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Explaining European Unemployment: Testing the NAIRU Theory and a Keynesian Approach

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In writing this paper I have benefited from comments by Fabio Rumler and Alfred Stiassny. All mistakes are mine.

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Abstract

The aim of the paper is to contrast and test the NAIRU theory and the Keynesian theory of unemployment econometrically. For the former, wage push variables are key in explaining the rise of European unemployment, for the latter accumulation is. The theories are tested using time series data for Germany, France, Italy, the UK and the USA, using the seemingly unrelated regression method (SUR). Unemployment benefits, union density and the tax wedge were used as wage push variables, and the growth of business capital stock as the accumulation variable. The NAIRU specification performed poorly, with only the tax wedge having a positive effect on unemployment as predicted. The Keynesian approach was more successful, with accumulation being statistically significant in all countries. Moreover, the tax wedge and accumulation are fairly robust to changes in the specification and can be pooled across countries.

Key words: unemployment, NAIRU, Keynesian theory, labor market flexibility, accumulation

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Introduction

Major European countries have experienced two digit unemployment rates for more than ten years, associated with high individual as well as social costs. It is widely recognized that creating more employment is one of the foremost policy priorities as witnessed by recent declarations of the European union that declares "to promote economic and social progress and a high level of employment and to achieve balanced and sustainable development" (Treaty of Amsterdam, p. 11) as its policy goal.

Most of the policies designed to combat unemployment focus on the labor market, or what is often called "employability". For example Siebert argues "that institutional changes affecting Europe's labor markets over the last 25 years are a central reason for Europe's poor labor market performance." (Siebert, 1997, 39) and consequently: "Indeed, the specter of unemployment that is haunting Europe will not be exorcised unless governments are prepared to undertake major reforms of the institutional set up of the labor market." (Siebert 1997, 53).
This approach has been taken up by governments and supranational organizations in their recommendations on labor market policy. The OECD offers a details list how to increase labor market flexibility (OECD 1997), advising to reduce and shorten unemployment benefits, reduce employment protection, and decentralize collective bargaining. More modestly, the EU member countries have agreed to "review and, where appropriate, refocus its benefit and tax system and provide incentives for unemployed or inactive people to seek and take up work". (EU Employment Guidelines 1999)

This approach, the theoretical underpinnings of which are provided by the NAIRU theory, is in stark contradiction to a Keynesian approach that stresses demand deficiency in explaining unemployment. Keynes short run analysis was developed further by Joan Robinson and Nicholas Kaldor. In these models investment behavior is crucial in determining employment growth. The paper empirically tests the influence of labor market factors and demand factors in a time series analysis for four major European economies and the USA. The findings give little support to the labor market inflexibility hypothesis.

The paper is organized as follows. The first section contrasts the NAIRU model based on which labor market inflexibility is identified as the prime cause of European unemployment and the Keynesian model which argues that a slowdown in accumulation is the prime reason for the rise in unemployment. Section two summarizes the empirical work available and discusses shortcomings of cross country analysis. Section three describes the econometric methods employed. Sections four, five and six present the regression results for the NAIRU model, the Keynesian model and combinations of both, respectively. Finally, section seven concludes.

NAIRU vs. Keynes: conflicting theories of unemployment

The NAIRU approach and the Keynesian approach offer differing theories of unemployment, both in the sense of what function unemployment fulfills in the economic system and of how its level is determined. Consequently both arrive at counterposed explanations of the rise of European unemployment over the past two decades.

Much of the energy of NAIRU theorists has gone into the microeconomics of bargaining and price and wage setting (Layard, Nickell and Jackman 1991, Phelps 1994), for our purpose it suffices to present a simple macroeconomic version (following Blanchard 1990). In the NAIRU system the equilibration of income claims by capital and labor is at the center stage. In the short run this is achieved by unanticipated inflation: Prices rise faster than workers had expected at the point of negotiating wages, thus a redistribution of income takes place. In the short run therefore, effective demand determines unemployment, but with unanticipated inflation if the rate of unemployment falls below the NAIRU, the long run equilibrium rate of unemployment. In the long run expectations are fulfilled, income claims then are equilibrated through the rate of unemployment. The goods market adjusts passively to the corresponding "natural" output level through the real balance effect. Blanchard (1990, 70) summarizes this approach as follows: "Unemployment must reconcile the income claims of firms and workers. The aggregate demand relation, as usual, plays no other role in equilibrium than to determine the price level or the rate of inflation"

INSERT TABLE 1 ABOUT HERE

Table 1 summarizes a stylized macroeconomic NAIRU model. Note that the NAIRU depends on wage push factors and the mark up, which is equivalent to the price push factors, but not autonomous demand. The NAIRU story of European unemployment then is that wage push factors, mostly welfare state related, (γ_0 in table 1) caused unemployment. (What these wage push factors exactly are, will be discussed later).

In Keynes' analysis there is no equilibrium rate of unemployment in the sense of an unemployment rate equilibrating income claims, but only in the sense of unemployment being derived from the equilibrium on the goods market. In the short run investment, or more generally, autonomous expenditures, are exogenously given and determine output, which adjust such that investment equals savings. Keynes (1936, 30): "Thus the level of employment is not determined by the marginal disutility of labour measured in terms of real wages, except in so far as the supply of labour available at a given real wage sets a maximum level to employment. The propensity to consume and the rate of new

investment determine between them the volume of employment, and the volume of employment is uniquely related to a given level of real wages--not the other way round."

In the long run, following J. Robinson and N. Kaldor, investment is endogenized being a function of profitability, but maintain an autonomous component reflecting what Keynes called the "animal spirits". The equilibration between investment and savings is still at the center stage, with output growth and income distribution, the rate of profit to be precise, as the adjusting variables. Employment is usually added by assuming fixed proportions in production, but this is only a matter of convenience (see Marglin 1984 for a presentation of Keynesian growth theory with a CES production function).

INSERT TABLE 2 ABOUT HERE

Table 2 summarizes the Keynes-Robinson growth model. Employment growth is a function of equilibrium accumulation, which gives rise to the possibility of exploding unemployment, i.e. a divergence between Harrod's warranted rate of growth and the natural rate of growth. There need not be an equilibrium *rate* of unemployment in a Keynesian system, since unemployment has no equilibrating function. Moreover, the Keynesian theory of distribution gets by without unemployment, since investment expenditure and the savings propensity out of profit income determine profits (Kalecki 1971, Kaldor 1960).

A Keynesian story of European unemployment is hence a story of accumulation slowdown (Davidson 1998). This slowdown can be due to a variety of reasons, like high real interest rates (Schulmeister 1996), an increasingly uncertain investment climate (Maddison 1991), or rising rates of return required by financial markets. The slowdown in accumulation translates into overall lower growth rates, which, given a stable natural rate of growth, leads to higher unemployment rates.

To sum up, in the NAIRU theory the unemployment rate equilibrates income claims of workers and firms with the goods market adjusting passively through the real balance effect. In the Keynesian theory growth and income distribution equilibrate savings and investment, with the employment growth adjusting to the goods market equilibrium, the warranted rate of growth. Thus there is no equilibrium rate of unemployment but only a rate of employment growth derived from the goods market. For the empirical work, we not only have different explanatory variables (wage push factors vs. accumulation), but also different dependent variables. For the NAIRU theory, it is the rate of unemployment that is explained, for Keynesians it is the growth rate of employment.

Empirical work (review)

Both theoretical approaches have lead to empirical studies, but most of the work has been in the NAIRU tradition. It can roughly be divided into estimations of wage setting and price setting curves within countries on the one hand (Economic Journal supplement 1985, Bean and Dreze 1990, Layard, Nickell and Jackman 1991, Gordon and Franz 1993) and regressions explaining unemployment by institutional data on the other hand (Nickell 1997, Scarpetta 1996). The first approach, mostly using time series data, allows for a calculation of the NAIRU implicit in wage and price setting, whereas the second, using cross country data, explicitly attempts to explain unemployment.

This second approach is of interest here because the link between unemployment and labor market variables and wage pressure factors is analyzed. Variables that are identified as wage push factors include high and durable unemployment benefits, strong unions, a high degree of job protection and high minimum wages and were shown to be positively correlated with unemployment. (e.g. Scarpetta 1994, OECD 1994). However, by now, for most factors there is also econometric evidence available questioning this effect. For example, OECD 1998 finds no general support for a negative impact of minimum wages, OECD 1999 fails to find evidence that job security caused unemployment. Monastiriotis (1999) shows how sensitive the results are to the specification of the dependent variable. Nickell 1997 is probably the most careful analysis of the cross country approach.

Fewer studies testing the Keynesian approach are available, reflecting the disinterest in old Keynesian theory that has been prevalent among economists. Rowthorn 1995 and Glyn 1998, however, provide cross country evidence that accumulation is positively correlated with employment growth.

Empirical studies explaining unemployment have thus been inclusive and, in our view, suffer two major shortcomings. First few studies have attempted to include labor market factors as well as demand factors (Blanchard and Wolfers 1999 being an exception). Second, there has been an unhealthy focus on cross country data. Cross country evidence is able to explain differences between countries, but once it is used for policy prescription it relies on the implicit assumption that mechanisms are the same within a country as between countries. Technically speaking, it is assumed that the countries can be pooled (this criticism also applies to Blanchard and Wolfers), which is an assumption that usually cannot be tested for in cross country studies. Thus cross country studies are inherently limited.

The aim of this paper is to test the NAIRU approach and the Keynesian approach and to combine both. We use specification similar to that in cross country regressions and

explore their explanatory power in the face of time series data. Further we test whether or which variables can be pooled across countries.

Econometric method

The following sections will report the econometric results. Five countries were investigated: Germany, France, Italy, UK and USA. The choice was motivated by the desire to explain unemployment in the large European countries. The USA serves as a benchmark case. We estimate identical specifications for all countries which may lead to the neglect of country specificities, but has the advantage that it provides a better test of the validity of the model in question. More technically, it reduces the problem of data mining (xxx), since we do not costumize the specification to get a best fit regression or high t-values.

Since the five regressions cover the same period, we can make use of the possible correlation of the error terms that may arise from shocks that simultaneously hit all countries. This is done by applying Zellner's seemingly unrelated regression (SUR) method. To illustrate this procedure, take the two country case

$$\begin{bmatrix} y_1 \\ y_2 \end{bmatrix} = \begin{bmatrix} b_1 \\ b_2 \end{bmatrix} \begin{bmatrix} X_1 & 0 \\ 0 & X_2 \end{bmatrix} + \begin{bmatrix} e_1 \\ e_2 \end{bmatrix}$$

where y_c is the vector of variable to be explained and X_c is a matrix of explanatory variables for country c. For simplicity assume that X_c consists of vectors $x_{c,i}$ where the variable i represents the same variable for various countries c.

Assuming away autocorrelation and heteroscedasticity, the covariance matrix of the error term will have the following form.

$$\begin{bmatrix} e_1 \\ e_2 \end{bmatrix} * \begin{bmatrix} e_1 & e_2 \end{bmatrix} = \left[\begin{array}{ccc|ccc} s_{11} & \cdots & 0 & s_{12} & \cdots & 0 \\ \vdots & \ddots & \vdots & \vdots & \ddots & \vdots \\ 0 & \cdots & s_{11} & 0 & \cdots & s_{12} \\ \hline s_{12} & \cdots & 0 & s_{22} & \cdots & 0 \\ \vdots & \ddots & \vdots & \vdots & \ddots & \vdots \\ 0 & \cdots & s_{12} & 0 & \cdots & s_{22} \end{array}\right]$$

The partitions on the main diagonal reflect the standard assumption of OLS. If the main diagonal elements of the off-diagonal partitions are non-zero, the error terms of both countries are correlated. Estimating two separate OLS regressions is equivalent to

assuming that these elements are zero. If they are not, the SUR method, first proposed by Zellner 1962 (for a textbook presentation see e.g. Greene 1997), using a generalized least square (GLS) procedure, will be appropriate. Thus even if the data cannot be pooled, more efficient estimates can be obtained if the two regressions are treated as a system if the error terms of the two countries are correlated, i.e. if $s_{12} \neq 0$

Pooling in this example is the restriction that the two coefficient vectors are identical, i. e. $b_1 = b_2$. Pooling is thus a restriction that can be tested for (with an F-test). Of course, we need not pool all variables, but could do so for only one variable, i.e. $b_{1,i} = b_{2,i}$ .We proceed by estimating the equation first by OLS, second by SUR and test for pooling. Third, where appropriate by estimating a restricted, i.e. pooled SUR.

There is one potential practical problem that may arise from using SUR. Since we need the same period of observation for all countries, the country with the least observations dictates the period of investigation.

Since we are dealing with time series data we have to be aware of the problems of spurious regression results that may arise when to variables with unit roots are regressed onto each other (Campbell and Perron 1991; Charemza and Deadman 1997). Unfortunately in finite samples tests cannot distinguish between unit roots and autocorrelation. Miron's conclusion "since we can never know whether the data are trend stationary or difference stationary, any result that relies on the distinction is inherently uninteresting" (Miron 1991, 212) may be too nihilistic, but it effectively illustrates the need for flexible modelling. Fortunately, autoregressive distributed lag (ADL) models do have desirable statistical properties, in particular the estimates of the standard errors of the coefficients are consistent except for the lagged dependent variable (Sims, Stock and Watson 1991, Hamilton 1994). We will thus test the robustness of our results by means of ADL models, where the ADF tests failed to reject a unit root in variables

Testing the NAIRU story

In the NAIRU story, the rate of unemployment equilibrates income claims of workers and capitalists, thus the dependent variable in the regression has to be the rate of unemployment. Since what is explained is structural unemployment, i.e. the NAIRU, we want to control for cyclical fluctuations. The appropriate variable in the NAIRU context is the change in inflation (INFL).

Since the core of the NAIRU explanation of European unemployment is that labor market inflexibility and wage pressure we need variables for these. While a considerable amount

of data is now available on a cross country basis (collected e.g. in OECD1994, Jackman, Nickell and Layard 1991), time series data are still limited. We were able to incorporate a measure of the generosity of unemployment benefits (RR), union density (UD) and the tax wedge (TW). Additionally, to control for the oil price shock, the terms or trade (TOT) were included. Except for job protection legislation and minimum wage, we therefor have taken into account the most frequently cited wage push factors.

Thus the regression equation becomes:

(I) $$u_t = b_0 + b_1 \Delta INFL_t + b_2 RR_t + b_3 UD_t + b_4 TW_t + b_5 TOT_t + e_t$$

For the countries under investigation, no substantial empirical difference exists between the standardized and the national definition of the rate of unemployment. Following conventional practice, we used standardized OECD unemployment rates. For France national unemployment rates were used for the time before 1965, which is unlikely to create a break in the series, since for the period 1965-1970, the two time series are virtually identical. Inflation is measured by the rate of growth of the GDP deflator. The terms of trade (TOT) are import prices over export prices.

As the measure of the generosity of the unemployment benefit system the OECD gross replacement ratios (RR) were used. The OECD series offer comparable time series for most OECD countries that are based on legal entitlements, not actual payments. They count replacement rates for the first five years of unemployment with higher weight for the first year. Thus the measure takes into account the level as well as the duration of unemployment benefits. UD is the net union density from Visser 1996, which excludes retired and unemployed union members. The same union density, of course can mean different things in different countries, but in any country a stronger union should increase wage claims, and, according to the NAIRU story, unemployment. The tax wedge (TW) is the difference between the wage cost paid by the firm and the wage income received by the worker. TW is direct taxes on household income plus social security contributions divided by the wage sum. Household income includes capital income, introducing some bias into our measure. However the resulting error ought to be small.

INSERT TABLE 3 ABOUT HERE

The results of this regression are reported in table 3. First we have to address the question of spurious regression results. The regression passes a frequent rule of thumb, that the dw-statistics exceeds the R-squared, but, except for France, the more rigorous Engle-Granger cointegration test fails to reject the null hypothesis of no cointegration. For

Germany, Italy and the UK, the dw-statistics indicates the presence of autocorrelation. Thus we will have to look for better time series specifications, but it is still instructive to look at the results of this first regression. Only for the inflation variable do the results confirm the NAIRU approach. In four countries its sign is negative and in three cases it is statistically significant at conventional levels. For the other variables, looking only at coefficients that are statistically significant at least at the 10% level, the signs do not correspond to the predictions: RR is negative in Italy and positive in the USA, UD is negative in Germany, TW is positive in Italy and negative in the USA. TOT is negative in Italy and positive in the USA. We conclude that while the trade off between unemployment and the acceleration of inflation, the expectations augmented Phillips curve, is confirmed, the regression clearly fails to explain the changes in the NAIRU.

We have tested different time series specifications, starting with an unrestricted autregressive distributed lag (ADL) model, which gives weak supports to entering the explanatory variables in levels rather than differences. The difference version of (1) renders most variables insignificant, nor does an autocorrelation procedure lead to the predicted results.

As a convenient way to correct for autocorrelation in order to improve the reliability of the results, the dependent variable was added on the right hand side (RHS) of the equation. The lagged dependent variable has the advantage of having an economic interpretation: it measures the extent of unemployment persistence. Thus the second equation to be estimated is:

(II) $$u_t = b_0 + b_1 \Delta INFL_t + b_2 RR_t + b_3 UD_t + b_4 TW_t + b_5 TOT_t + b_6 u_{t-1} + e_t$$

INSERT TABLE 4 ABOUT HERE

Table 4 summarizes the results of this regression. With the exception of the UK, autocorrelation of the error term is not a problem now. Since a lagged dependent variable is used the DW critical values do not apply, but the dw-statistics is still suggestive, as the Breusch-Godfrey serial correlation LM test confirmed. (The estimates for the UK cannot be improved by an autocorrelation procedure, because the parameter estimates do not converge) The results are similar to the first regression with the exception of TW, which is now positive and significant at least at the 5% level in three countries, the continental European ones. The change in inflation still consistently positive and significant in all but one country. UD and RR are significant in only one country each, Germany and Italy respectively, with a negative sign. TOT has the expected sign in Germany and the USA, but a negative sign in Italy. Unsurprisingly, the lagged unemployment rate is highly

significant in all countries except the USA, with values ranging from .59 to .9. Thus persistence is high in these countries, but probably below full hysteresis.

Overall, while the expectations augmented Phillips relations is confirmed, we failed to find evidence for labor market variables explaining changes in the NAIRU. In particular unemployment benefits and the organizational density of unions do not increase unemployment. Only the tax wedge seems to play the role that it is attributed by the NAIRU theory.

Testing the Keynesian story

Accumulation is supposed to drive employment growth in the Keynesian model. To control for cyclical fluctuations, we add the change in capacity utilization. Thus the simple Keynesian regression is

III $$EPG_t = b_0 + b_1 ACCU_t + b_3 \Delta CAPUT_t + e_t$$

We regard the growth of private employment as the appropriate variable to be explained in the Keynesian story, because a stable relation between growth, driven by accumulation and employment growth is posited. As measure for employment growth (EPG) the rate of growth of private sector employment is used. Accumulation (ACCU) is the rate of growth of the business sector gross fixed capital stock. Capacity utilization is measured alternatively by detrended capital productivity of the business sector and by the output gap. Both series are highly correlated. For the former we can construct longer time series, thus it is used.

EPG is clearly I(0), so is the change in CAPUT. The order of integration is less clear for ACCU, for which the ADF test indicates I(1) rather than I(0), with trend stationarity not rejected either for most countries. However, the interval -5 to +15 probably captures all values accumulation has taken on historically, making it very unlikely that it is a random walk (a random walk has no fixed mean, thus it wanders around freely). Thus we will treat ACCU as if it were I(0), but test how sensitive the results are to this assumption.

INSERT TABLE 5 ABOUT HERE

Table 5 summarizes the results of equation (III). Autocorrelation was initially present, which may have indicated missing variables. An autocorrelation correction procedure was applied, improving the dw-statistics but hardly changing the coefficient estimates and their standard errors. Applying SUR to the regression does improve the significance, but not change the signs of the coefficients. ACCU as well as CAPUT are significant at the 1%

level in all but one country, Germany and Italy respectively. In Germany ACCU is significant at the 10% level. The explanatory power varies between countries. For Italy only 16% of the variation of the dependent variable is explained, in all other countries, more than half of the variation is explained. There is also a noteworthy difference in the intercepts. The European countries with the exception of Germany have statistically significant negative intercepts, whereas the US does not. In other words: in the absence of accumulation jobs will be destroyed in Europe, but not the USA.

These results are fairly robust. Using the output gap as the capacity utilization variable has no effect on the significance of ACCU. Nor does using a lagged dependent variable on the RHS instead of the autocorrelation procedure. Adding a first difference of ACCU is often significant, but does not effect the estimates of ACCU.

Overall, the Keynesian model performs remarkably well. Employment growth is consistently and at high levels of statistical significance correlated with accumulation. However the question remains whether this result still holds once labor market variables are included.

Combining NAIRU and Keynesian factors

Finally we wish to combine the explanatory factors of the NAIRU story and the Keynesian story. Note that we do so on empirical grounds, without offering a unified theoretical framework, because we doubt, whether this is possible. The question then is how the theories can be combined empirically. Should we insert labor market factors in the Keynesian employment growth model or accumulation in the NAIRU unemployment model? To do justice to both theories, we will do both.

First we will add accumulation to equation II, which leads to the following specification

IV $$u_t = b_0 + b_1 \Delta INFL_t + b_2 RR_t + b_3 UD_t + b_4 TW_t + b_5 TOT_t + b_6 u_{t-1} + b_7 ACCU_t + e_t$$

which is II with ACCU added. Since the Keynesian argument is that accumulation determines employment growth we would expect the log of capital stock rather than accumulation determine unemployment. However, including both log capital stock and accumulation in the regression makes clear that accumulation is the appropriate specification of the variable. Note that this may affect the interpretation. The log capital stock captures the capacity effects whereas its change, accumulation, captures the income effect.

Equation IV was estimated with SUR in which TW, U_{-1}, ACCU and INFL were highly

significant with the predicted signs. Next tests were performed to test whether these variables could be pooled. As a result we failed to reject pooling TW for France, Italy and the UK; U_{-1} for France, Germany, Italy and the UK; and ACCU for France, Germany, Italy and the USA. For INFL pooling was rejected for more than two countries.

INSERT TABLE 6 ABOUT HERE

Table 6 summarizes the results of this restricted SUR. Autocorrelation problems remain for the UK, but are no serious problem for the other countries. The results are consistent with the separate NAIRU and Keynesian regressions. The explanatory power of ACCU and TW are confirmed. Moreover, the fact that we could not reject pooling suggests that their effects are similar in different countries. Unemployment persistence can be pooled across European countries giving a value of about two thirds, whereas for the USA it is around one third. INFL still is consistently negative and statistically significant in three of five countries. The fact that we cannot pool ΔINFL suggest that the inflation unemployment trade off varies between countries. RR is significant twice, but with a negative sign, UD is also significant twice, once with a positive sign, once with a negative one.

TOT is statistically significant in four countries, but with two positive and two negative signs. This is surprising, given the importance of the oil shocks of the 1970s. The UK may be a special case because of the North Sea oil, but the result for Italy is certainly unexpected. One explanation may be that the effects of the rise of the oil price in the 1970s and their subsequent fall in the 1980s were so asymmetric. However this explanation raises as many questions as it answers, nor does it explain, why the coefficient is significant in so many countries. Or it might simply be, that TOT is not measuring what it is supposed to measure, which would be surprising too, since it is a standard variable in similar regressions.

Second we enter the labor market variables in the Keynesian employment growth regression. This is done in differences.

V $$EPG_t = b_0 + b_1\Delta CAPUT_t + b_2\Delta RR_t + b_3\Delta UD_t + b_4\Delta TW_t + b_5\Delta TOT_t + b_6 ACCU_t + e_t$$

To estimate equation V we first estimated V by SUR and test what variables could be pooled. For CAPUT we failed to reject the null of pooling for France, Italy and the USA; for TW we failed to reject pooling for all countries; and for ACCU we failed to reject pooling for France, Germany, UK and USA. Furthermore for RR and TOT we cannot reject the hypothesis that coefficients are simultaneously zero in all countries.

ENTER TABLE 7 ABOUT HERE

Table 7 reports the estimation results of specification V with the above pooling restrictions on CAPUT, TW and ACCU. CAPUT is the cyclical variable thus its generally high level of significance is not surprising. TW, pooled for all countries, is significant at the 10% level, but could be easily improved if Germany and UK were allowed to have different values (in the unrestricted version Germany and UK had TW negative estimates close to zero). ACCU is highly significant in the pooled version with the expected sign and with a negative sign in Italy. Among the other coefficient estimates only few are statistically significant: UD in Italy (positive) and TOT in the USA (positive).

In short, neither adding accumulation to the NAIRU specification nor adding labor market variables to the Keynesian specification changes the results strongly. Accumulation performs well in the NAIRU specification, and so does the tax wedge in the Keynesian specification. Accumulation and tax wedge seem to have a strong effect on unemployment irrespectable of the specification, though exceptions like the USA for the tax wedge in the NAIRU specification and Italy for accumulation in the Keynesian specification, exist.

Correlation, of course, is not causation. In particular, the results do not tell us the direction of causation. For both significant variables, we cannot exclude that changes in employment are causing changes in accumulation and the tax wedge respectively. Higher employment may cause investment through an accelerator effect. Higher unemployment may lead to high taxes, since unemployment benefits have to be financed. Granger causality tests could in principle be used to address the question of causality, but in practice they are inconclusive, since we use yearly data. Finer time series data would be needed to distinguish between cause and effect.

Conclusion

The aim of the paper was to contrast and test the NAIRU theory and the Keynesian theory of unemployment. For the former, wage push variables are key, for the latter accumulation. Moreover, they also suggest different specifications of the dependent variable, the rate of unemployment and the growth of employment respectively. The theories were tested using time series data for Germany, France, Italy, the UK and the USA, using SUR.

Unemployment benefits, union density and the tax wedge were used as wage push variables. The NAIRU specification performed poorly, with only the tax wedge having a positive effect on unemployment as predicted. As to the Keynesian approach, the role of accumulation was confirmed. Moreover, the tax wedge and accumulation are robust to the

specification and can be pooled across countries.

These findings are at odds with parts of the empirical literature on the subject. This may be due to the fact that most of it has operated with cross section data or has paid insufficient attention to the question, and the testing, of pooling. While cross country analysis is valuable in itself, time series evidence is indispensable if one aims at policy recommendations.

We conclude that the focus on labor market institutions in combating European unemployment is inappropriate. For example we found no evidence that reducing unemployment benefits reduces unemployment. Demand variables, that according to the Keynesian theory are key even in the long run, on the other hand, should be taken more seriously. Our evidence indicates that the slowdown in accumulation is at least partially responsible for the insufficient creation of new jobs.

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Tables

Table 1. A NAIRU model

demand	$y = a_0 - a_3 p$	1.1
employment function	$e = j_0 + j_4 y$	1.2
price setting	$p = e_0 + w^e$	1.3
wage setting	$w = g_0 - g_5 (n - e) + p^e$	1.4
unemployment	$u \equiv n - e$	

(all variables in logs)

y	output
p	prices
e	employment
w	wages
n	labor force
u	unemployment

if expectations are fulfilled

$$u^* = \frac{e_0 + g_0}{g_5}$$

Table 2. A Keynesian model

investment	$g^I = \frac{I}{K} = a_0 + a_1 r$	1.1
saving	$g^S = \frac{S}{K} = sr$	1.3
prices	$P = \overline{W} a_1 + rPa_0$	1.4
employment function	$g^e = j g^*$	1.2
unemployment	$u_t \equiv \left(g^n - g^e\right) + u_{t-1}$	

g^I	accumulation
g^S	savings/capital stock
g^e	employment growth
$\overline{W}$	money wages
g^n	natural rate of growth (growth of the labor force)
u	unemployment rate
P	price level
r	profit rate
a_0	capital output ratio
a_1	labor output ratio
s	saving ratio of profit income

in equilibrium: $g^* = \frac{sa_0}{s - a_1}$ and $g^e = \varphi \frac{sa_0}{s - a_1}$

Table 3. Unmployment regression: u = c + Δ infl + rr + ud + tw + tot

u = c + Δ infl + rr + ud + tw + tot					
	D	F	I	UK	US
r2	.96	.98	.96	.94	.84
period	63-93	66-92	63-92	63-93	63-93
C	2.36	4.8	2.03	24 **	.25
t-value	*.17*	*.8*	*1.49*	*2.56*	*.06*
Δ infl	-21.8 **	-12.4 *	.28	-4.18	-40.6 ***
t-value	*2.5*	*1.72*	*.09*	*1.1*	*2.98*
rr	33.7	7.7	-12.4 **	4.33	33 *
t-value	*.71*	*.92*	*2.57*	*.14*	*1.69*
ud	-30.3 *	-20	1.64	-30	-3.2
t-value	*1.77*	*.89*	*.38*	*1.61*	*.32*
tw	10.7	10.6	39.1 ***	-11.9	-19.8 *
t-value	*.86*	*.8*	*12*	*1.31*	*1.73*
tot	.12	-.18	-3.8 **	-2.6	8.3 **
t-value	*.04*	*.09*	*2.07*	*.52*	*2.18*
dw	1.3	1.75	1.5	1.17	1.92
ADF	2.24	5.38 *	4.8	3.32	4.5

Note. Computations performed with Eviews. Germany: dummy for 1991 (unification) included.

critical values of Engle-Granger cointegrating ADF (30, 6) test:

1% 6.55

5% 5.66

10% 5.23

(source: Charemza and Deadman 1997)

Table 4. Unmployment regression: $u = c + u_{-1} + \Delta$ infl + rr + ud + tw + tot

OLS

$u = c + u_{-1} + \Delta$ infl + rr + ud + tw + tot					
	D	F	I	UK	US
r2	.98	.99	.98	.92	.84
period	62-93	66-92	62-92	62-93	62-93
C	-2.6	-8.1 ***	1.3	4	-1.1
t-value		*3.09*	*1.58*	*.6*	*.3*
u_{-1}	.7 ***	.59 ***	.65 ***	.9 ***	.19
t-value	*10*	*4.2*	*4.7*	*6.6*	*1.29*
Δ infl	-21.3 ***	-12.7 *	-6.5 **	-8.12	-38-5 ***
t-value	*2.78*	*1.82*	*2.28*	*1.47*	*2.8*
rr	.54	7.9	-10.3 ***	-10.1	29.8
t-value	*0*	*1.27*	*3.14*	*.6*	*1.54*
ud	-19.4 ***	4.3	2.8	4.3	.6
t-value	*3.44*	*.5*	*1.28*	*.7*	*0*
tw	12 ***	16.1 **	14.2 **	-.7	-15.2
t-value	*3.35*	*2.24*	*2.46*	*.1*	*1.36*
tot	4.94 ***	2.2	-2.2 *	-2.3	6.9 **
t-value	*3.1*	*1.43*	*1.82*	*.6*	*2.17*
dw	1.91	1.98	1.87	1.13	1.79

Note. Computations performed with Eviews. Germany: dummy for 1991 (unification) included.

u = c + u(-1)

	France	Germany	Italy	UK	USA
r2	.98	.95	.96	.91	.61
u-1	.98	.99	.99	.91	.78
t-value	34	26	27	18.9	7.4
dw	1.21	1.03	1.45	.88	1.47

note. intercept included, but not reported.

Table 5. Employment growth regression (gk and dz) SUR

epg = c + gkb + Δz + ar(1) SUR! 1962-96					
	France	Germany	Italy	UK	USA
R2	0.67	0.96	0.16	0.56	0.58
period					
C	-0.01 **	-0.01	-0.03 ***	-0.03 ***	0.00
	-2.32	*-1.53*	*-2.72*	*-3.33*	*-0.27*
Δ CAPUT	0.96 ***	0.98 ***	0.19	1.41 ***	0.55***
	6.02	*5.33*	*0.99*	*4.75*	*6.09*
ACCU	0.38 ***	0.34 *	0.85 ***	1.50 ***	0.59 ***
	2.83	*1.89*	*2.92*	*3.43*	*3.60*
dw	1.93	1.76	1.98	1.68	1.85

Note. Computations performed with Eviews. Germany: dummy for 1991 (unification) included.

Table 6. Unemployment: restricted SUR – LM, gK u(-1)

	Pooled	France	Germany	Italy	UK	USA
R-squared		0.99	0.98	0.98	0.95	0.88
DW		1.63	1.86	2.09	1.29	1.90
C		-1.87	-1.15	4.48 ***	14.47 ***	-4.56 **
		-1.11	*-0.31*	*5.73*	*5.04*	*-2.18*
Δ INFL		-8.02	-19.95 ***	-2.29	-7.81 **	-26.16 ***
		-1.76	*-4.15*	*-1.13*	*-2.30*	*-3.54*
RR		3.80	14.13	-8.03 ***	-24.57 ***	16.62
		1.07	*1.08*	*-3.47*	*-4.09*	*1.58*
UD		3.80	-22.80 ***	-0.78	-5.24	16.02 ***
		0.67	*-6.60*	*-0.44*	*-1.14*	*2.89*
TW	11.20 ***	pooled	7.88 ***	pooled	pooled	-2.90
	6.28		*3.55*			*-0.51*
TOT		0.48	3.73 ***	-2.32 ***	-4.12 *	6.42 ***
		0.45	*3.79*	*-2.68*	*-1.68*	*3.47*
U(-1)	0.64 ***	pooled	pooled	pooled	pooled	0.32 ***
	17.26					*3.89*
ACCU	-39.35 ***	pooled	pooled	pooled	-162.02 ***	pooled
	-6.97				*-5.80*	

Note. The regressions were first estimated with an unrestricted SUR and tested for pooling. Then SUR was performed with the pooling restrictions that we failed to reject. The first column reports the estimate of the parameters that were restricted to be equal for the countries marked "pooled".

Table 7. EPG with Δ LM and ACCU

	Pooled	France	Germany	Italy	UK	USA
C		-0.02 ***	-0.02 ***	0.02 **	-0.02 ***	0.00
		-4.09	*-3.38*	*2.52*	*-3.09*	*-0.61*
Δ CAPUT	0.58 ***	pooled	0.99 ***	pooled	1.14 ***	pooled
	7.79		*5.28*		*3.28*	
Δ RR		-0.01	0.97 *	0.05	-0.10	-0.25
		-0.09	*1.71*	*0.52*	*-0.28*	*-1.49*
Δ UD		-0.24	-1.03 **	0.31 *	0.06	0.25
		-1.26	*-2.36*	*1.67*	*0.21*	*0.80*
Δ TW	0.10 *	pooled	pooled	pooled	pooled	pooled
	1.64					
Δ TOT		-0.02	-0.01	0.05	-0.02	0.10 **
		-1.09	*-0.37*	*1.47*	*-0.30*	*2.37*
ACCU	0.64 ***	pooled	pooled	-0.58 ***	pooled	pooled
	4.76			*-3.06*		
R-squared		0.70	0.97	0.16	0.47	0.72
Adjusted R2		0.58	0.95	-0.11	0.27	0.64
DW		1.60	1.72	2.08	1.64	2.15

Note. The regressions were first estimated with an unrestricted SUR and tested for pooling. Then SUR was performed with the pooling restrictions that we failed to reject. The first column reports the estimate of the parameters that were restricted to be equal for the countries marked "pooled".

Appendix Unit root tests

unit root test for u

	F	D	UK	US	Italy
n					
ADF	1.19	1.02	1.91	2.53	.73
ADF + trend	3.48 *	2.42	3.6 *	2.96	2.72 *
differences	3.93 ***	3.34 **	5.5 ***	4.77 ***	5.09 ***

crit value ADF (at 10%): 2.6; with trend: 3.2

Unit root tests for EPG

	France	Germany	Italy	UK	USA
	68-96	63-96	63-94	64-96	64-96
ADF	3.77 ***	14.6 ***	4.22 ***	4.36 ***	4.77 ***

Data Appendix

EPG growth of private employment; source: OECD Economic Outlook

ACCU growth of private sector gross capital stock; source: OECD Economic Outlook

CAPUTcapital productivity of the private sector; source: OECD Economic Outlook

RR replacement rate of unemployment benefits; source: OECD (the Gross Replacement Ratio data set was kindly made available to me). Data is available only for odd year, the rest was interpolated. Since there is little short term variation in the series, the resulting error is probably small.

UD net union density; source: Jelle Visser, Unionisation Trends. The OECD Countries Union Membership File, Amsterdam: University of Amsterdam, Centre for Research of European Societies and Labour Relations CESAR, 1996.

TW tax wedge. Direct taxes plus social security contributions divided by household income. source: OECD Economic Outlook data set.

TOT terms of trade (import prices / export prices). source: OECD Economic Outlook data set.