Employment, unemployment, labour force

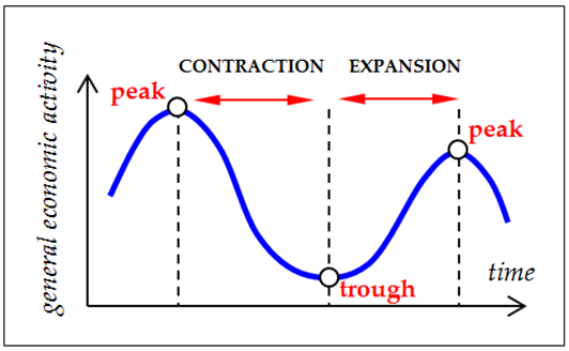
Employment is the number of people having a job. Unemployment is the number of people not having a job but looking for one. The labour force is employment plus unemployment.

$$\text{Unemployment rate} = \text{Unemployment} / \text{Labour force}$$

$$\text{Participation rate} = \text{Labour force} / \text{Economically active population}$$

Business cycle

The business cycle consists of the ups and downs in overall economic activity. The graph below depicts the stylized view of the business cycle.



• **Remark 1.** If real GDP is considered a good indicator of overall economic activity, then the business cycle can be roughly identified with fluctuations of (real) GDP.

• **Definition 1.** The period during which economic activity falls is a contraction or a recession. A depression is a severe recession. The trough is the lowest point in the recession.

• **Definition 2.** The period during which economic activity grows is an expansion or a boom. The highest point in the boom is called the peak.

• **Remark 2.** A business cycle is given by a decline-recovery sequence from peak to peak or by a recovery-decline sequence from trough to trough.

• **Remark 3.** The final stages of the expansionary phase are characterized by an increasing GDP, an accelerating inflation rate, longer working hours, and lower unemployment (higher employment). The following self-sustained process powers the expansion:

$$\uparrow Y \Rightarrow \downarrow u \Rightarrow \uparrow \mathrm{AD} \Rightarrow \uparrow \pi \Rightarrow \uparrow Y.$$

In this process, a growing production (GDP) leads to a fall in the unemployment rate. The fall in the unemplyment rate stimulates aggregate demand AD (the overall demand for goods). The demand stimulus fuels inflation. Finally, a rising inflation rate encourages production.

• **Remark 4.** After the turning point of the expansion, economic activity decays and this is reflected in stagnating sales whose effects eventually propagate over most of the economy. The consolidation of the contractionary phase reverses the engine of the expansionary phase. Now, production is reduced, the inflation rate declines, working hours are shortened, and both part-time and full-time unemployment go up. The positive feedback process that sustains the contraction is captured by the sequence

$$\downarrow Y \Rightarrow \uparrow u \Rightarrow \downarrow \mathrm{AD} \Rightarrow \downarrow \pi \Rightarrow \downarrow Y.$$

• **Remark 5.** There is an asymmetry between expansions and contractions (as between inflation and deflation). Potentially, an expansion could go on forever: there is no conceptual limit to a rise in GDP or the inflation rate (AD could increase with constant unemployment rate: to consume more it is not necessary to have more people, as it suffices that the same people consumes each

time more). But a contraction has a conceptual limit: production cannot get below zero and prices cannot turn negative. This means that the positive feedback process will eventually turn into a negative feedback process, in the sense that it stabilizes, converges, or stops.

• **Remark 6.** The recovery occurs during the initial stages of the expansionary phase. External events (typically, some measure of economic policy) may facilitate the transition between contraction and expansion. As a process, recovery is vulnerable because it is initially weak and subject to reversal. Once momentum is gained, with increases in production and prices being sustained, the recovery consolidates and the economy enters fully into a new expansionary phase.

• **Remark 7.** The V-type recovery just makes the new expansion follow, without a break, the last contraction. The W-type recovery illustrates the fragility of recovery after the contraction: in this case, recovery is interrupted by a short-lived new contraction, after which a stronger recovery unfolds and gives rise to a consolidated expansion. An W-type could develop into an WW-type if recoveries are hard to sustain or if negative side-effects of the contractionary phase persist, recur, or worsen. The L-type recovery is one in which the economy stagnates at the bottom of the cycle for an unsually long period. The economy remains in a short of limbo where economic activity neither improves nor worsens. The danger of this state is that, the longer the economy stays in it, the harder it is to get out of it. This is due in great part to the working of the Tinkerbell effect: the more people believe the economy will remain stagnated, the more it will remain stagnated. In ths case, the L-type could become an L___-type.

Basic types of unemployment

(i) Frictional (or search) unemployment occurs while workers are changing jobs or looking for a better job. (ii) Structural unemployment labels the trend (even stable) component of unemployment. It is due to structural changes in the economy that create and eliminate jobs and to the institutions that match workers and firms. Determinants of structural unemployment include firing and hiring costs, minimum wages, labour taxes, unemployment benefits, employment protection, mobility restrictions, and workers' lack of adequate training. (iii) Cyclical (demand-deficient) unemployment is generated by the short-run fluctuations of GDP (rises with recessions, falls with booms). Seasonal unemployment is cyclical unemployment that occurs at regular intervals and can therefore be anticipated.

Technological unemployment

It is structural unemployment caused by, associated with, or attributable to technological change/innovation.

• **Remark 1.** Technological innovations, from the perspective of the production activities, tend to be labour-saving innovations: the activity previously carried out by persons is, with the innovation, conducted by machines. Since at least the Industrial Revolution, technological change has become a process by which human work is being replaced by mechanical work (at least initially, applied to repetitive, routine work).

• **Remark 2. The (presumed) Luddite fallacy.** (IPA: /ˈlʌd.aɪt/) [The Luddites were a technophobic movement of machine destroyers active between the end of the 18th century and the beginning of the 19th century.] The Luddite fallacy refers to the presumption that technological innovation

reduces employment on the activities where the innovation is introduced without creating employment in other activities. It expresses the fear of the displacement of human skill by machines. The historical evidence from the last two centuries seems to suggest that the jobs lost by technological progress are more than compensated by jobs created in new activities made possible by the technological progress or by the stimulus that technological progress in one sector produces on other sectors. Up to now, innovation appears to have created more new employment opportunities than the jobs that it destroys: innovation reallocates and multiplies jobs.

• **Example 1.** The invention of motor vehicles reduced the jobs available to the drivers of coaches and carriages, but eventually created more jobs: some associated with new types of drivers (taxi drivers, bus drivers) and others arising from the car-making industry itself and from new business that exist because of automobiles (automobile repair shops, filling stations, parking facilities, insurance companies, road construction companies… and the list goes on).

• **Remark 3.** The Luddite fallacy can be viewed as an example of the zero-sum fallacy: as the total amount of work is supposed to be fixed, the introduction of labour-saving technology makes work previously done by people be transferred to machines.

• **Remark 4. Creative destruction.** A term popularized by Joseph Schumpeter (1883-1950) that captures the idea that capitalism survives thanks to a process of continuous transformation in which whole sectors or industries are created at the cost of the destruction of other sectors or industries. Creative is the engine that keeps capitalism going. Innovation and technological change developed by entrepreneurs are fundamental disruptive forces that mutate economic structures.

• **Remark 5.** Technological innovation appears to create a wedge between two kinds of workers: high-skilled (those using and hence benefiting from the innovation) and low-skilled workers (whose production activities are more labour-intensive and do not require an investment in training to master the tools that embody technical innovations). 'Skill-biased technological change' refers to technological change that increases the productivity of high-skilled workers (and thus the demand for them and their earnings) and reduces the need for low-skilled workers. As this sort of technological change make the wages of high-skilled workers grow faster than the wage of low-skilled workers, it has been considered a source of rising inequality among workers.

https://upload.wikimedia.org/wikipedia/commons/b/bf/Pyramid_of_Capitalist_System.png

Moravec's paradox

It is the observation by Hans Moravec that, contrary to what was expected, basic (low-level) sensory skills are hard to reproduce mechanically (by robots, machines, computers), whereas high-level reasoning has been relatively easy to automatize.

• **Remark 1.** So far, the attempts to make a computer mimic, or surpass, the performance of humans in superior cognitive tasks (performing intelligence tests, using mathematics, abstract thinking, playing chess) has proved successful, while reproducing the perception and mobility

skills of a child (recognize a face, identify a voice, walk, differentiate objects, move in space) appears to be a very complex endeavour. In sum, what is difficult for us looks like easy for computers/robots, but what is easy for us appears to be hard for computers/robots.
Hans Moravec (1998): "When will computer hardware match the human brain," Journal of Evolution and Technology, 1.

• **Remark 2.** The explanation Moravec suggested is that intellectual skills have developed late in evolution, for which reason natural selection has not had the opportunity to improve and optimize these skills in comparison to sensory-motor skills, which have benefited from milions of years of adaptation, adjustement, and optimization. The result of this long process is that we have been modified to use those skills effortlessly and easily, almost without notice. The intellectual skills look more complicated for us because they have not been completely nor adequately interiorized: we are not so familiar with them.

• **Remark 3.** An economic implication of Moravec's paradox is that robotics and computerization are creating a gap between two kinds of workers. At the upper level of the earnings scale, there are the tasks that are for the moment immune to the competition by machines and computers: essentially, the activities involving creativity and high-level intelectual skills: manage a firm, rule a country, teach undergraduates, do scientific research, compose music, write a novel, judge a case… At the other extreme there are the tasks that do not require a sophisticated training, like guard labour, cleaning services, serving food, caring for children or the elderly… in general, low-wage services. The tasks in between are those that have been already captured by computers and robots: activities that can be formulated in terms of algorithms (a set of instructors) that computers and robots can execute (manual work, engineering).

• **Remark 4.** High-tech investments extend conventional forms of mechanization to that middle realm by creating automated measuring devices, data-management systems, word-processing, communications networks… Even trading in financial markets is conducted by machines. This is the so-called high-frequency trading, which has been blamed for one of the most shocking recent events in the stock market: the flash crash of the 6th of May, 2010. This was a one-trillion stock market crash that lasted just some 30 minutes.
https://en.wikipedia.org/wiki/2010_Flash_Crash

Say's law A thesis named after Jean-Baptiste Say (1767-1832) which is very often condensed by the expression or motto "supply creates its own demand".

• **Remark 1.** Say's law (also known as 'law of the markets') relies on the contention that the creation of value by production activities is the source for demand: the sale of goods provides the source of the income that finances purchases. Individuals must first sell to the market to be able to buy from the market. To buy (to demand) one must first sell (supply). The answer to a glut (excess) of goods or workers is to make more goods, thereby employing workers. Prices and wages will adjust to balance supply and demand.

• **Remark 2.** By Say's law, if businesses make products, the wages paid to the workers employed will enable them to buy all that is produced. There will never be too many workers because their

wages would fall until all are hired. Thus, any glut of goods or workers will be only temporary. Say's law views demand is constituted by supply and, thus, demand failure is a symptom, not a cause.

• **Remark 3.** Say's law negates the existence of structural (and, a fortiori, technological) unemployment as it invokes the intervention of compensatory mechanisms. Any labour displaced by a technological labour-saving innovation will find a job among the employment opportunities generated by an economy that grows thanks to the labour-saving innovation. The innovation allows more goods to be produced, makes them cheaper, increases their supply, and (through Say's law) expands their demand. In the last instance, if the new employment opportunities are not enough to eliminate some residual unemployment, wages will adjust until the aggregate demand for labour meets the total supply of labour.

• **Remark 4.** Say's law does not deny the possibility of temporary unemployment in some industry. The claim is that problems in one industry do not reverberate over the whole economy: failures are not systemic. The economy absorbs any shock that hits any part of it.

The 'employer of last resort' proposal

L. Randall Wray, among other scholars, has proposed that, through a Job Guarantee Programme, the government acted as an employer of last resort to provide a job to any person asking for a job.

• **Remark 1.** Economic reality and economic analysis are both full of evident, curious, unquestioned, blind-spot asymmetries. For banks, the government has created a lender of last resort (the central bank) that implicitly rescues banks in distress. Most economists do not object to the existence of that lender. Contrariwise, it seems that people do not deserve to be rescued, since neither governments nor economists take seriously that governments could act as employers of last resort, giving a job to anyone that has not been able to find one in the private sector.

• **Remark 2.** If unemployment represents a waste for the economy (unused production resources), would it not be a better utilization to give a job to unemployed people, giving them the opportunity to train and improve their skills, accumulate experience, remove the pyschological costs of remaining unemployed, and make their employability in the private sector more likely? Randall Wray (2015): *A Primer on Macroeconomics for Sovereign Monetary Systems*.

Basic questions about unemployment

(i) Why unemployment occurs. (ii) Why unemployment may persist. (iii) How unemployment evolves. (iv) Which groups of people are more likely to be affected by unemployment.

Some facts of unemployment

(i) Unemployment fluctuates in time. (ii) The fluctuations are more intense between than within business cycles. (iii) The longer a person remains unemployed, the more difficult for this person to fill a vacancy and find a job (so short-term and long-term unemployment look like different phenomena). (iv) Unemployment differs significantly between economies, age-groups, occupations, and ethnic origins.

• **Remark 1.** In historical perspective, the relationship between employers and employees have been conflictual. In this respect, unemployment can be seen as an expression of the struggle between employees and employers (the latter having more power in the relationship). Labour organizations have recurrently asked for a higher wage and a shorter working time, particularly during the expansionary phase of the business cycle. Governments eventually (following the Great Depression of the 1930s) stepped in to regulate this relationship, offering protection to employees by establishing minimum wages and legal limits to working time. Since the 1980s, the government intervention is in retreat. Jean Vercherand (2014): *Labour: a heterodox approach*, ch. 1.

Okun's law

Okun's law states that there is a negative relationship between the change $\Delta u = u - u_{-1}$ in the unemployment rate and the rate of growth $\hat{Y} = \frac{Y - Y_{-1}}{Y_{-1}}$ of GDP.

• **Remark 1.** Okun's law is an empirical relationship suggested in 1962 by the US economist Arthur Okun (1928-80). Figs. 1 and 2 illustrate this relationship.

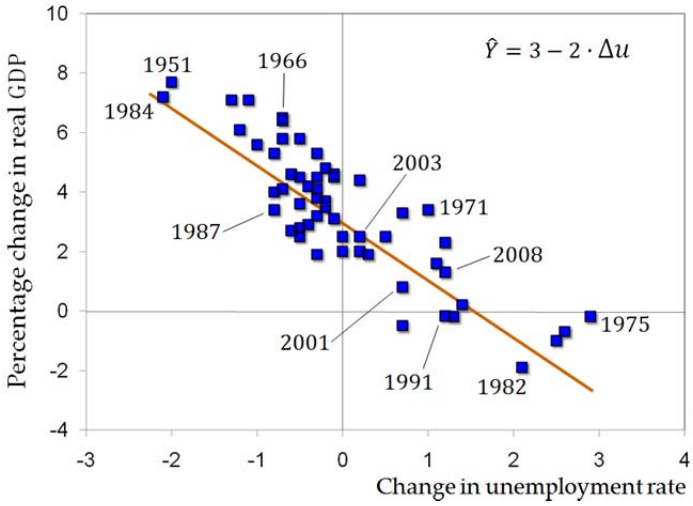


Fig. 1. Okun's law, US, 1951-2008
https://www2.bc.edu/~murphyro/EC204/PPT/CHAP09.ppt

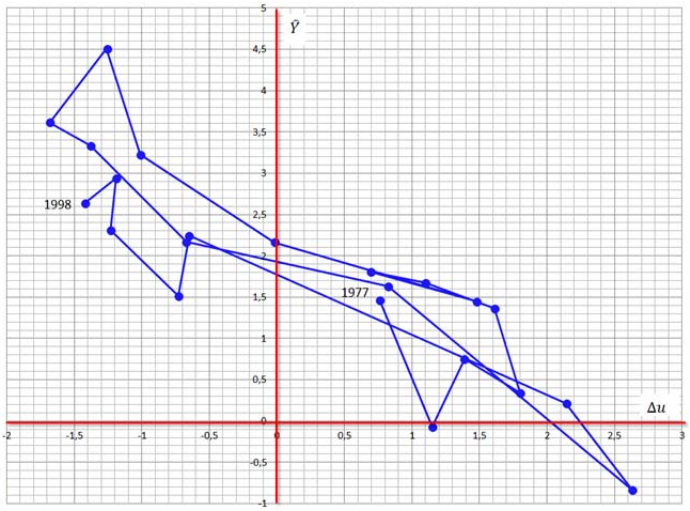


Fig. 2. Okun's law, Spain, 1977-1998
http://www.ine.es

• **Remark 2.** A simple formal expression of the law is

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

where a and b are positive constants: a represents the increase in u that occurs when the economy does not grow (if $\hat{Y} = 0$, then $\Delta u = a$), whereas b measures the ability of the economy to transform GDP growth into a smaller unemployment rate (increasing y by one point reduces u by b points).

• **Example 1.** Expressing the variables as annual percentages, in the US, $a \approx 1.5$ and $b \approx 0.5$ (see Fig. 1). Therefore, $\Delta u = 1.5 - \hat{Y}/2$ or, equivalently,

$$u = u_{-1} + 1.5 - \hat{Y}/2. \qquad (1)$$

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

$2/2 = u_{-1} + 0.5$. If $\hat{Y} = 3\%$, then $u = u_{-1} + 1.5 - \hat{Y}/2 = u_{-1} + 1.5 - 3/2 = u_{-1}$. Therefore, increasing 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 y becomes 0.5 points less of u.

• **Example 2.** Let $a = 1$ and $b = 2$, so $\Delta u = 1 - 2 \cdot \hat{Y}$. That is, $u - u_{-1} = 1 - 2 \cdot \hat{Y}$ or $u = u_{-1} + 1 - 2 \cdot \hat{Y}$. This equation yields the current value u of the unemployment rate when the unemployment rate u_{-1} in the immediately preceding period and the current GDP growth rate $\hat{Y}$ are known. The table below shows the values obtained from this equation for seven periods, given that the sequence of GDP growth rates in those periods is 0%, 0.25%, 0.5%, 1%, 2%, 0%, and –1%. Even when GDP grows, the unemployment rate does not decline (this happens from $t = 1$ to $t = 2$, when $\hat{Y}_1 = 0\%$ and $\hat{Y}_2 = 0.25\%$). This is due to the fact that $\Delta u < 0$ (the unemployment rate falls) if and only if $a - b \cdot \hat{Y} > 0$; that is, if and only if $\hat{Y} > a/b$. With $a = 1$ and $b = 2$, $a/b = 0.5$. Accordingly, for the unemployment rate diminish, GDP growth should at least be 0.5%.

time t	0	1	2	3	4	5	6	7
$\hat{Y}$		0	0.25	0.5	1	2	0	–1
u	26	26+1–2·0 = 27	27+1–2·0.2 = 27.5	27.5+1–2·0.5 = 27.5	27.5+1–2·1 = 26.5	26.5+1–2·2 = 23.5	23.5+1–2·0 = 24.5	27.5

Phillips curve

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

• **Remark 1.** The Phillips curve is an empirical relationship between the inflation rate and the unemployment rate 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). In the paper, he found, for UK in the period 1861–1957, a stable, inverse, and non-linear relationship between the rate of change of money wage rates and the unemployment rate. The interpretation was that wage inflation is triggered and speed up by an excess demand for labour (which appears more intense the lower the unemployment rate).

• **Example 1.** Fig. 3 plots the inflation rate and the unemployment rate in Spain. The graph suggests that a falling unemployment rate tends to coincide with a rising inflation rate and, conversely, a rising unemployment rate tends to occur with a falling inflation rate.

• **Remark 2.** With α and β positive constants, a linear Phillips curve is represented by an equation of the sort

$$\pi = \alpha - \beta \cdot u \,. \qquad (2)$$

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. [If $u = 10\%$, then increasing u by one percent point means that u goes from 10% to 11%, while increasing u by one percent means that goes from 10% to 10.1%.]

• **Example 2.** Let $\alpha = 10$ and $\beta = 2$. If $u = 4\%$, then $\pi = 10 - 2 \cdot 4 = 2\%$. Then, for u fall one point (from 4% to 3%), π has to increase two percentage points (from $\pi = 2\%$ to $\pi = 10 - 2 \cdot 3 = 4\%$).

• **Remark 3.** Parameter α is the inflation rate under zero unemployment. It is a measure of underlying inflation. The Phillips curve seems to be more unstable than Okun's law. The reason is that α is a volatile parameter, because it 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.

• **Remark 4.** Parameter 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).

• **Example 3.** Fig. 4 shows the Phillips curve for Spain. In fact, there appear to be at least three such curves, as the curve shifts with time, as shown in Figs. 5 and 6.

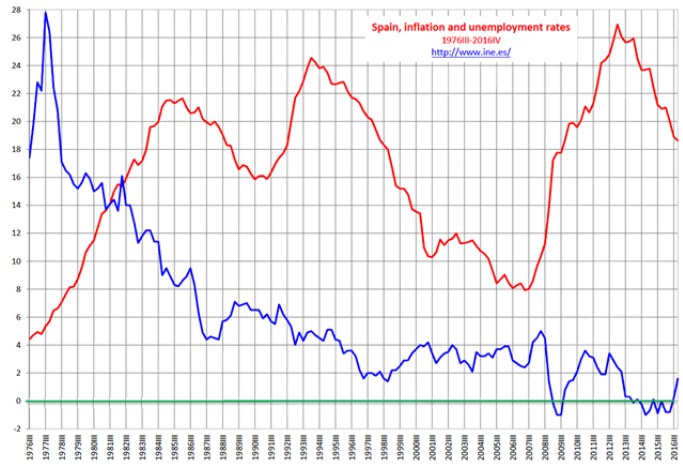


Fig. 3. Inflation, unemployment, Spain, 1976III-2016IV

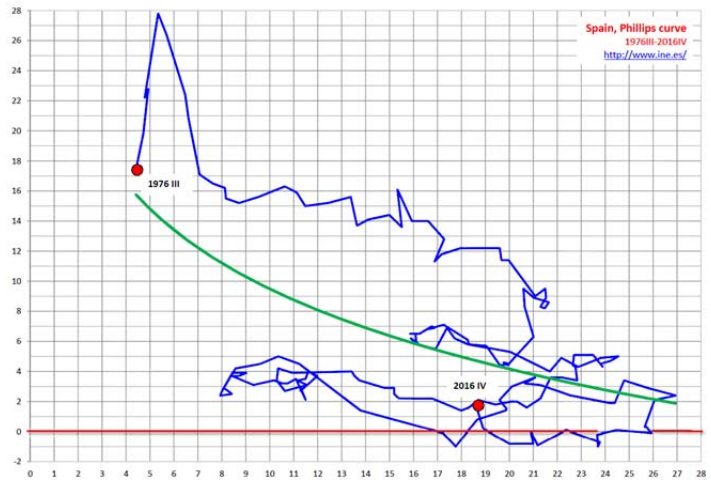


Fig. 4. Phillips curve, Spain, 1976III-2016IV

Fig. 5. Phillips curve, Spain, 1976III-1986IV

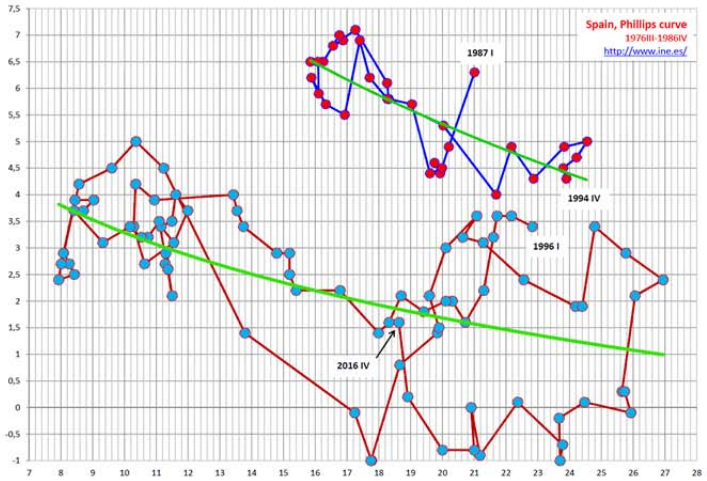


Fig. 6. Phillips curve, Spain, 1987I-2016IV