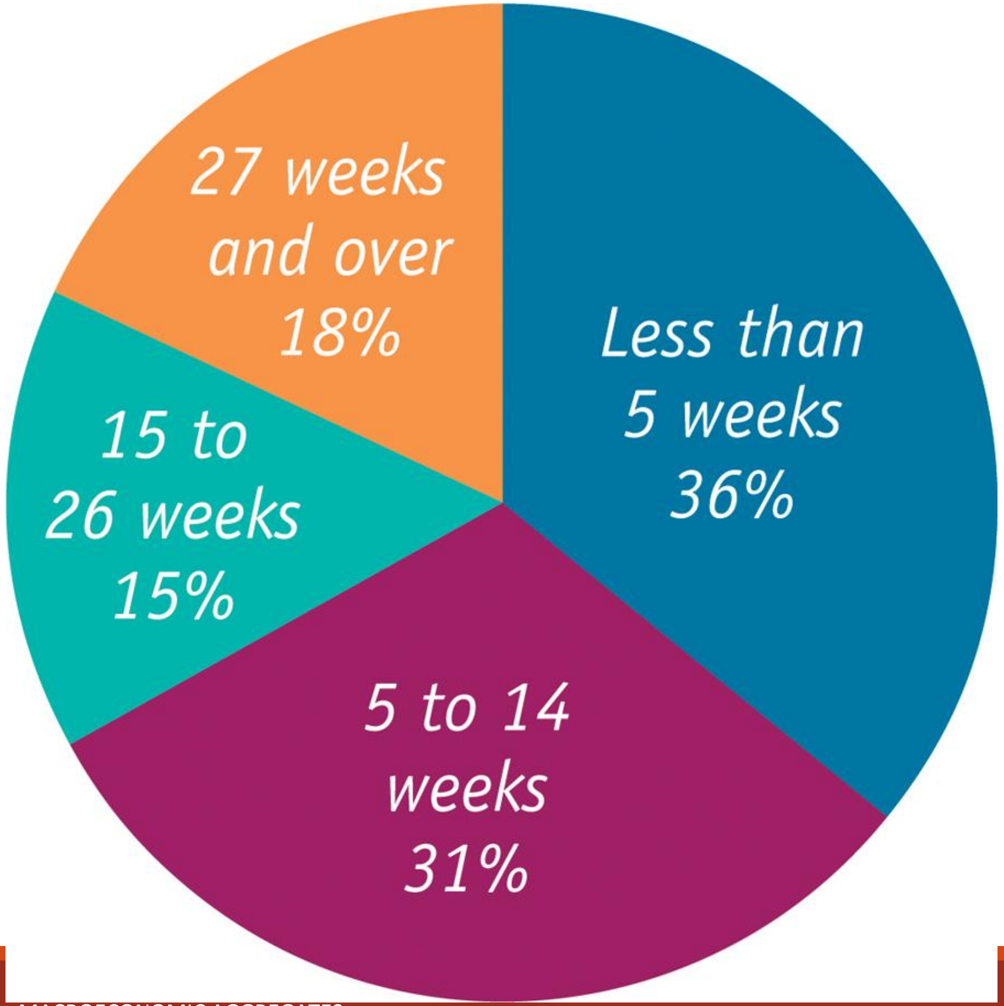
1. **Frictional unemployment** is unemployment due to the time workers spend looking for a job (job search).

    - Information scarcity.

    - Matching jobs to people takes time.

Natural rate of unemployment

In times of low unemployment, short-term unemployment suggests that unemployment is frictional.



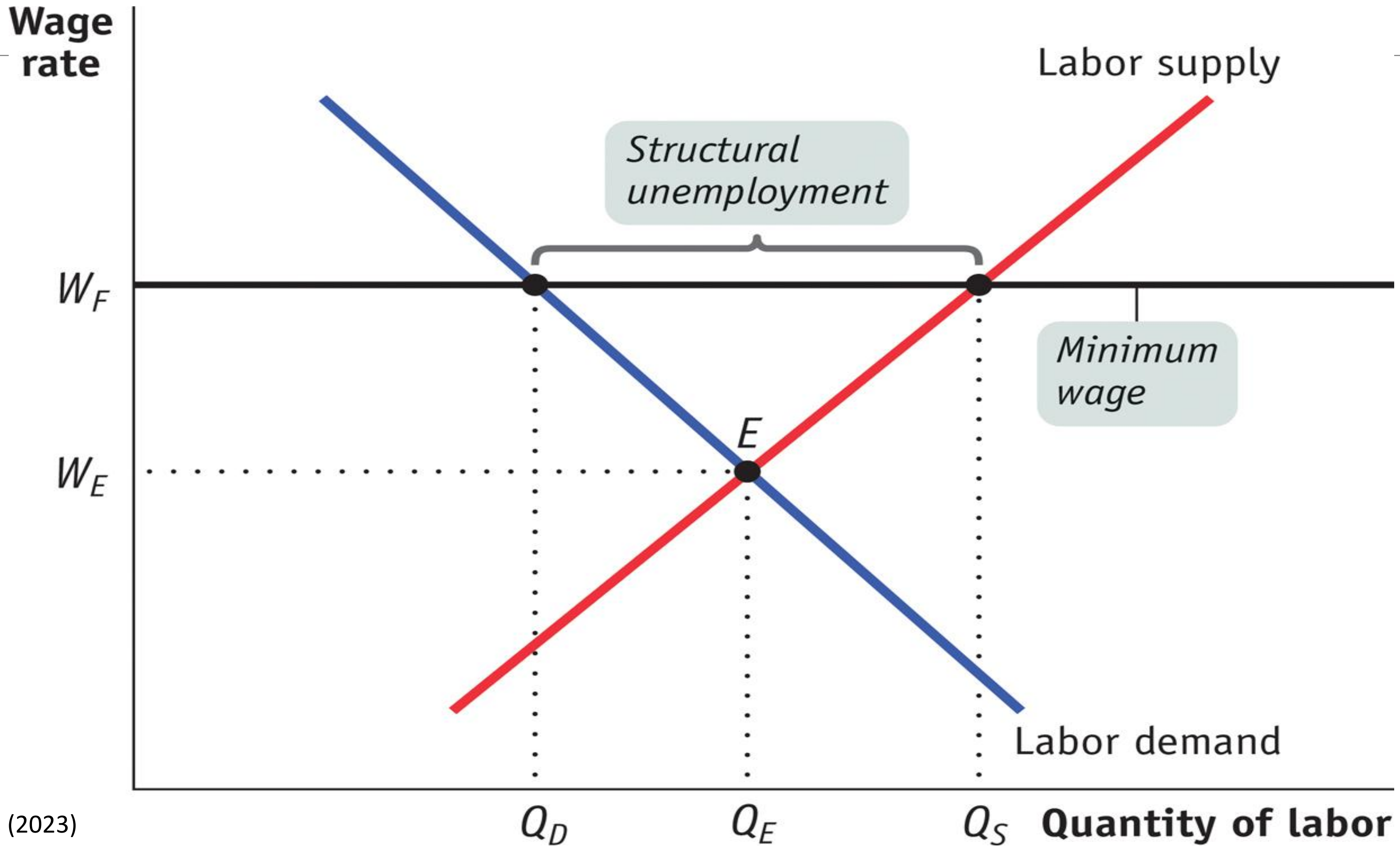
Source: Krugman and Wells (2023).

Natural rate of unemployment

2. **Structural unemployment**: more people are seeking jobs in a particular labor market than there are jobs available at the current wage rate (even at peaks in the business cycle).

- **Minimum wages**: wages defined by law above market equilibrium.
- **Unions**: employers are adverse to union bargaining power.
- **Efficiency wages**: wages above equilibrium that serve as an incentive to achieve higher performance.
- **Side effects of government policies**: unintended effects of unemployment benefits.
- **Employee-employer mismatches**: due to changes in the economy: qualification.

Minimum wage



Source: Krugman and Wells (2023)

Natural rate of unemployment

- There is a relationship between natural unemployment and observed unemployment:

  Natural Unemployment =

  Frictional Unemployment + Structural Unemployment

  Actual unemployment =

  Natural unemployment + Cyclical unemployment

- **Cyclical unemployment**: unemployment caused by downturns in the business cycle.

Natural rate of unemployment

- We need estimates of the natural rate of unemployment for both forecasting and policy analysis.

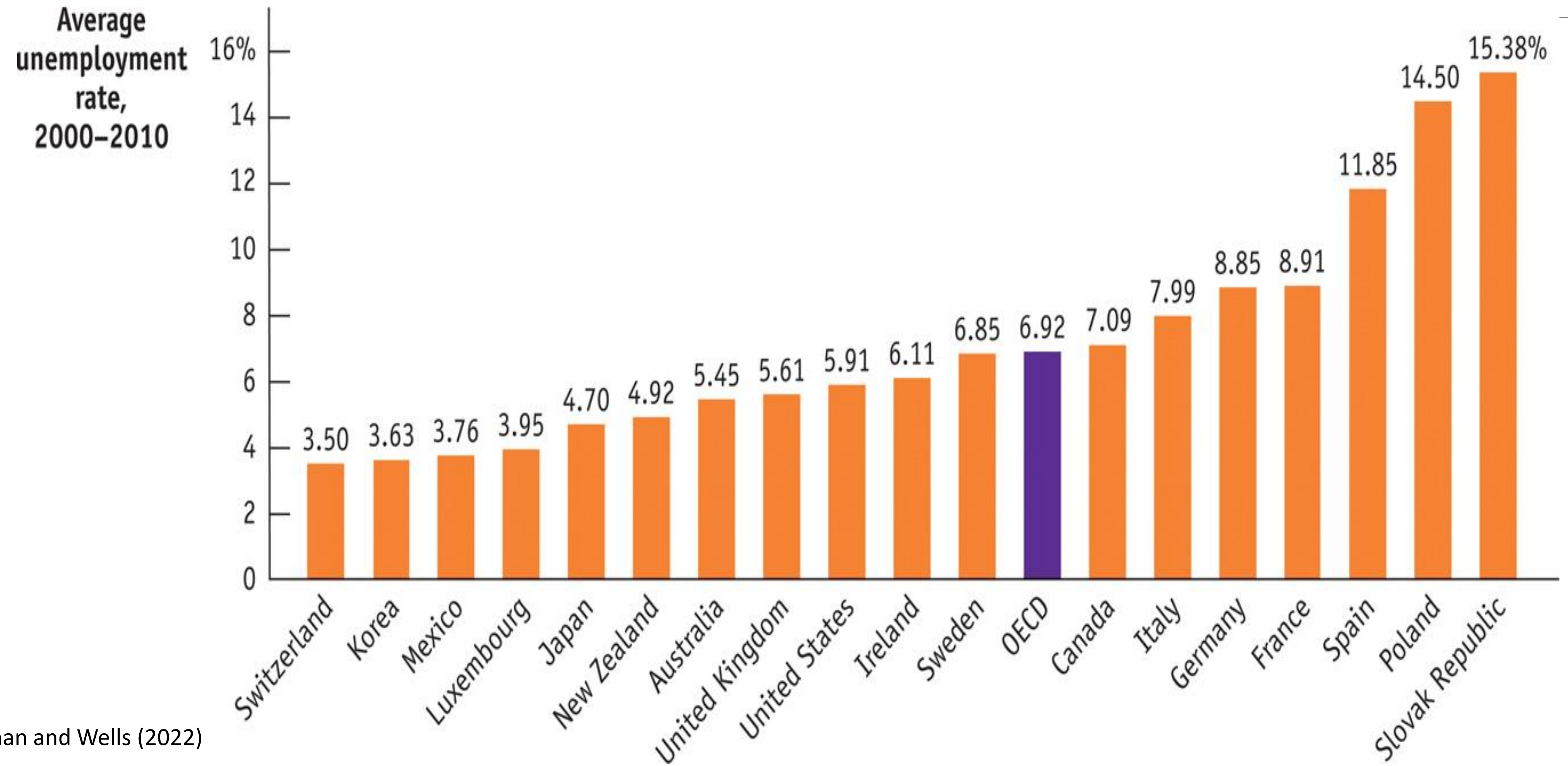
- What causes it to change?

  - Changes in the characteristics of the labor force: Demographic changes.

  - Changes in labor market institutions: Unions, temporary employment agencies, and new technologies.

  - Changes in government policies: Job training programs.

Natural rate of unemployment



Source: Krugman and Wells (2022)

Labor market and inflation

- **Real wage** is the wage rate divided by the price level.
- Real income is income divided by the price level.

Source: Krugman and Wells (2022)

Labor market and inflation

- The **interest rate** on a loan is the price, calculated as a percentage of the amount borrowed, that a lender charges a borrower for the use of his savings for one year.

  - The **nominal interest rate** is the interest rate expressed in monetary terms.

  - The **real interest rate** is the nominal interest rate **minus** the inflation rate.

Mandatory readings

- Krugman, P. and Wells, R. (2023). *Essentials of Economics*. MacMillan Learning. 6th edition.
  - Chapter 12: Macroeconomics: The big picture.
  - Chapter 13: GDP and the CPI: Tracking the macroeconomy.
  - Chapter 14: Unemployment and inflation.

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End of Topic 5

Macroeconomic Aggregates

Prof. David A. Sánchez-Páez