

Macroeconomics

- Macroeconomics is the area of economics that studies the overall economic activity in a country or region by means of indicators of that activity.
- There is no essential divide between micro and macroeconomics, since the relationships between the aggregate indicators are the result of the decisions made by individuals.
- Modern macroeconomics is macroeconomics with microfoundations: theories of aggregate economic activity rely on individual behaviour.

Typical macro questions (I)

- Why is the average Spaniard in 2010 more than ten times richer than the average Spaniard in 1910?
- Why is the average 2010 Spaniard more than a 50% poorer than the average 2010 American?
- Why the Spanish proportion of unemployed workers nearly triplicates the German proportion?
- Why have prices been rising in Spain for at least the last 50 years but fell in 2009?
- Why the economy booms and slumps?

Typical macro questions (II)

- Are slumps unavoidable? Can economic policy alleviate slumps?
- Why is the Spanish government currently so concerned with its budget deficit? Why not before?
- Would a depreciation of the euro with respect to the dollar be favourable to the Spanish economy?
- Is a trade deficit good or bad news?
- When has the European Central Bank to rise or lower the interest rate? Why is it so low now?

Methodology of macroeconomics

- Macroeconomists answer the above questions by:
 - describing the situation and the facts to be explained;
 - developing a formal model of the situation in which the facts occur;
 - “solving” the model;
 - comparing the predictions of the model with the facts;
 - reformulating the model, if necessary, and/or extending it to cover additional situations.

Tasks carried out by macroeconomists

- Describe the economy (definition of variables, measurements of such variables, identities).
- Construct models to explain. Models link variables to establish how endogenous variables (those the model explains) depend on the exogenous ones (determined outside the model: the parameters).
- Formulate and evaluate economic policies using the models' predictions to control the economy.
- The course is organized according to these 3 tasks.

Outline of the course

- Task 1: summary and description of an economy.
 - Main variables are defined and linked
 - Fundamental macroeconomic identities
 - Separation of the real side from the financial side
- Task 2: construction and solution of three models.
 - Two on the financial side (liquidity & exchange rate)
 - One on the real side (the overall AS-AD model)
- Task 3: analysis of basic economic policies and a summing up of policy debates (and macro schools).

Gross domestic product (GDP)

- GDP is the value of all the final goods (“goods” will always mean “goods and services”) produced in an economy (or territory) within a given period.
- Final good = not used to produce other goods
- Value = market value
- The rate y at which GDP varies is the growth rate of the economy, where GDP_{-1} is the GDP from the previous period (to get a percentage, add $\times 100$).
$$y = \frac{GDP - GDP_{-1}}{GDP_{-1}}$$

Nominal GDP (GDP^n)

- GDP^n , or GDP at current prices, is the value of the final goods produced in an economy during a given period when the value is computed using current prices (the prices of the period).
- GDP^n is obtained by adding up the quantities of final goods multiplied by their current prices.
- GDP^n may vary because prices change or because the quantities of final goods produced change.

Computing GDP^n : an example

<i>time t</i>	p_1^t	q_1^t	p_2^t	q_2^t
1	4	6	2	8
2	9	5	3	5

- GDP^n at $t = 1$ is $p_1^1 q_1^1 + p_2^1 q_2^1 = 4 \cdot 6 + 2 \cdot 8 = 40$ (monetary units of $t = 1$).
- GDP^n at $t = 2$ is $p_1^2 q_1^2 + p_2^2 q_2^2 = 9 \cdot 5 + 3 \cdot 5 = 60$ (monetary units of $t = 2$). From $t = 1$ to $t = 2$, GDP^n has increased a $50\% = (60 - 40)/40$ multiplied by 100.

Real GDP (GDP^r)

- GDP^r , or GDP at constant prices, is the value of the final goods produced in an economy during a given period when the value is computed using the prices of a given fixed period (the base period).
- GDP^r is obtained by adding up the quantities of final goods multiplied by their prices in the base period.
- GDP^r is also called GDP adjusted for inflation or GDP in the monetary units of the base period (for instance, real GDP of 2010 in 2005 euros).

Computing GDP^r : an example

- Continuing with the GDP^n example, GDP^r in $t = 1$ at constant prices of period $t = 1$ is $p_1^1 q_1^1 + p_2^1 q_2^1 = 4 \cdot 6 + 2 \cdot 8 = 40$ (monetary units of $t = 1$). So $GDP^r = GDP^n$ at the base period (this always happens).
- GDP^r in $t = 2$ at constant prices of period $t = 1$ is given by $p_1^1 q_1^2 + p_2^1 q_2^2 = 4 \cdot 5 + 2 \cdot 5 = 30$ (monetary units of $t = 1$). Hence, GDP^r has fallen a 25%.
- If the base period is $t = 2$, GDP^r in $t = 1$ is $p_1^2 q_1^1 + p_2^2 q_2^1 = 9 \cdot 6 + 3 \cdot 8 = 78$ and GDP^r in $t = 2$ is $p_1^2 q_1^2 + p_2^2 q_2^2 = 9 \cdot 5 + 3 \cdot 5 = 60$. Now, GDP^r has fallen a 23%.

Objections to real GDP

- Theoretical: depends on the prices of the base period, which is always an arbitrary choice.
- Practical: excludes black market activities (underground economy) and does not value goods that are not exchanged in markets, like
 - political institutions (democracy vs dictatorship)
 - social and cultural institutions (people's values)
 - the quality of education or of the environment
 - the leisure time
 - the way wealth is distributed among people...

Underground economy (estimation)

Country	Percentage of GDP
Bolivia	68 percent
Zimbabwe	63
Peru	61
Thailand	54
Mexico	33
Argentina	29
Sweden	18
Australia	13
United Kingdom	12
Japan	11
Switzerland	9
United States	8

Source: Friedrich Schneider. Figures are for 2002.

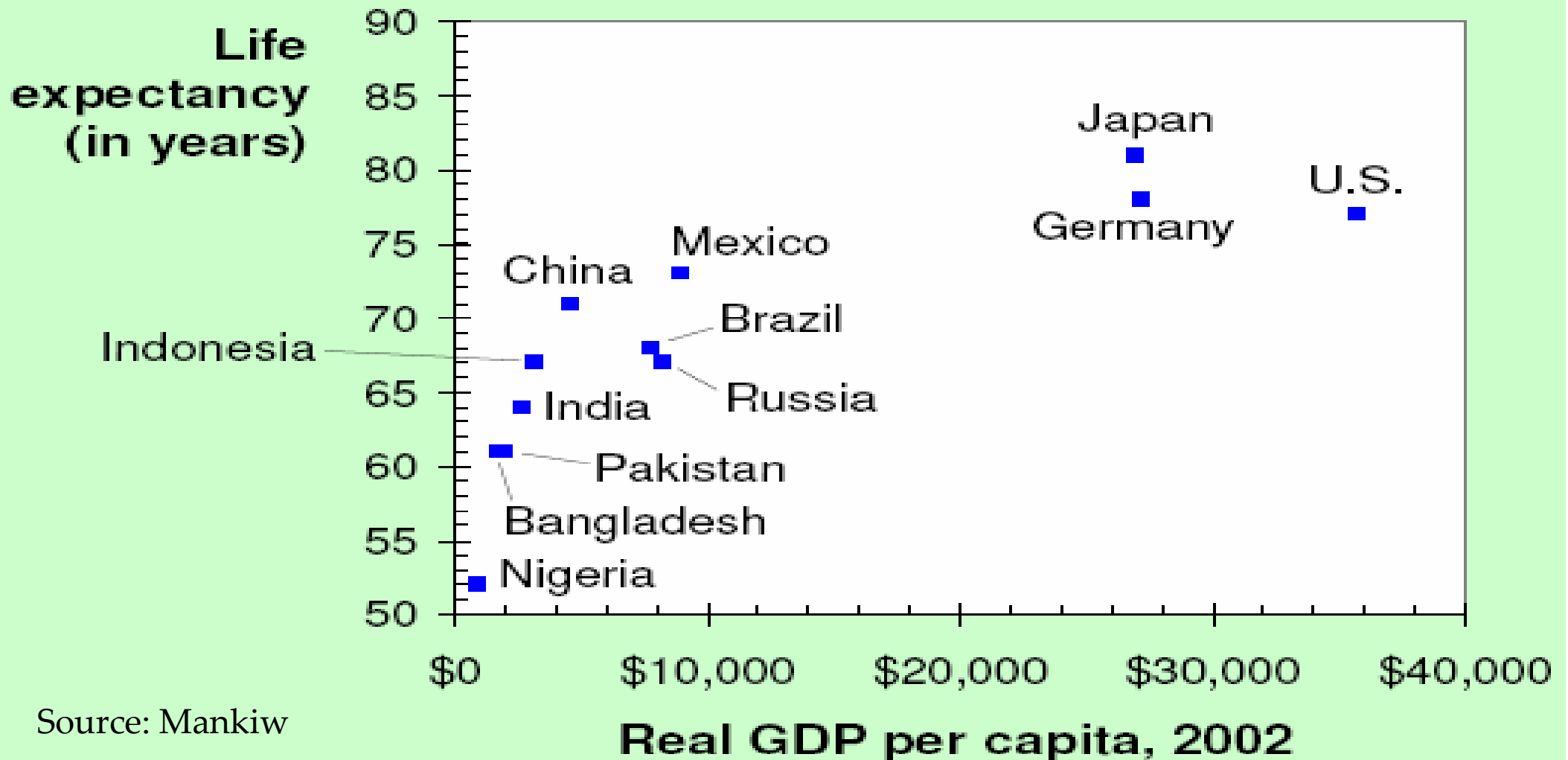
Source:
Mankiw

Real GDP per capita

- Real GDP provides a measure of the size of an economy.
- Real GDP per capita is defined as the ratio of real GDP to the population of the economy.
- Real GDP per capita is a measure of the average standard of living in the economy.
- Real GDP per capita is positively correlated with many indicators of economic development and the quality of life: life expectancy, subjective well-being, education, health care expenditure...

GDP per capita & life expectancy

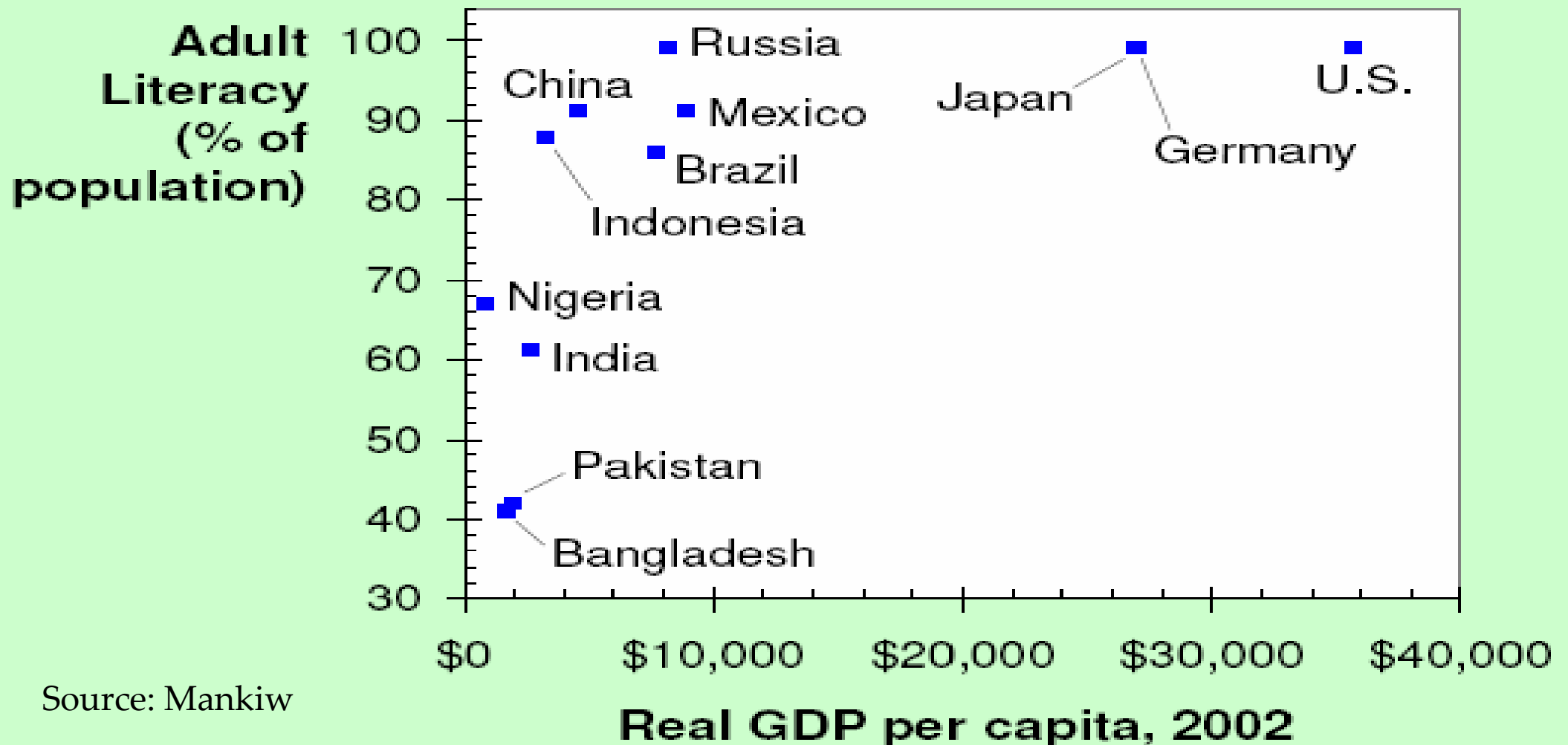
GDP and Life Expectancy in 12 Countries



Source: Mankiw

GDP per capita & adult literacy

GDP and Adult Literacy in 12 Countries



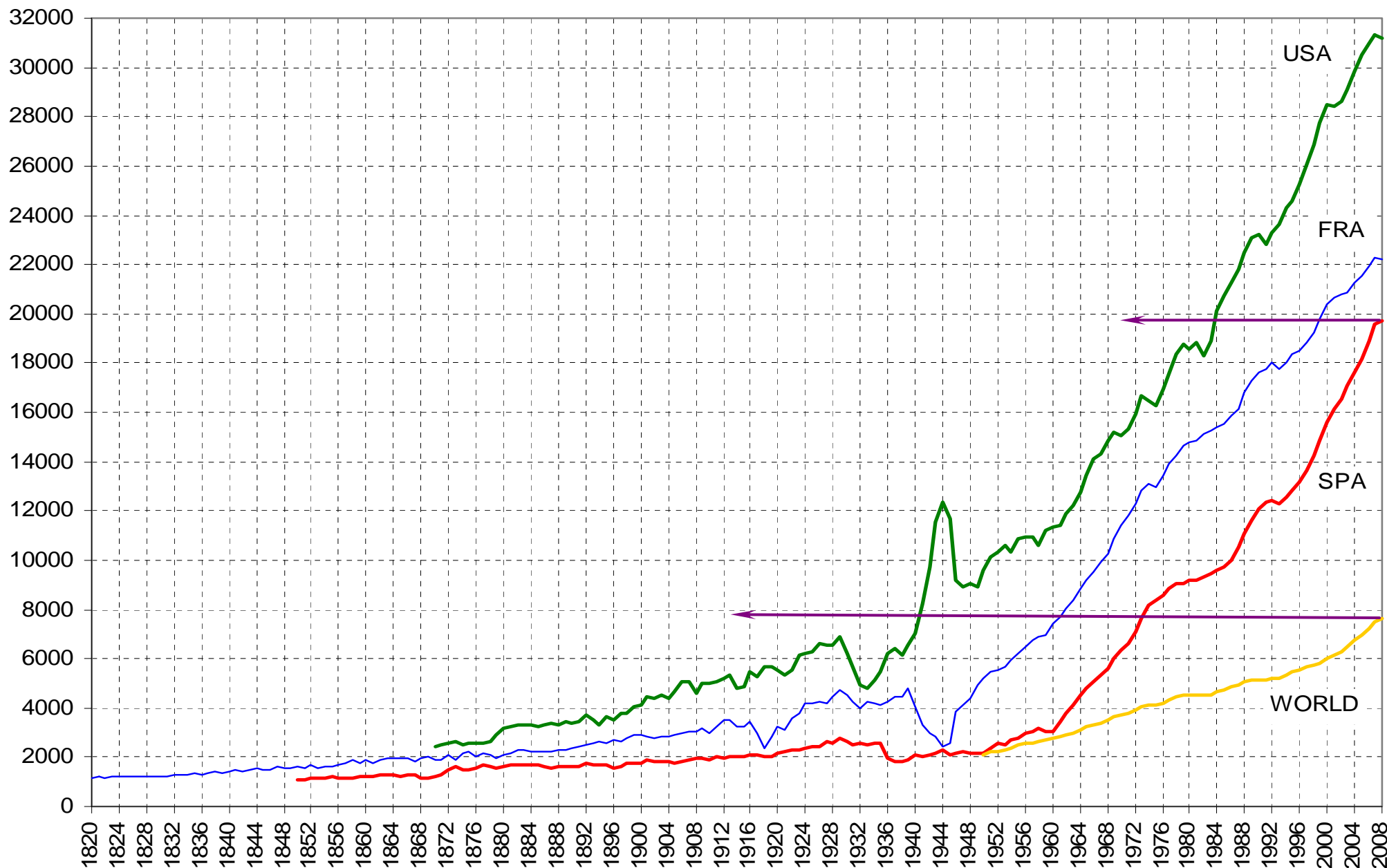
Source: Mankiw

GDP per capita & Internet usage

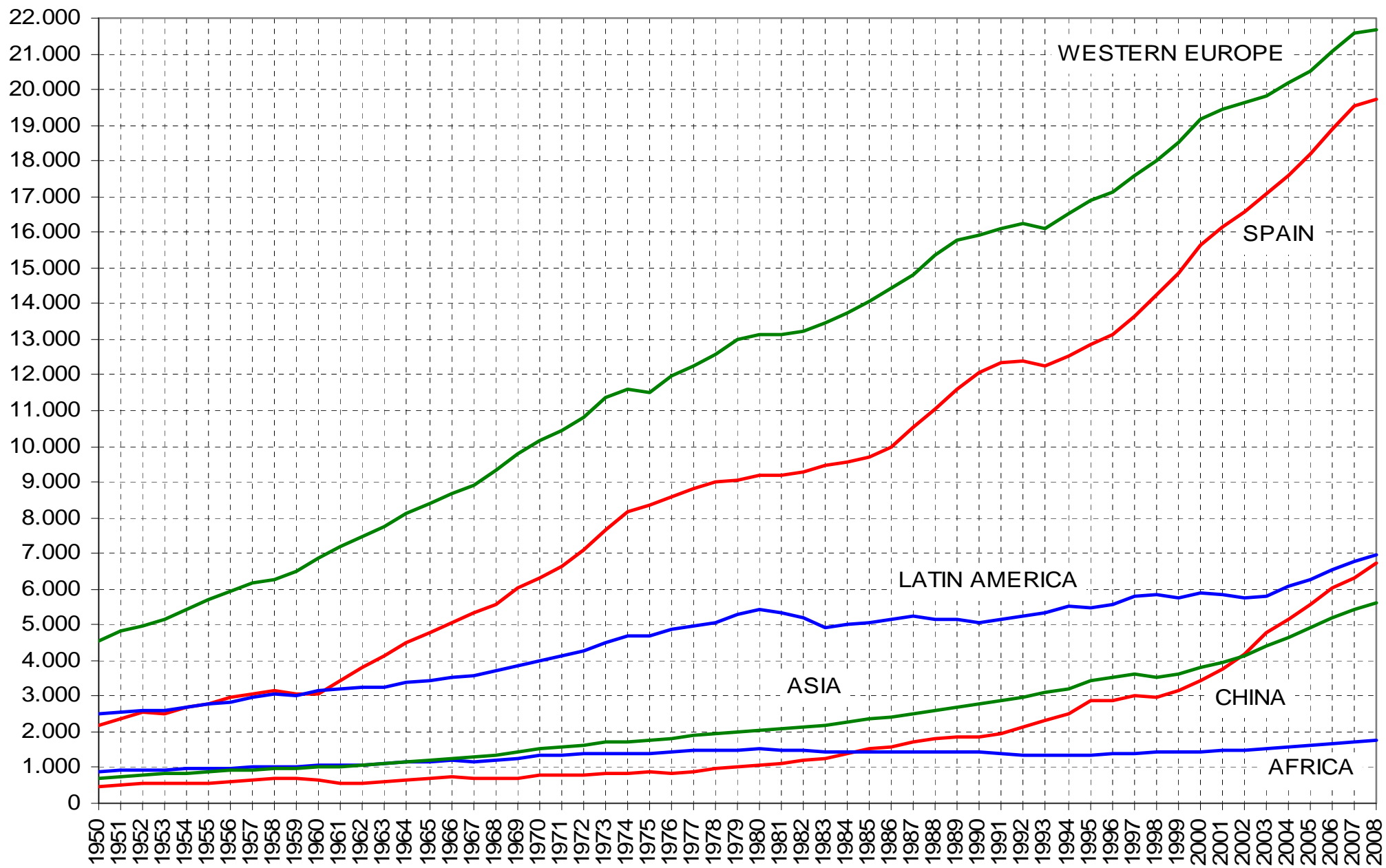
Country	Real GDP per Person (2005)	Life Expectancy	Adult Literacy (% of population)	Internet Usage (% of population)
United States	\$41,890	78 years	99%	63 %
Japan	31,267	82	99	67
Germany	29,461	79	99	45
Russia	10,845	65	99	15
Mexico	10,751	76	92	18
Brazil	8,402	72	89	19
China	6,757	72	91	9
Indonesia	3,843	70	90	7
India	3,452	64	61	3
Pakistan	2,370	65	50	7
Bangladesh	2,053	63	47	0.3
Nigeria	1,128	47	69	4

Source: Mankiw

GDP per capita (1820-2008)



GDP per capita (1950-2008)



Growth in the long run

- Even though it is not a perfect measure of economic development, real GDP per capita growth provides a reasonable estimate.
- Economic development (how to increase a nation's wealth) was probably the main topic addressed by the first modern economists in the XVIII century.
- This course does not address economic growth in the long run (when periods are measured in generations). It focus on growth in the short run (periods measured in months or quarters).

Price indices

- A price index is a measure of the general price level of an economy, which can be thought of as a weighted average of the prices of all the goods.
- By assuming the fiction that there is a unique good in the economy (domestic product), if GDP measures the quantity of this good, then the price level would represent the price of that good.
- As distinguished from GDP, price indices have no units and the value by itself means nothing. It is the rate of change of the index that is informative.

GDP (implicit price) deflator

- The GDP deflator is a price index defined as

$$\text{GDP deflator} = \frac{\text{Nominal GDP}}{\text{Real GDP}} .$$

- It measures the changes in prices in all the goods produced in an economy between the base period used in the real GDP and the current period.
- If $\text{GDP}^n_{2009} = 100$, $\text{GDP}^r_{2009} = 80$, $\text{GDP}^n_{2010} = 135$, and $\text{GDP}^r_{2010} = 90$, then GDP_{2009} deflator = 1'25 and GDP_{2010} deflator = 1'5, indicating a price increase.

Consumer price index (CPI)

- The CPI is a measure on the cost of purchasing a fixed basket of goods of a consumer considered representative.
- The CPI_t at period t is defined as

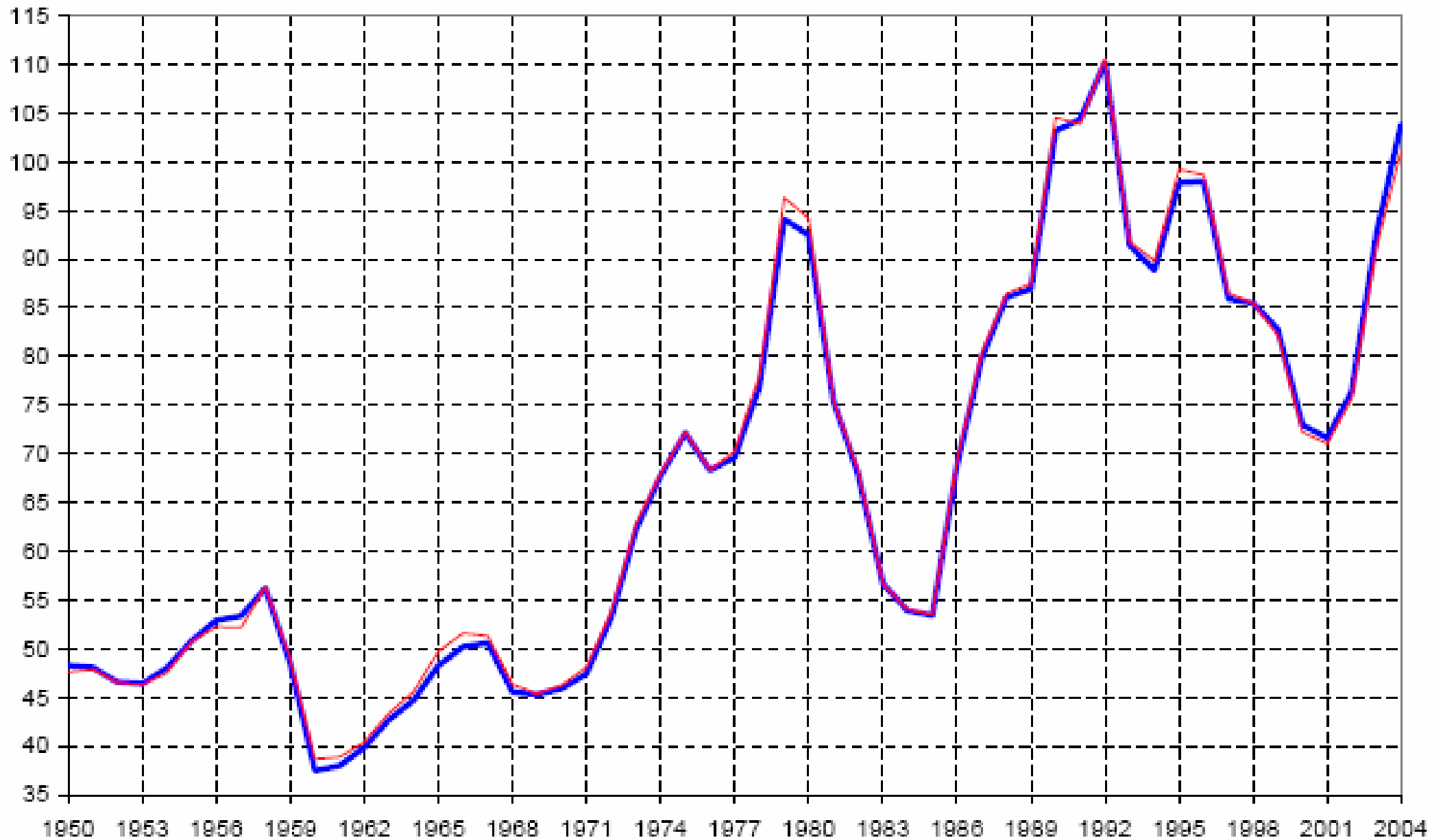
$$CPI_t = \frac{\text{Value of the basket at prices in period } t}{\text{Value of the basket at prices in the base period}} \cdot$$

- For the index to have base 100, just multiply the right-hand side by 100.

Difference between CPI & deflator

- The CPI generally includes imported goods.
- The GDP deflator does not: it only includes the goods produced in the economy, not abroad.
- The basket of goods in the GDP deflator may vary from period to period.
- The basket in the CPI generally does not.
- Despite this both indices are strongly correlated.

GDP deflator and CPI, Spain



Computing a CPI: an example

- The basket is given by $(x, y, z) = (3, 2, 1)$.

<i>time</i>	p_x	p_y	p_z	$V_t = \text{value of the basket at period } t$
1	1	4	5	$3 \cdot 1 + 2 \cdot 4 + 1 \cdot 5 = 16$
2	2	1	8	$3 \cdot 2 + 2 \cdot 1 + 1 \cdot 8 = 16$
3	3	1	1	$3 \cdot 3 + 2 \cdot 1 + 1 \cdot 1 = 12$
4	2	5	4	$3 \cdot 2 + 2 \cdot 5 + 1 \cdot 4 = 20$

- Taking $t = 1$ as the base period, $\text{CPI}_1 = V_1/V_1 = 1$; $\text{CPI}_2 = V_2/V_1 = 16/16 = 1$; $\text{CPI}_3 = V_3/V_1 = 12/16 = 0.75$; and $\text{CPI}_4 = V_4/V_1 = 20/16 = 1.25$.

Inflation rate

- The inflation rate π associated with the price index P is the rate of change in the price index P :

$$\pi = \frac{P - P_{-1}}{P_{-1}}$$

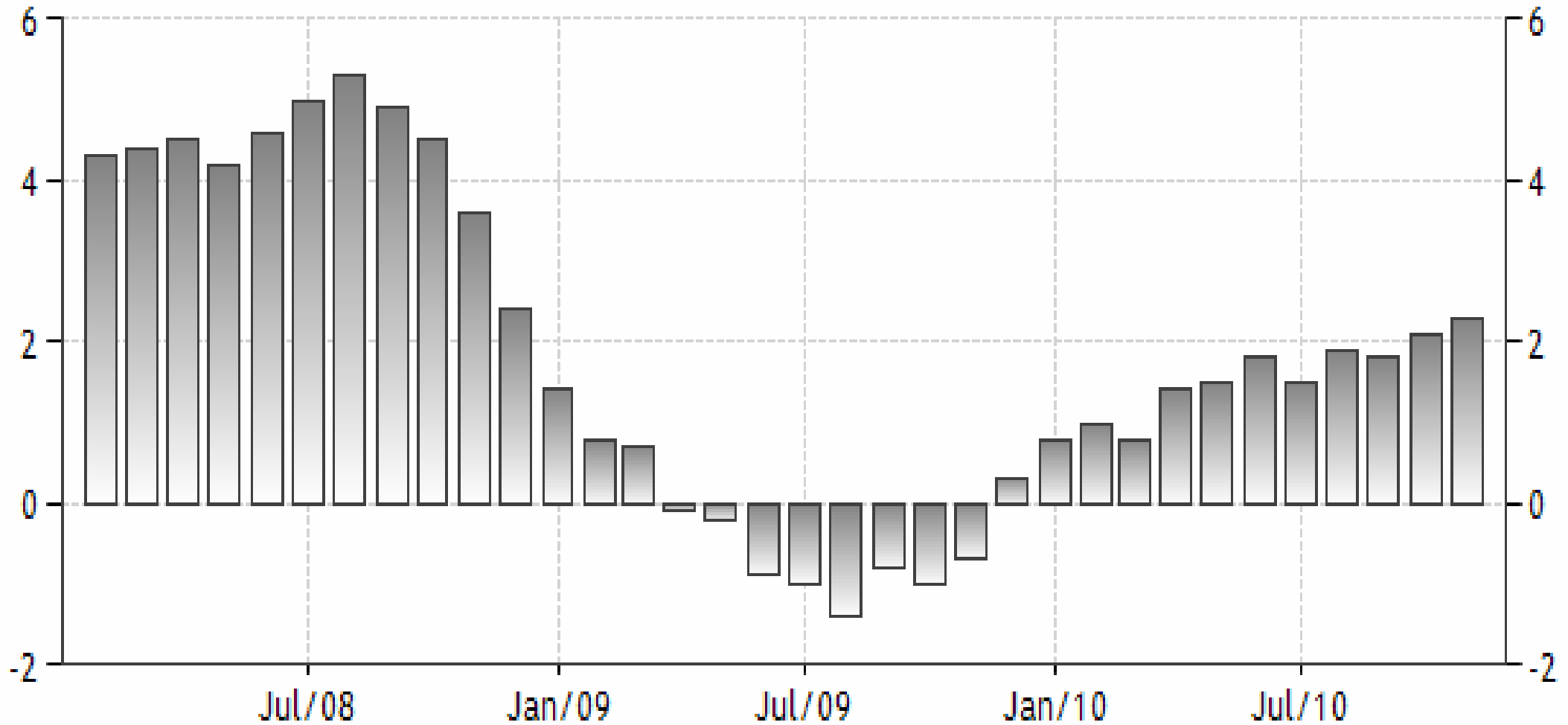
where P is the price index in the current period and P_{-1} is the one in the immediately preceding period.

- To express in the inflation rate as a percentage, the right hand must be multiplied by 100. For instance, if $P = 50$ and $P_{-1} = 40$, then $\pi = \frac{1}{4} = 0'25$ (= 25%): the price index has been pushed up a 25%.

Inflation rate, Spain (Feb08–Nov10)

SPAIN INFLATION RATE

Annual Change on Consumer Price Index



source: TradingEconomics.com; Instituto Nacional de Estadist

Inflation rate: an example

- Let π be the inflation rate associated with the CPI of the previous example.
- In this case:
 - π_1 is not defined (since there is no CPI_0)
 - $\pi_2 = (\text{CPI}_2 - \text{CPI}_1)/\text{CPI}_1 = (1 - 1)/1 = 0$
 - $\pi_3 = (\text{CPI}_3 - \text{CPI}_2)/\text{CPI}_2 = (.75 - 1)/1 = -.25 = -25\%$
 - $\pi_4 = (\text{CPI}_4 - \text{CPI}_3)/\text{CPI}_3 = (1.25 - .75)/.75 = 66.6\%$.
- If π is calculated, for instance, from $t = 1$ to $t = 4$, then $\pi = (\text{CPI}_4 - \text{CPI}_1)/\text{CPI}_1 = (1.25 - 1)/1 = 25\%$.

Inflation concepts

- As an economic phenomenon, inflation refers to the sustained increase of the CPI. It occurs for periods during which the inflation rate is positive.
- Deflation is the opposite phenomenon: sustained decrease of the CPI (negative inflation rates).
- Disinflation takes place when, during inflation, the inflation rate diminishes (but remains positive).
- Hyperinflation occurs with astronomical inflation rates (monthly inflation rates of at least 50%). Under hyperinflation, inflation is out of control.

Inflation rate, Spain (1962M1–2010M12)



Core inflation rate

- The core inflation rate is the inflation rate computed, typically from a CPI, by excluding the prices of food and energy prices, which tend to be very volatile.
- It is a measure of underlying long-term inflation.
- It can also be used as an indicator of future inflation.
- Headline inflation rate refers to the inflation rate initially defined (takes into account all prices).

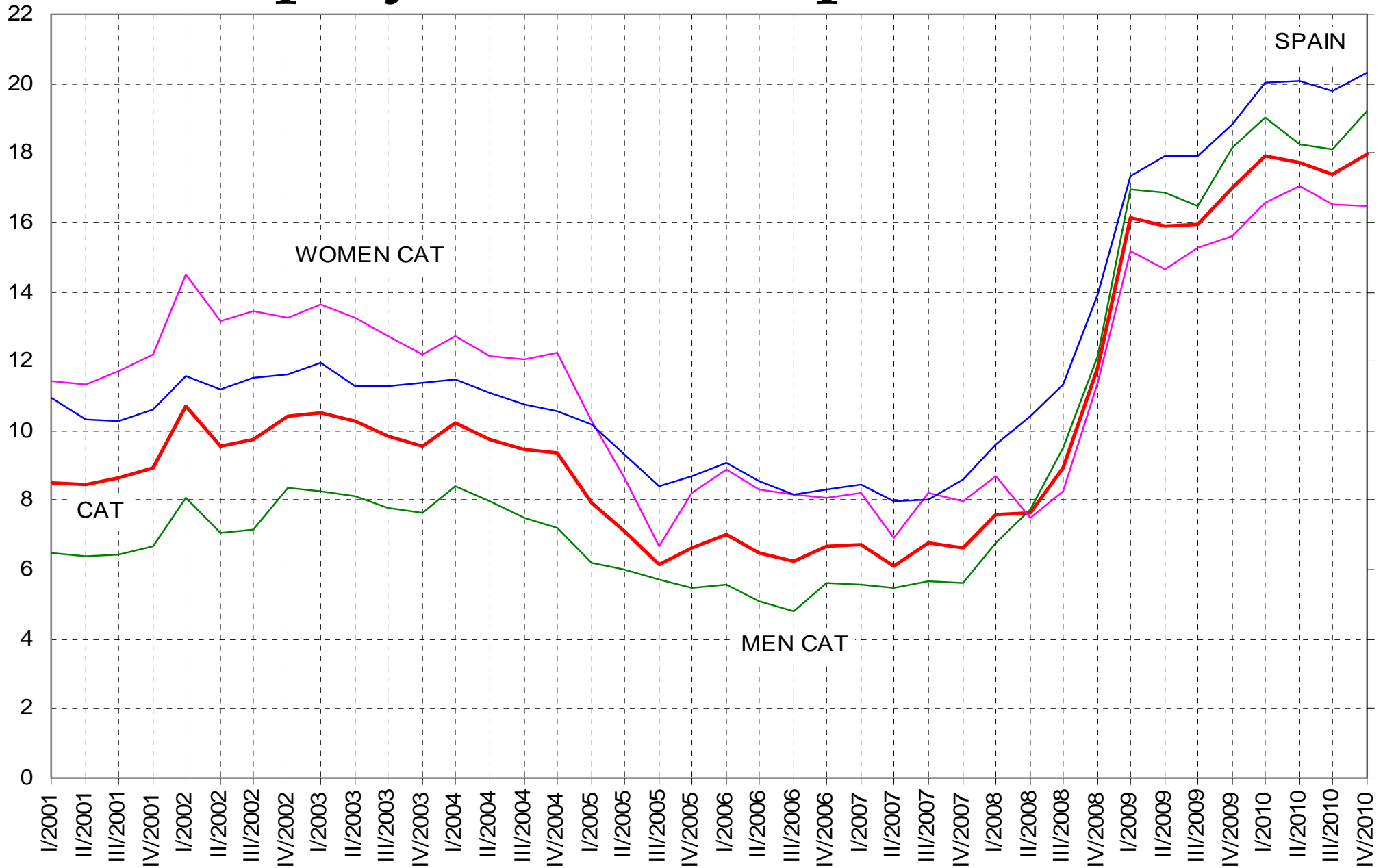
Unemployment rate

- Employment = number of people having a job
- Unemployment = number of people not having a job but looking for one
- Labour force = Employment + Unemployment
- Unemployment rate = $\frac{\text{Unemployment}}{\text{Labour force}}$
- Participation rate = $\frac{\text{Labour force}}{\text{Total population of working age}}$

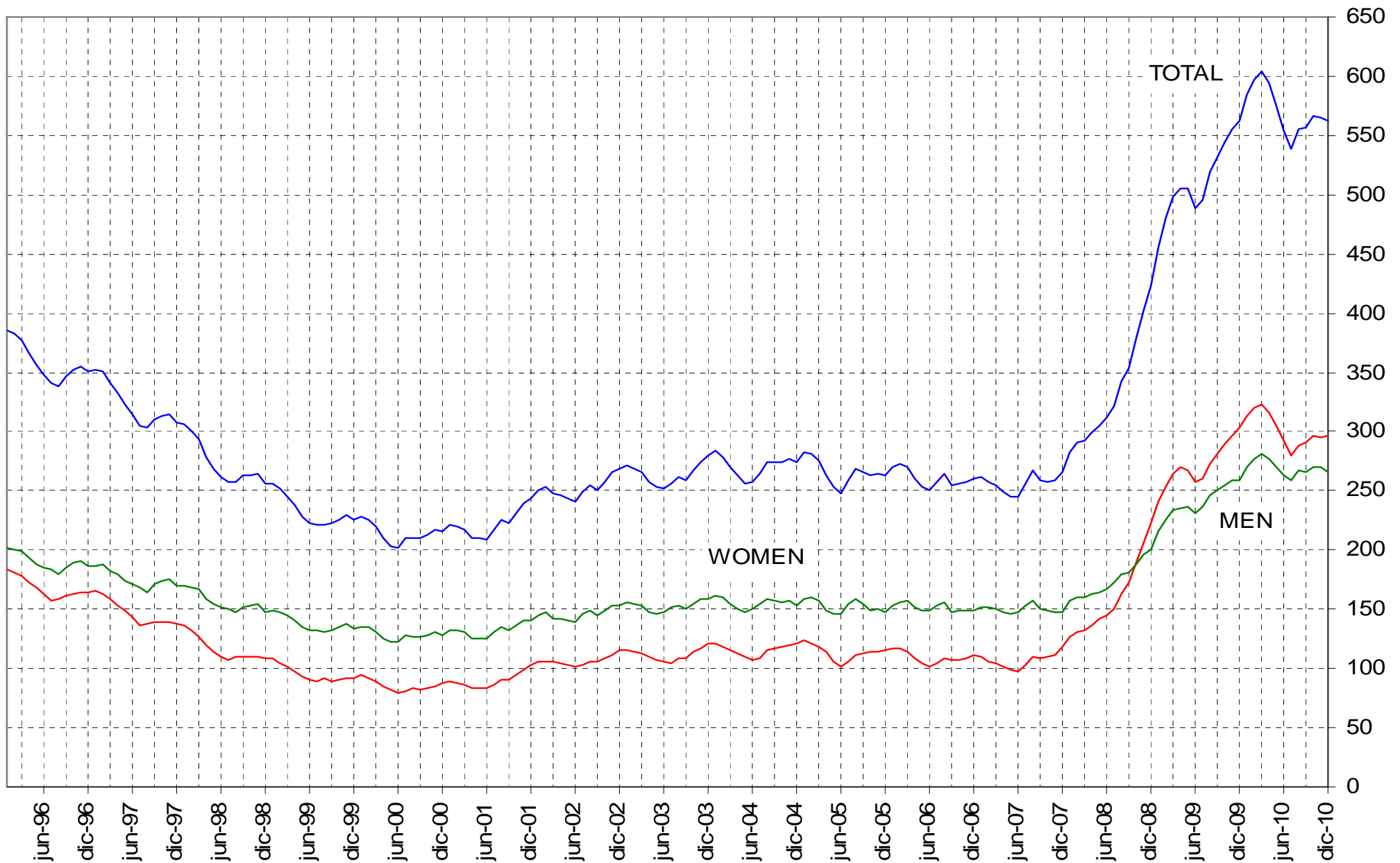
Types of unemployment

- Actual unemployment is divided into 3 categories (the first two define “natural unemployment”).
- Frictional. Occurs while workers are changing jobs.
- Structural. Due to structural changes in the economy that create & eliminate jobs and to the institutions that match workers and firms (firing & hiring costs, minimum wages, unemployment benefits, mobility restrictions, lack of training...).
- Cyclical. Generated by the short-run fluctuations of GDP (rises with recessions, falls with booms).

Unemployment rate, Spain, Catalonia



Registered unemployment, Catalonia



Nominal variable

- A nominal variable is measured in terms of current prices.
- Changes of current prices may affect the nominal variable.
- The typical nominal variable is measured in monetary units.
- Examples: the GDP at current prices, the stock of money, the (nominal) interest rate, the (nominal) exchange rate, and the CPI.

Real variable

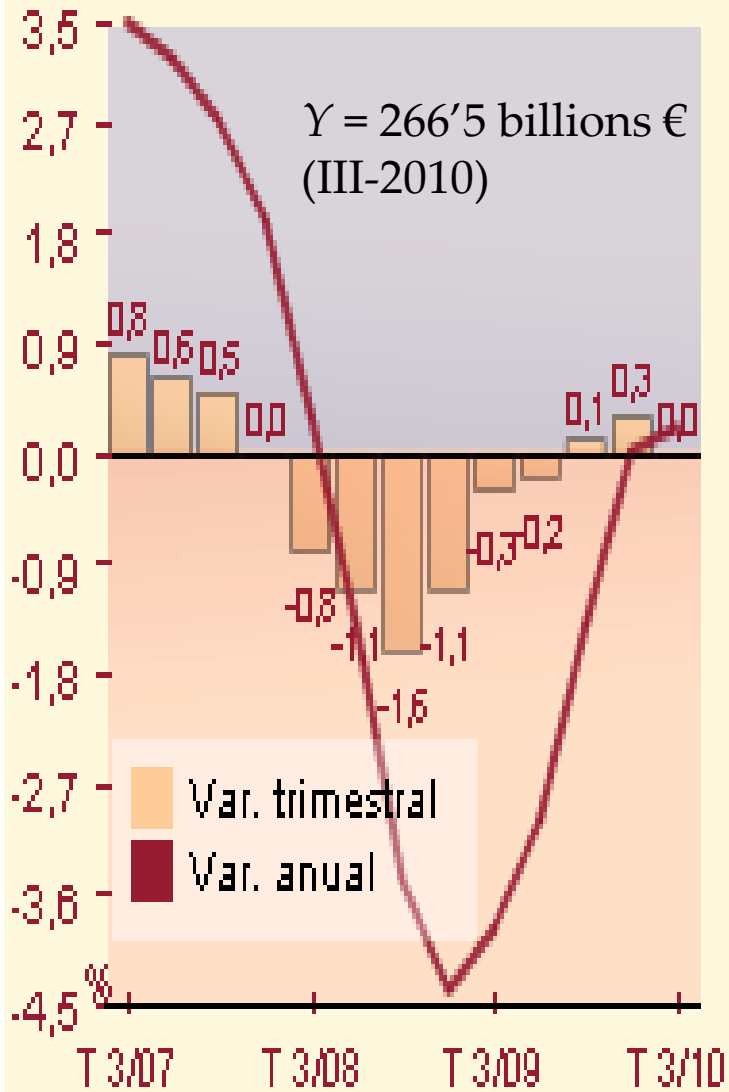
- A real variable measures physical quantities. Real variables are not affected by current prices.
- Some real variables need not prices to be defined, like total employment or the unemployment rate.
- Others are defined by fixing prices, like GDP at constant prices, which measures production using the prices of a base period.
- Still others come from nominal variables by removing the effects of prices, like the real interest rate.

Stock variable & flow variable

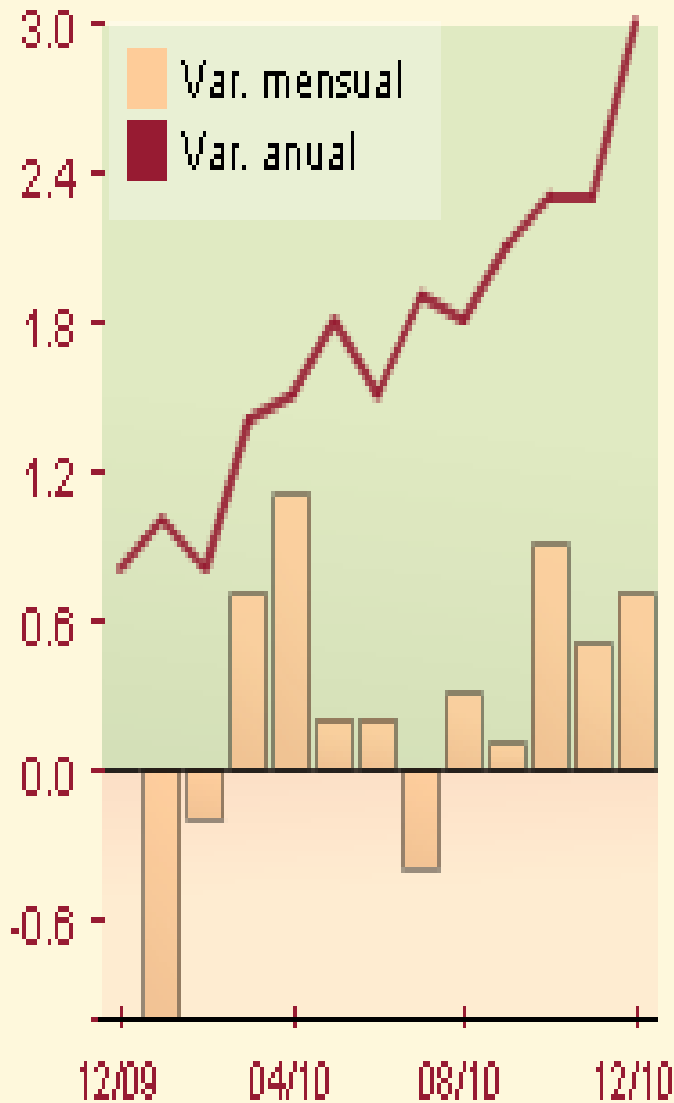
- A stock variable is measured in levels rather than rates of change.
- A flow variable is measured in rates per unit of time rather than levels.
- GDP is a flow variable, since it measures production during a period of time (so GDP is production per unit of time).
- Unemployment at a given moment of time is a stock variable.

Main indicators for Spain (INE)

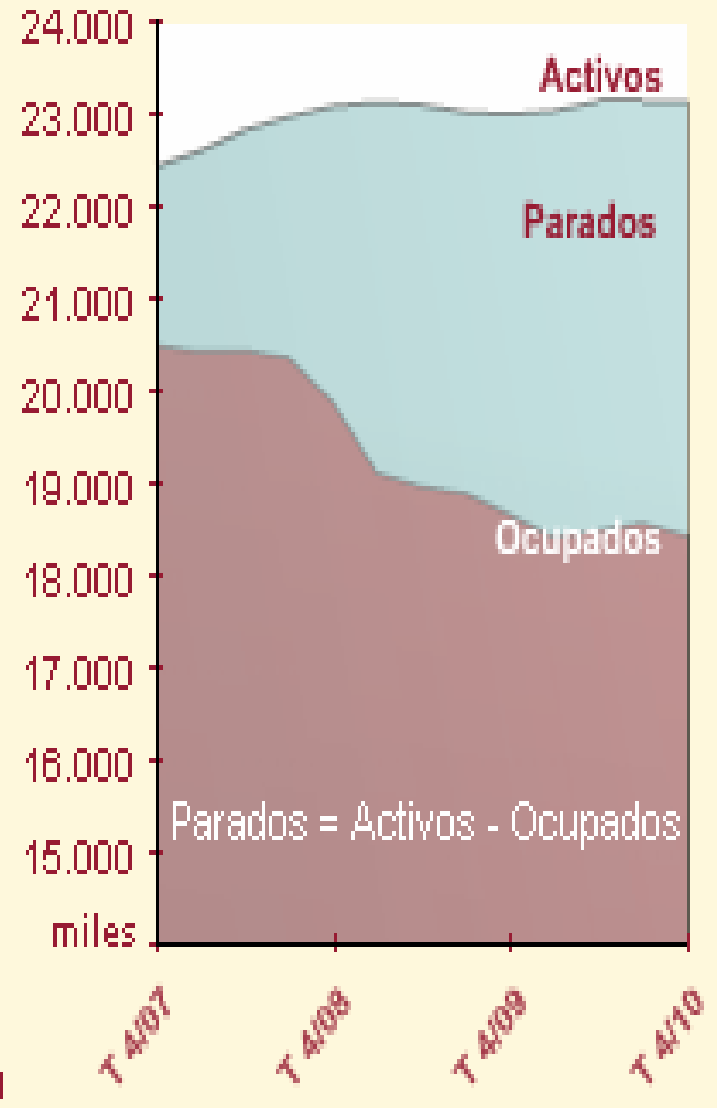
Producto interior bruto. PIB



Indice de precios de consumo. IPC



Encuesta de población activa. EPA



$\uparrow Y = 0'2\%$ (III-2009/III-2010) $\pi = 3\%$ (Dec2009/Dec2010) $u = 20'33\%$ (IV-2010)

Country	GDP Billions US\$	GDP Growth	Interest Rate	Inflation Rate	Jobless Rate
United States	14256	3.20%	0.25%	1.50%	9.00%
Euro Area	12456	0.40%	1.00%	2.50%	10.10%
Japan	5068	1.10%	0.00%	0.00%	4.90%
China	4909	9.80%	5.81%	4.60%	4.10%
Germany	3347	0.70%	1.00%	1.90%	7.00%
France	2649	0.40%	1.00%	1.70%	10.00%
United Kingdom	2175	-0.50%	0.50%	3.70%	7.90%
Italy	2113	0.20%	1.00%	2.10%	8.20%
Brazil	1572	0.50%	11.25%	5.91%	5.30%
Spain	1460	0.20%	1.00%	2.30%	20.80%
Canada	1336	0.30%	1.00%	2.40%	7.80%
India	1296	8.90%	5.50%	8.33%	8.00%
Russia	1231	2.70%	7.75%	9.60%	7.20%
South Korea	929	0.50%	2.75%	4.10%	3.70%
Australia	925	0.20%	4.75%	2.70%	5.20%
Mexico	875	0.50%	4.50%	4.40%	4.94%
Netherlands	792	-0.10%	1.00%	1.60%	5.20%
Turkey	617	1.10%	6.25%	4.90%	11.20%
Indonesia	540	3.45%	6.75%	7.02%	7.14%
Switzerland	500	0.70%	0.25%	0.50%	3.60%
Belgium	469	0.40%	1.00%	2.86%	8.50%
Poland	430	1.30%	3.75%	3.10%	11.70%
Sweden	406	2.10%	1.25%	2.30%	7.40%
Austria	385	0.90%	1.00%	1.80%	4.80%
Norway	382	-1.56%	2.00%	2.80%	2.70%

RANK	COUNTRY	GDP (PURCHASING POWER PARITY)	DATE OF INFO
1	<u>European Union</u>	\$ 14,890,000,000,000	2010 est.
2	<u>United States</u>	\$ 14,720,000,000,000	2010 est.
3	<u>China</u>	\$ 9,872,000,000,000	2010 est.
4	<u>Japan</u>	\$ 4,338,000,000,000	2010 est.
5	<u>India</u>	\$ 4,046,000,000,000	2010 est.
6	<u>Germany</u>	\$ 2,951,000,000,000	2010 est.
7	<u>Russia</u>	\$ 2,229,000,000,000	2010 est.
8	<u>Brazil</u>	\$ 2,194,000,000,000	2010 est.
9	<u>United Kingdom</u>	\$ 2,189,000,000,000	2010 est.
10	<u>France</u>	\$ 2,160,000,000,000	2010 est.
11	<u>Italy</u>	\$ 1,782,000,000,000	2010 est.
12	<u>Mexico</u>	\$ 1,560,000,000,000	2010 est.
13	<u>Korea, South</u>	\$ 1,467,000,000,000	2010 est.
14	<u>Spain</u>	\$ 1,374,000,000,000	2010 est.
15	<u>Canada</u>	\$ 1,335,000,000,000	2010 est.