Comment on "Hysteresis and the European unemployment problem revisited" by Jordi Galí

By Robert J. Gordon[88]

The contrast between the behaviour of the unemployment rate in the United States and the euro area ranks as among the most important puzzles in macroeconomics. The US unemployment rate is strongly mean reverting and is stationary over long periods of time, reaching a value of 5.3% in June 2015, roughly the same as in 1954 (5.6%), 1964 (5.2%), 1974 (5.6%), 1989 (5.3%), 1996 (5.4%) and 2004 (5.5%). By contrast, the euro area unemployment rate appears to have an upward trend, climbing from 1.6% in early 1970 to 11.4% in late 2014. The point of departure for Jordi's paper is a set of characteristics of the euro area unemployment rate, which wanders around an upward trend, has movements that are less volatile and more persistent than in the United States, and has no tendency to gravitate towards a long-run equilibrium rate. These differences are visible in Jordi's Chart 1, which plots the US and euro area unemployment rates in quarterly data from the first quarter of 1970 to the fourth quarter of 2014.

The aim of the paper is to explore the causes and explanations of the unique behaviour of the unemployment rate in the euro area. What factors contribute to its failure to establish a fixed long-run equilibrium value? Three candidate theories are proposed as alternative frameworks for this exploration – the natural rate hypothesis, the long-run trade-off hypothesis and the hysteresis hypothesis. My discussion focuses on the empirical properties of euro area unemployment and inflation behaviour. Several comments on Jordi's three theories are deferred to the end.[89]

1 Unemployment and unit roots

The difference in unemployment behaviour so evident in Jordi's Chart 1 is confirmed by formal statistical tests. In his Table 1, repeated in the left-hand side of my Table 1, an Augmented Dickey-Fuller (ADF) test of the null of a unit root cannot be rejected for the euro area unemployment rate, but can be rejected for the United States. However, this outcome is entirely due to the rapid increase of the euro area unemployment rate during the 1970s. If the start date is moved forward from the first quarter of 1970 to the first quarter of 1980, as shown in the right-hand side of my Table 1, the hypothesis of a unit root is rejected more strongly for the euro area than for the United States.

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89 All data, including everything on Europe and on the United States unemployment rate, were taken from the data provided in the contribution by Galí. The data used for the US GDP deflator and the food-energy effect were taken from the US National Accounts.

Table 1

ADF unit root tests, revised

1970-2014				1980-2014			
euro area		United States		euro area		United States	
1 lag	4 lags	1 lag	4 lags	1 lag	4 lags	1 lag	4 lags
-2.04	-1.92	-3.4*	-2.97*	-3.28*	-2.73**	-2.83**	-2.42

Notes: t-statistics of Augmented Dickey-Fuller tests (with intercept) for the null of a unit root in the unemployment rate; the sample period is from the first quarter of 1970 to the fourth quarter of 2014 and from the first quarter of 1980 to the fourth quarter of 2014; single asterisks denote significance at the 5% level, double asterisk at the 10% level; critical values (adjusted for sample size) for the null of a unit root are -2.58 (10%) and -2.89 (5%).

When the 1970s and 1980s are omitted, as shown in my Chart 1, the behaviour of the unemployment rate in the two areas both appear to be relatively stationary, with the main difference being that the euro area rate is consistently higher by an average of about 3.5%. The euro area rate is relatively stationary, with a value in late 2014 of 11.4%, little different from the 11% rates that occurred between 1994 and 1998. A regression of the euro area rate on the US rate yields an excellent fit without the need for a trend term, as shown by the actual and fitted values in my Chart 2.

Chart 1

Unemployment rates in the United States and euro area for the period 1990-2014

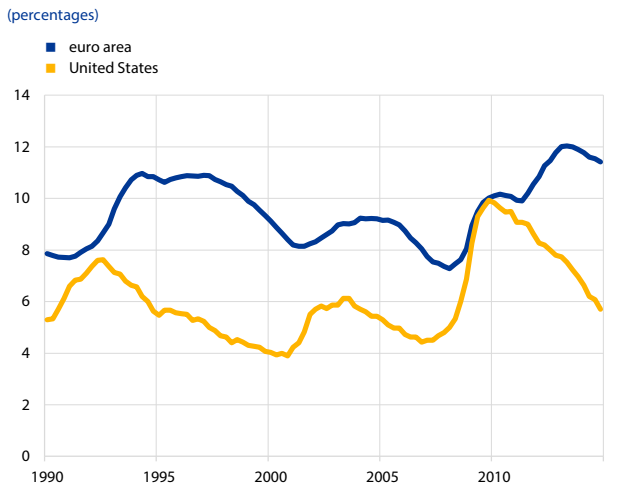
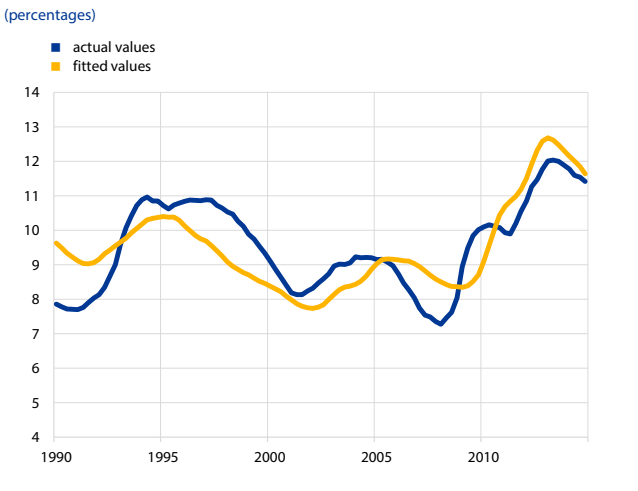


Chart 2

Model of euro area unemployment, constant constrained at 3.55% for the period 1990-2014



Here the euro area rate is regressed on the fourth and twelfth lag of the US unemployment rate, with a constant constrained to be the average difference between the euro area and US unemployment rates (3.5%). The lag structure captures the fact that the euro area unemployment rate responds more slowly, although the total adjustment is the same in that the sum of coefficients on the two US lagged unemployment variables is 0.99.[90] In reaction to the financial crisis, the US unemployment rate jumped quickly from 4.5% in the second quarter of 2007 to 9.9% in the fourth quarter of 2009, whereas the euro

[90] The estimated equation is $EU_t = 3.55 + 0.496 * M4USU_{t-4} + 0.496 * M4USU_{t-12}$, where EU is the euro area unemployment rate, USU is the US unemployment rate and M4 is a four-quarter moving average. The t-ratios on the two right-hand variables are 8.8 and 8.5 respectively. The adjusted R^2 is 0.980 and the SEE is 0.888.

area rate rose more slowly from 7.3% in the first quarter of 2008 to 12.0% in the second quarter of 2013, rising almost as much, but over a longer period of adjustment.

2 Price inflation, not wage inflation

Jordi conducts his empirical investigation of the euro area inflation process with data on changes in wages. I prefer to study inflation by using price data for several reasons. First, central banks have a target for price inflation, not wage inflation. Second, time series such as Jordi uses for employee compensation are inherently noisy, as they incorporate changes in the composition of employment between high-paid and low-paid workers. Third, when labour's share is constant, price inflation equals wage inflation minus the trend growth rate of productivity. However trend productivity growth has not been steady in the euro area: it has exhibited a steady deceleration from 4% per annum in 1971 to less than 1% in the past decade, as shown in my Chart 3. Fourth, not only is productivity growth not constant but neither is labour's share. As shown in my Chart 4, labour's share soared from 48% in 1971 to a peak of 58% in 1992, after which it entered a period of slow decline, to stand at 50.4% in the fourth quarter of 2014. Changes in trend productivity growth and in labour's share can cause substantial changes in wage inflation that do not carry over to price inflation.

Chart 3

HP 6400 trend of productivity growth, Europe versus the United States from Q1 1971 to Q4 2014

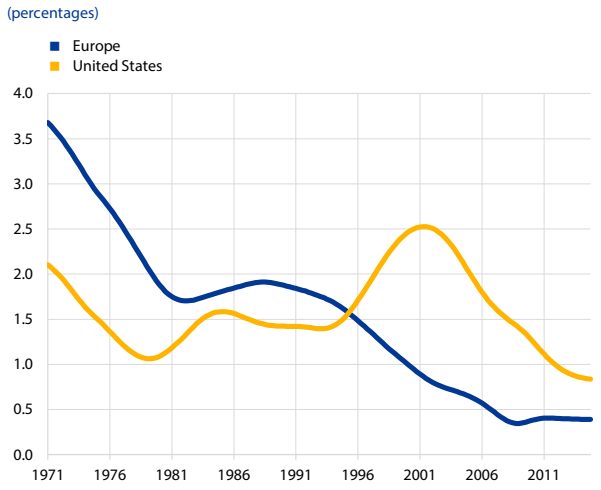
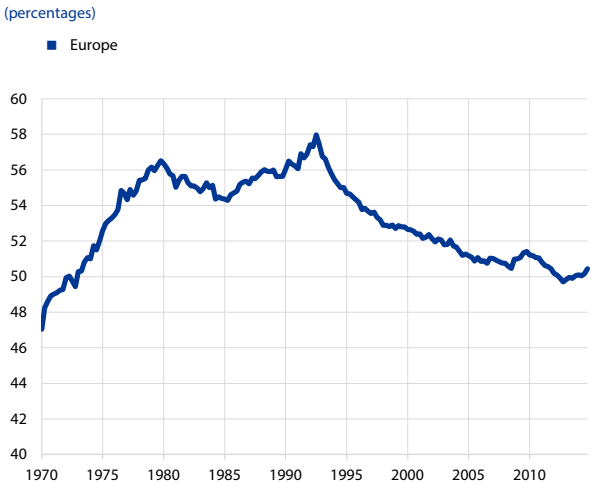


Chart 4

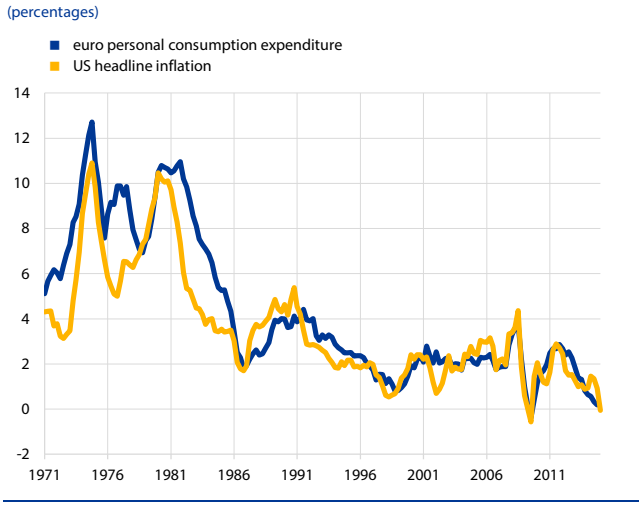
Labour's share, Europe from Q1 1970 to Q4 2014



Unlike unemployment, where the euro area has registered an average rate since 1990 that is 3.5% above the US rate, there is virtually no difference in inflation behaviour between the United States and euro area over the entire period going back to 1971, as shown in my Chart 5. Both inflation rates, as measured by the headline deflator for personal consumption expenditures, share the same time path, from high and volatile between 1971 and 1986, followed by much lower volatility after 1986. Both series share a dip in the late 1990s and a zig-zag related to the volatility of oil prices in 2008-09.

Chart 5

Annual inflation rate, Europe versus the United States from Q1 1971 to Q4 2014



Is euro area inflation described by a Phillips curve mechanism, in which the change in the inflation rate from its own past values depends on the unemployment rate? The same Phillips curve specification can be applied to data for the United States and the euro area covering the period from the first quarter of 1987 to the fourth quarter of 2014 The influence of past inflation, which represents some combination of expected inflation and the influence of overlapping price and wage contracts, is represented by three successive four-quarter moving averages of the dependent variable for lags one, five, and nine. The influence of unemployment is entered as the unemployment gap, the difference between the actual unemployment rate and the time-varying NAIRU (non-accelerating inflation rate of unemployment). The influence of food and energy prices is represented by the "food-energy effect," defined simply as the difference between the headline and core (net of food-energy) inflation rates in the United States. This US variable is used in the euro area equation as well, as I did not have data handy to represent the food-energy effect for the euro area.

Table 2

Estimated equations for quarterly changes in the headline PCE deflator, Europe versus the United States from Q1 1987 to Q4 2014

Variable	Lags	Europe	United States
Lagged dependent variable	1-9[a]	1.00**	1.00**
Unemployment gap	0	-0.17**	-0.24**
Food-energy effect	0-4	0.80**	0.51**
Adj. R2		0.71	0.91
SEE		0.69	0.50
SSR		49.49	25.79

a) Lagged dependent variable is entered as the four-quarter moving average for lags 1, 5 and 9 respectively.
b) *indicates coefficient or sum of coefficients is statistically significant at the 5% level, ** indicates significance at the 1% level.

The coefficients and significance levels are displayed in Table 2. Coefficients on the unemployment gap are similar, while euro area inflation has a larger response to the US food-energy variable than does the US all variables are significant at the 1% level. The fit of the US equation is better than that of the euro area equation, which is not surprising given that the food-energy effect is measured in the euro equation by US data. Chart 6 displays the euro area unemployment rate, estimated time-varying NAIRU and the unemployment gap.

The hysteresis effect, one of the models examined in Jordi's paper, is usually interpreted as implying that inflation depends only on the rate of change of the unemployment rate, not on its level. If hysteresis dominates the inflation process, then a permanent increase in the unemployment rate, say to 11% as in the case of the euro area, would reduce the inflation rate while the unemployment is rising, but would put no further downward pressure on the inflation rate once the unemployment rate levels off at its new higher value of 11%. With hysteresis the inflation equation has a significant negative coefficient on the *change* in the unemployment rate and an insignificant coefficient on the *level* of the unemployment rate.

Chart 6

Unemployment rate, NAIRU and unemployment gap, Europe from Q1 1987 to Q4 2014

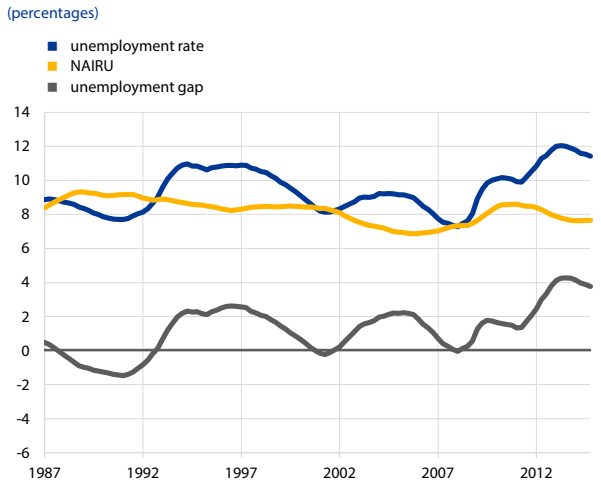


Chart 7

Actual inflation rate versus simulated inflation rate, Europe, from Q1 1987 to Q4 2014; alternate sample end: Q4 2010

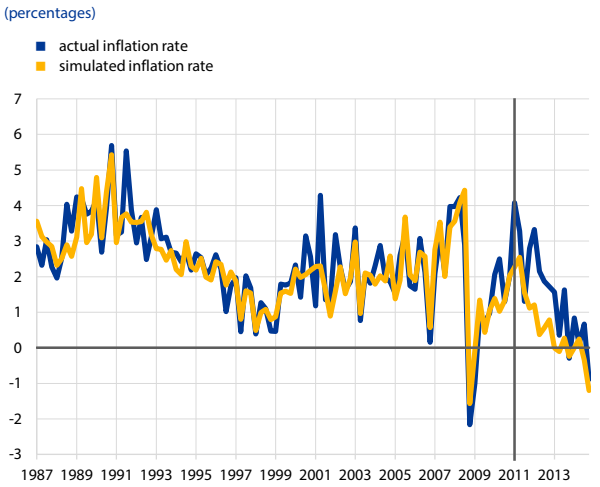


Table 3

Estimated equations for quarterly changes in the headline PCE deflator, Europe versus the United States from Q1 1987 to Q4 2014

Variable	Lags	EU	United States
Lagged dependent variable	1-9[a]	1.00**	1.00**
Unemployment gap	0	-0.13**	-0.22**
Four-quarter difference		-0.19	-0.09
Food-energy effect	0-4	0.66**	0.47**
Adj. R2		0.72	0.91
SEE		0.68	0.50
SSR		47.77	25.55

a) Lagged dependent variable is entered as the four-quarter moving average for lags 1, 5, 9, 13, 17 and 21 respectively.
b) *indicates coefficient or sum of coefficients is statistically significant at the 5% level, ** indicates significance at the 1% level.

Table 3 adds the change in the unemployment rate to the equations already estimated in Table 2. The change term, intended to represent the hysteresis effect, is not significant in either equation, even at the 10% level. The values and significance levels of the other variables remain roughly the same as in Table 2. Thus the hysteresis effect can be rejected for European data, at least for the post-1987 period. An extension of this approach to encompass the full 1971-2014 interval would, however, find evidence of hysteresis in the behaviour of the euro area inflation-unemployment relationship, in the light of the sustained rise of the unemployment rate during the 1970s, when there was a period of sustained high inflation.

Because of the strong explanatory role of the lagged inflation terms in the inflation equations of Tables 2 and 3, plots of actual and fitted values always provide the appearance of a good fit. A more demanding test of an inflation equation is to estimate the coefficients for a subset of the sample period, which we do for the period from the first quarter of 1987 to the fourth quarter of 2010, and then perform a dynamic simulation for the interval from the first quarter of 2011 to the fourth quarter of 2014 in which the lagged inflation terms are calculated endogenously from the predicted rather than actual values. Chart 7 shows that the simulated values do a good job of tracking the substantial downward movement of the euro area inflation rate over the period 2011-14. This downward movement would not have occurred, given the sustained high level of unemployment during this interval, if the inflation rate had been generated by a hysteresis-like process.

3 The three models

Jordi's paper presents three models. The first, called the "natural rate" model, generates increased unemployment through an exogenous shock to the wage mark-up. This approach would be better labelled as the "wage-push" model and can be tested by inspecting a graph of labour's income share, as presented above in my Chart 4. Indeed the euro area labour's share did increase markedly from 1971 to 1980, a period of high inflation, but the timing is not right because the share remained high until 1993, whereas the inflation rate declined from 11% in 1980 to 3% in 1993. According to the model, this decline of inflation should have been accompanied by a marked decline in labour's share. Jordi's discussion of this model makes no mention of the readily available data on labour's share. It does not address the problem that wage shocks occur at the national level (as in the French general strike of 1968) and would have minimal impact on the overall euro area-wide wage level in the absence of contagion effects across national borders.

The second theory is called the "long-run trade-off" model, which is juxtaposed with the natural rate model in which there is no long-run trade-off. Now the shock, instead of to the wage mark-up, instead is to the price target of the central bank. In Jordi's simulations the price adjusts immediately, while output and unemployment respond slowly. This scenario is implausible, because it ignores the timing sequence in the real world, where the instrument of the central bank is the interest rate, not the price level. When there is a shock to central bank policy, the economy evolves as in the example of the US Volcker disinflation of the early 1980s. The interest rate shot up in early 1981, unemployment rose from mid-1981 to late 1982, and the downward adjustment of the inflation rate was stretched out from early 1981 to late 1986.

The third approach is the "hysteresis" model, which I have already tested in Table 3 above. Jordi's version is in the same spirit, except that he relates wage change to the change in employment, whereas above I related the change of the inflation rate to the change in the unemployment rate. The problem with Jordi's application is that his wage data are not cooperative and provide no evidence of a hysteresis effect. As shown in Jordi's charts, the rate of wage change was virtually constant between 1992 and 2014, but the change of employment was not. In fact, the growth rate of euro area employment at an annual rate was 0.4% for 1989-1998, 1.1% for 1999 to 2008, and a turnaround to -0.6% for 2009-2014. Jordi's empirical tests also fall short by failing to provide confidence levels for the level versus the rate of change effect. Further, there is nothing in Jordi's results comparable to my post-sample dynamic simulations.

4 Conclusion – puzzles about the euro area inflation-unemployment process

As I look at post-war history and compare the euro area evolution of inflation and unemployment compared to that of the United States, I find three important puzzles that future research should address.

1. **Why was unemployment so low before the 1970s?** How could the euro area maintain an unemployment rate of 2% or below during the 1950s and 1960s without

generating runaway inflation? After all, in the United States, inflation accelerated steadily during the period 1966-70 in response to an unemployment rate of 3.5 to 4.0%. One possible answer is that Europe in those decades experienced a continuous regime of excess demand owing to post-war reconstruction, but this did not have inflationary consequences as a result of a steady flow of labour from farm to city. This idea of the "unlimited supply of labour" was originally formulated by W. Arthur Lewis and was applied to western Europe in a 1966 book by Charles Kindleberger.

2. **Why did the unemployment rate rise so much between 1975 and 1985?** Macroeconomic theory has long established that supply shocks, such as higher oil prices and increases in labour's income share, raise some combination of the inflation rate and unemployment rate, with the mix depending on the extent of wage indexation and of monetary policy accommodation. During the 1970s Europe experienced the oil shocks of 1973-75 and of 1979-80, plus the steady increase in labour's share displayed above in Chart 4. Europe's response was characterised by wage indexation, and the mix of reactions in the 1980s shifted to more unemployment and less inflation owing in part to the tight monetary policy imposed by the Deutsche Bundesbank.

3. **Why was the euro area unemployment rate so high in 2014?** This question can be rephrased – why in May 2015 was the unemployment rate in Germany 4.7% while that in Greece was 25.6%, that in Spain 22.5%, and that in Italy 12.4%? The weighted average for the euro area was a rate of 11.1%. The ultimate answer to the apparent puzzle of high average euro area unemployment is that the euro was not a good idea, as many economists predicted before 1999, because of the lack of a centralised fiscal budget and insufficient labour mobility. The German economy is thriving and is able to impose its version of tight money on the peripheral countries, most of which suffer from severe forms of structural unemployment and perverse labour-market institutions.