Q1: How big is an economy?

- Macroeconomics is the area of economics that studies the overall economic activity in a country or region by means of indicators of that activity.

- That "overall economic activity in a country" will be called, for short, "an economy".

- One basic question with which Macroeconomics is concerned refers to the size of an economy.

- A simple measure of the size of an economy: to evaluate the aggregate production in the economy.

I   1

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 "×100").

$$y = \frac{GDP - GDP_{-1}}{GDP_{-1}}$$

I   2

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.

I   3

Computing GDP^n: an example

time t	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.

I   4

Real GDP (GDP^r)

- GDP^r, or <u>GDP at constant prices</u>, 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 <u>GDP adjusted for inflation</u> or GDP in the monetary units of the base period (for instance, real GDP of 2010 in 2005 euros).

I   5

Computing GDP^r: an example

- Continuing with the GDP^n example, GDP^r in $t = 1$ at constant prices of period $t = 1$ is $p_1^1 q_1^1 + p_2^1 q_2^1 = 4·6 + 2·8 = 40$ (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 $p_1^1 q_1^2 + p_2^1 q_2^2 = 4·5 + 2·5 = 30$ (monetary units of $t = 1$). Hence, <u>GDP^r has fallen a 25%</u>.

- If the base period is $t = 2$, GDP^r in $t = 1$ is $p_1^2 q_1^1 + p_2^2 q_2^1 = 9·6 + 3·8 = 78$ and GDP^r in $t = 2$ is $p_1^2 q_1^2 + p_2^2 q_2^2 = 9·5 + 3·5 = 60$. Now, <u>GDP^r has fallen a 23%</u>.

I   6
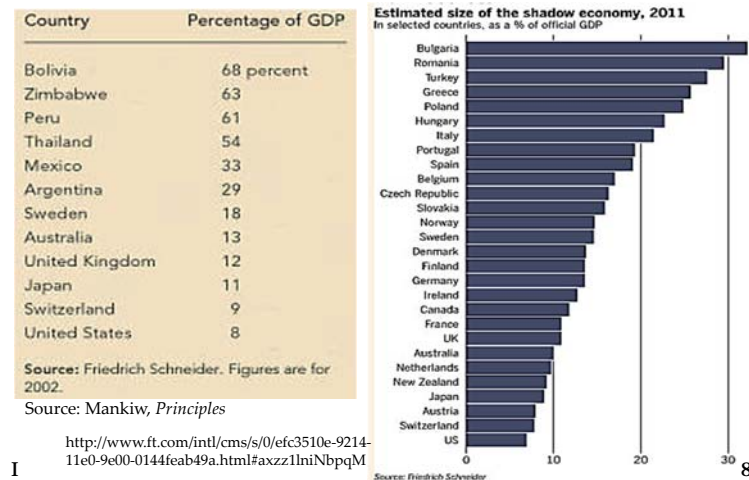
Objections to real GDP

- Theoretical: <u>depends on the prices of the base period</u>, which is always an arbitrary choice.

- Practical: excludes black market activities (underground economy) and <u>does not value goods that are not exchanged in markets</u>, 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…

I   7

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, *Principles*

http://www.ft.com/intl/cms/s/0/efc3510e-9214-11e0-9e00-0144feab49a.html#axzz1lniNbpqM

I   8

## Q2. How developed is an economy?

- <u>Real GDP per capita</u> provides a measure of how developed or "prosperous" an economy is. It is viewed as a <u>measure of the average standard of living</u> in the economy.

- Real GDP per capita is defined as the ratio of real GDP to the population of the economy.

- Real GDP per capita is positevely correlated with many indicadors of economic development and the quality of life: life expectancy, subjective well-being, education, health care expenditure…

I   9

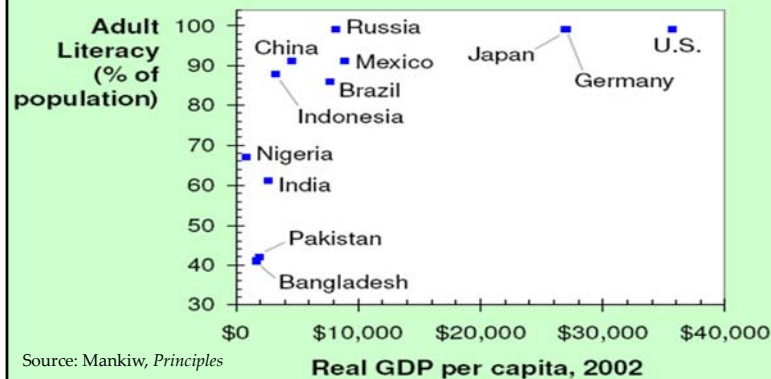## GDP per capita & life expectancy
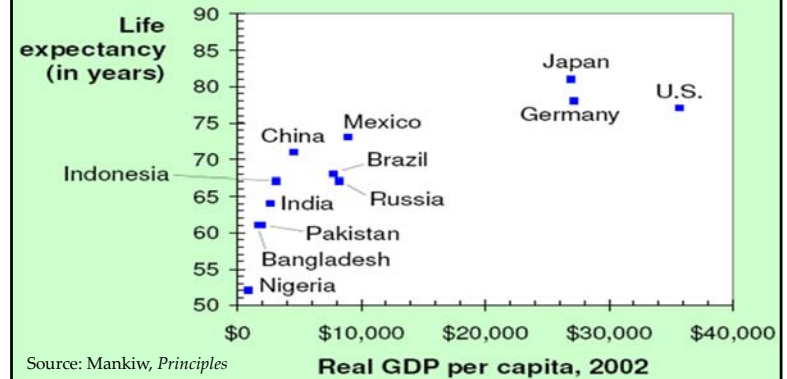
Source: Mankiw, *Principles*

I   10

GDP per capita & adult literacy

Source: Mankiw, *Principles*

I   11

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

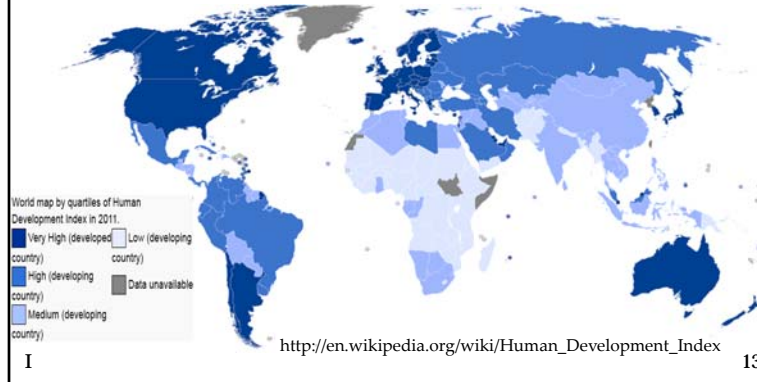Source: Mankiw, *Principles*

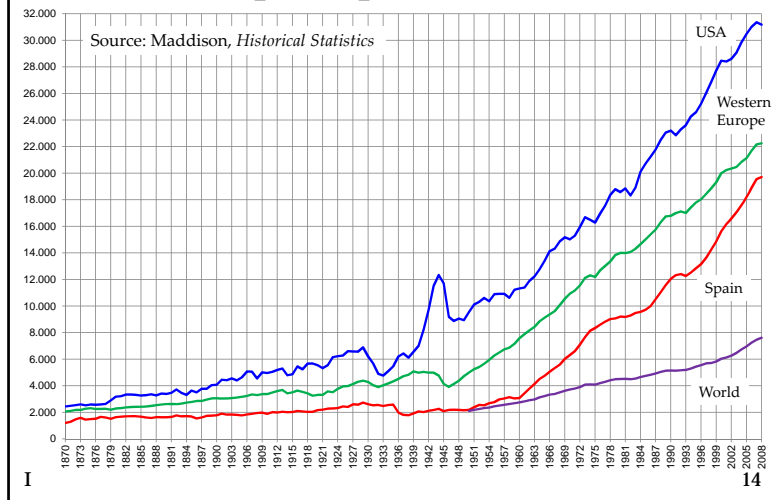I   12

GDP per capita & HDI

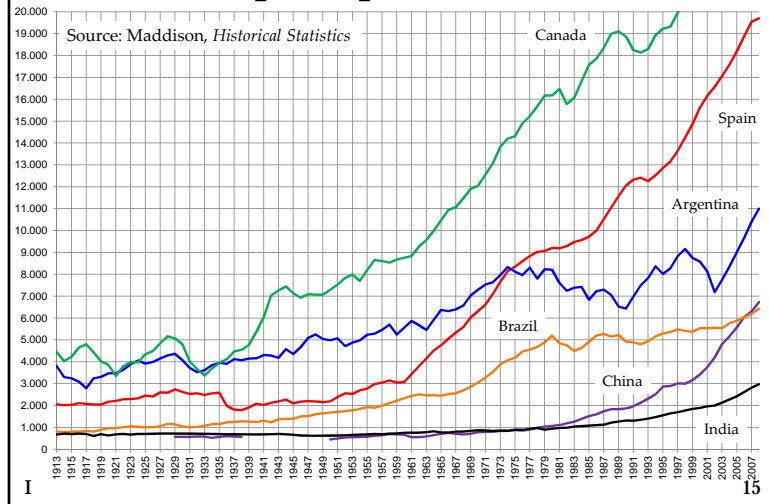- GDP per capita is strongly correlated with the Human Development Index.

http://en.wikipedia.org/wiki/Human_Development_Index

GDP per capita (1820-2008)

Source: Maddison, *Historical Statistics*

GDP per capita (1913-2008)

Source: Maddison, *Historical Statistics*

GDP per capita (1950-2008)

Source: Maddison, *Historical Statistics*
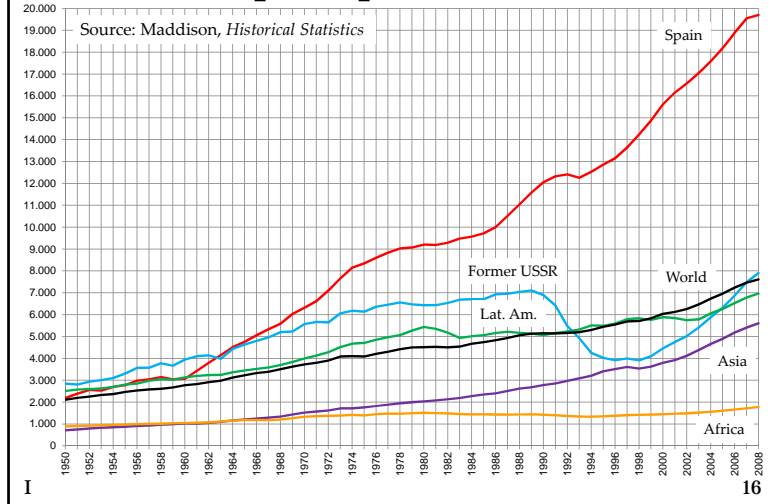
Q3: What purchasing power has the €?

- In essence, all the activities in an economy involve flows of either goods or money. A basic question in macroeconomics is how these flows are related.

- The purchasing power of an amount of money is its capacity to be exchanged for goods.

- Loosely speaking, the purchasing power of money is the "quantity" of goods that it can purchase.

- To quantify purchasing power it is common to define some sort of "average price" of an economy.

I   17

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.

I   18

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.

I   19

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

$$\text{CPI}_t = \frac{\text{Value of the basket at prices in period } t}{\text{Value of the basket at prices in the base period}} .$$

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

I   20
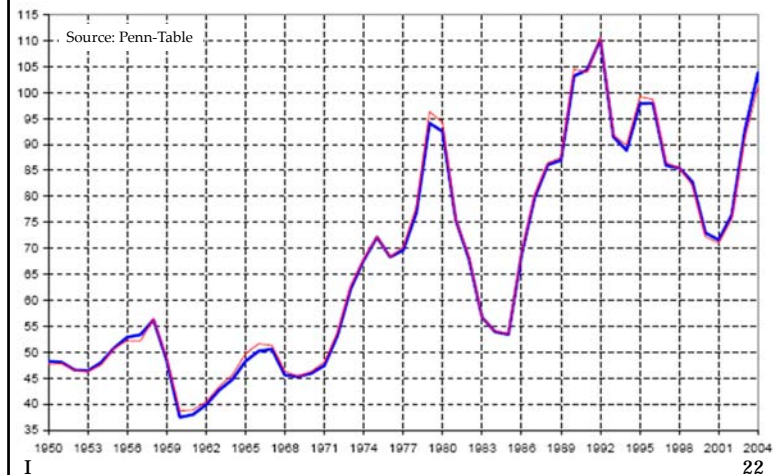
Difference between CPI & deflator

- 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 $(x, y, z) = (3, 2, 1)$.

time	p_x	p_y	p_z	V_t = value of the basket at period t
1	1	4	5	3·1 + 2·4 + 1·5 = 16
2	2	1	8	3·2 + 2·1 + 1·8 = 16
3	3	1	1	3·3 + 2·1 + 1·1 = 12
4	2	5	4	3·2 + 2·5 + 1·4 = 20

- Taking $t =1$ as the base period, $CPI_1 = V_1/V_1 = 1$; $CPI_2 = V_2/V_1 = 16/16 = 1$; $CPI_3 = V_3/V_1 = 12/16 = 0.75$; and $CPI_4 = V_4/V_1 = 20/16 = 1.25$.

Inflation rate

- The inflation rate π associated with the price index P is the rate of change in the price index P:
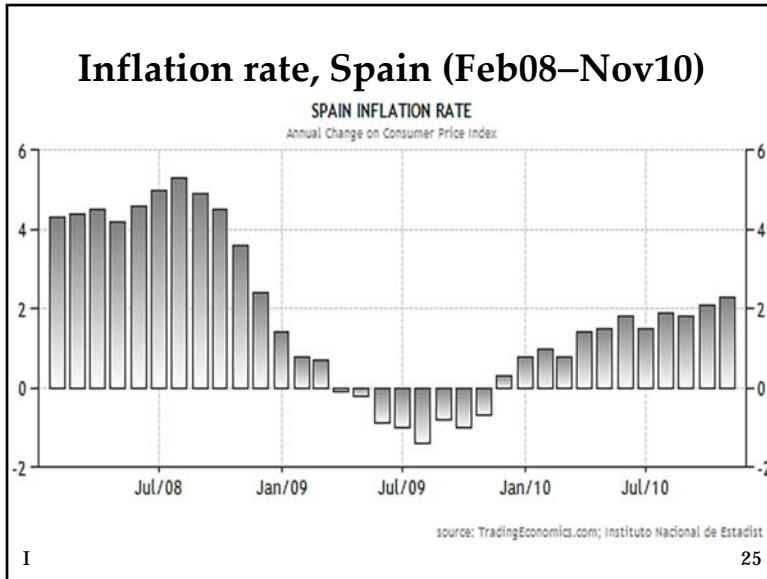
$$\pi = \frac{P - P_{-1}}{P_{-1}}$$

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

- To express the inflation rate as a percentage, multiply by 100 the right-hand side. 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)

Inflation rate, Spain (Feb10–Jan12)

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)
  - $\pi_2 = (CPI_2 - CPI_1)/CPI_1 = (1 - 1)/1 = 0$
  - $\pi_3 = (CPI_3 - CPI_2)/CPI_2 = (.75 - 1)/1 = -.25 = -25\%$
  - $\pi_4 = (CPI_4 - CPI_3)/CPI_3 = (1.25 - .75)/.75 = 66.6\%$.

- If π is calculated, for instance, from $t = 1$ to $t = 4$, then $\pi = (CPI_4 - CPI_1)/CPI_1 = (1.25 - 1)/1 = .25 = 25\%$.

I   27

Inflation concepts

- As an economic phenomenon, <u>inflation refers to the sustained increase of the CPI</u>. It occurs for periods during which the inflation rate is positive.

- <u>Deflation</u> is the opposite phenomenon: sustained decrease of the CPI (negative inflation rates).

- <u>Disinflation</u> takes place when, during inflation, the inflation rate diminishes (but remains positive).

- <u>Hyperinflation</u> occurs with astronomical inflation rates (montly inflation rates of at least 50%). Under hyperinflation, inflation is out of control.

I   28

Inflation rate, Spain (1962M1–2011M12)

Source: INE
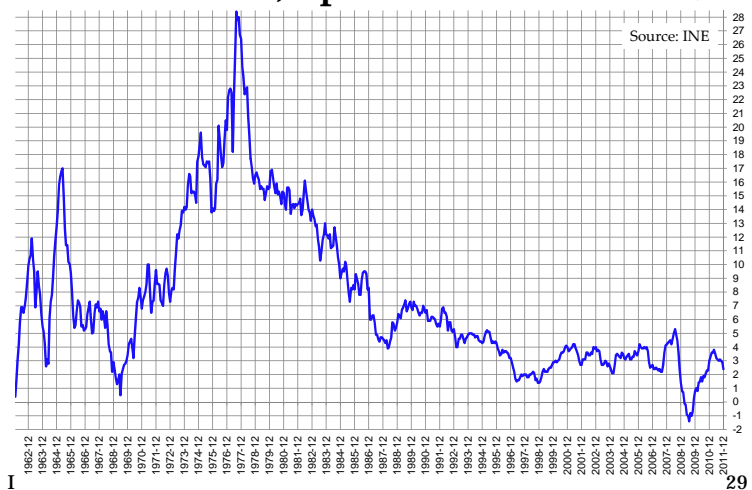
Core inflation rate

- The core inflation rate is the inflation rate computed, typically from a CPI, by <u>excluding the prices of food and energy prices</u>, which tend to be very volatile.

- It is a measure of <u>underlying long-term inflation</u>.

- It can also be used as an indicator of future inflation.

- <u>Headline inflation</u> rate refers to the inflation rate initially defined (takes into account all prices).

Q4: Is the economy doing well or badly?

- <u>Potential (or "natural") GDP</u> refers to the maximum GDP level that an economy can sustain over time (potential GDP can be associated with a point in the production possibilities frontier).

- When GDP is below potential, some production inputs must lie idle (remain unused).

- Since labour services constitute one of the main inputs, its rate of employment is a measure of the degree to which an economy is performing well.

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 = $\dfrac{\text{Unemployment}}{\text{Labour force}}$

- Participation rate = $\dfrac{\text{Labour force}}{\text{Total population of working age}}$

Types of unemployment

- Actual unemployment is divided into 3 categories (the first two define "natural unemployment").

- <u>Frictional</u>. Occurs while workers are changing jobs.

- <u>Structural</u>. 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…).

- <u>Cyclical</u>. Generated by the short-run fluctuations of GDP (rises with recessions, falls with booms).

I   33

Registered unemployment, Spain

Source: MEYSS

I   34
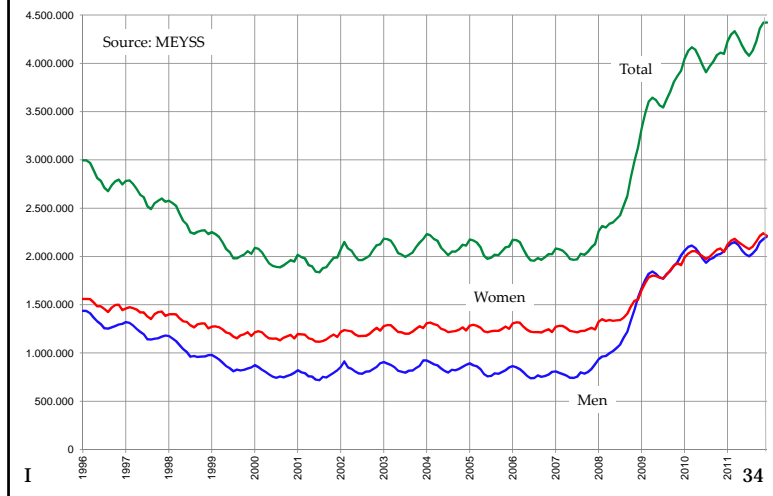
Estimated unemployment, Catalonia

Source: Idescat

I   35

Unemployment rate, Spain, Catalonia

CAT <24 (IV-2011: 47.93%)

Source: Idescat

I   36

Unemployment rate, Spain, Catalonia

Source: Idescat

SPA <24
CAT <24
SPA Total
CAT Total

I 37
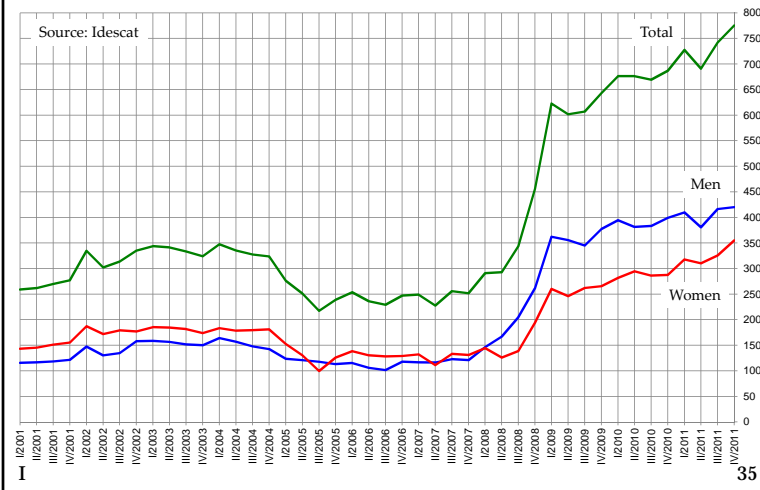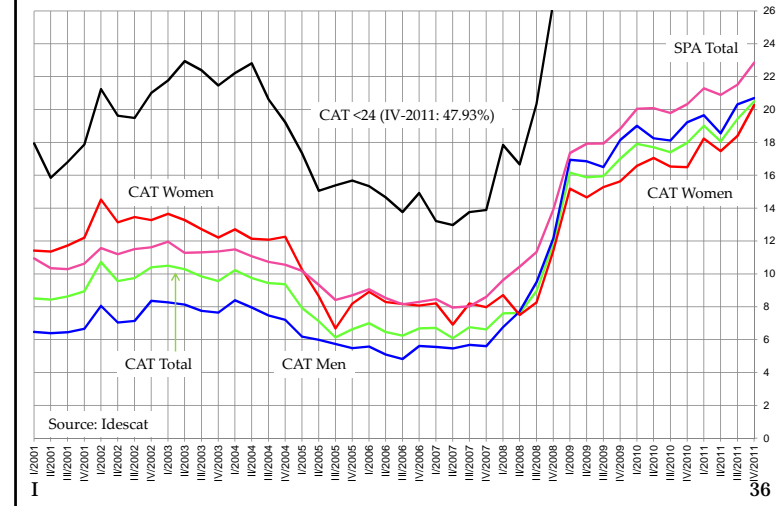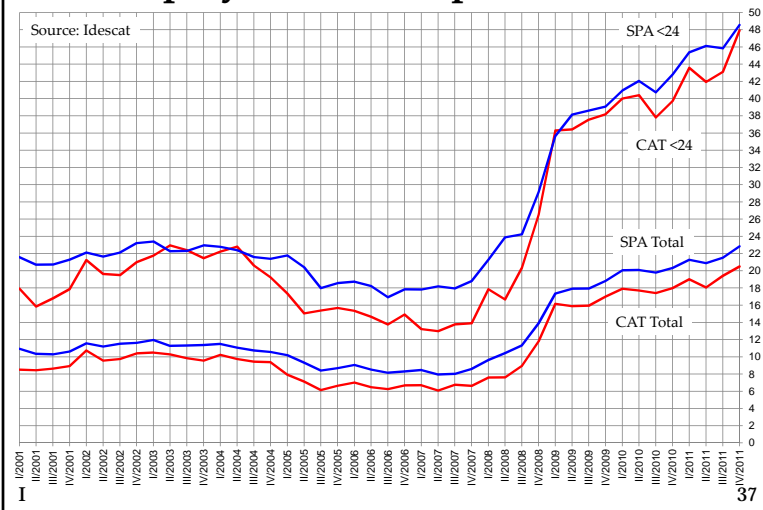
Nominal variable

- <u>A nominal variable is measured in terms of current prices</u>.

- 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.

I 38

Real variable

- <u>A real variable measures physical quantities</u>. 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.

I 39

Stock variable & flow variable

- A <u>stock variable is measured in levels</u> rather than rates of change.

- A <u>flow variable is measured in rates per unit of time</u> 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.

I 40

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I — Source: Tradingeconomics.com, accessed the 8th of February, 2012   **41**

Country	GDP Billion USD	GDP QoQ	GDP YoY	Interest rate	Inflation rate	Jobless rate	Gov. Budget	Debt to GDP
United States	14582	2.80%	1.60%	0.25%	3.00%	8.30%	-10.30	93.20
Euro Area	12456	0.20%	1.40%	1.00%	2.70%	10.40%	-6.20	85.10
China	5879	2.00%	8.90%	6.56%	4.10%	4.10%	-2.50	17.70
Japan	5498	1.40%	-0.70%	0.00%	-0.20%	4.60%	-8.20	220.30
Germany	3310	0.50%	2.50%	1.00%	2.00%	6.60%	-4.30	83.20
France	2560	0.30%	1.55%	1.00%	2.50%	9.70%	-7.10	81.70
United Kingdom	2246	-0.20%	0.80%	0.50%	4.20%	8.40%	-10.30	80.00
Brazil	2088	0.00%	2.10%	10.50%	6.50%	4.70%	2.20	66.10
Italy	2051	-0.20%	0.20%	1.00%	3.20%	8.90%	-4.60	119.00
India	1729	6.90%	6.90%	7.50%	6.49%	9.40%	-5.10	69.20
Canada	1574	0.90%	2.40%	1.00%	2.30%	7.60%	-2.10	84.00
Russia	1480	0.40%	4.80%	8.00%	4.20%	6.30%	-3.90	9.90
Spain	1407	-0.30%	0.30%	1.00%	2.40%	22.85%	-9.30	60.10
Mexico	1040	1.30%	4.50%	4.50%	3.82%	5.04%	-2.30	42.70
South Korea	1014	0.40%	3.40%	3.25%	3.40%	3.10%	-1.10	30.86
Australia	925	1.00%	2.10%	4.25%	3.10%	5.20%	-4.30	22.30
Netherlands	783	-0.20%	1.10%	1.00%	2.40%	5.80%	-5.10	63.70
Turkey	735	1.70%	8.20%	5.75%	10.61%	9.40%	-3.60	41.70
Indonesia	707	-1.30%	6.50%	6.00%	3.65%	6.56%	-0.62	26.90
Switzerland	524	0.20%	1.30%	0.00%	-0.70%	3.40%	-1.30	55.00
Poland	469	1.00%	4.20%	4.50%	4.60%	12.10%	-7.80	55.00
Belgium	467	-0.20%	0.90%	1.00%	3.20%	7.20%	-4.10	96.80
Sweden	458	1.60%	4.60%	1.75%	2.30%	7.50%	0.20	39.80
Taiwan	431	-0.98%	1.90%	1.88%	2.40%	4.18%	-3.20	39.70
Norway	414	1.40%	3.80%	1.75%	0.20%	3.40%	10.60	44.70
Venezuela	388	0.00%	4.20%	15.55%	26.00%	6.50%	-4.02	38.70

Slide 42

The Spanish economy : February 2012   Source: INE

A year ago

I   **42**

Slide 43
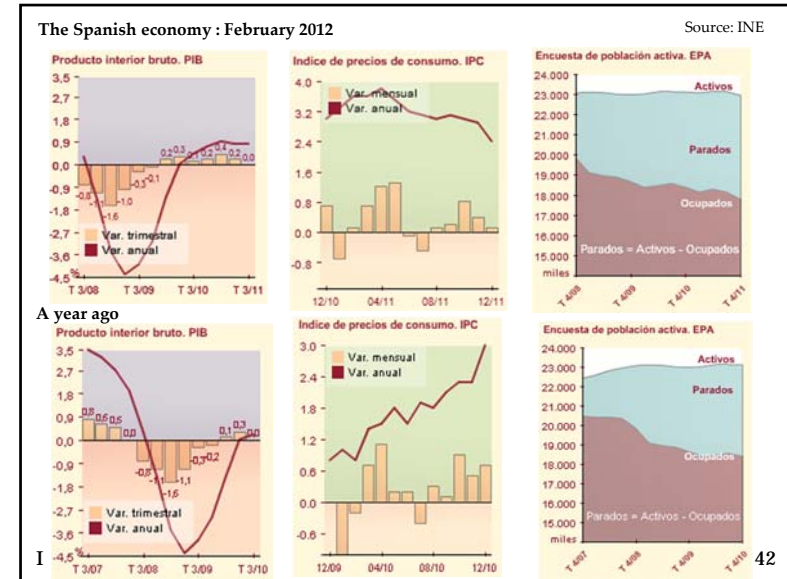
1st fundamental accounting identity

- With all variables being <u>real</u>, the <u>fundamental national income accounting identity</u> states that

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

ex-post supply of output   ex-post demand for output

C = consumption spending by households
I = investment spending by firms and households
G = government purchases of goods
NX = net exports of goods = exports – imports
                                          EX IM

I   **43**

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2nd fund. accounting identity/v1

- T = taxes paid by households and firms
- TR = transfers paid to households and firms
- S = private saving (saving by households & firms)
- $C + S \equiv Y_D$ (disposable income) $\equiv Y + TR - T$
- By adding $TR - T$ to each side of $Y \equiv C + I + G + NX$ and rearranging, the following identity obtains:

$$I \equiv S + (T - TR - G) + (IM - EX).$$

investment   private saving   government saving   foreign saving

I   **44**

2nd fund. accounting identity/v2

- The identity says that <u>domestic investment must be financed by private saving, public saving, or foreign saving</u>. It can also be expressed as follows:

$$\underbrace{(S-I)}_{\text{net private saving}} \equiv \underbrace{(G+TR-T)}_{\substack{\text{government} \\ \text{budget =}}} + \underbrace{NX}_{\substack{\text{trade} \\ \text{balance} \\ \text{or} \\ \text{net} \\ \text{exports}}} .$$

budget surplus if $T > G + TR$

budget deficit if $T < G + TR$

government budget = spending – receipts (can also be defined the other way round)

lending capacity

= trade surplus if $NX > 0$

trade deficit if $NX < 0$

financial need

Where do savings go?

- The identity can also be formulated as

$$S \equiv I + (G+TR-T) + NX .$$

- This says that there are three ways of disposing of the savings of an economy.

- Savings can go to firms to finance investment…

- … to the government to finance a budget deficit…

- … or to foreigners, when they buy more from the economy than the economy buys from them.

Twin deficits: twice the fun

- If investment equals savings, so $I = S$, the 2nd identity (version 2) implies that the government budget deficit equals the trade balance.

- This means that <u>if the government runs a budget deficit, then it must be financed by foreigners</u>: if $I = S$, then $G + TR - T > 0$ implies $NX < 0$.

- In sum, the government spends more without having to increase taxes and the rest of members of the economy buy from abroad more goods than they sell; see the US case during the 80s and 90s.

Twin deficits: the US case (% of GDP)

Net Borrowing (-) of general government
Net imports (-) of goods and services
Source: Wikipedia

Twin deficits: the Spanish case

Government net lending/borrowing (% GDP)

Current account balance (% GDP)

Source: IMF

I   49

From expenditure to GDP

- According to national income accounting, GDP equals expenditure, income, and value added.

- The expenditure approach to measure GDP splits GDP into four components *(C, I, G,* and *NX)* according to the identity of the purchaser (or according to the purpose of the expenditure).

- The expenditure approach leads to the identity $Y \equiv C + I + G + NX$: everything that is produced is purchased by consumers to be consumed, by firms to be invested, by the government, or by foreigners. Hence, production ≡ expenditure.

I   50

GDP, Spain, expenditure approach

	2011Q1 2010Q1	2011Q2 2010Q2	2011Q3 2010Q3
C	162.8 153.3	153.8 156	151.4 156.5 58.8% 61.1
I	58.8 65.3	64.4 62.9	55.3 51.8 21.4% 20.2
G	47.4 46.2	57.5 58.4	48 48.7 18.6% 19
EX	75.7 62.3	81.4 70.1	83.4 72.5 32.4% 28.3
IM	82.9 70	82.3 76.2	80.8 73.6 −31.3% −28.7
GDP	261.9 257.3	275.2 271.5	257.4 255.9 100%

Source: INE http://www.ine.es/daco/daco42/daco4214/tabcntr.xls   billions of €

I   51

From income to GDP

- The income approach to measure GDP obtains GDP as the sum of the payments made to all the factors of production (inputs).

- Inputs are aggregated into two categories: labour (workers) and capital (firms). The government is a third category, because it collects taxes.

- The income approach leads to the identity $Y \equiv$ wages + profits + taxes: everything that is produced becomes the income of workers (wages), of firms (profits), or of the government (taxes). Summing up, production ≡ income.

I   52

GDP, Spain, income approach

	2011Q1$_{2010Q1}$	2011Q2$_{2010Q2}$	2011Q3$_{2010Q3}$	
wages	119.3$_{119.7}$	130.1$_{132.3}$	118.9$_{121.3}$	(46.1%)
profits	115.8$_{109.8}$	122.6$_{118.2}$	114.9$_{110}$	(44.6%)
taxes	26.6$_{27.7}$	22.4$_{20.9}$	23.5$_{24.6}$	(9.1%)
GDP	261.9$_{257.3}$	275.2$_{271.5}$	257.4$_{255.9}$	(100%)

Source: INE http://www.ine.es/daco/daco42/daco4214/tabcntr.xls   billions of €

I

53

From value added to GDP

- The value added approach to measure GDP views GDP as the sum of the value that each producer adds to the production purchased by the producer.

- If the reprographic industry buys paper worth 100 and energy worth 200 to make copies worth 600, then the added value of the industry is 600 – 200 – 100 = 300. If that value were 600, the production of paper and energy would be counted twice.

- Value added = value of the final (new) goods produced – value of the intermediate goods. In this case, production ≡ total value added.

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GDP, Spain, value added approach

	2011Q1	2011Q2	2011Q3	
Agriculture &c.	5.6	7.9	4.9	(1.9%)
Industry	45.9	40.8	38	(14.7%)
(Manufactures)	(35.3)	(32.9)	(30.5)	(11.8%)
Construction	25.9	28.4	30	(11.6%)
Services	159.9	177.6	163.5	(63.5%)
Taxes	24.5	20.3	20.8	(8.08%)
GDP	261.9	275.2	257.4	(100%)

I Source: INE http://www.ine.es/daco/daco42/daco4214/tabcntr.xls   billions of € 55

A stockpile of definitions

- Government budget: $GB = T – TR – G$.
- A budget surplus occurs when $GB > 0$.
- A budget deficit occurs when $GB < 0$.

- Trade balance: $NX = EX – IM$.
- A trade surplus occurs when $NX > 0$.
- A trade deficit occurs when $NX < 0$.

- Domestic demand for GDP = $C + I + G$
- Net foreign demand for GDP = $NX = EX – IM$
- Disposable income = $Y + TR – T$ (which must equal $C + S$)

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