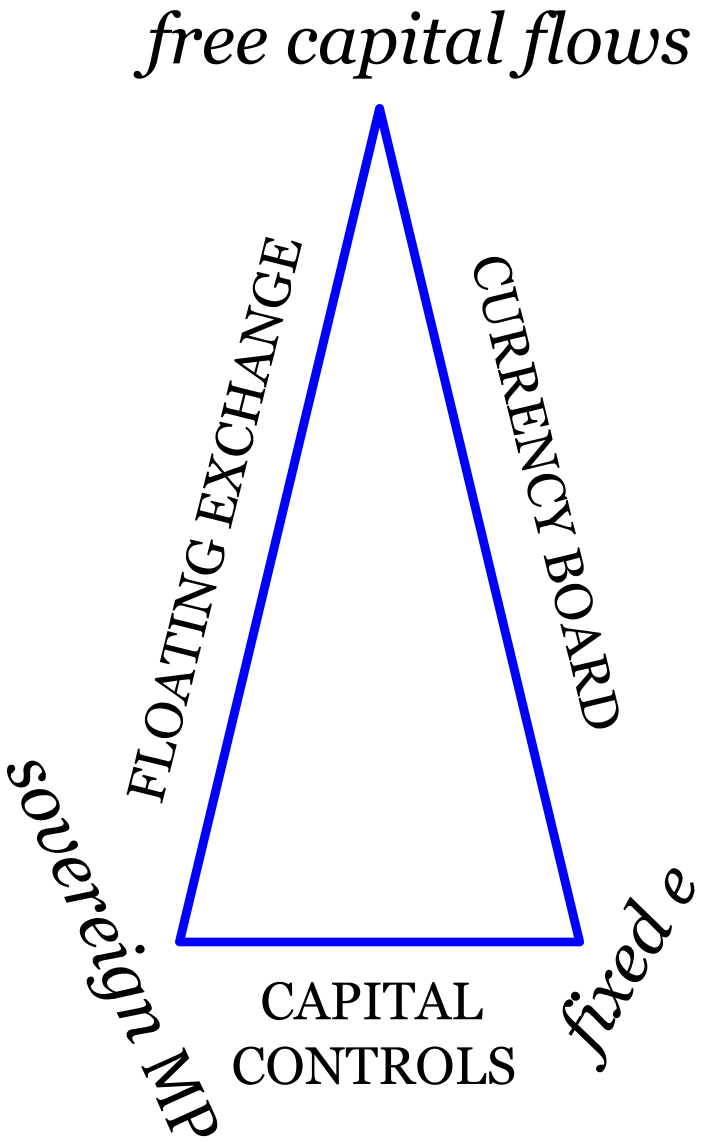
Today's menu

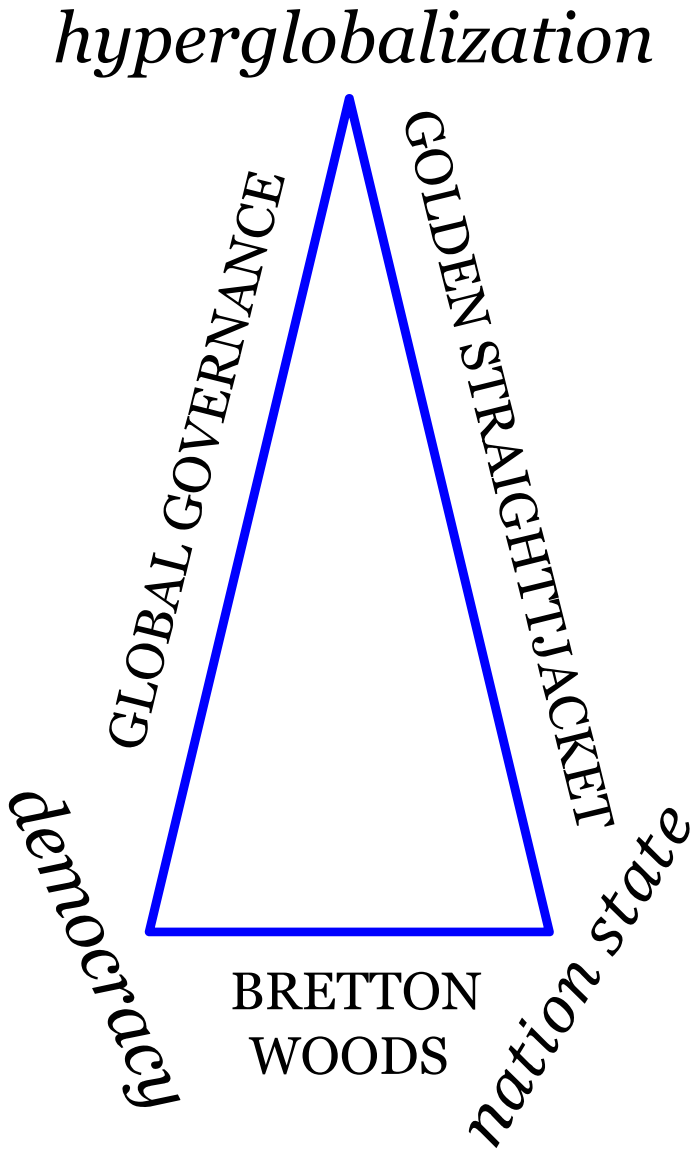
- Real exchange rate | competitiveness
- Absolute purchasing power parity | commercial arbitrage | Big Mac index
- Relative purchasing power parity
- Uncovered interest rate parity
- Unemployment rate
- Okun's law | Phillips curve

1. Trilemmas

- Impossible trinity: you can only have two of
  - fixed exchange rate
  - independent monetary policy
  - unrestricted international mobility of capital

- Rodrik's trilemma: you can only have two of
  - domestic democracy
  - independent domestic policy (sovereign state)
  - hyperglobalization


free capital flows
FLOATING EXCHANGE
CURRENCY BOARD
sovereign MP
fixed e
CAPITAL
CONTROLS


hyperglobalization
GLOBAL GOVERNANCE
GOLDEN STRAIGHTJACKET
hyperdemocracy
nation state
BRETTON
WOODS

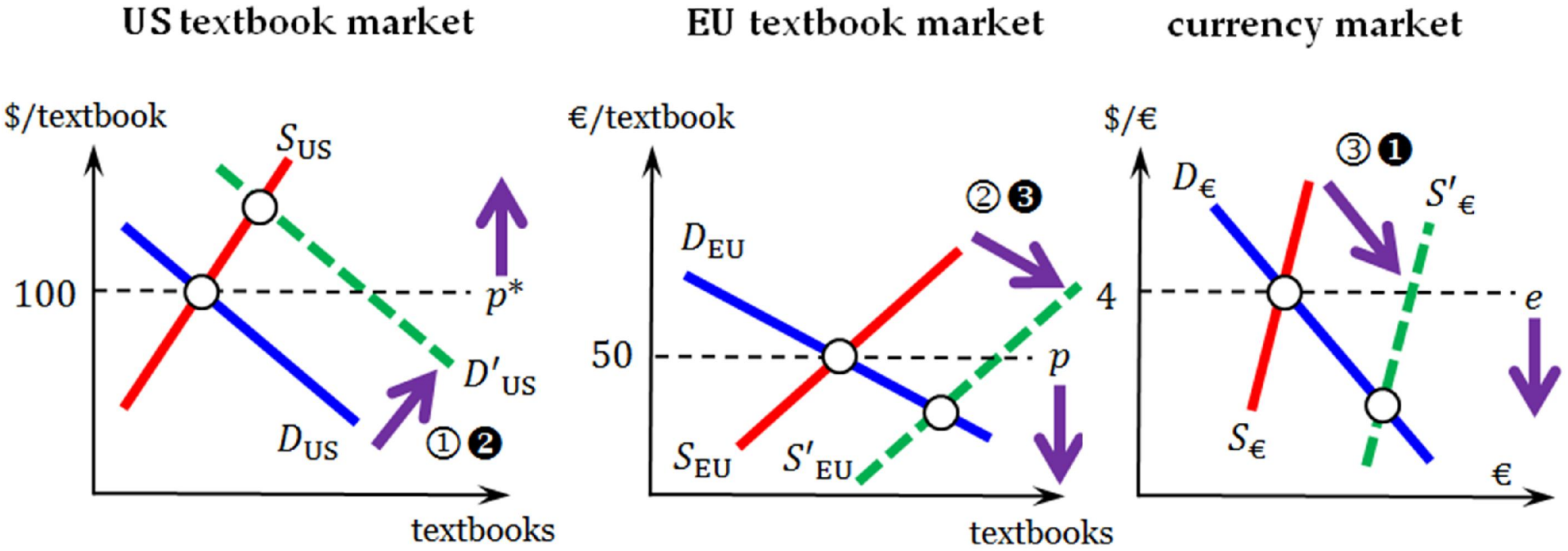
2. Real exchange rate

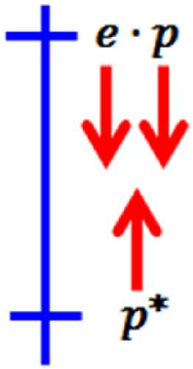
- Defined as $e_r = e \cdot \frac{P}{P^*}$
- Competitiveness / real appreciation & depreciation
- Purchasing power parity exchange rate

$$e_{\text{PPP}} = \frac{P^*}{P}$$

- Commerical arbitrage and PPP
- The Big Mac index

Commercial arbitrage





①=Americans buy textbooks in US ②= sell them in EU ③= and convert € in to $

❶=Europeans convert € into $ ❷= buy textbooks in US ❸= and sell them in EU

US = home economy	P^* = BM home price	BM price in \$ = P^*/e	PPP of \$ = P^*/P	market e on 22 Jan 2014	Over (+) under (–) valuation against the \$
US	P = 4.62	–	–	–	–
Brazil	12.4 R\$	5.25	2.68	2.36	13.48
UK	2.79 £	4.63	1.66 \$/£	1.66 \$/£	0.06
China	16.6 ¥	2.74 \$	3.59 ¥/\$	6.05 ¥/\$	–40.68
Eurozone	3.65 €	4.96	1.26 \$/€	1.35 \$/€	7.3
India	95 ₹	1.54	20.54	61.85	–66.78
Russia	89 *руб*	2.62	19.25	33.94	–43.29
Sweden	40.7 kr	6.29	8.8	6.47	35.97
Venezuela	45 Bs.F.	7.15	9.73	6.29	54.66

http://bigmacindex.org/

US = home economy	P^* = BM home price	BM price in \$ = P^*/e	PPP of \$ = P^*/P	market e on 22 Jan 2015	Over (+) under (–) valuation against the \$
US	P = 4.79	–	–	–	–
Brazil	13.5 R$	5.21	2.82	2.59	8.70
UK	2.79 £	4.63	1.66 \$/£	1.66 \$/£	0.06
China	17.2 ¥	2.77 \$	3.59 ¥/\$	6.21 ¥/\$	–42.19
Eurozone	3.68 €	4.26	0.77 \$/€	0.86 \$/€	–10.98
India	116.25 ₹	1.89	24.27	61.62	–60.61
Russia	89 *руб*	1.36	18.58	65.23	–71.51
Sweden	40.7 kr	4.97	8.50	8.19	3.73
Switzerland	6.5 CHF	7.54	1.36	0.86	57.49
Venezuela	132 Bs.F.	2.53	27.56	52.10	–47.119

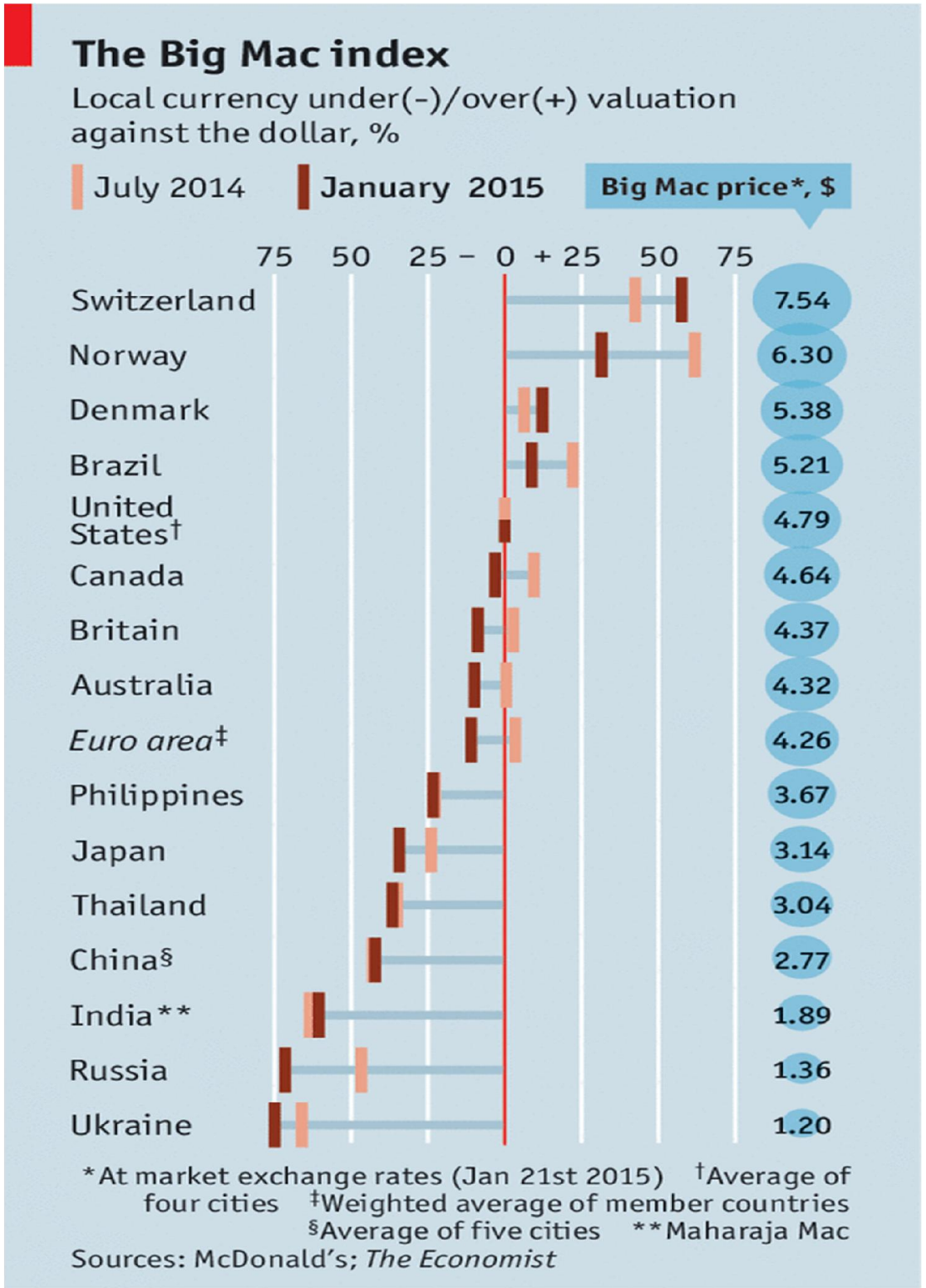
Big MacCurrencies

Hamburger prices round the world

Country	Price* in local currency	Implied† purchasing power parity of the dollar	Actual exchange rate Sept 1st	% over (+) or under (−) valuation of US$
Australia	A$1.75	1.09	1.64	+50
Belgium	BFr90	56	42	−25
Brazil	Cz$2.5	7.80	13.80	+78
Britain	£1.10	0.69	0.67	−3
Canada	C$1.89	1.18	1.39	+18
France	FFr16.4	10.30	6.65	−35
Hongkong	HK$7.60	4.75	7.80	+64
Ireland	IR£1.18	0.74	0.74	−1
Japan	Y370	231	154	−33
Holland	Fl4.35	2.72	2.28	−16
Singapore	S$2.80	1.75	2.15	+23
Spain	Ptas260	163	133	−18
Sweden	SKr16.5	10.30	6.87	−33
United States	$1.60	—	—	—
W Germany	DM4.25	2.66	2.02	−24

$$e_{PPP} = \frac{p^*}{p} = \frac{1.60\ \text{USD/BM}}{260\ \text{Pts/BM}} = 162.5\ \frac{\text{Pts}}{\text{USD}}$$

$$\%\ overvaluation = \frac{e - e_{PPP}}{e_{PPP}} \cdot 100 = \frac{133 - 162.5}{162.5} \cdot 100 = -18.15\%.$$


The Big Mac index
Local currency under(-)/over(+) valuation against the dollar, %
July 2014
January 2015
Big Mac price*, $
75
50
25
–
0
+
25
50
75
Switzerland 7.54
Norway 6.30
Denmark 5.38
Brazil 5.21
United States† 4.79
Canada 4.64
Britain 4.37
Australia 4.32
Euro area‡ 4.26
Philippines 3.67
Japan 3.14
Thailand 3.04
China§ 2.77
India** 1.89
Russia 1.36
Ukraine 1.20
*At market exchange rates (Jan 21st 2015) †Average of four cities ‡Weighted average of member countries §Average of five cities **Maharaja Mac
Sources: McDonald's; The Economist

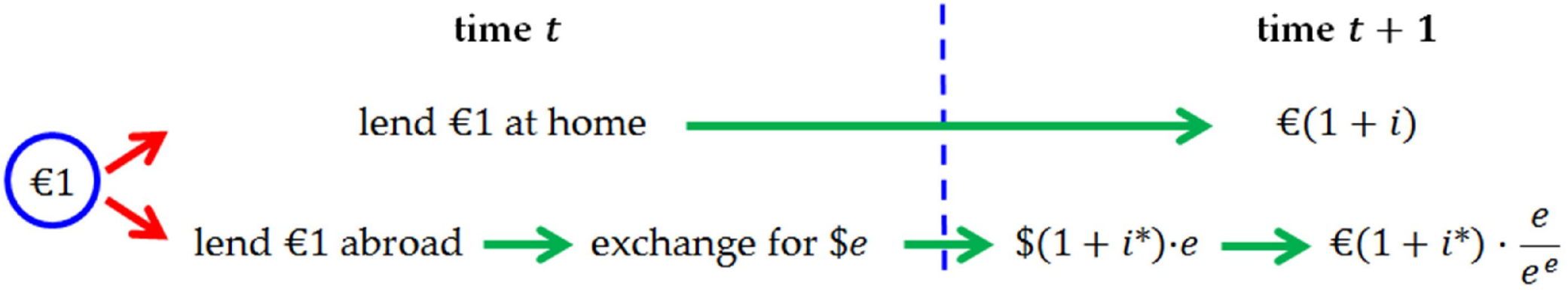
3. More parities

- Relative purchasing power parity (PPP ⇒ relative PPP)

$$\hat{e} \approx \pi^* - \pi$$

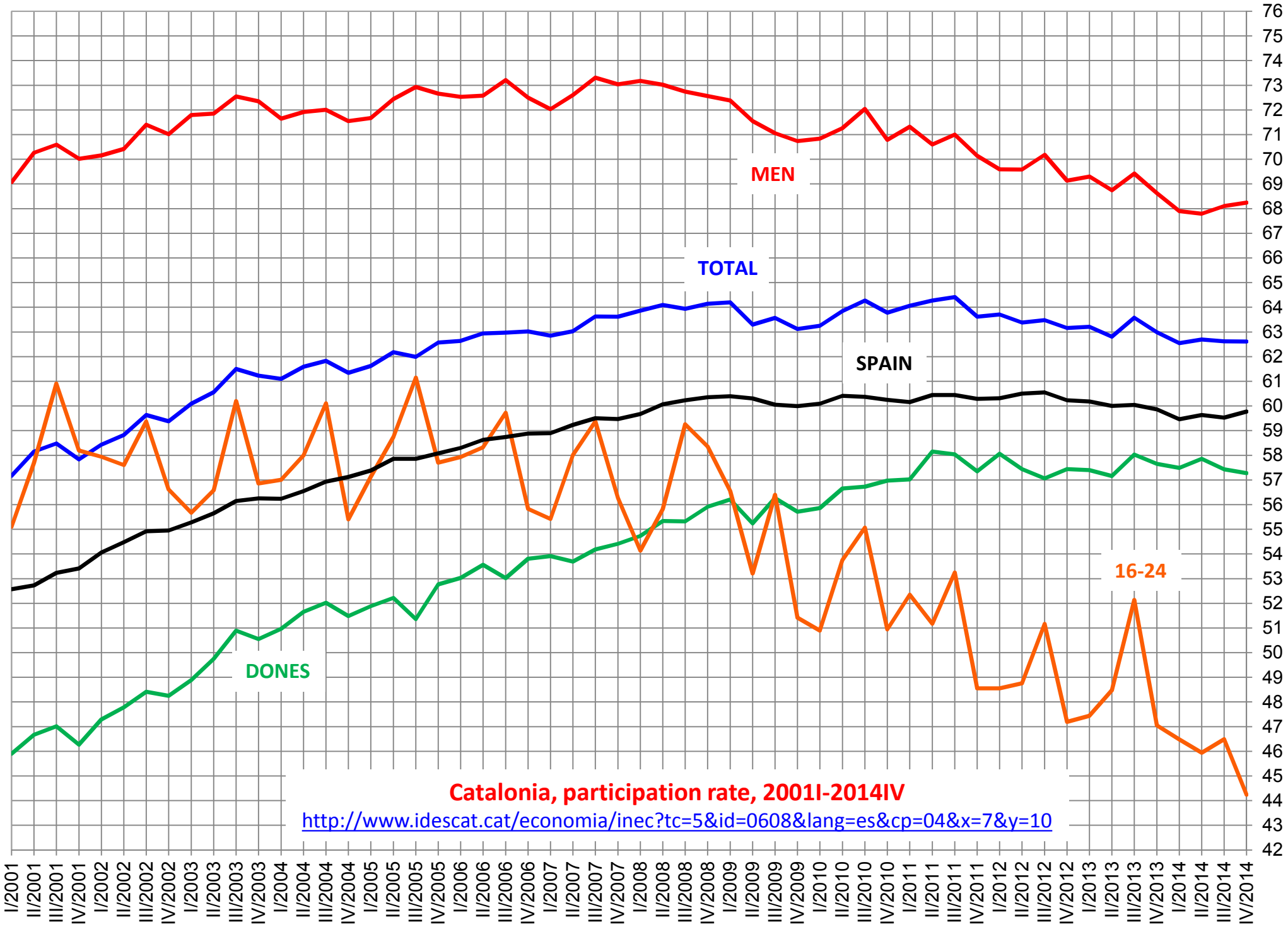
- Uncovered interest rate parity

$$\hat{e}^e \approx i^* - i$$



4. Unemployment rate

- Important rates in an economy: interest rate, exchange rate, inflation rate, and 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
- $\text{Unemployment rate} = \dfrac{\text{Unemployment}}{\text{Labour force}}$
- $\text{Participation rate} = \dfrac{\text{Labour force}}{\text{Economically active population}}$

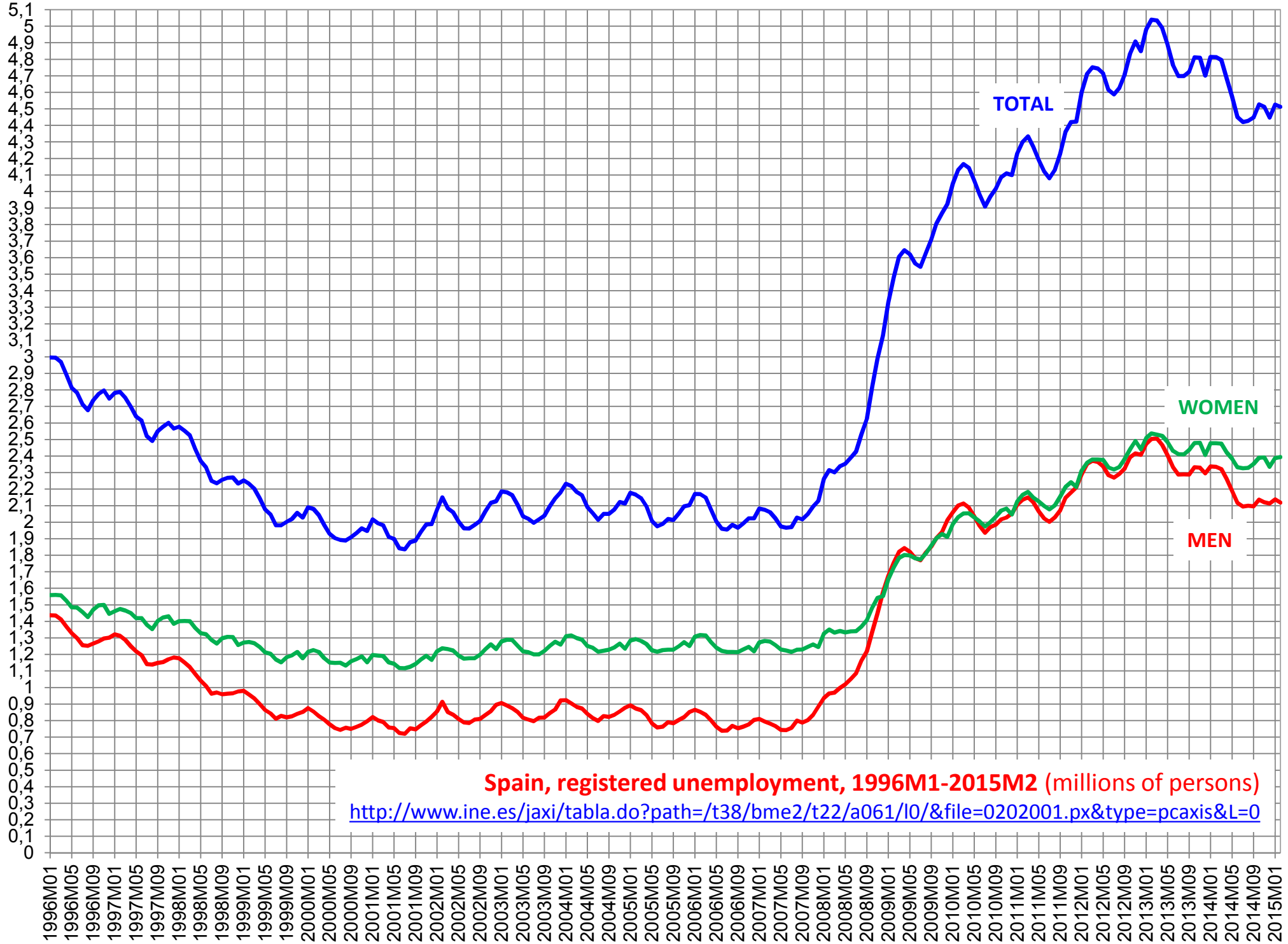


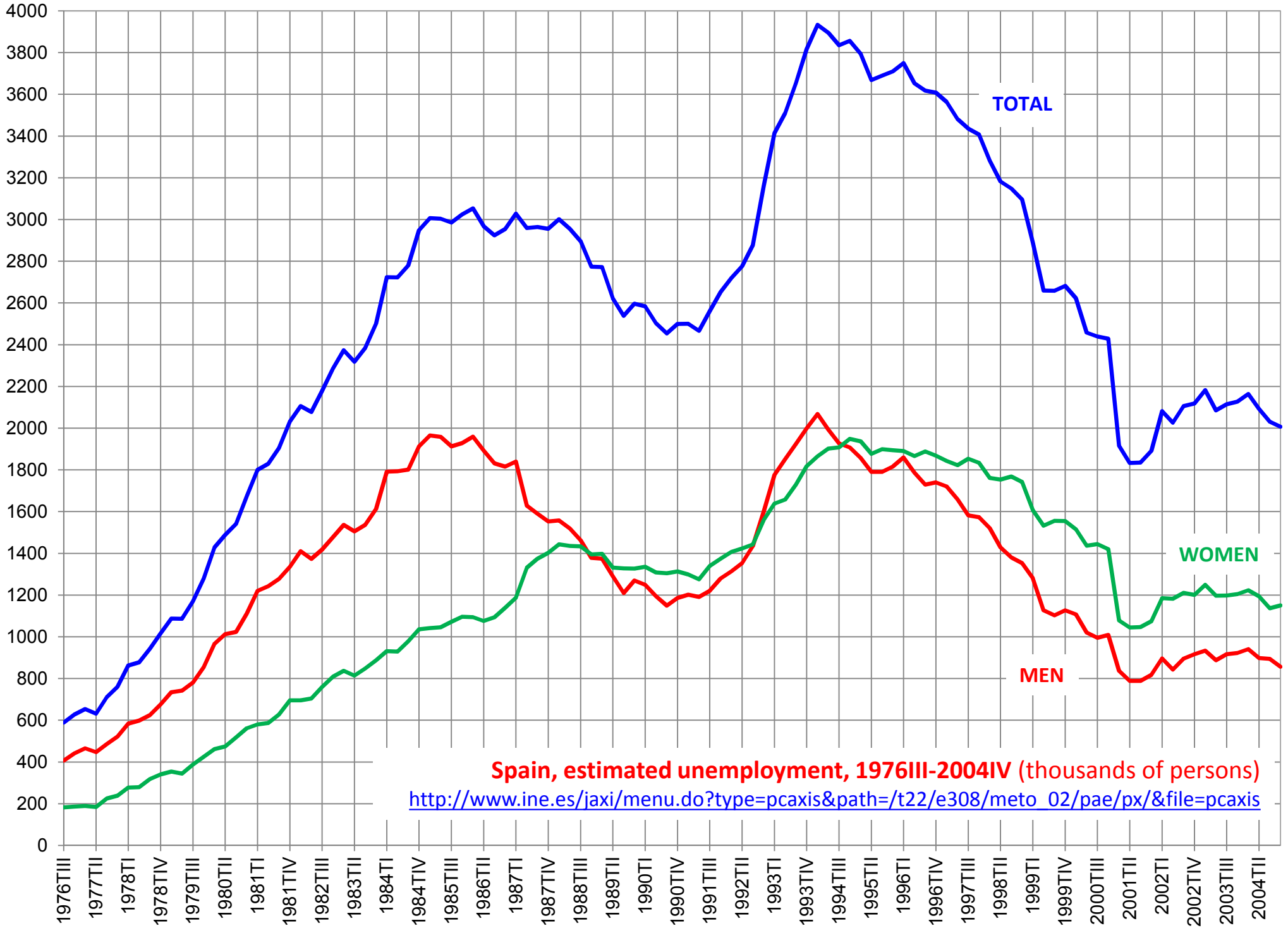
Catalonia, participation rate, 2001I-2014IV

http://www.idescat.cat/economia/inec?tc=5&id=0608&lang=es&cp=04&x=7&y=10

Basic types of unemployment

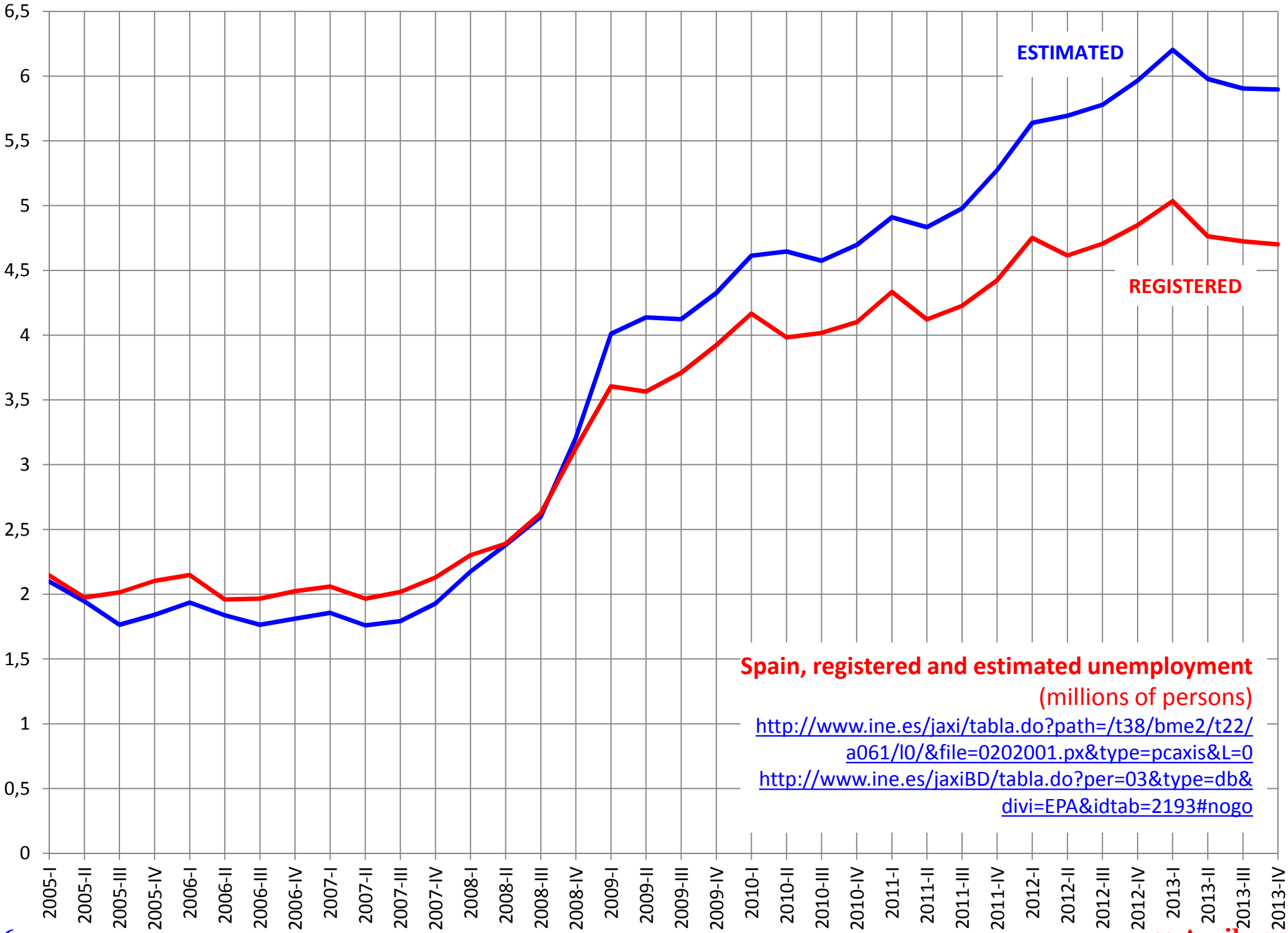
- Actual unemployment is divided into three categories (the first two define "natural unemployment").
- Frictional. Occurs while workers are changing jobs.
- Structural. Due to structural changes in the economy that create and eliminate jobs and to the institutions that match workers and firms (firing and 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).


TOTAL
WOMEN
MEN
Spain, registered unemployment, 1996M1-2015M2 (millions of persons)
http://www.ine.es/jaxi/tabla.do?path=/t38/bme2/t22/a061/l0/&file=0202001.px&type=pcaxis&L=0

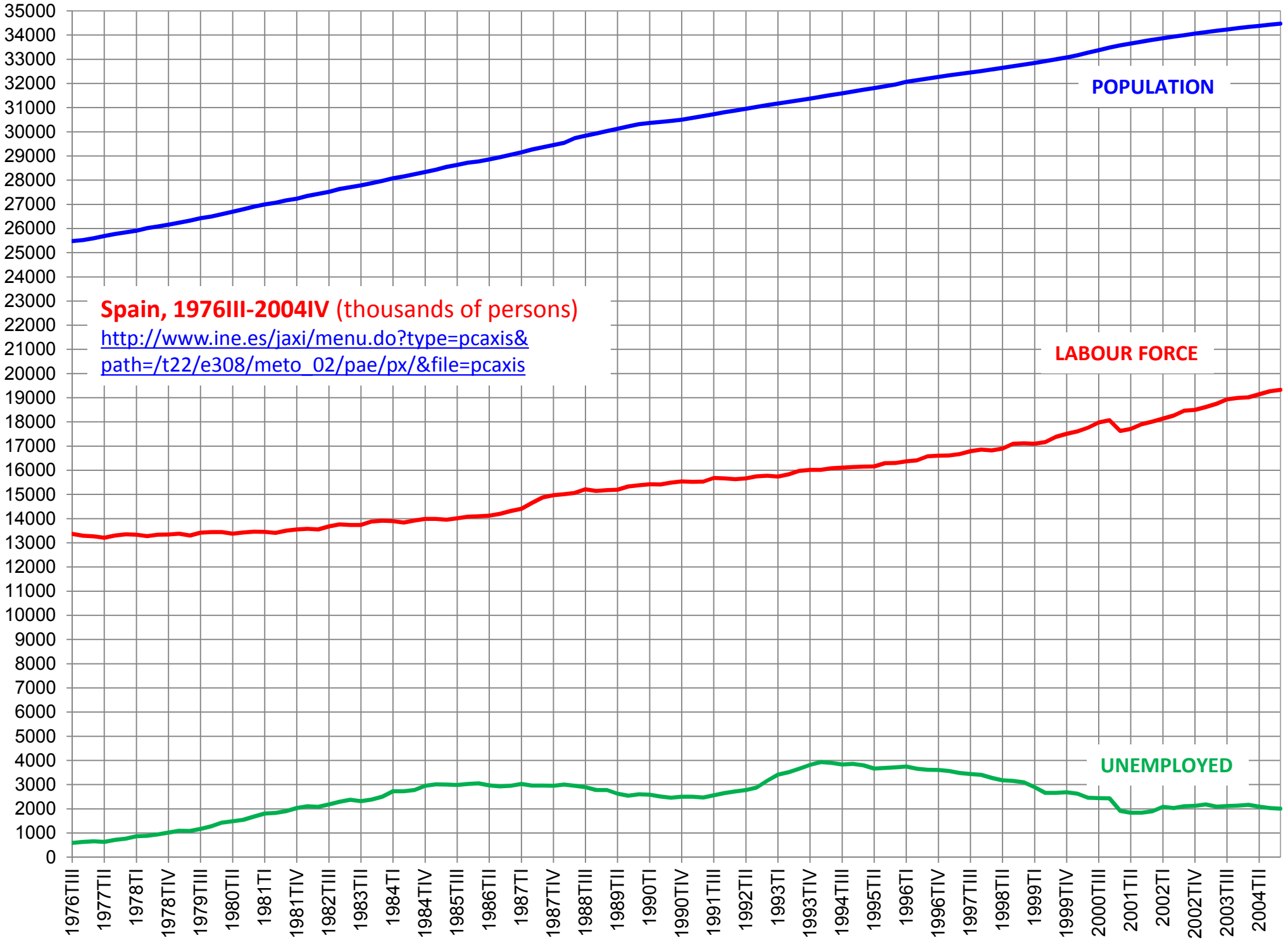


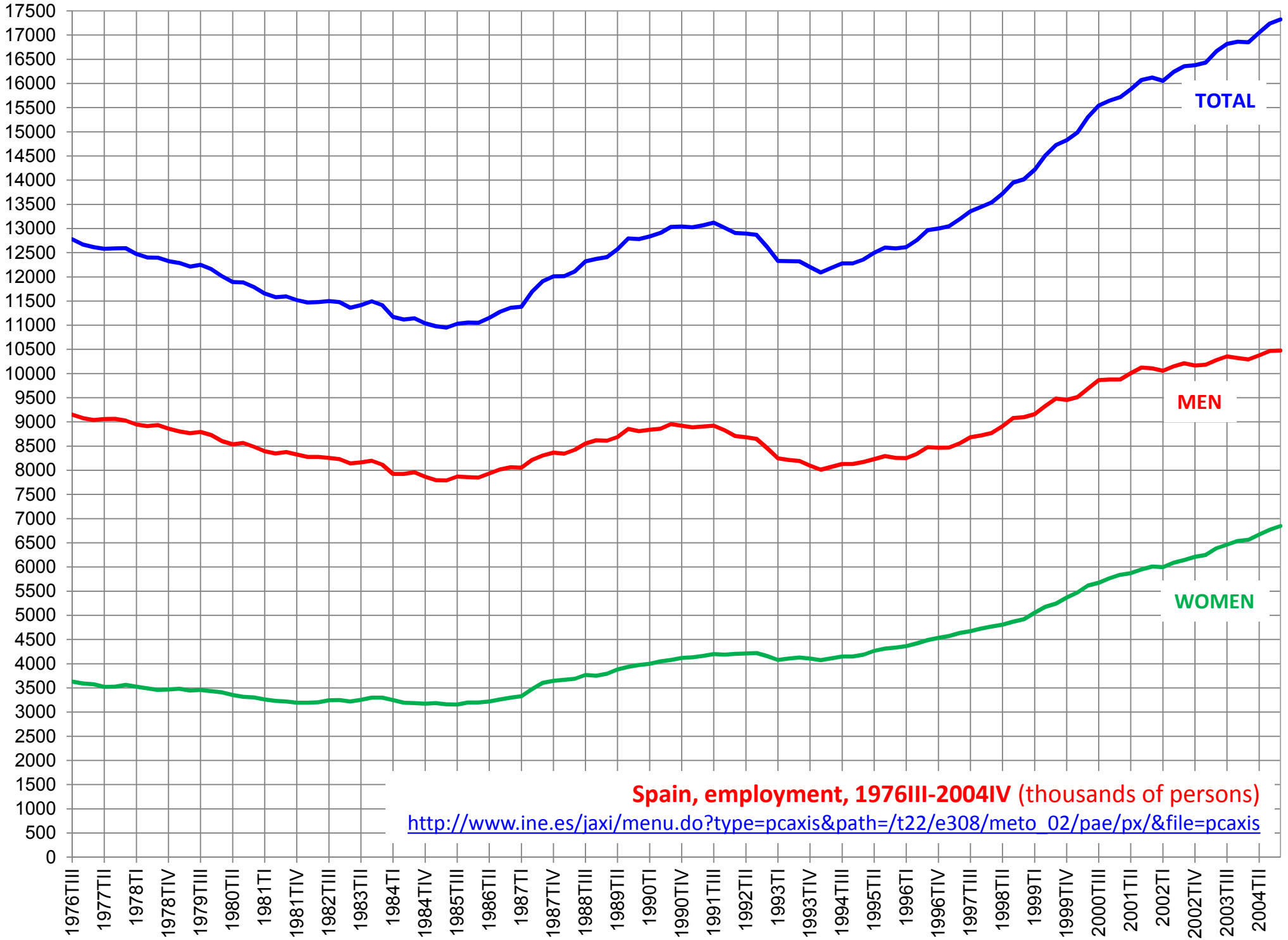
Spain, estimated unemployment, 1976III-2004IV (thousands of persons)

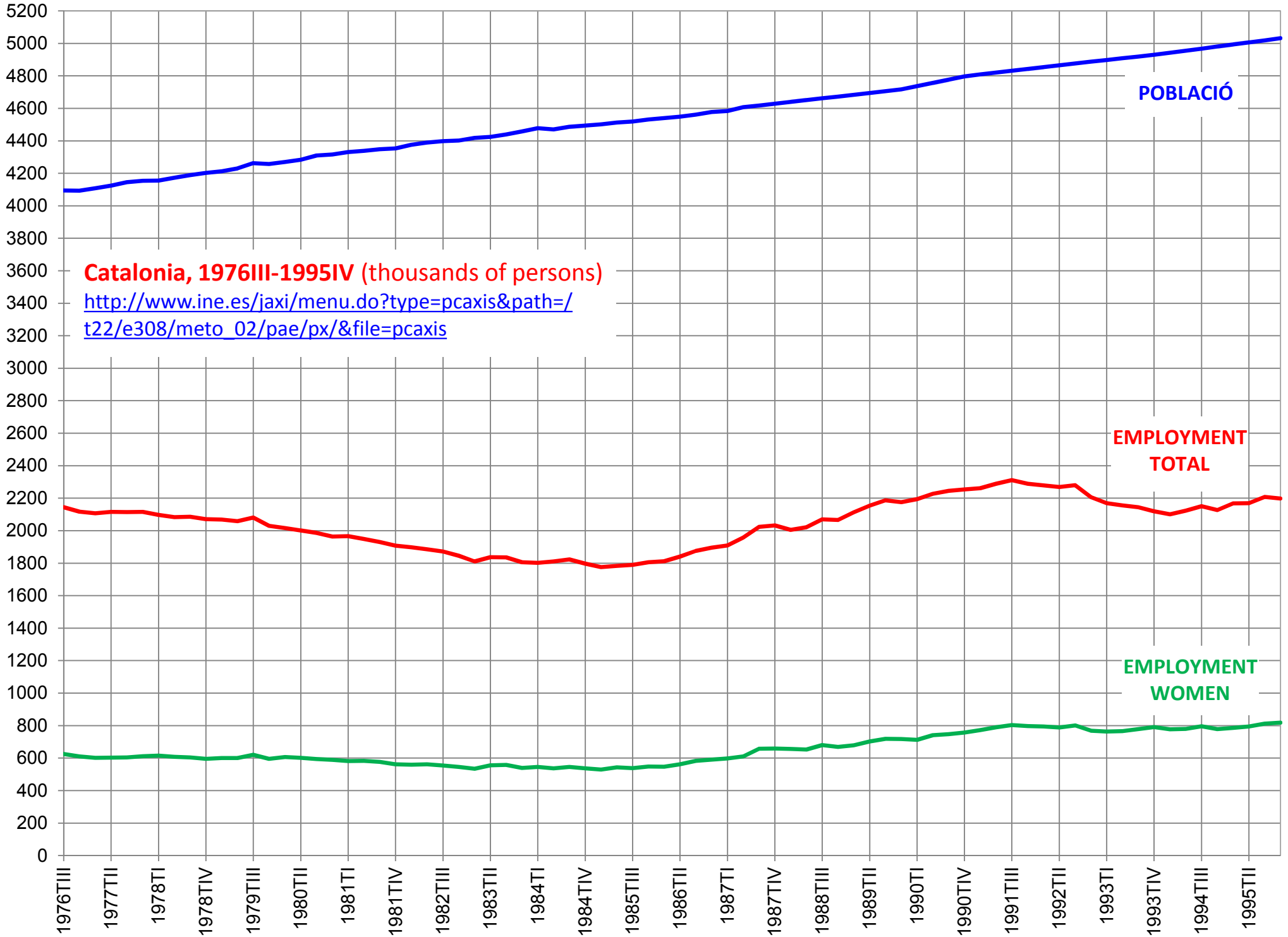
http://www.ine.es/jaxi/menu.do?type=pcaxis&path=/t22/e308/meto_02/pae/px/&file=pcaxis

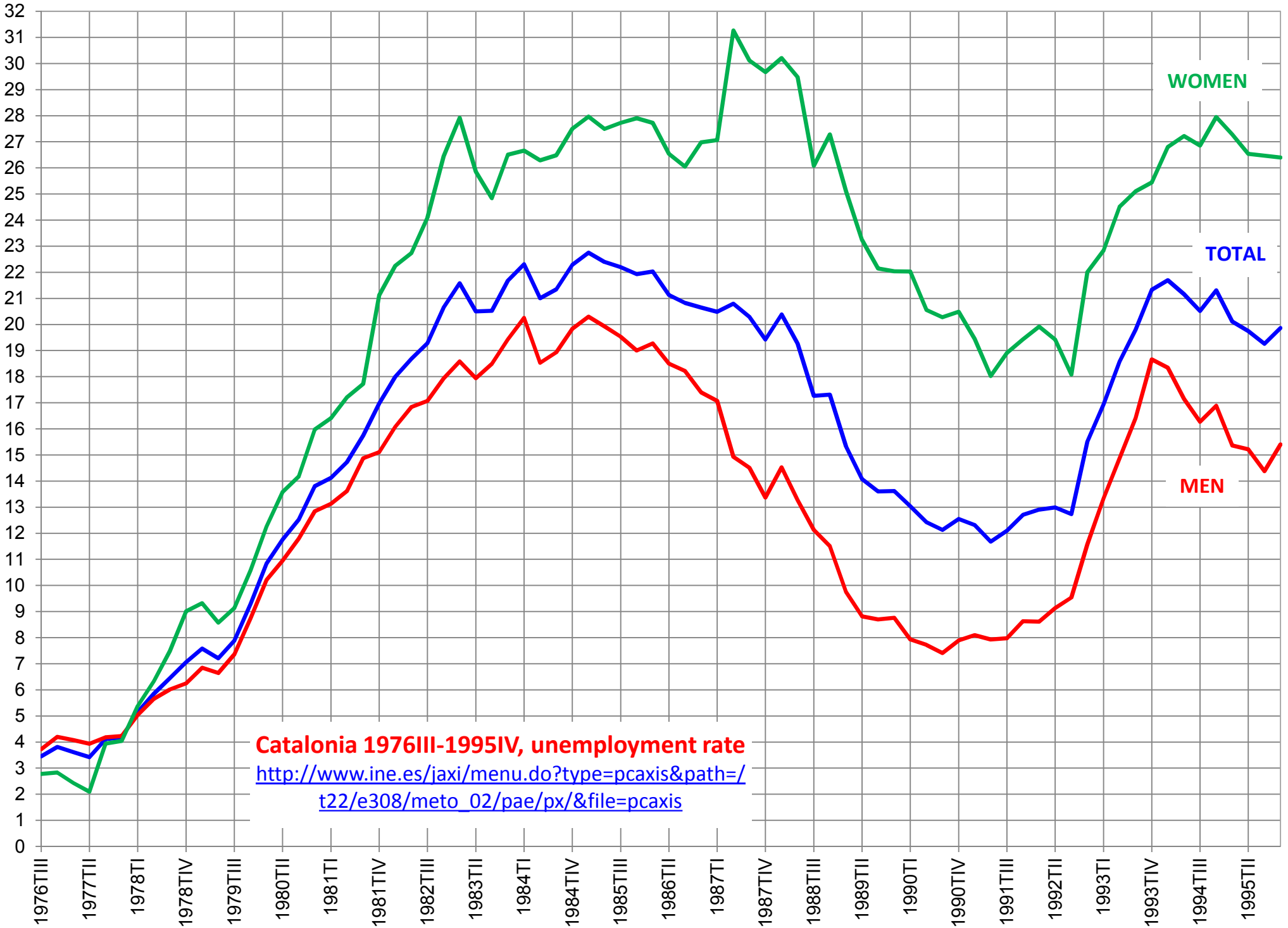


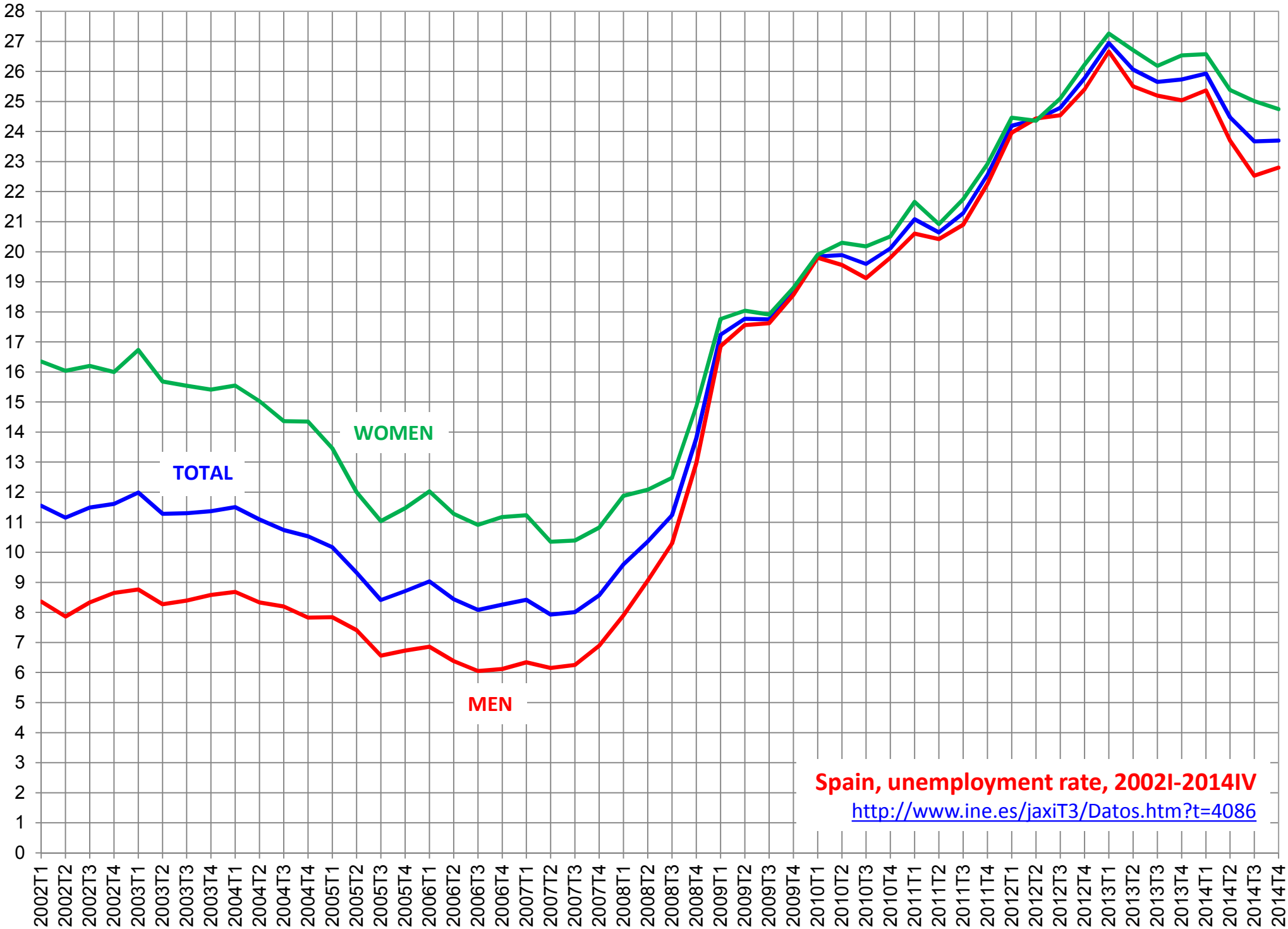
Spain, registered and estimated unemployment
(millions of persons)
http://www.ine.es/jaxi/tabla.do?path=/t38/bme2/t22/a061/l0/&file=0202001.px&type=pcaxis&L=0
http://www.ine.es/jaxiBD/tabla.do?per=03&type=db&divi=EPA&idtab=2193#nogo

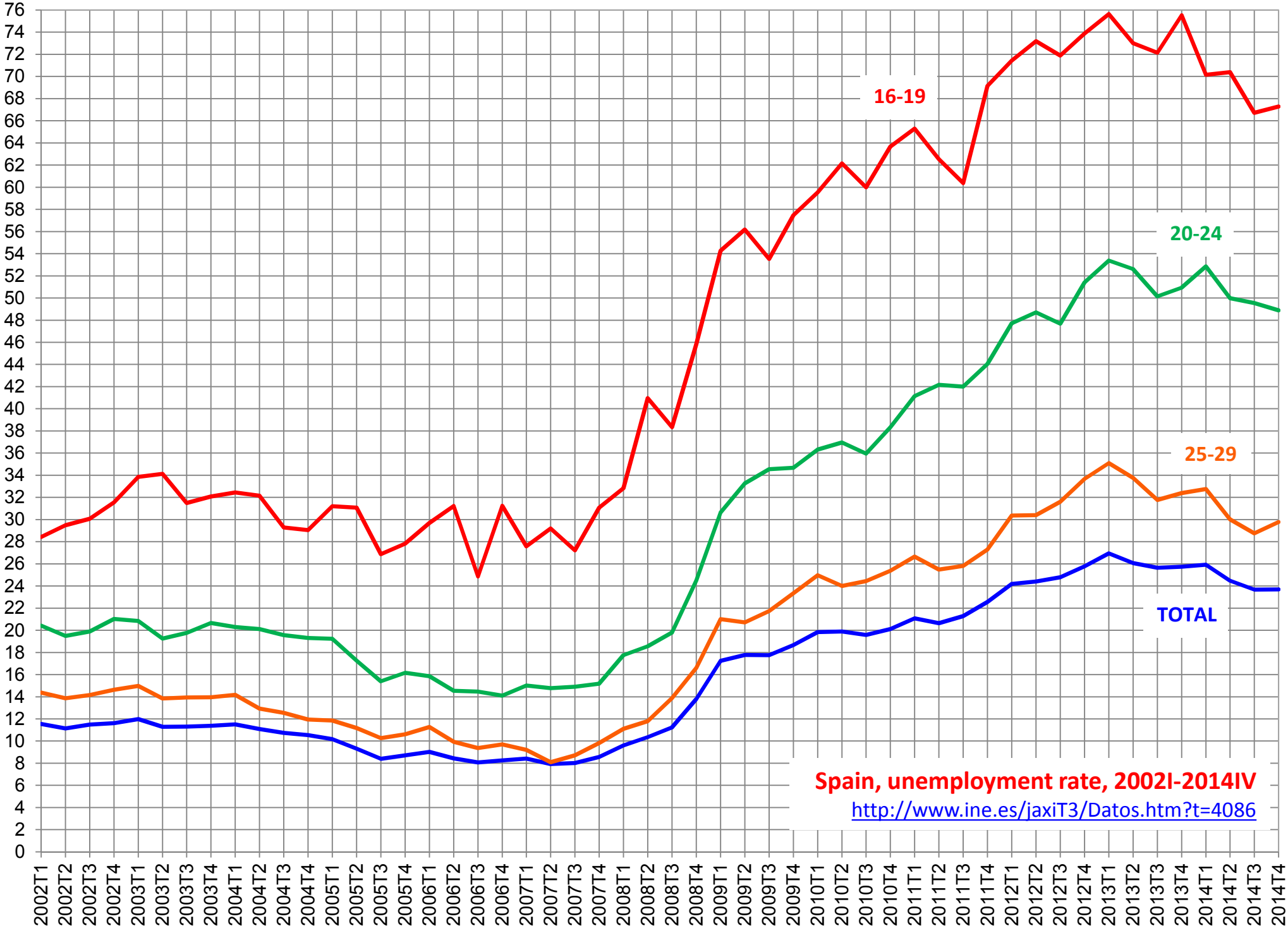

35000
34000
33000
32000
31000
30000
29000
28000
27000
26000
25000
24000
23000
22000
21000
20000
19000
18000
17000
16000
15000
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
Spain, 1976III-2004IV (thousands of persons)
http://www.ine.es/jaxi/menu.do?type=pcaxis&
path=/t22/e308/meto_02/pae/px/&file=pcaxis
POPULATION
LABOUR FORCE
UNEMPLOYED
1976TIII
1977TII
1978TI
1978TIV
1979TIII
1980TII
1981TI
1981TIV
1982TIII
1983TII
1984TI
1984TIV
1985TIII
1986TII
1987TI
1987TIV
1988TIII
1989TII
1990TI
1990TIV
1991TIII
1992TII
1993TI
1993TIV
1994TIII
1995TII
1996TI
1996TIV
1997TIII
1998TII
1999TI
1999TIV
2000TIII
2001TII
2002TI
2002TIV
2003TIII
2004TII

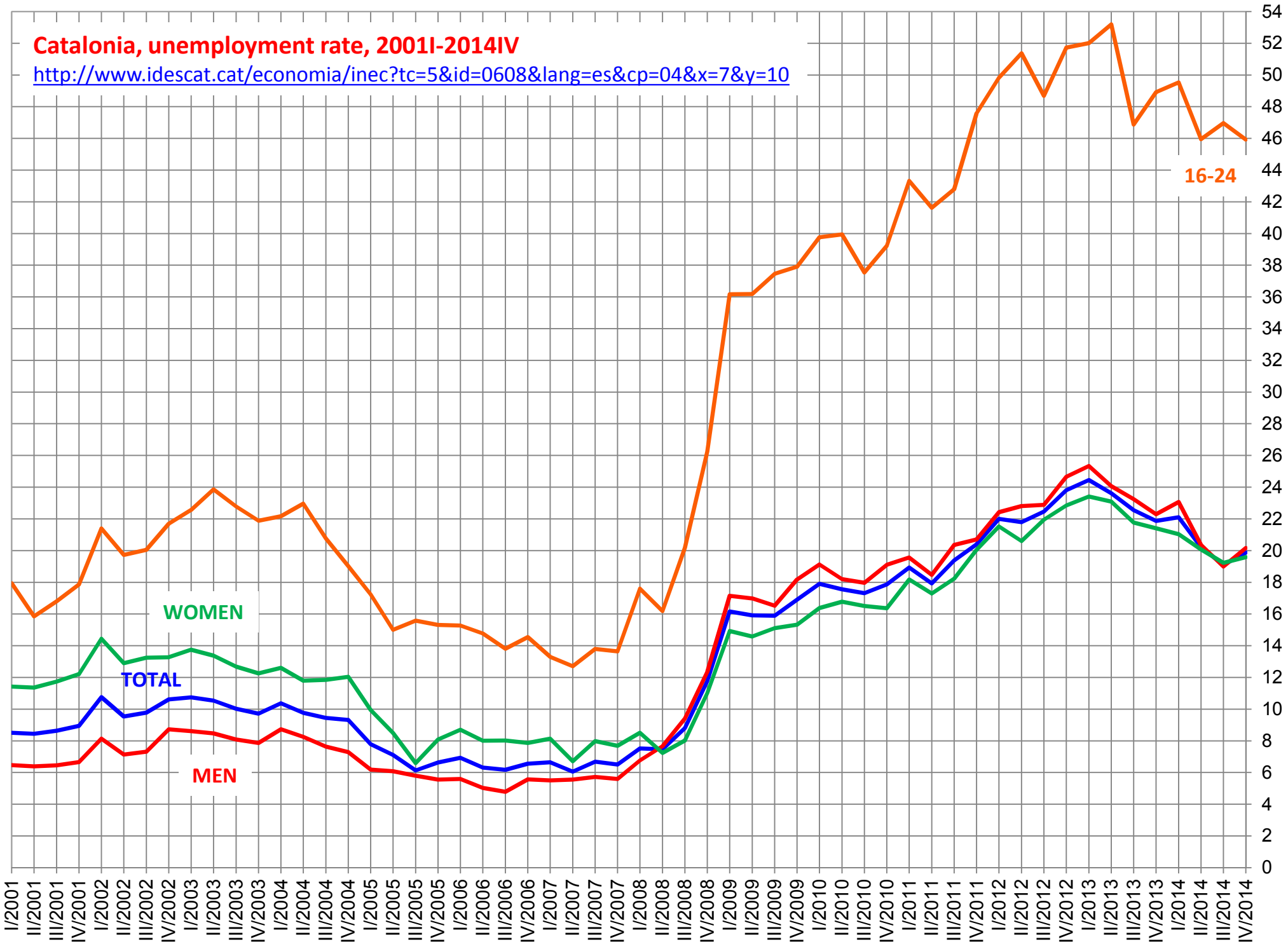

TOTAL
MEN
WOMEN
Spain, employment, 1976III-2004IV (thousands of persons)
http://www.ine.es/jaxi/menu.do?type=pcaxis&path=/t22/e308/meto_02/pae/px/&file=pcaxis


Catalonia, 1976III-1995IV (thousands of persons)
http://www.ine.es/jaxi/menu.do?type=pcaxis&path=/t22/e308/meto_02/pae/px/&file=pcaxis
POBLACIÓ
EMPLOYMENT TOTAL
EMPLOYMENT WOMEN
5200
5000
4800
4600
4400
4200
4000
3800
3600
3400
3200
3000
2800
2600
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
1976TIII
1977TII
1978TI
1978TIV
1979TIII
1980TII
1981TI
1981TIV
1982TIII
1983TII
1984TI
1984TIV
1985TIII
1986TII
1987TI
1987TIV
1988TIII
1989TII
1990TI
1990TIV
1991TIII
1992TII
1993TI
1993TIV
1994TIII
1995TII


WOMEN
TOTAL
MEN
Catalonia 1976III-1995IV, unemployment rate
http://www.ine.es/jaxi/menu.do?type=pcaxis&path=/t22/e308/meto_02/pae/px/&file=pcaxis
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
1976TIII 1977TII 1978TI 1978TIV 1979TIII 1980TII 1981TI 1981TIV 1982TIII 1983TII 1984TI 1984TIV 1985TIII 1986TII 1987TI 1987TIV 1988TIII 1989TII 1990TI 1990TIV 1991TIII 1992TII 1993TI 1993TIV 1994TIII 1995TII


WOMEN
TOTAL
MEN
Spain, unemployment rate, 2002I-2014IV
http://www.ine.es/jaxiT3/Datos.htm?t=4086


16-19
20-24
25-29
TOTAL
Spain, unemployment rate, 2002I-2014IV
http://www.ine.es/jaxiT3/Datos.htm?t=4086


Catalonia, unemployment rate, 2001I-2014IV
http://www.idescat.cat/economia/inec?tc=5&id=0608&lang=es&cp=04&x=7&y=10
16-24
WOMEN
TOTAL
MEN
54
52
50
48
46
44
42
40
38
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
I/2001
II/2001
III/2001
IV/2001
I/2002
II/2002
III/2002
IV/2002
I/2003
II/2003
III/2003
IV/2003
I/2004
II/2004
III/2004
IV/2004
I/2005
II/2005
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III/2006
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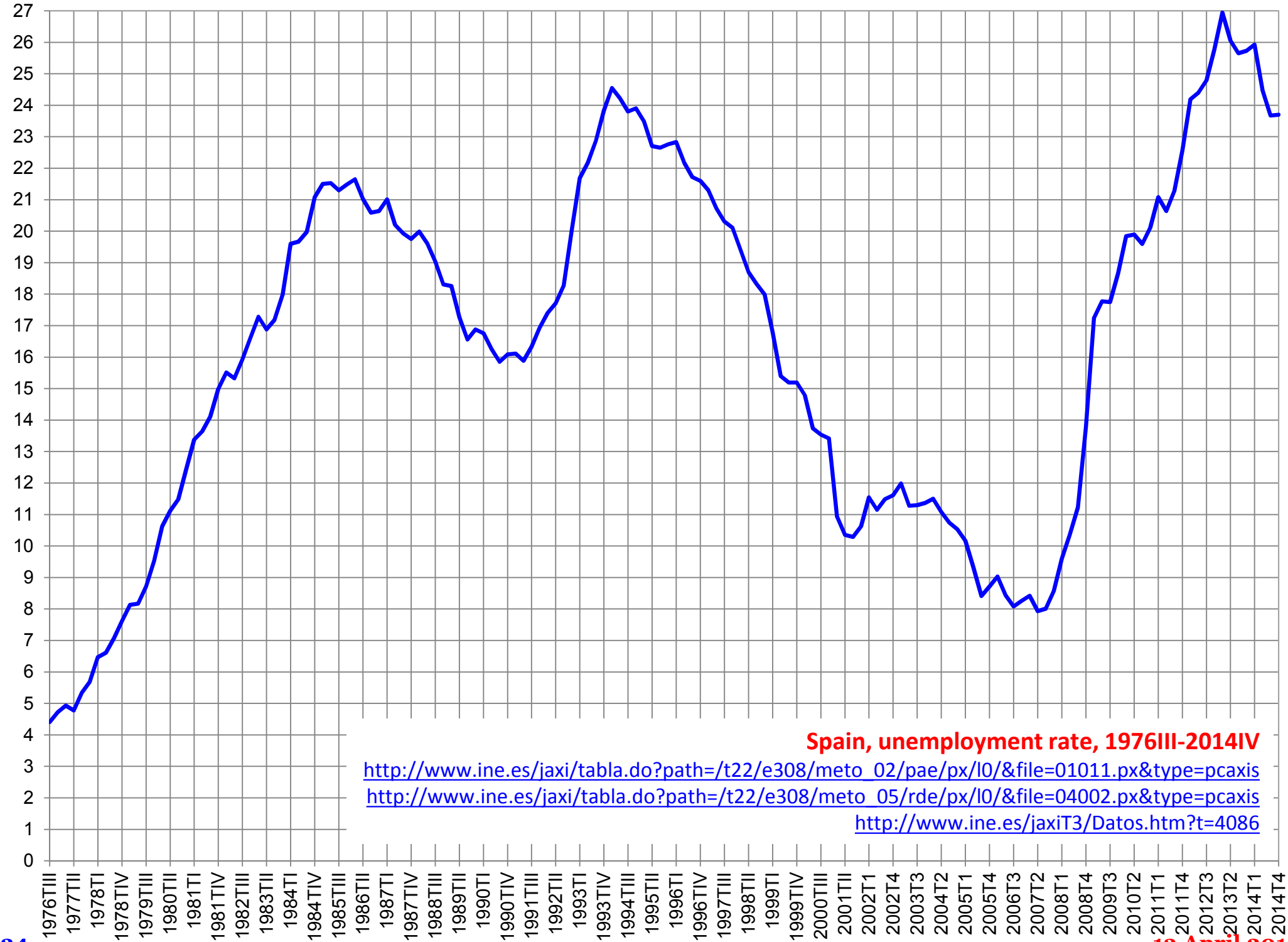
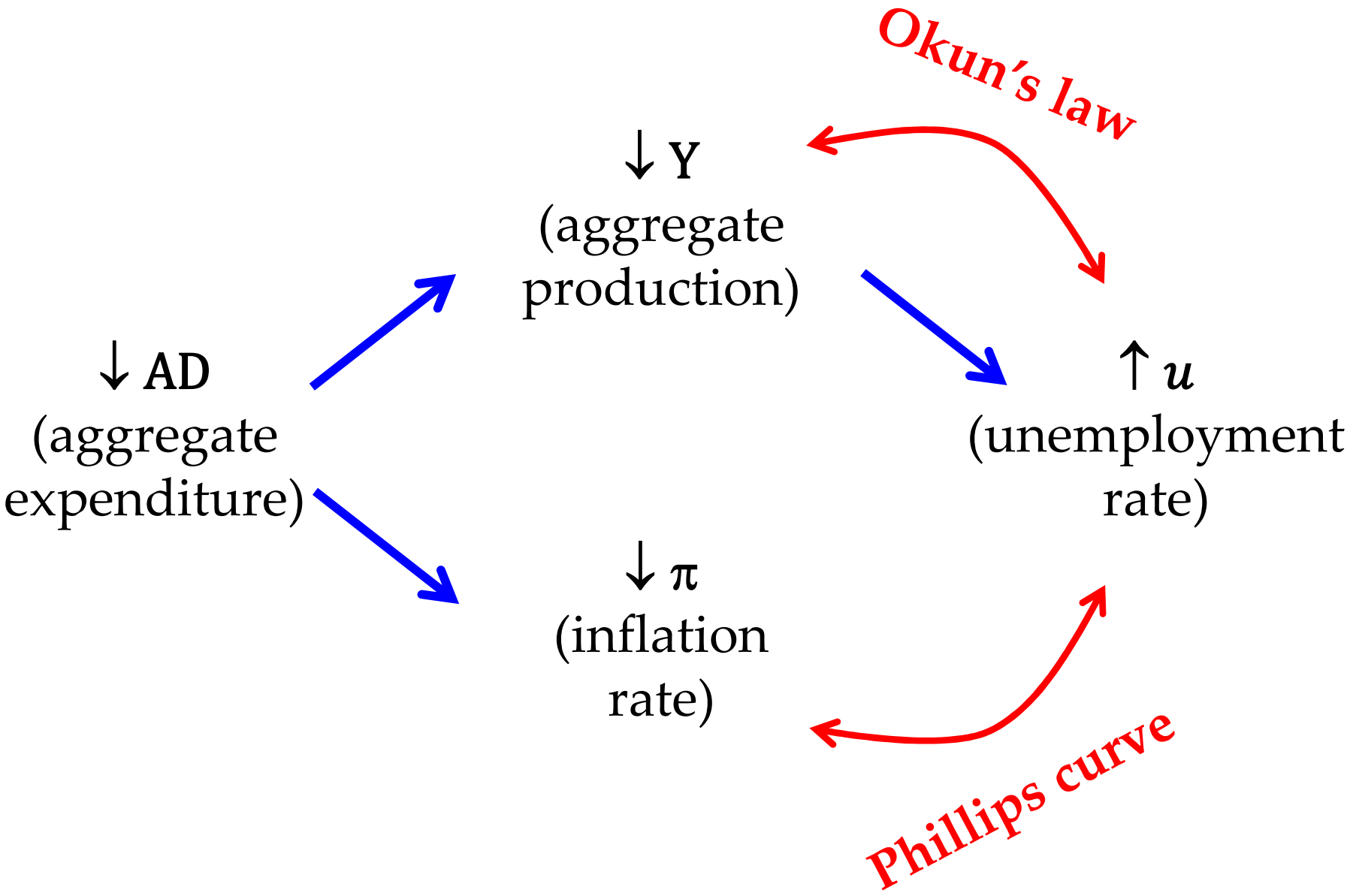
II/2014
III/2014
IV/2014


Spain, unemployment rate, 1976III-2014IV
http://www.ine.es/jaxi/tabla.do?path=/t22/e308/meto_02/pae/px/l0/&file=01011.px&type=pcaxis
http://www.ine.es/jaxi/tabla.do?path=/t22/e308/meto_05/rde/px/l0/&file=04002.px&type=pcaxis
http://www.ine.es/jaxiT3/Datos.htm?t=4086


Okun's law
↓ Y
(aggregate
production)
↓ AD
(aggregate
expenditure)
↑ u
(unemployment
rate)
↓ π
(inflation
rate)
Phillips curve

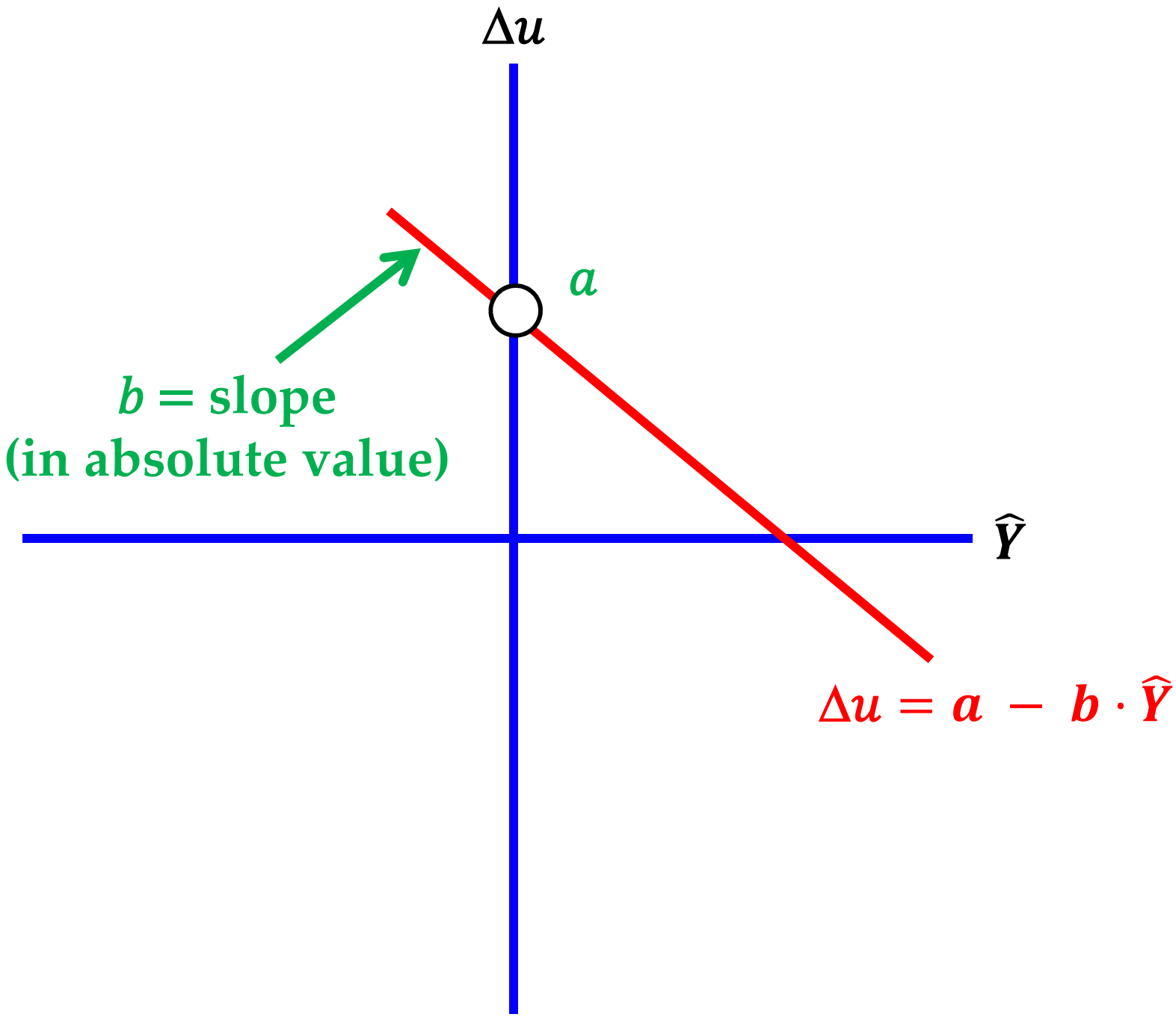
5. Okun's law

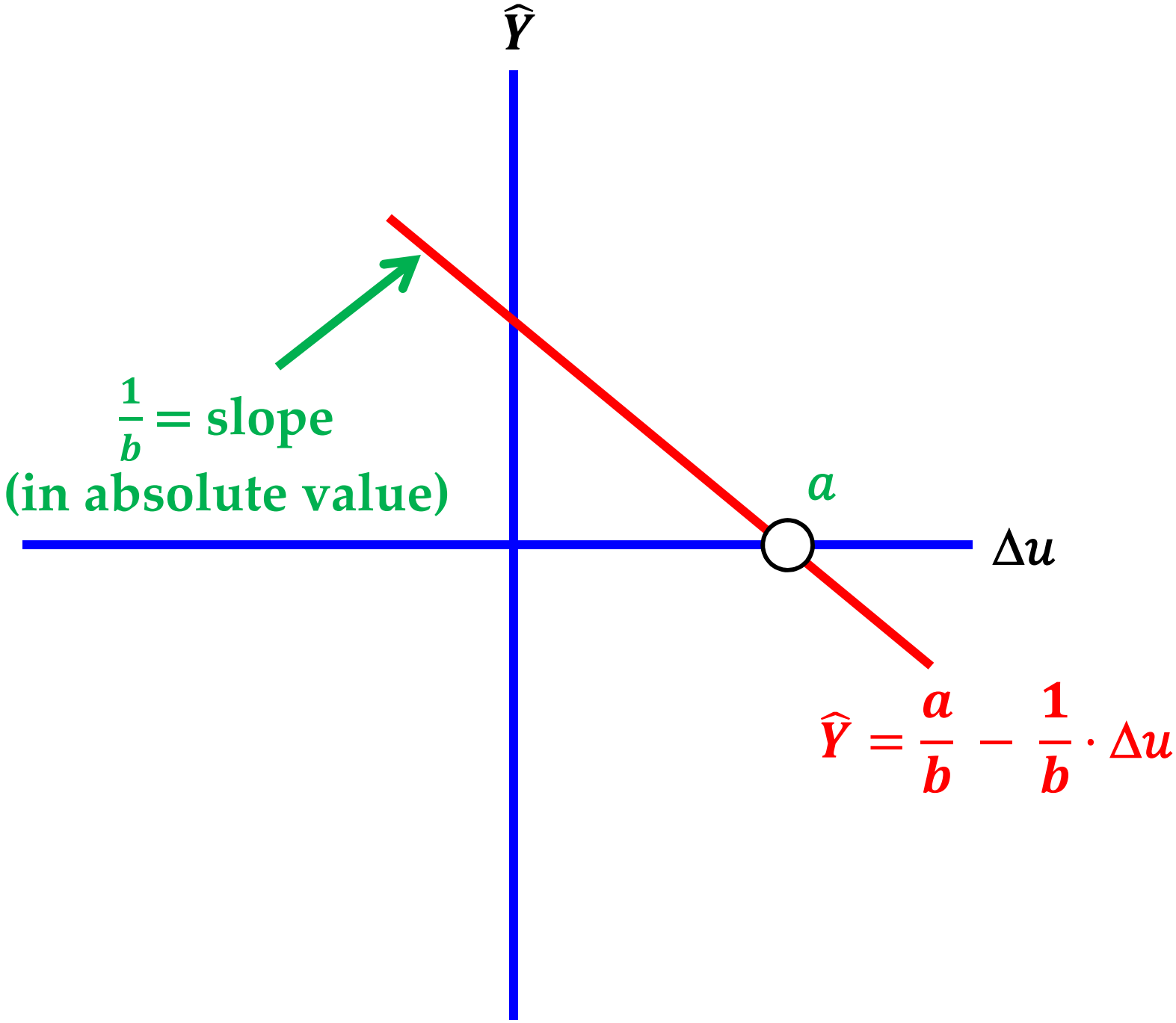
- Okun's law is an empirical relationship suggested in 1962 by the US economist Arthur Okun (1928-80).

- Okun's law: there is a negative relationship between the change $\Delta u = u - u_{-1}$ in the unemployment rate and $\hat{Y} = \frac{Y - Y_{-1}}{Y_{-1}}$, the rate of growth of real GDP Y. A simple formal expression of the law is

$$\Delta u = a - b \cdot \hat{Y}$$

where a and b are positive constants that depend on the economy considered and the period with respect to which variables u and $\hat{Y}$ are measured.


Δu
a
b = slope
(in absolute value)
$\widehat{Y}$
$\Delta u = a - b \cdot \widehat{Y}$


$\widehat{Y}$
$\frac{1}{b}$ = slope
(in absolute value)
a
Δu
$\widehat{Y} = \frac{a}{b} - \frac{1}{b} \cdot \Delta u$

Okun's law (US version) /1

- Expressing the variables as annual percentages, in the US, $a \approx 1.5$ and $b \approx 0.5$. Therefore:

$$\Delta u = 1.5 - \hat{Y}/2 \qquad \text{or} \qquad u = u_{-1} + 1.5 - \hat{Y}/2.$$

- a represents the increase in u that occurs when the economy does not grow: if $\hat{Y} = 0$, then $\Delta u = a$.

- For instance, if $u_{-1} = 2\%$ and $\hat{Y} = 0$, then $u = u_{-1} + a - \hat{Y}/2 = 2 + 1.5 - 0/2 = 3.5$. Hence, if the unemployment rate at the beginning of the year is 2% and the economy does not grow, then at the end of the year the rate is 3.5%.

Okun's law (US version) /2

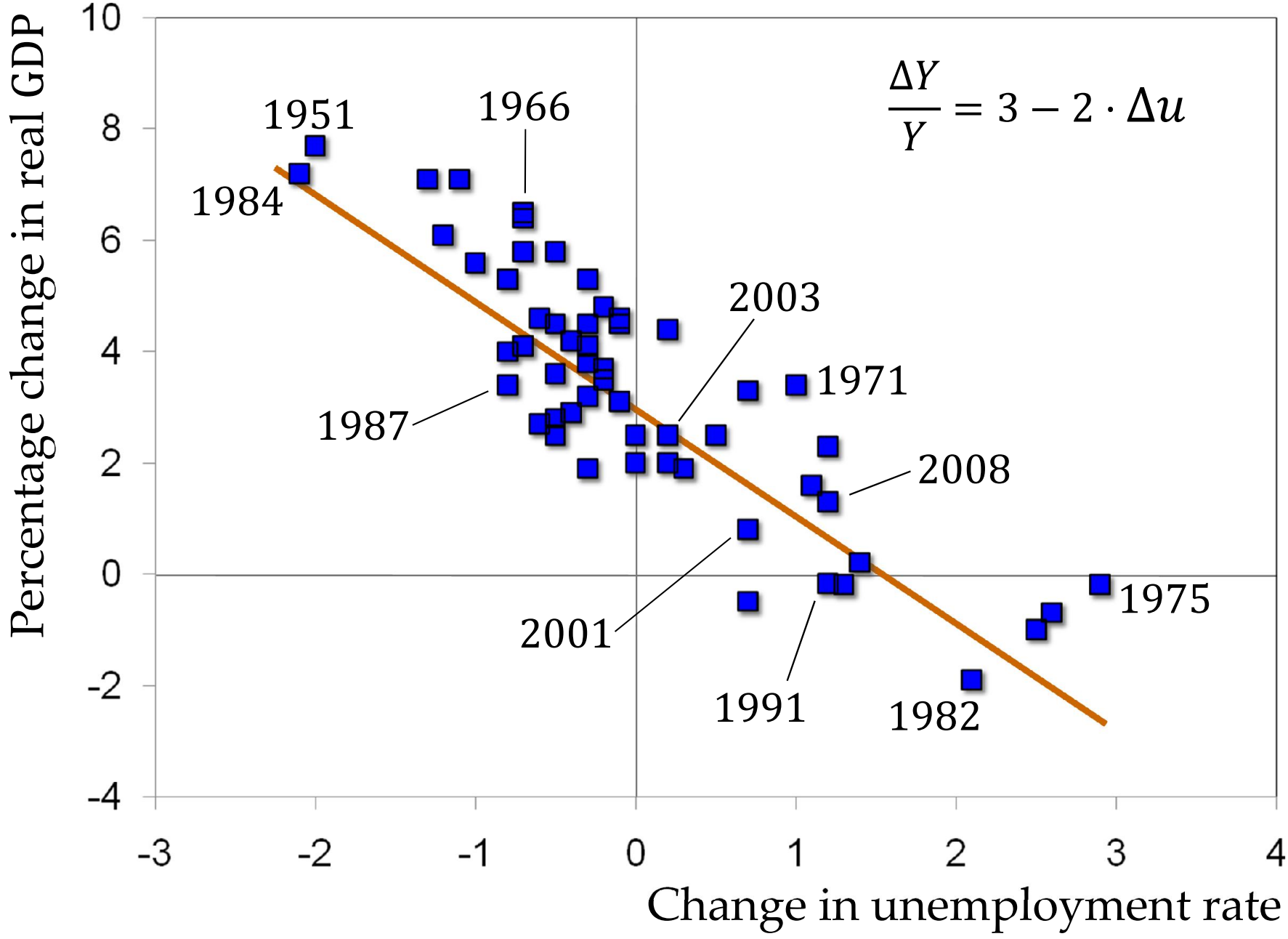
- b measures the ability of the economy to transform GDP growth into a smaller unemployment rate: $b \approx 0.5$ means that increasing $\hat{Y}$ by one point reduces u by 0.5 points.

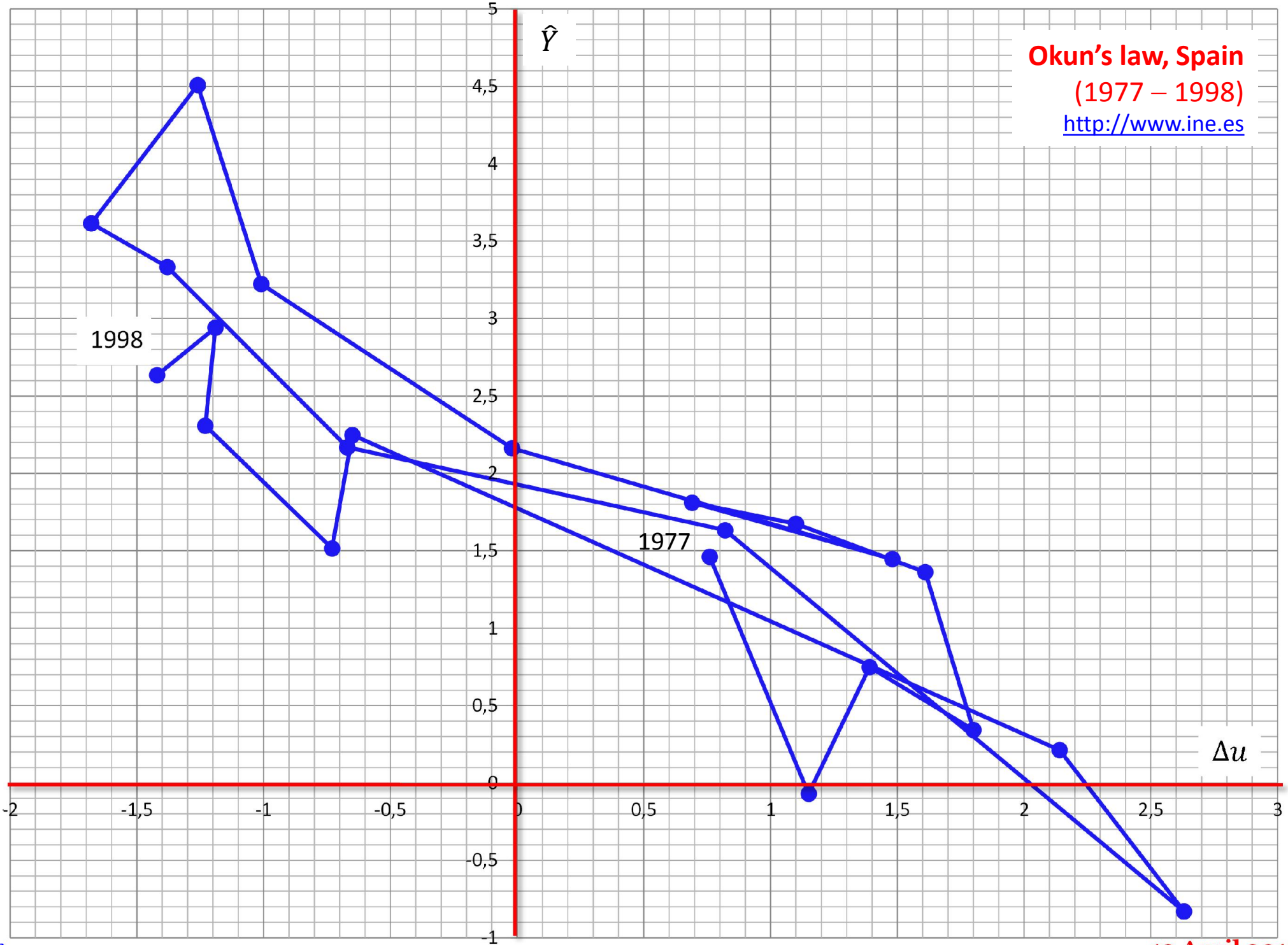
- If $\hat{Y} = 2\%$, then $u = u_{-1} + 1.5 - \hat{Y}/2 = u_{-1} + 1.5 - 2/2 = u_{-1} + 0.5$. If $\hat{Y} = 3\%$, then $u = u_{-1} + 1.5 - \hat{Y}/2 = u_{-1} + 1.5 - 3/2 = u_{-1}$.

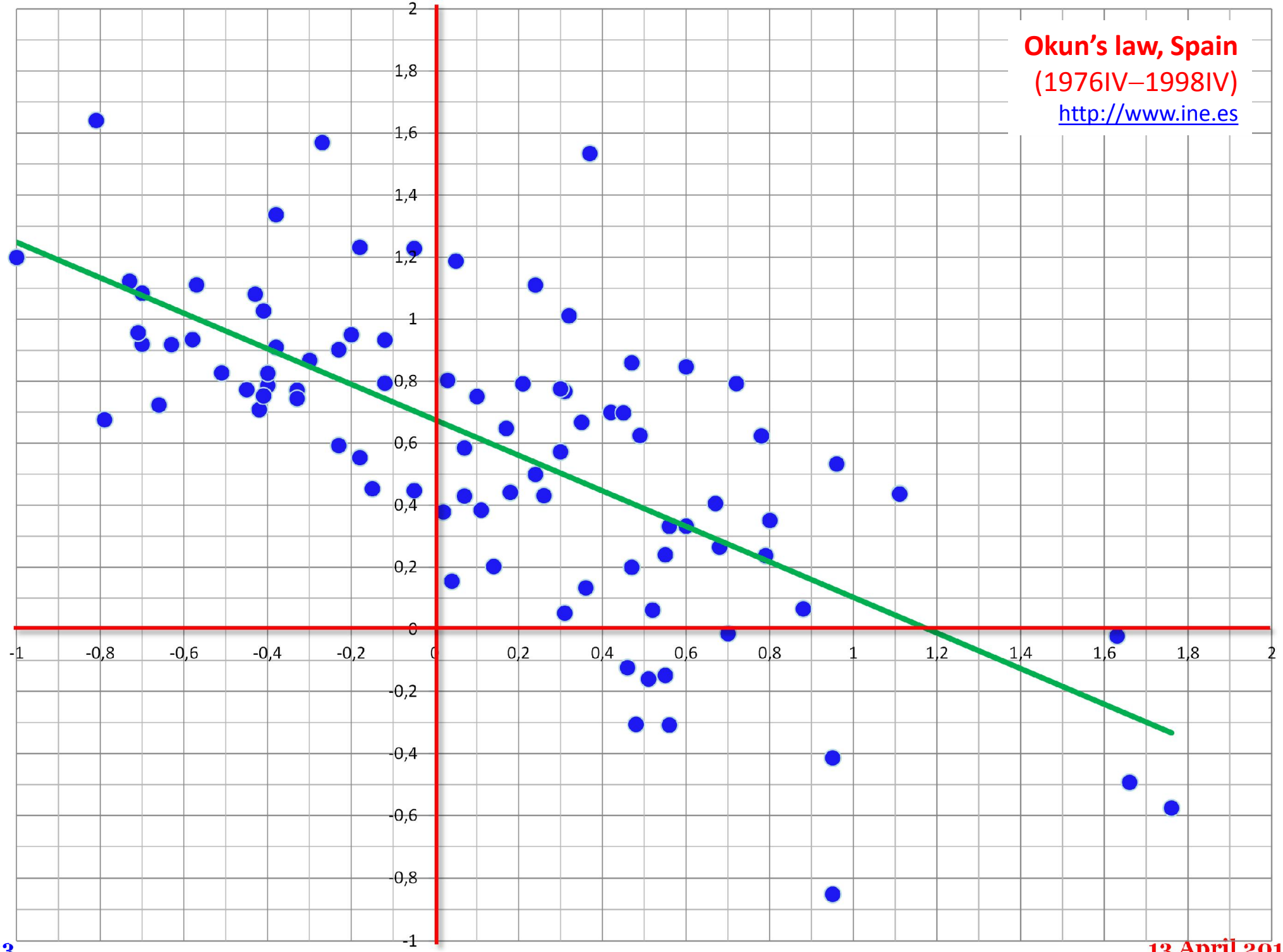
- Therefore, increasing $\hat{Y}$ from 2% to 3% reduces u from $u_{-1} + 0.5$ to u_{-1}. There is a gain of 0.5 points: an additional 1% in $\hat{Y}$ reduces u by 0.5 points.

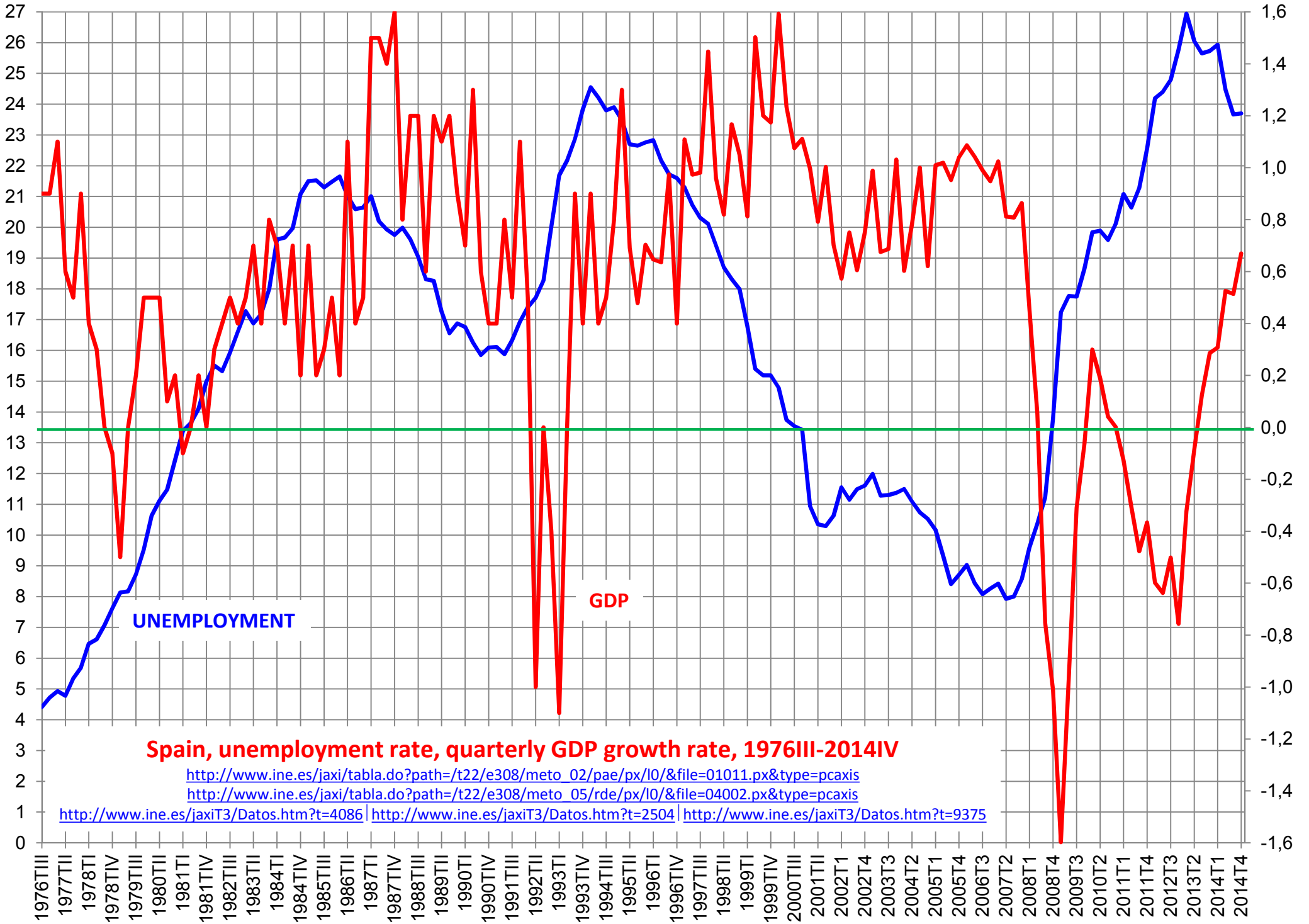
Okun's law, US, 1951-2008

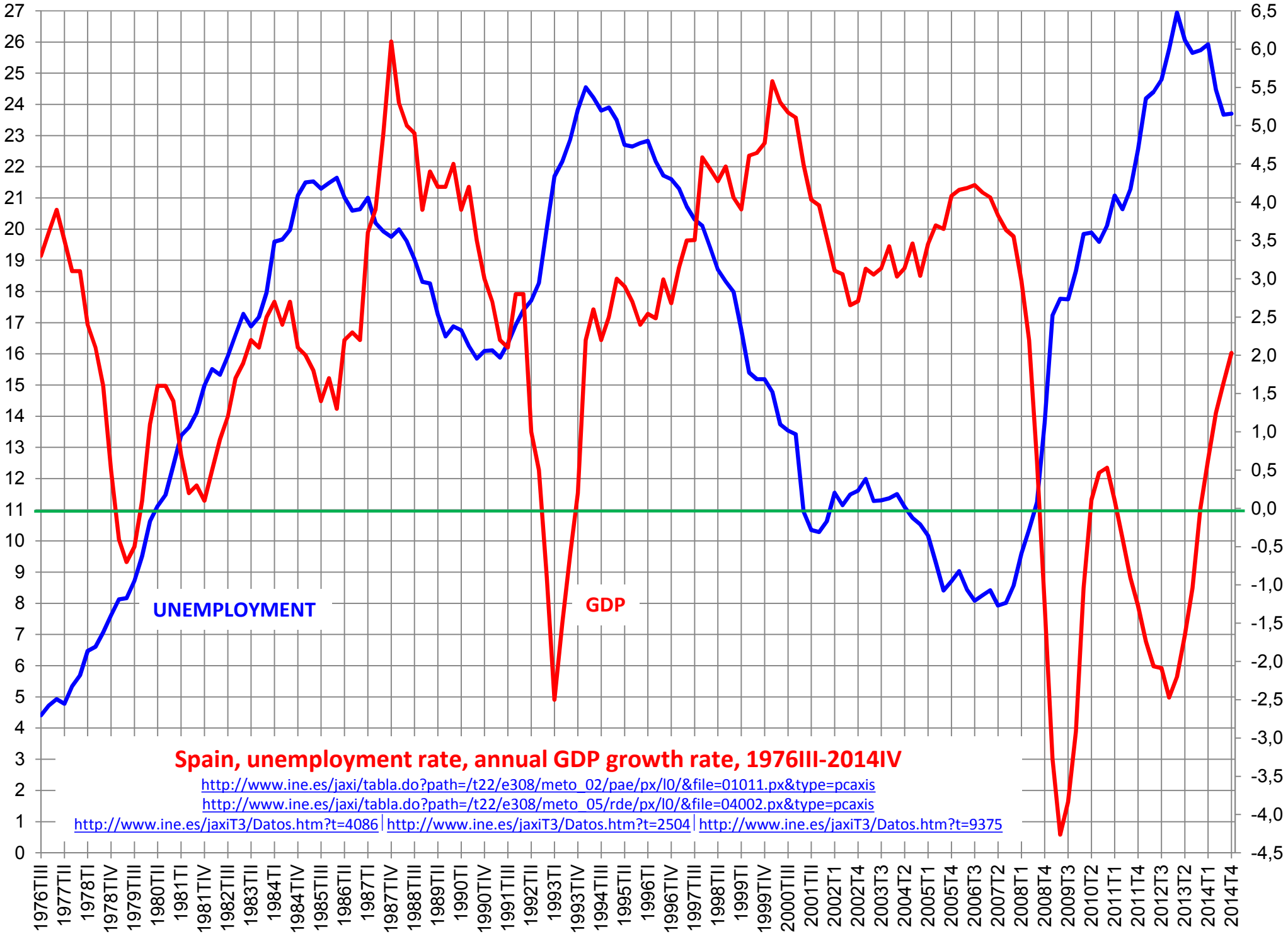
https://www2.bc.edu/~murphyro/EC204/PPT/CHAP09.ppt

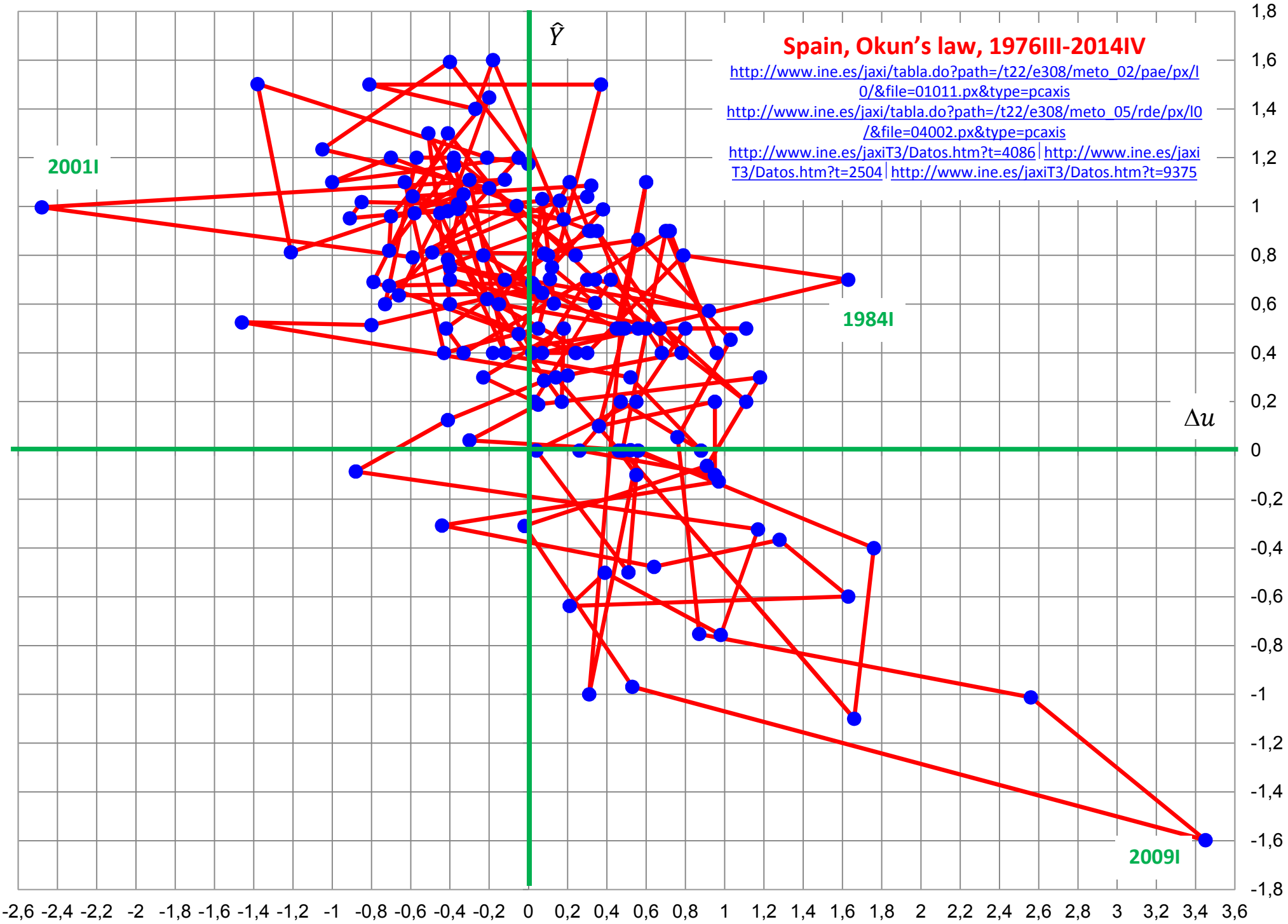


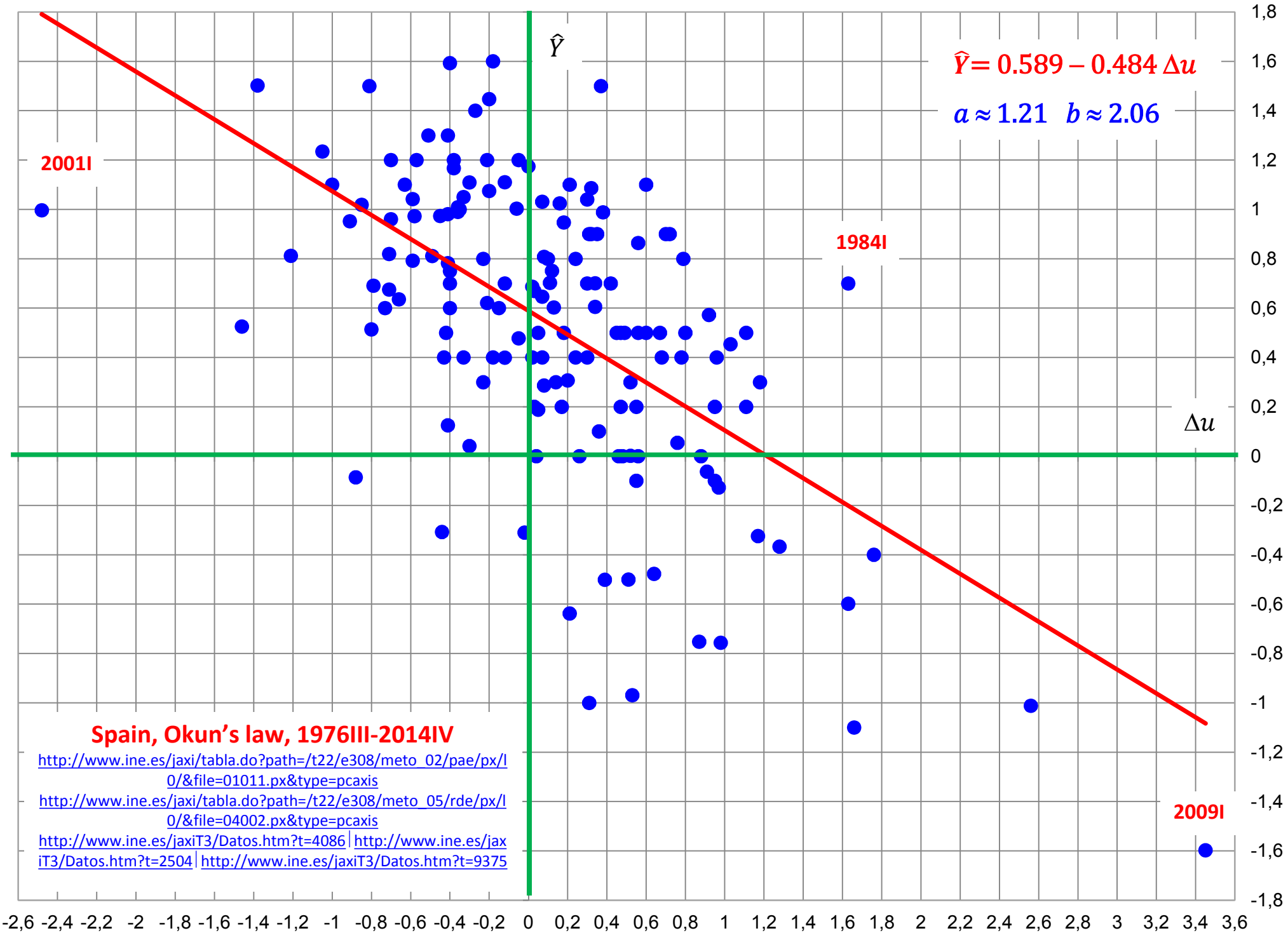

Okun's law, Spain
(1977 – 1998)
http://www.ine.es
$\hat{Y}$
Δu
1998
1977
5
4,5
4
3,5
3
2,5
2
1,5
1
0,5
0
-0,5
-1
-2
-1,5
-1
-0,5
0
0,5
1
1,5
2
2,5
3


Okun's law, Spain
(1976IV–1998IV)
http://www.ine.es
2
1,8
1,6
1,4
1,2
1
0,8
0,6
0,4
0,2
0
-0,2
-0,4
-0,6
-0,8
-1
-1
-0,8
-0,6
-0,4
-0,2
0
0,2
0,4
0,6
0,8
1
1,2
1,4
1,6
1,8
2


UNEMPLOYMENT
GDP
Spain, unemployment rate, quarterly GDP growth rate, 1976III-2014IV
http://www.ine.es/jaxi/tabla.do?path=/t22/e308/meto_02/pae/px/l0/&file=01011.px&type=pcaxis
http://www.ine.es/jaxi/tabla.do?path=/t22/e308/meto_05/rde/px/l0/&file=04002.px&type=pcaxis
http://www.ine.es/jaxiT3/Datos.htm?t=4086 | http://www.ine.es/jaxiT3/Datos.htm?t=2504 | http://www.ine.es/jaxiT3/Datos.htm?t=9375


UNEMPLOYMENT
GDP
Spain, unemployment rate, annual GDP growth rate, 1976III-2014IV
http://www.ine.es/jaxi/tabla.do?path=/t22/e308/meto_02/pae/px/l0/&file=01011.px&type=pcaxis
http://www.ine.es/jaxi/tabla.do?path=/t22/e308/meto_05/rde/px/l0/&file=04002.px&type=pcaxis
http://www.ine.es/jaxiT3/Datos.htm?t=4086 | http://www.ine.es/jaxiT3/Datos.htm?t=2504 | http://www.ine.es/jaxiT3/Datos.htm?t=9375


Spain, Okun's law, 1976III-2014IV
http://www.ine.es/jaxi/tabla.do?path=/t22/e308/meto_02/pae/px/l0/&file=01011.px&type=pcaxis
http://www.ine.es/jaxi/tabla.do?path=/t22/e308/meto_05/rde/px/l0/&file=04002.px&type=pcaxis
http://www.ine.es/jaxiT3/Datos.htm?t=4086 | http://www.ine.es/jaxiT3/Datos.htm?t=2504 | http://www.ine.es/jaxiT3/Datos.htm?t=9375
$\hat{Y}$
Δu
2001I
1984I
2009I
1,8 1,6 1,4 1,2 1 0,8 0,6 0,4 0,2 0 -0,2 -0,4 -0,6 -0,8 -1 -1,2 -1,4 -1,6 -1,8
-2,6 -2,4 -2,2 -2 -1,8 -1,6 -1,4 -1,2 -1 -0,8 -0,6 -0,4 -0,2 0 0,2 0,4 0,6 0,8 1 1,2 1,4 1,6 1,8 2 2,2 2,4 2,6 2,8 3 3,2 3,4 3,6


$\hat{Y}$
$\hat{Y} = 0.589 - 0.484\,\Delta u$
$a \approx 1.21 \quad b \approx 2.06$
2001I
1984I
2009I
Δu
Spain, Okun's law, 1976III-2014IV
http://www.ine.es/jaxi/tabla.do?path=/t22/e308/meto_02/pae/px/l0/&file=01011.px&type=pcaxis
http://www.ine.es/jaxi/tabla.do?path=/t22/e308/meto_05/rde/px/l0/&file=04002.px&type=pcaxis
http://www.ine.es/jaxiT3/Datos.htm?t=4086 | http://www.ine.es/jaxiT3/Datos.htm?t=2504 | http://www.ine.es/jaxiT3/Datos.htm?t=9375
1,8 1,6 1,4 1,2 1 0,8 0,6 0,4 0,2 0 -0,2 -0,4 -0,6 -0,8 -1 -1,2 -1,4 -1,6 -1,8
-2,6 -2,4 -2,2 -2 -1,8 -1,6 -1,4 -1,2 -1 -0,8 -0,6 -0,4 -0,2 0 0,2 0,4 0,6 0,8 1 1,2 1,4 1,6 1,8 2 2,2 2,4 2,6 2,8 3 3,2 3,4 3,6

6. The Phillips curve

- It is an empirical relationship described in 1960 by Paul Samuelson and Robert Solow based on a 1958 paper by the New Zealand economist Alban William Housego Phillips (1914–1975).

- The Phillips curve expresses a negative relationship between the unemployment rate u and the inflation rate π: the lower u, the higher π.

- With α and β positive constants, a linear Phillips curve is represented by an equation of the sort

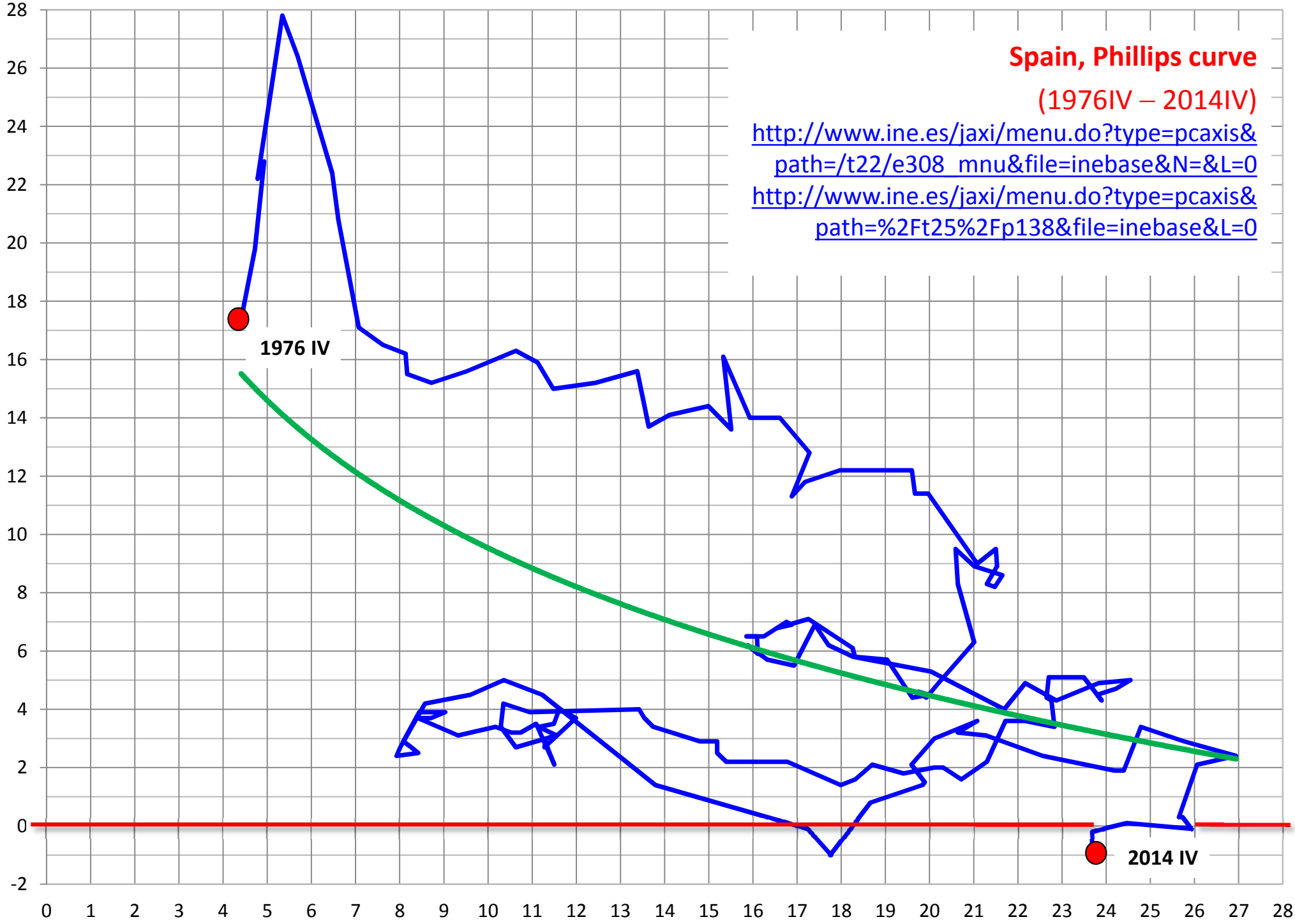
$$\pi = \alpha - \beta \cdot u \ .$$

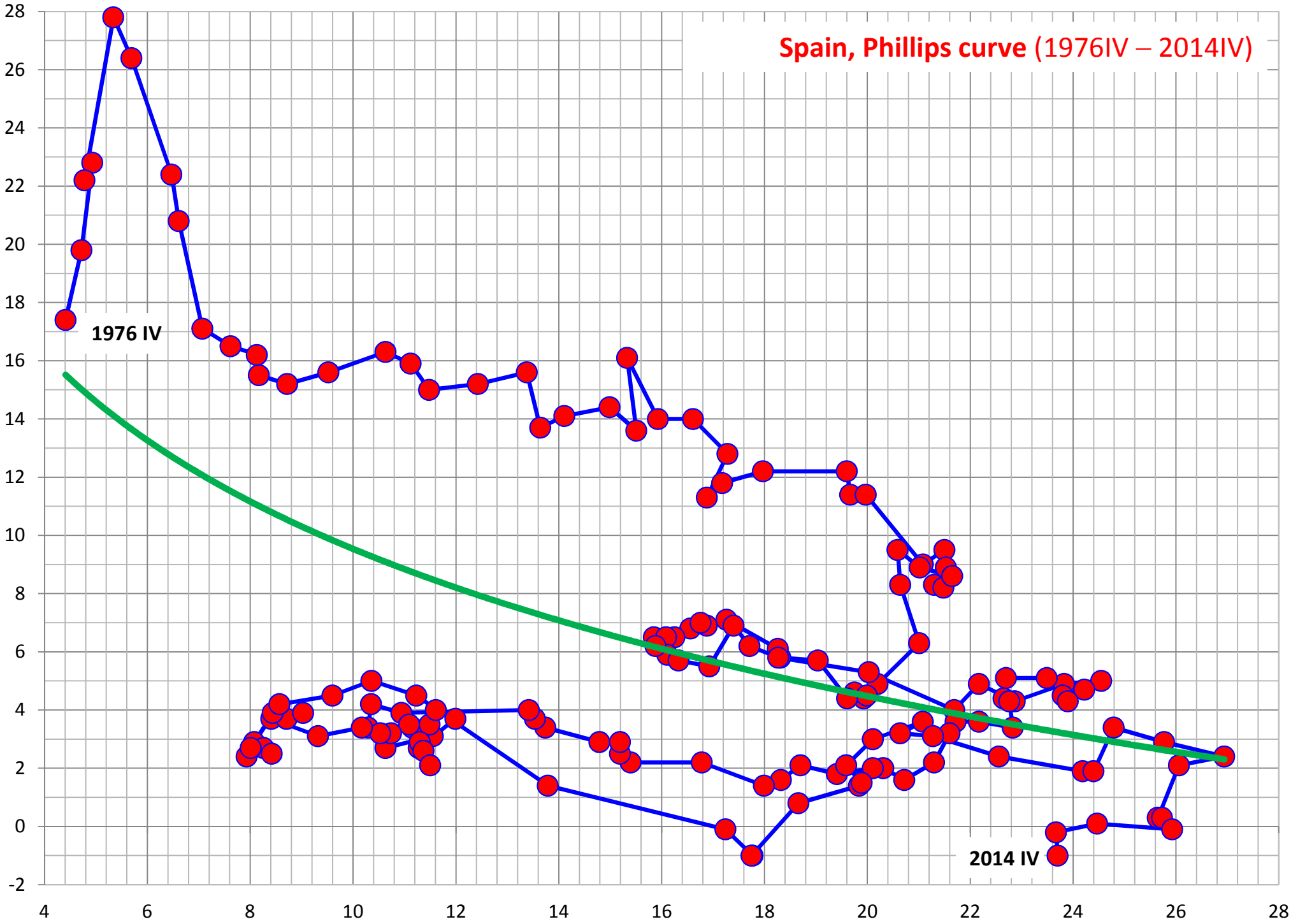
Trade-off between u and π

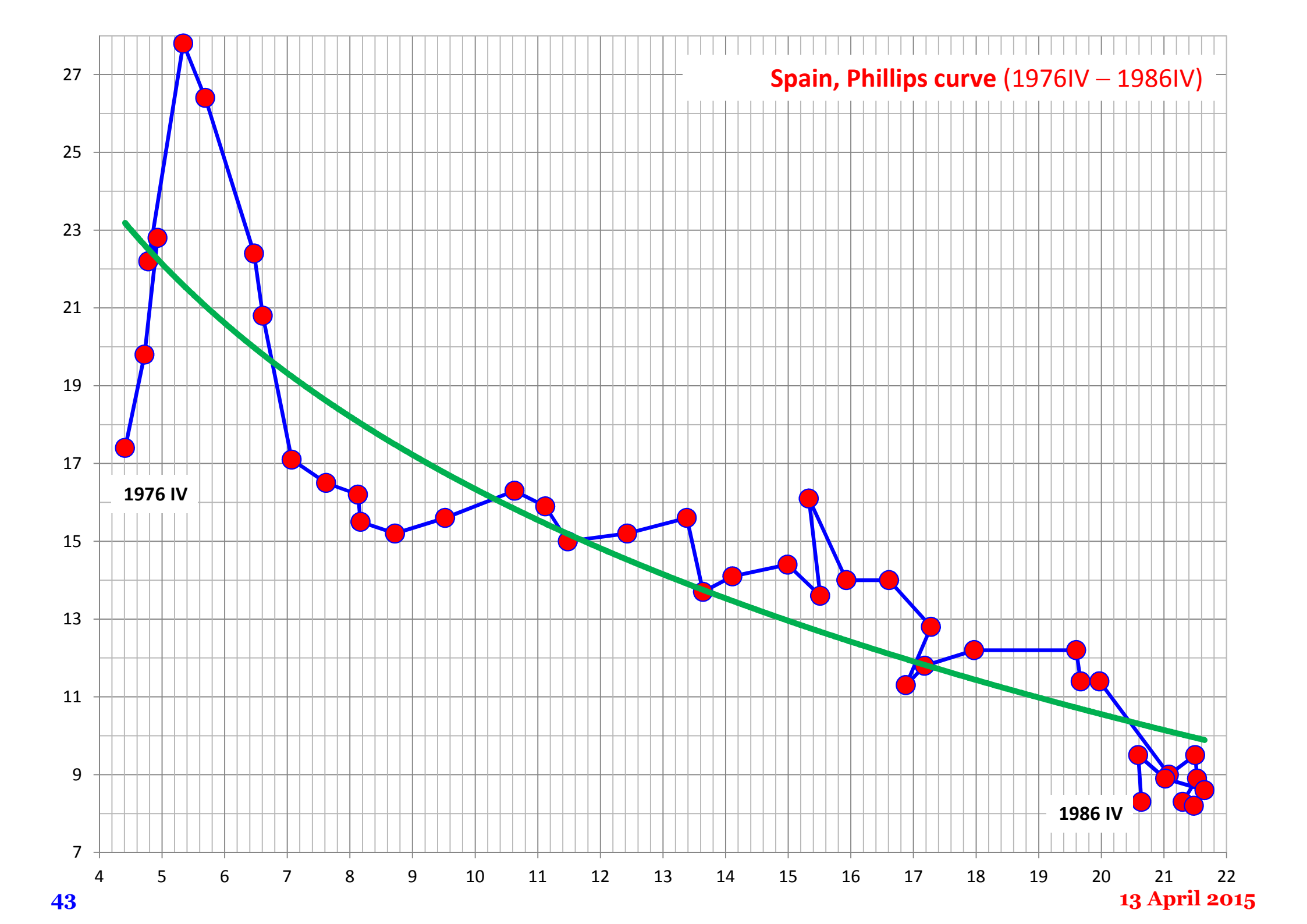
- Expressing π and u in percentage terms, that $\pi = \alpha - \beta \cdot u$ means that, to reduce one percentage point the unemployment rate u, it is necessary to accept an increase in the inflation rate π of β points.
- Let $\alpha = 10$ and $\beta = 2$. If $u = 4\%$, then $\pi = 10 - 2 \cdot 4 = 2\%$. Then, for u to be reduced one point (from 4% to 3%), π must be increased in two percentage points (from $\pi = 2\%$ to $\pi = 10 - 2 \cdot 3 = 4\%$).
- α is the inflation rate that obtains with zero unemployment. It is a measure of underlying inflation.

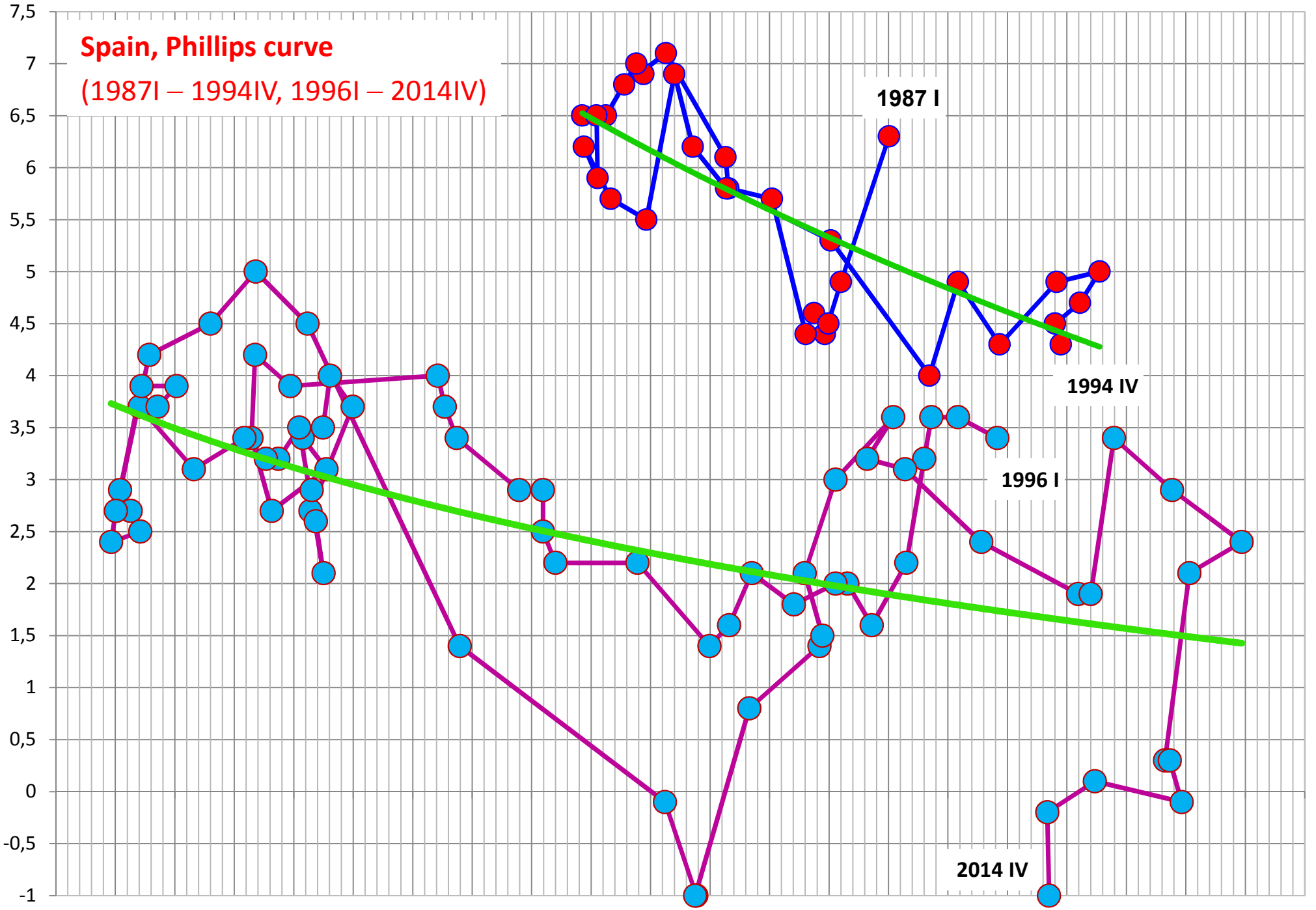
Unstability of the Phillips curve

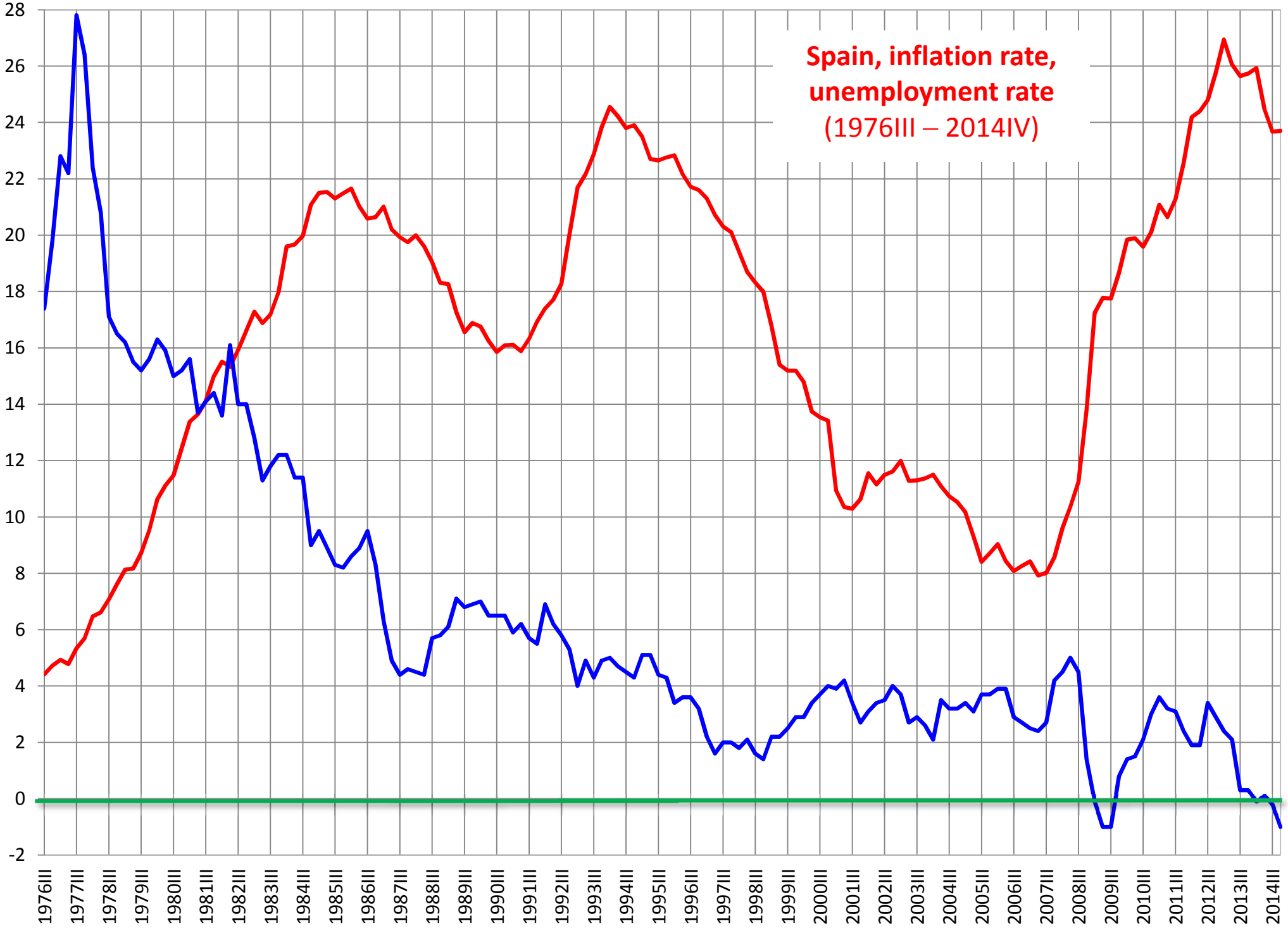
- In contrast to Okun's law, the Phillips curve is in general unstable, since α is a volatile parameter.
- α depends on inflation expectations and the firms' cost structure: an increase in expected inflation or in the production costs rises α. When α rises, the curve shifts upward, so more inflation must be paid to reduce the unemployment rate.
- β indicates how sensitive π is to changes in u. It depends on institutional factors, like the bargaining power of trade unions (more power, higher β).


Spain, Phillips curve
(1976IV – 2014IV)
http://www.ine.es/jaxi/menu.do?type=pcaxis&path=/t22/e308_mnu&file=inebase&N=&L=0
http://www.ine.es/jaxi/menu.do?type=pcaxis&path=%2Ft25%2Fp138&file=inebase&L=0
1976 IV
2014 IV
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28


Spain, Phillips curve (1976IV – 2014IV)
1976 IV
2014 IV
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
4
6
8
10
12
14
16
18
20
22
24
26
28


Spain, Phillips curve (1976IV – 1986IV)
1976 IV
1986 IV
27
25
23
21
19
17
15
13
11
9
7
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22


Spain, Phillips curve
(1987I – 1994IV, 1996I – 2014IV)
1987 I
1994 IV
1996 I
2014 IV
7,5
7
6,5
6
5,5
5
4,5
4
3,5
3
2,5
2
1,5
1
0,5
0
-0,5
-1
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28


Spain, inflation rate,
unemployment rate
(1976III – 2014IV)
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
1976III
1977III
1978III
1979III
1980III
1981III
1982III
1983III
1984III
1985III
1986III
1987III
1988III
1989III
1990III
1991III
1992III
1993III
1994III
1995III
1996III
1997III
1998III
1999III
2000III
2001III
2002III
2003III
2004III
2005III
2006III
2007III
2008III
2009III
2010III
2011III
2012III
2013III
2014III

Japan's Phillips curve looks like Japan

(1980M1 – 2005M8)

http://www.econ.yale.edu/smith/econ116a/japan.pdf