THE NAIRU CONCEPT – MEASUREMENT UNCERTAINTIES, HYSTERESIS AND ECONOMIC POLICY ROLE

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INTRODUCTORY REMARKS

In 1968 Friedman put forward the notion of a "natural" rate of unemployment to encapsulate the idea that a "normal" level of unemployment, roughly equivalent to the amount of frictional and structural unemployment, persists even when the labour market is in equilibrium. Since there are no direct measures of the natural rate, as it is essentially a theoretical construct, one must be satisfied with proxy estimates derived using various methods including that which draws on Tobin's concept of the non-accelerating inflation rate of unemployment (i.e. the NAIRU).

This latter concept has been used extensively since the 1970s to show that policy makers are not in a position to buy permanent reductions in unemployment by tolerating a higher rate of inflation. Once expectations have fully adapted to any new expansionary policy regime, unemployment will ultimately return to that level of unemployment required to hold inflation steady i.e. the NAIRU. Deviations from the NAIRU or natural rate could only be maintained at the cost of continuously accelerating or decelerating wage increases with the former leading to the well-known phenomenon of wage-price spirals.

The concept of the NAIRU should therefore be seen in the context of the shift in the framework for analysis of the labour market over the last number of decades from one focussed on whether the labour market clears or not, to one which allows for imperfectly competitive goods markets and recognises that unions have a role to play in terms of wage determination. This shift to a bargaining framework of wage setting under imperfect competition is likely to lead to a NAIRU estimate which converges to an unemployment rate which is higher, because of the monopolistic element, compared with that under the classical competitive paradigm and its theoretically equivalent concept of the natural rate.

The present paper looks at this notion of a NAIRU and asks whether it continues to stand up to rigorous analysis in terms of both its theoretical underpinnings or of its empirical applicability. The paper addresses the essential questions in relation to an examination of the NAIRU, namely

- 1. Can it be reliably calculated ? and
- 2. Does the concept continue to have any relevance in terms of the micro and macro policy debate ?

In relation to the first question, it is stressed that precise measurements of the NAIRU are extremely difficult to produce because any measurement process is dogged by the existence of two fundamental sources of uncertainty. The first source of uncertainty

emanates from the fact that the NAIRU must be estimated since it is unobserved, with many different modelling approaches and empirical specifications from which to choose, all of which give plausible, although different, point measurements of the NAIRU. Amongst the competing approaches a preference is shown for the bargaining model method, with the latter being used to produce NAIRU estimates for the US, Japan and the EC15. The second source of uncertainty is the degree of doubt surrounding the NAIRU point estimates themselves, which are imprecisely calculated from a combination of stochastic variables and parameters, with the computing of confidence intervals for the latter highlighting the extent of the imprecision of the various methods used in the calculation. This latter issue of confidence interval estimation is discussed in detail, with the results of the various calculation methods being presented.

As regards the second question, following a discussion on the history of the NAIRU, which stresses its Phillips Curve origins and its role in the policy debates over the last three decades, the paper goes on to discuss the issue of the continuing policy relevance of the concept. In this regard, the growing unease, openly articulated in the vast literature on this topic, concerning both the theoretical and empirical underpinnings of the NAIRU, suggests caution needs to be exercised in terms of any policy role being attributed to the concept. At a fundamental level the theoretical weaknesses, in particular hysteresis mechanisms, call into question the existence of a unique long run NAIRU, i.e. it may be indeterminate or stochastic by nature. At a more practical level, as mentioned above, the existence of a multitude of different point estimates due to model selection/specification differences allied to wide confidence intervals for all of the individual point estimates produced must instil a strong sense of dubiousness in the minds of policy makers. The paper tentatively concludes that while theoretically the NAIRU is still a useful concept its extensive empirical inadequacies render it less than useful in the macro policy context, although a case can still be made for sustaining its use as a structural indicator for cross country, labour flexibility, comparisons.

CHAPTER 1 : UNCERTAINTIES CONCERNING MODEL SELECTION : A NUMBER OF PLAUSIBLE MODELLING APPROACHES EXIST FOR MEASURING THE NAIRU

There are two broad modelling approaches normally adopted in defining the NAIRU, the expectations-augmented Phillips curve approach, which distinguishes a series of labour market variables as potential empirical determinants of the NAIRU, and the atheoretical univariate framework method in which the time series properties of the macroeconomic variable in question are used to identify the NAIRU.

1.1 UNIVARIATE METHODS / MODELS: Univariate methods are essentially statistical as opposed to economic models of the NAIRU, with the underlying assumption being that unemployment always reverts to its mean or natural rate over time. If the latter assumption is true then the NAIRU can be defined uniquely in terms of the behaviour of the unemployment series itself. Conceptually, in terms of the dynamics of unemployment, most time series methods for constructing NAIRU estimates break down the unemployment rate into a deterministic or trend component, which is understood to represent the NAIRU, and a stochastic or cyclical element.

Changes in the deterministic component of unemployment could be interpreted as occurring as a result of structural breaks or regime changes which have the effect of shifting the equilibrium rate of unemployment from time to time; for example the widespread adoption of non-accommodating policies in the early 1980s is often represented as a policy regime change which could have fundamentally modified wage determination relationships and consequently the NAIRU. A radically different interpretation is also possible, based on the notion of hysteresis mechanisms operating in the labour market, which suggests that there is no equilibrium level to which unemployment reverts to in the long run i.e. equilibrium unemployment rates may be non-stationary in that they follow a stochastic or indeterminate trend. Adopting this latter interpretation would suggest that the NAIRU is history dependent in that it is heavily influenced by the historical evolution of actual unemployment.

IS UNEMPLOYMENT A STATIONARY OR NON-STATIONARY PROCESS ? : Since inflation has been stable in Europe for some years now one could, in theory, make a case for suggesting that the prevailing rate of unemployment in Europe is close to, or equal to, its natural rate. However, this is only true if the unemployment series itself is a stationary one. Since the unemployment series in Europe may be non-stationary (i.e. it may not be mean reverting or it may be very slowly mean reverting due to the influence of slow adjustment mechanisms in the labour market) then it may be difficult to estimate a long-run NAIRU since although the present rate of inflation may be stable, the unemployment rate may or may not be. Consequently, this distinction between stationary and non-stationary series is an important one and depends on whether or not the variable contains a unit root.

Testing the US and EC15 unemployment series for the presence of a unit root can be carried out in several ways with the augmented Dickey- Fuller (ADF) and Phillips-Perron (PP) tests being adopted for the present exercise. In testing for the presence of a unit root, it is necessary to allow both an intercept and a time trend to enter the

regression model. The null hypothesis to be tested is that the unemployment time series is non-stationary (i.e. it contains a unit root) against the alternative hypothesis of stationarity. ADF and PP statistics for the US and EC15 unemployment rates are shown in Table 1 and when compared with the MacKinnon critical values clearly suggest that for both areas, the unemployment series are non-stationary, although the US comes much closer than the EU to rejecting the null hypothesis. This latter distinction between the two areas is corroborated in Graph 1 which shows trend unemployment[1] for both geographical zones, with the EU15 trend appearing to drift upwards from cycle to cycle whereas the US appears to be moving back to its mean 1970's value in the present decade.

ARE NAIRU'S PRODUCED USING UNIVARIATE METHODS OF ANY USE ? While NAIRU estimates are very easy to construct using the various univariate methods available, there is a cost to be paid for such simplicity. Use of such methods unfortunately limits the policy usefulness of the estimates produced since no explanation is possible as to the causal factors at work in terms of the evolution of the NAIRU over time. Consequently, since policy makers are left in the dark as to the interactions or interdependencies between the various determining variables, they are precluded from undertaking any meaningful policy interventions. Despite these difficulties, such analysis can nevertheless be useful in highlighting certain observed weaknesses in the NAIRU concept, in particular the view that the effects of unemployment shocks tend to persist over time i.e. the relatively weak tendency for the jobless totals to revert to pre-shock levels. There is growing empirical support, especially in the EU, for this notion of persistence in unemployment, with univariate models being used to demonstrate such hysteresis/persistence mechanisms at work in European labour markets. This persistence issue is discussed in more depth in Chapter 4.

[1]Trend unemployment is calculated using the Hodrick-Prescott (H-P) filter approach. This is a trend estimation method which basically uses a long-run moving average to detrend a particular series, in this case unemployment. Using the H-P filter is justified for calculating the natural component of unemployment since the latter concept assumes that factors affecting the natural rate are infrequent and are slow to change.

TABLE 1 US and EC15 Unemployment (1970Q1- 1997Q4) Statistical Stationary Tests

*A. Augmented Dickey-Fuller and Phillips-Perron Unit Root Tests in Levels**

A.1. Intercept included in test equation (4 lagged differences)

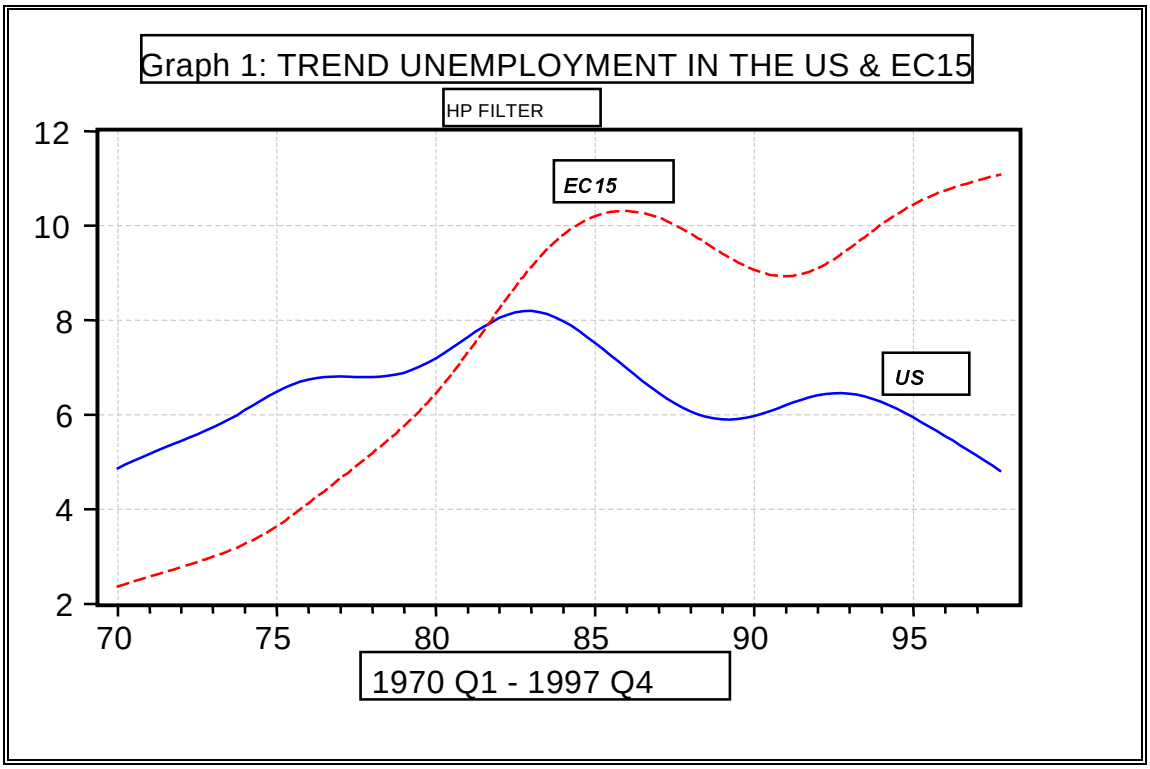
	ADF TEST STATISTIC	*PP TEST STATISTIC*
US	*- 2.31*	*- 2.45*
EC15	*- 1.73*	*- 1.42*

A.2. Trend and intercept included in test equation (4 lagged differences)

	ADF TEST STATISTIC	*PP TEST STATISTIC*
US	*- 2.36*	*- 2.47*
EC15	*- 1.90*	*- 1.18*

** MacKinnon critical values for rejection of hypothesis of a unit root*

	Intercept	*Intercept + Trend*
1% critical value =	*- 3.49*	*- 4.05*
5% critical value =	*- 2.89*	*- 3.45*
10% critical value =	*- 2.58*	*- 3.15*



1.2 VARIANTS OF THE EXPECTATIONS AUGMENTED PHILLIPS CURVE APPROACH

Of all the methods used to calculate the NAIRU, the most widely adopted approach is that of an expectations-augmented Phillips curve. The calculation of the equilibrium or steady-state (i.e. stable inflation) value of unemployment from the latter framework constitutes a genuine estimate of the NAIRU given that the Phillips curve postulates a formal relationship between the unemployment rate and wage/price inflation. As regards this approach, the NAIRU is established at the point where a stable Phillips-curve relationship exists between the deviation of unemployment from the NAIRU and unexpected inflation. Within this dominant Phillips curve framework two variants have emerged, namely the single equation inflation approach, an example being Gordon's "Triangle" model, and the multiple equation wage-price model approach (e.g. the Bargaining model).

1.2.1 SINGLE EQUATION METHODS

Using a single equation approach the NAIRU can be defined as the level of unemployment which is consistent with a stable expectations - augmented Phillips curve relationship. The most widely used variant of this single equation approach is Gordon's « Triangle Model » framework (see Gordon 1997), with the latter postulating that the inflation rate depends on a "triangle" of basic factors, namely: expected inflation, demand conditions, as proxied by the unemployment gap (i.e. the deviation of the unemployment rate from the NAIRU or natural rate), and supply side shocks:

$$\pi_t = \pi_t^e + \beta\left(U_t - \bar{U}\right) + yX_t + e_t \qquad (1)$$

with π_t and π_t^e, the actual and expected rates of inflation, *Ut* as the unemployment rate, $\bar{U}$ as the NAIRU and with *Xt* included to represent supply side shocks. e_t is a serially uncorrelated error term.

Estimation of the above equation requires an assumption with regard to the formation of expectations. With regard to π_t^e, since the inflation process in many countries is dominated by inertia, with year-to-year changes in inflation being small, the most commonly adopted approach to providing an estimate of inflationary expectations is to use a distributed lag of past rates of inflation as a proxy for future inflation i.e. a backward looking specification such as $\pi_t^e = \sum \beta_1 \pi_{t-1}$. A stable inflation rate requires that the sum of the coefficients on the lagged inflation rate variables equals one i.e. $\sum \beta_1 = 1$. This latter homogeneity restriction implies the absence of any long run trade off between inflation and unemployment with the unitary coefficient encapsulating the idea that any given rate of inflation, if left to itself in the sense of no policy interventions to change it, is self-perpetuating.

If this "random walk" or "adaptive" model of inflationary expectations is adopted with only one lag on the inflation rate being used (i.e. $\pi^e = \pi_{t-1}$) then $\pi_t - \pi_t^e = \Delta\pi_t$ and if unemployment in t_{-1} is used instead of the contemporaneous rate of unemployment, in order to accommodate the assumption that unemployment Granger-causes inflation in the sense of preceding it in time[2], equation 1 becomes:

$$\Delta\pi_t = \alpha + \beta\left(U_{t-1} - \bar{U}\right) + yX_t + \upsilon_t \qquad (2)$$

In the absence of supply shocks, equation (2) encapsulates a standard Phillips curve relationship i.e. there is a "natural rate" for the demand variable which is in keeping with a constant inflation rate[3]. The assumed absence of supply shocks ensures that the NAIRU estimates remain relatively stable since they do not take into account any sudden, supply induced, hikes in the inflation rate.

If, by way of a simple example, one estimates this latter, essentially bivariate, equation for the US, with no allowance being made for supply side shocks or inertia factors in the form of additional lags on the inflation term, one produces an estimate of the NAIRU as a nonlinear function of the regression coefficients (i.e. $\bar{U} = \alpha / \beta$). In the example in the box below the US Nairu is estimated at 6.2. Despite the simplicity of the approach adopted the latter estimate is remarkably close to the consensus value for the NAIRU established by commentators using substantially more sophisticated specifications.

EQ(1) Modelling the Change in US Inflation by OLS

Sample: 1962 to 1997

Variable	Coefficient	Std.Error	t-value
Constant	2.2571	0.81304	2.776
us_u_1	-0.36315	0.12878	-2.820

R^2 = 0.189544 DW = 2.16

With the latter rudimentary bivariate approach one simply assumes that inflation is a function only of demand effects. A number of points can be made about these equation results: firstly, unemployment and inflation are clearly negatively related

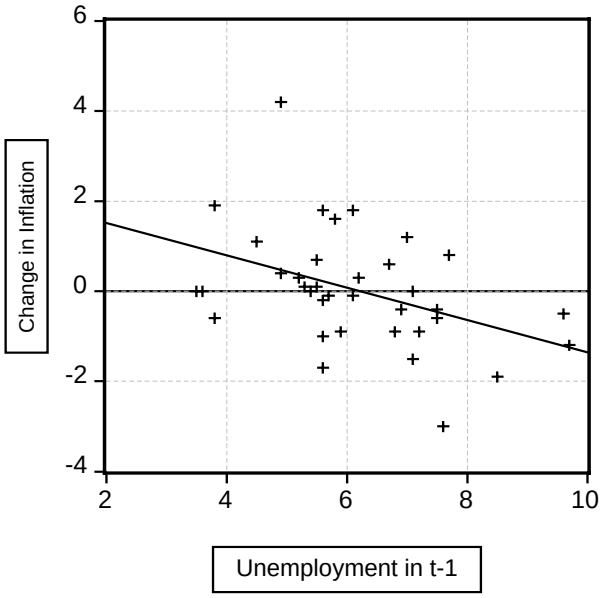
[2] See King and Watson (1994) for a justification of the use of the unemployment rate as an inflation predictor.

[3] The actual inflation rate must equal its expected value for the inflation rate to be stable. The basic Phillips curve in fact captures the relationship between the change in the inflation rate and the unemployment gap.

(coefficient of – 0.36 on the unemployment term) and given that the relationship is statistically significant, unemployment can be regarded as a useful indicator of future changes in inflation; secondly given the imprecision of the coefficient estimates there is considerable uncertainty surrounding the point estimate of the NAIRU.

One can also show this expectations – augmented Phillips curve graphically by plotting the annual change in inflation as a function of the unemployment rate in the previous year. This bivariate graph shows the inverse relationship between the 2 variables and points again to a NAIRU estimate of around 6 % for the US which is the point on the unemployment axis which is intersected by the least-squares regression line (i.e. this NAIRU estimate of 6% is sometimes referred to as the x-axis intercept). However, given that the coefficient estimates underlying this regression line are not precisely measured, as reflected in the relatively small t-statistics, then this uncertainty element surrounding the regression line ensures that the NAIRU itself is imprecisely estimated.

Graph 2: US NAIRU: Change in Inflation V Unemployment in t-1



1.2.2 WAGE-PRICE MODELS

Analysing both price and wage setting in the combined environment provided by a wage-price model should in theory lead to improved NAIRU estimates because of the important role played by the wage and price setting schedules in terms of the NAIRU's development. In this context the wage-setting and price-setting curves should be seen as labour supply and demand curves respectively. Any factors which influence the slope or position of either curve influences the NAIRU. A wide range of factors fall into this category such as real wage resistance factors, emanating for

example from tax wedge effects or a deceleration in trend productivity[4] and structural factors such as labour or product market changes which alter the balance of bargaining power between employers and employees or which affect the search effectiveness of the unemployed. The latter structural factors are likely to affect both the position and slope of the wage and price setting schedules and consequently the long-run NAIRU. Real wage resistance influences on the other hand should only lead to shifts in the curves but not in their slopes and have only temporary effects in terms of movements in the short-run NAIRU i.e. hysteresis type effects where the unemployment rate slowly adjusts to the long-run NAIRU.

- **FACTORS AFFECTING WAGE SETTING**: While a large number of factors can be pointed to in terms of influencing wage developments in individual countries, most of the latter can be grouped under four broad headings: firstly the system of wage determination which is operating in a country, including the relative importance attributed nationally to the main variants of such systems such as the bargaining model as opposed to the efficiency wage or competitive approaches to wage setting[5]; secondly, the relative generosity of the treatment afforded to the unemployed; thirdly, labour market rigidities including hiring and firing rules, taxation issues, etc, and finally mismatch problems emanating either from skill mismatches i.e. an inability to find appropriately skilled workers amongst the ranks of the unemployed or from a lack of geographical/occupational mobility in the labour market generally.

- **FACTORS AFFECTING PRICE SETTING / MARK-UP'S:** Amongst the factors most usually cited in the literature as impacting on the mark-up decisions of firms are the extent of competition being faced by producers in their respective markets and real interest rate developments. While the degree of competition not surprisingly impacts negatively on mark-up developments, the effect of real interest rate changes on the latter is less clearcut.

In theory, movements of the NAIRU over time should be capable of being explained by changes in the various labour market variables listed above. Consequently, the estimation of wage-price models, specified using some of these variables, should provide valuable information as to the constituent structural elements of the NAIRU,

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[4] Workers adjust their expectations of productivity growth relatively slowly with a slowdown in the latter leading to an increase in the natural rate of unemployment in the adjustment phase.

[5]Factors Affecting Wage setting: Differences across countries could reflect differences concerning the relative importance of the three main approaches to wage determination which tend to characterise the situation reasonably well in the respective national labour markets:

- 1. The bargaining model where wages are determined on the basis of the relative bargaining power of employees and employers;
- 2. The efficiency wage approach where workers are paid above their reservation wage because of productivity considerations – in other words employers have a vested interest in recruiting, retaining and motivating the most efficient workers;
- 3. The competitive approach where, at the low end of the skill range, workers' bargaining power is attenuated because of the relative ease with which they can be replaced and employers have little incentive to pay "efficiency" wages because of the routine nature of a lot of the tasks to be performed. In advanced economies one would suspect that wage setting would be less and less characterised by the competitive approach.

at least the distinction between those elements which can be associated with wage formation and price setting respectively.

A detailed analysis of these mark-up and wage pressure influences could therefore be expected to provide the answers to differences in unemployment rates across countries in a long-run time frame. In this regard, given that any of these NAIRU determining factors can vary across countries, with evidence that such institutionally based differences are in many cases extensive, it is hardly surprising to find, as the estimates produced in the next chapter indicate, large international differences in NAIRU estimates. These institutional differences, in terms of both labour and product markets, not only differ across countries but can also differ over time within individual countries with, for example, changes in the wage bargaining structures or in the generosity of the social welfare benefits system leading to structural shifts in the workings of the respective national labour markets. Such differences across time highlight the fact that these institutional parameters are indeed of the time-varying variety.

BROAD THEORETICAL FRAMEWORK UNDERLYING THE BARGAINING "WAGE-PRICE" MODEL APPROACH: Wage-Price models can be set up in a wide variety of ways to reflect the, above mentioned, international differences between the labour and product market systems of individual countries. One widely used wage-price model draws on the bargaining framework of wage determination. This latter bargaining view of the world interprets real wage developments as being the result of a bargaining process between employers and employees, the outcome of which reflects the relative degree of market power possessed by the actors involved. Workers bargaining power, for example, is negatively related to the prevailing rate of unemployment and positively influenced by factors which tend to push up real wage demands such as generous social welfare benefits, mismatch problems in the labour market and unionisation rates. Under this approach real wages are the outcome of a negotiated compromise between the respective parties with employees, basing their nominal wage demands on aspirations regarding a target real wage, and employers responding with views as to the feasible or warranted real wage.

Bargaining models of wage determination suggest a process of wage bargaining closer to a bilateral monopoly than to perfect competition. The essential features of the bargaining model are a downward sloping price setting relationship and an upward sloping wage setting curve, with the uncertainties regarding future price and wage developments ensuring that the process results in the setting of wages as a mark-up over expected prices and the setting of prices as a mark-up over expected wages. In equilibrium, worker's wage setting behaviour and the price setting behaviour of firms is consistent with the maintenance of the prevailing rate of price inflation. This approach, commonly referred to in the literature as "the battle of the mark-ups", is associated with the work of Layard, Nickell and Jackman (1991) and is felt to be the most appropriate one to be adopted in the European context. This preference is reflected in the fact that the following chapter is devoted to the estimation of NAIRU estimates for the US, Japan and the EC15 using an empirical version of the above approach.

CHAPTER 2 : PRODUCTION OF NAIRU ESTIMATES FOR THE US, JAPAN AND EU15 USING A CONVENTIONAL BARGAINING MODEL APPROACH

As discussed in Chapter 1, given that the NAIRU is an unobserved variable, a wide range of admissible estimation approaches exist for its calculation, ranging from univariate time series methods to various forms of wage-price models. As made clear in that chapter, it is felt that the latter models, based on the bargaining approach, with their explicit analysis of price and wage setting, may be more appropriate in terms of the production of NAIRU estimates, especially in the European context. This view is based on the fact that both the price setting and wage formation processes have an important bearing on the evolution of the NAIRU over time, with shifts in the latter schedules leading to changes in equilibrium unemployment.

As a result of this link, wage–price models are the most frequently adopted method for deriving NAIRU estimates, with firms formulating pricing strategies based on their expectations about future wages and with employees setting wage demands based on their forecasts for future prices. When employers price expectations and employees wage expectations are realised, inflation is constant and the unemployment rate is at its long-term equilibrium level, the NAIRU[6].

The wage and price setting schedules can be presented as follows with labour market equilibrium (i.e. the point establishing the extent of equilibrium unemployment : the NAIRU) occurring where wage and price decisions are consistent :

$$\Delta \log(w / pc) = \alpha_1 + \alpha_2 \log(u_{t-1}) + \alpha_3 \Delta \log(p_{t-1}) + \alpha_4 \Delta \log(tot) \longrightarrow EQ1$$

$$\Delta \log(pgdp / w) = \beta_1 + \beta_2 \log(u_{t-1}) + \beta_3 \Delta \log(w_{t-1}) + \beta_4 \Delta \log(lp) \rightarrow EQ2$$

where « ***w*** »is the nominal compensation per employee (total economy) ; « ***pc*** » is the private consumption deflator ; « ***pgdp*** » is the GDP deflator; « ***u*** » is the unemployment rate (unemployment as a % of the civilian labour force) ; « ***lp*** » is labour productivity (defined as GDP at constant market prices per person employed) ; and « ***tot*** » is the terms of trade (defined as the difference between the PCE deflator and the GDP deflator).

[6] If one assumes the existence of a NAIRU then one implicitly accepts that the coefficient on the inflation term in the expectations-augmented Phillips curve equation is equal to one (i.e. an absence of money illusion ensures a vertical long-run Phillips curve).

One can interpret the lagged price terms in the above equations as proxies for expected wage and price inflation. In other words, in keeping with a widely used assumption in the NAIRU literature, the formation of inflationary expectations is modelled as a simple random walk phenomenon where the expected inflation rate is set equal to the existing inflation rate i.e. $\Delta \log(p) = \Delta \log(p_{t-1})$.[7] This is not an unreasonable assumption given the empirical evidence in many countries which indicates that last year's inflation rate provides a good approximation for the expected rate of inflation i.e. price inertia is compatible with an assumption of rational expectations.

As regards the individual equations, the wage setting equation relates the dependent variable to changes in inflation, to unemployment in the previous year and to a terms of trade effect. The unemployment rate is the main disequilibrium component since it serves as a proxy for excess demand in the labour market. The terms of trade variable attempts to reflect the relative bargaining power of firms compared with that of workers. This variable can be interpreted as a proxy for mark-up pressures and can be seen as a counterpart to the Phillips curve effect, with the latter reflecting the bargaining power of trade unions e.g. if unemployment is high, their bargaining power is low and vice versa[8]. Equilibrium phenomena, such as trend productivity, are not modelled explicitly but form part of the constant which is the overall equilibrium component of the equation. As regards price setting, it is assumed that firms set prices on the basis of three key elements, current unit labour cost developments (as reflected in wage and productivity trends), cyclical conditions in the market place (proxied by the unemployment rate) and finally the prices established in the past.

In overall terms therefore the above specification suggests that the NAIRU depends essentially on wage setting factors, on the mark-up set by firms and on the response of wages to unemployment. It is consequently an endogenously determined parameter, one which, by definition, is not constant since it depends on the economic and wage formation systems prevailing in the respective countries. The parameters of the unemployment rate in the wage and price equations, by measuring the extent to which unemployment influences price and wage formation, are the most important structural parameters affecting the NAIRU. The lower the latter parameter values, the weaker

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[7] Modelling inflationary expectations: The approach adopted here is the simple AR (1) expectations model i.e. the unit root hypothesis where the coefficient β is set to 1 in the following AR(1) model: $\pi_t^e = a + \beta \pi_{t-1}$. In other words inflation is assumed to be a highly persistent series in the sense that it does not change very much over time. Stationarity tests (eg ADF + PP tests) fail in fact to reject the unit root hypothesis at the 5% or even the 10% levels for both the US and EU15 inflation series, so the inflation series must be differenced, as in the above equation, to make it stationary and to avoid the "spurious" regression problem.

[8] The idea of the "mark-up" variable is therefore to highlight the distinction between the wage concept as seen from the viewpoint of employers compared to that of employees. While employees, in terms of labour supply, are interested in wage rates relative to consumer prices i.e. real wage developments, employers in terms of labour demand, are more interested in wage rates deflated by output prices.

the influence of the unemployment rate in terms of wage and price developments and consequently the higher is the NAIRU rate.

METHODS OF ESTIMATION : One can produce NAIRU estimates from the above system of equations[9] in a number of different ways including simply assuming that the price level is equal to the expected price level (i.e. inflation is stable) and solving the system of simultaneous equations to produce a NAIRU estimate. Alternatively, one can produce the reduced form version of the system of equations and estimate the NAIRU from the parameters of the reduced form equations. It is this latter approach which is adopted here with the reduced form wage, as opposed to the price, equation being used to produce the NAIRU estimates since the parameter estimates for the estimated reduced form price equations were not as statistically robust as those of the wage equation.

PRODUCING THE REDUCED FORM OF THE MODEL : When one expresses an endogenous variable, such as real wages in the present example, solely in terms of the systems predetermined variables (i.e. exogenous and lagged endogenous) and its error term, one produces what is referred to as a reduced form equation for the endogenous variable in question. Reduced form equations are simply an alternative way of expressing a simultaneous equations system. The reduced form wage equation which is based on a bargaining model and which therefore incorporates all the exogenous influences from the above wage- price system, including elements of the Phillips curve mechanism, is as follows :

$$\Delta \log(w / pc) = \delta_{11} + \delta_{21} \log(u_{t-1}) + \delta_{31} \Delta \log(lp) + \delta_{41} \Delta \log(tot)$$

with the NAIRU being endogenously determined in the wage/price system and estimated from this reduced form equation using the following formula :

$$\text{Nairu} = \left(u^* = \exp\{(\delta_{11} - (1 - \delta_{31})lpt) / \delta_{21}\} \right)$$ [10]

CONSTANT NAIRU V TIME VARYING NAIRU : As the above formula for calculating the NAIRU shows, it is possible to estimate either a constant NAIRU, simply by using the parameters of the reduced form wage equation, or produce what is

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[9] **IDENTIFICATION** : Before estimating the parameters of an equation within a simultaneous system of equations, the latter must be shown to be identified. In this regard the order condition requires that the total number of restrictions placed on the parameters of an equation be at least as great as the number of equations in the system less one. These restrictions can take different forms such as the omission of variables in the equation of interest or homogeneity restrictions. For example in the wage-price model given by equations 1 and 2 above, the variable « ***lp*** » does not appear in ***EQ1*** (i.e . its coefficient has been set to zero) while the variable ***« tot*** » is likewise excluded from ***EQ2.*** These simple restrictions are enough to ensure that each of the equations in the system are identified.

[10] Note: For the linear as opposed to the logarithmic case the formula is $u^* = (\delta_{11} - (1 - \delta_{31})lpt) / \delta_{21}\}$
see OECD Working Paper No86 by Kawasaki, Hoeller and Poret (1990)

referred to as a « time varying » NAIRU. The latter approach attempts to provide an indication of the path the NAIRU has taken over a particular period, by including variables which capture the impact of significant supply side shocks, over the period in question, which would have been expected to influence the NAIRU. Examples of the latter over the period 1961-1997 include the slowdown in trend productivity growth, the large external oil price shocks and the presumed deterioration, especially in Europe, in labour market flexibility. One can introduce this « time varying » element by using either a statistical model to determine the NAIRU, which allows the NAIRU to vary but ensures that this variation is smooth over time (eg Cubic Spline / Kalman Filter approaches) or an economic model approach which uses additional economic variables which capture the supply side shocks just mentioned to identify the NAIRU.

As the above equation for the NAIRU shows, an economic model is used here, with the variable « lpt » in the above formula equal to trend labour productivity growth, estimated using the Hodrick-Prescott filter. The introduction of « lpt » has the effect of producing a « time-varying » NAIRU, with estimates of the latter drifting upwards since the 1970s as a result of the slowdown in trend productivity. It should be stressed, however, that it is clearly unrealistic, given the list of shocks listed above, to assume that all changes in the NAIRU over the last number of decades have emanated solely from changes in trend productivity. Consequently, more complicated formulations would be expected to take into account the other supply side factors, such as oil price developments and labour market flexibility influences such as developments with regard to minimum wages, replacement ratios etc, which are also thought to have influenced the evolution of the natural rate over the period in question.

COUNTRY ESTIMATES : Using the above wage-price model, NAIRU estimates for the US, Japan and EC15 are produced, using annual timeseries data for the years 1961-1997 to estimate the respective reduced form equations[11]. These NAIRU estimates (see Table 2 and Graph 3 below for the US, Japan and EC15 estimates) have been produced, in virtually all cases, using not only the latter equivalent estimation period but also by using the same functional form and comparable variable definitions for all countries.

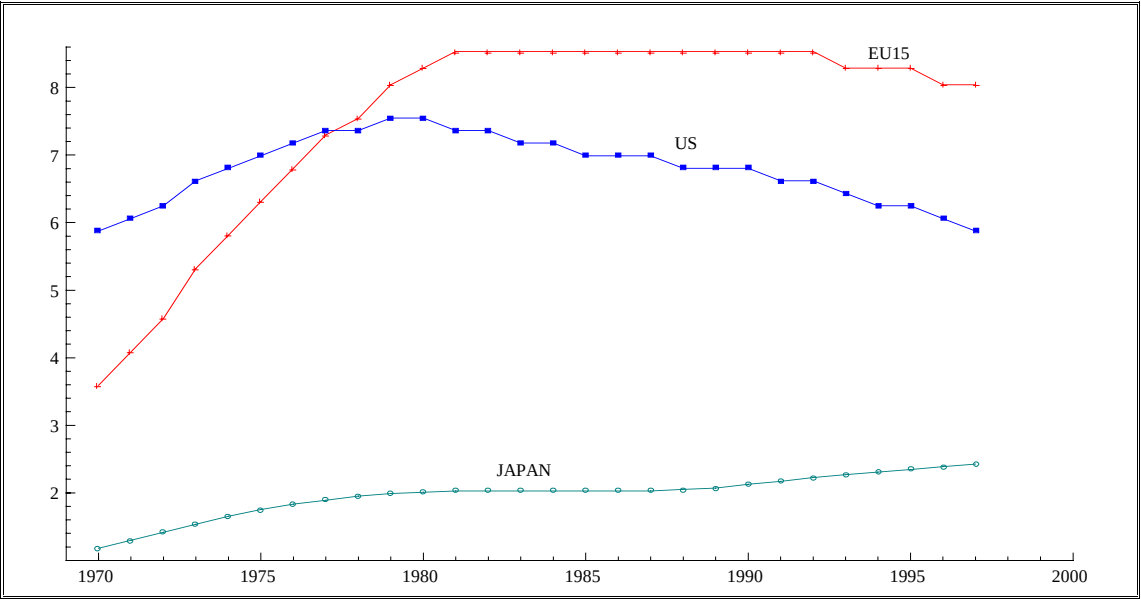
This « harmonised » estimation approach is important in ensuring that the results can be used for rough cross-country comparisons of the structural features of the respective labour markets. In this regard, while the wage-price model presented above may be sparsely specified, it nevertheless captures the main features of the respective labour markets in a satisfactory fashion, with the reduced form wage equations fitting the data well and with the equations performing satisfactorily on the basis of the standard statistical criteria. The present approach is justified therefore on

[11] At any particular point in time in fact the value of the NAIRU is dependent on a host of different factors including the structure and skills mix of the labour force, incentive and disincentive effects emanating from a country's taxation and social welfare systems, the search effectiveness of the unemployed etc. Data limitations have prevented the inclusion of variables which could act as proxies for some of these factors, such as replacement ratios, unionisation rates etc. which are widely regarded as important determinants of the natural rate.

the grounds that it provides reasonably robust, internationally comparable, estimates of institutional labour market differences across the countries in question.

The essential conclusion to be drawn from the estimates produced is that the NAIRU has risen substantially in the Community over the last number of decades i.e. the level of unemployment consistent with stable inflation appears now much higher than before the shocks of the 1970s. Furthermore, the Community seems to be have been particularly affected, compared with other areas around the world, most notably the US but also Japan, which have both performed much better. At the level of the EC15, an increase of the order of 4 percentage points in the NAIRU over the period is indicated compared with a 1 percentage point increase in Japan and no change in the case of the US[12].

Graph 3 : NAIRU Estimates for the US, Japan & EU15 1970-1997



Finally, in relation to the EC15 a feature of the NAIRU estimates is the poor relationship between those estimates and actual unemployment trends in the Community, as shown in Graph 4, with the NAIRU apparently well above the prevailing rate of unemployment throughout the 1970s and with the opposite trend emerging for most of the 1980s. These diverging trends are in sharp contrast to the picture presented by the US, where the actual unemployment rate moves in cycles around the NAIRU as opposed to trending upwards in the case of the Community.

[12] Stephen Nickell in a recent article in the Economic Journal succinctly summarised the research problem to be addressed in relation to explaining higher European unemployment "Any explanation of increased unemployment, particularly in Europe has to confront the following key fact. In the 1950s and 1960s, serious inflationary pressure in the economy only developed when there were many more vacancies than unemployed. In the late 1980s boom serious inflationary pressure developed when there were many more unemployed than vacancies. In Britain, for example, the numbers are very simple. In booms in the 1950s and 1960s, there were roughly twice as many vacancies as unemployed, in the 1980s boom, there were twice as many unemployed as vacancies. This suggests that by the 1980s either employers find it far harder to get the workers they want from the unemployed pool or the unemployed are much less enamoured of the work on offer. The problem is to provide a persuasive empirical analysis of these apparently large shifts in behaviour".

While various arguments can be expounded regarding the reasons for these anomalies, including a badly specified NAIRU model or aggregation bias in the EU15 NAIRU estimates, one is still left with the impression that applying the NAIRU concept to Europe is fraught with difficulties.

Graph 4 : NAIRU Estimates & Actual Unemployment for the US & EU15

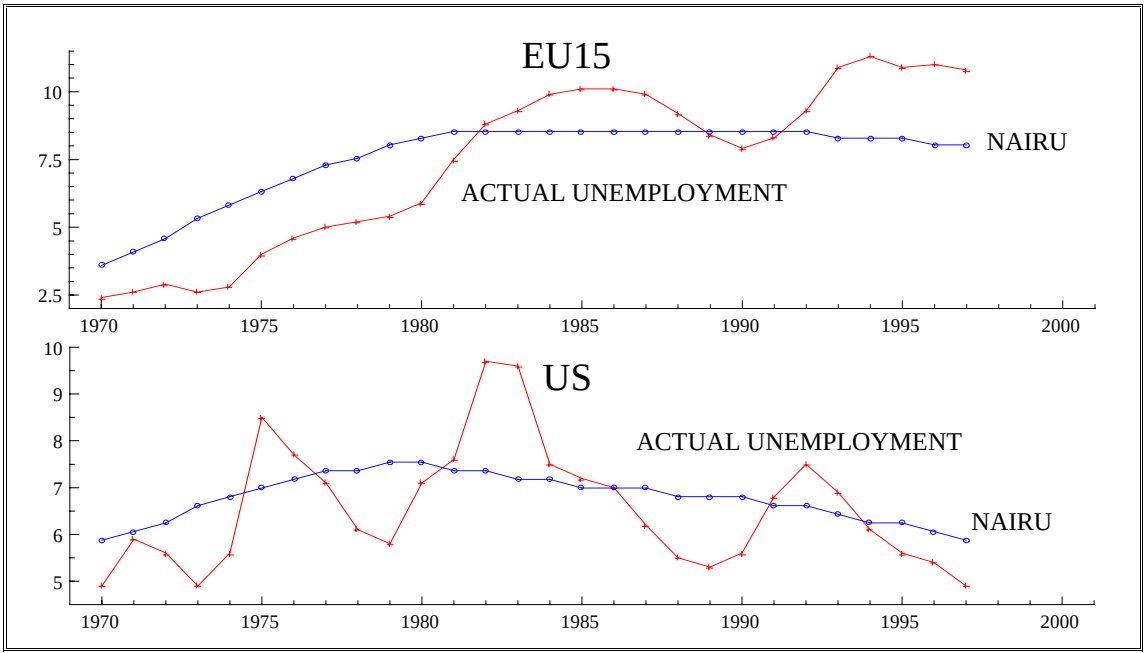


TABLE 2

NAIRU ESTIMATES 1970-1997*

	1970	1975	1980	1985	1990	1994	1997
UNITED STATES	5.9	7.0	7.5	7.0	6.8	6.2	5.9
JAPAN	1.2	1.8	2.0	2.0	2.1	2.3	2.4
EUROPEAN COMMUNITY	3.6	6.3	8.3	8.5	8.5	8.3	8.0

* Care should be taken in drawing inferences from the absolute NAIRU estimates, given the extensive empirical difficulties widely experienced in measuring this theoretical concept and given that all the NAIRU estimates produced are derived from an homogeneously determined equation specification to ensure cross-country comparability. Attention should therefore be focussed on the relative, not the absolute, performances of the countries concerned. In addition, the equation stability tests performed were inconclusive, with the Cusum and Cusum of Squares tests, based on the recursive OLS regression residuals, suggesting that the estimated equations are in general stable but with the results of the Chow tests pointing to possible equation instability. Finally, while the merits of the harmonised approach are substantial, it is important to state explicitly that this common specification technique has some drawbacks when one looks at the results for an individual country or region in isolation. Clearly, some of the individual NAIRU estimates could be improved upon with a richer lag structure and the inclusion of additional supply side variables.

1. **TABLE 3: REDUCED FORM WAGE EQUATION COEFFICIENTS FOR THE U.S., JAPAN AND EC15 ***

	CONSTANT	UNEMPLOYMENT	PRODUCT-IVITY	TERMS OF TRADE	R-SQUARED	D-W STAT.
UNITED STATES	2.03 (0.56)	-0.24 (0.09)	0.55 (0.11)	-0.67 (0.23)	.65	2.26
JAPAN	5.00 (1.11)	-1.94 (0.42)	0.62 (0.08)	-0.36 (0.19)	.86	1.35
EU15	5.35 (0.21)	-0.40 (0.03)	NS**	-1.17 (0.13)	.90	1.86

* Standard errors appear in parentheses below the coefficient estimates.

**NS = Not significant

CHAPTER 3 : EMPIRICAL INADEQUACIES : UNCERTAINTIES SURROUNDING THE NAIRU POINT ESTIMATES

The NAIRU is normally calculated indirectly as a non-linear function or ratio of the coefficients which have been estimated from either wage-price models, such as the bargaining model described in Chapter 2, or in single equation inflation models such as Gordon's "triangle" model. Empirically, as referred to earlier, two serious problems can arise in determining the NAIRU in this way.

- ***Firstly***, NAIRU estimates are model dependent with different specifications potentially giving widely different point estimates of the level of the NAIRU. This is a significant problem given that the NAIRU is an unobserved variable and consequently a variety of credible methodological approaches / models exist for its estimation. This point concerning the choice of model to be adopted has been adequately dealt with in Chapters 1 and 2.
- ***Secondly***, there is a considerable degree of statistical uncertainty surrounding any of the results obtained. The uncertainty margin is quite large since all the empirical models used to calculate the NAIRU use a combination of stochastic variables and econometrically estimated parameters which themselves are imprecisely measured. This latter issue of statistical uncertainty is discussed in the present chapter using two sources of information:

  1.Estimation of Confidence Intervals: In this regard, the confidence intervals surrounding the point estimates of the NAIRU can be used as an indicator of the degree of the potential inaccuracy which the various estimation methods are prone to.

  2.Results from other empirical studies of the NAIRU

3.1 CONFIDENCE INTERVALS AROUND THE NAIRU ESTIMATES PRODUCED USING THE BARGAINING METHOD

NAIRU estimates are usually given as a single figure. However, around any point estimate there is statistically a confidence interval reflecting sampling distribution. This adds a high degree of imprecision into the overall evaluation since not only does one have model type uncertainty, as discussed above, about the point estimates if their data generating process is subject to structural breaks or if the functional form adopted is incorrect, but one may also have statistical type uncertainty as reflected in "wide" confidence intervals around the central estimates themselves.

Obtaining confidence intervals for the NAIRU estimates produced is complicated since these latter estimates are based on a non-linear parameterisation and hence traditional interval methods (and estimation packages) are not available. In this section, however, we discuss two commonly used methods for deriving NAIRU confidence intervals: the Fieller method, which draws intervals around fixed-point estimates, and an approach which is essentially a Delta-method approximation.

Fieller Method: The Fieller iterative method is based on trial values[13] for the "true" Nairu, and uses repeated significance testing on the intercept to reject or accept those values. Specifically one estimates the reduced form wage equation from chapter 2:

$$\Delta \log(w / pc) = \delta_{11} + \delta_{21}\Delta \log(u_{t-1}) + \delta_{31}\Delta \log(lp) + \delta_{41}\Delta \log(tot) \qquad \textbf{(1)}$$

Where δ_{11} = -(δ_{21}) * U^{Nairu}. The central Nairu estimate is therefore a fixed point estimate recursively derived using the following non-linear combination of the Phillips Curve coefficients:

$$-\delta_{11} *(\ \delta_{21}\ )^{-1} = U^{Nairu}$$

This method picks trial values above and below the central point estimate and creates the series $Z_t = (u_{t-1} - U^*)_t$ where u_{t-1} and U^* are respectively lagged unemployment and the Nairu prior, and finally re-runs equation (1) above substituting the u_{t-1} term for Z. If the intercept is zero or insignificantly different from zero (at the 5% level) then the trial Nairu (i.e. U^*) falls within a 95% confidence interval of the true value. Re-running this for a wide range of possible Nairu's allows a confidence interval to be drawn around the Nairu. For example, if as an approximation, we fit the standard errors derived from this approach to the NAIRU estimates derived in Chapter 2, in the case of the EU the Fieller method produces a range of possible Nairu estimates of 7 to 9.5 around the central point estimate of 8. Consequently for all trial values between these limits you get an intercept which is zero or insignificantly different from zero at the 5% level whereas for values outside that range you get a statistically significant intercept term. What you are creating in effect is a 95% confidence interval around your central point estimate by the above iterative process.

Table four presents the Fieller confidence intervals for the EU15 plus Japan and the US. It is noticeable that despite its higher NAIRU level, the EU has tighter confidence intervals using this method relative to the US but still less than Japan. This surprisingly good performance on behalf of the Community probably reflects aggregation bias in the EU aggregates, since the method produces substantially wider confidence intervals when applied to the individual Member States. In addition, in many of the latter countries, the confidence intervals are so wide as to fall persistently beyond the limits provided by historical and plausible unemployment data.

TABLE 4 : NAIRU'S FOR 1997, CONFIDENCE INTERVALS CALCULATED USING THE FIELLER METHOD

	LOWER LIMIT	***CENTRAL NAIRU***	***UPPER LIMIT***
EU15	**7.0**	**8.0**	**9.5**
US	**4.4**	**5.9**	**11.6**
JAPAN	**2.0**	**2.4**	**2.9**

[13] These trial values or "priors" are chosen not on the basis of any real economic rationale but on the basis of the central Nairu estimate produced and a simple range of acceptable numerical values surrounding that central estimate.

DELTA METHOD APPROXIMATION: Given the unsatisfactory nature of the results achieved with the Fieller method, with the EU aggregate having tighter and the US having wider confidence intervals than initially expected, it was decided to experiment with another commonly used method for confidence interval estimation, namely the Delta method. This method has an advantage over the Fieller approach in that it is capable of drawing a confidence interval around time-varying NAIRU estimates, as opposed to the Fieller method which is restricted to a fixed point estimate. The DELTA method (see Staiger et al, 1996) is based on a Taylor series expansion (i.e. linearisation) of $-\delta_{11} *(\delta_{21})^{-1}$ to which an appropriate standard error is derived by applying an asymptotic variance formula. The approach followed here is similar and is based on a non-linear parameterisation of an existing Nairu formulation[14]. Equation (1) above is estimated non-linearly by imposing the restriction,

$$\delta_{11} = -(\delta_{21}) * U^{Nairu}.$$

Hence U, the Nairu, is a parameter to be estimated with an associated standard error. Using the latter parameter value and its associated standard error the confidence intervals around the Nairu point estimate can then be derived in the usual way. As an approximation, the standard errors derived from this approach are fitted to the time varying NAIRU derived recursively in Chapter 2.

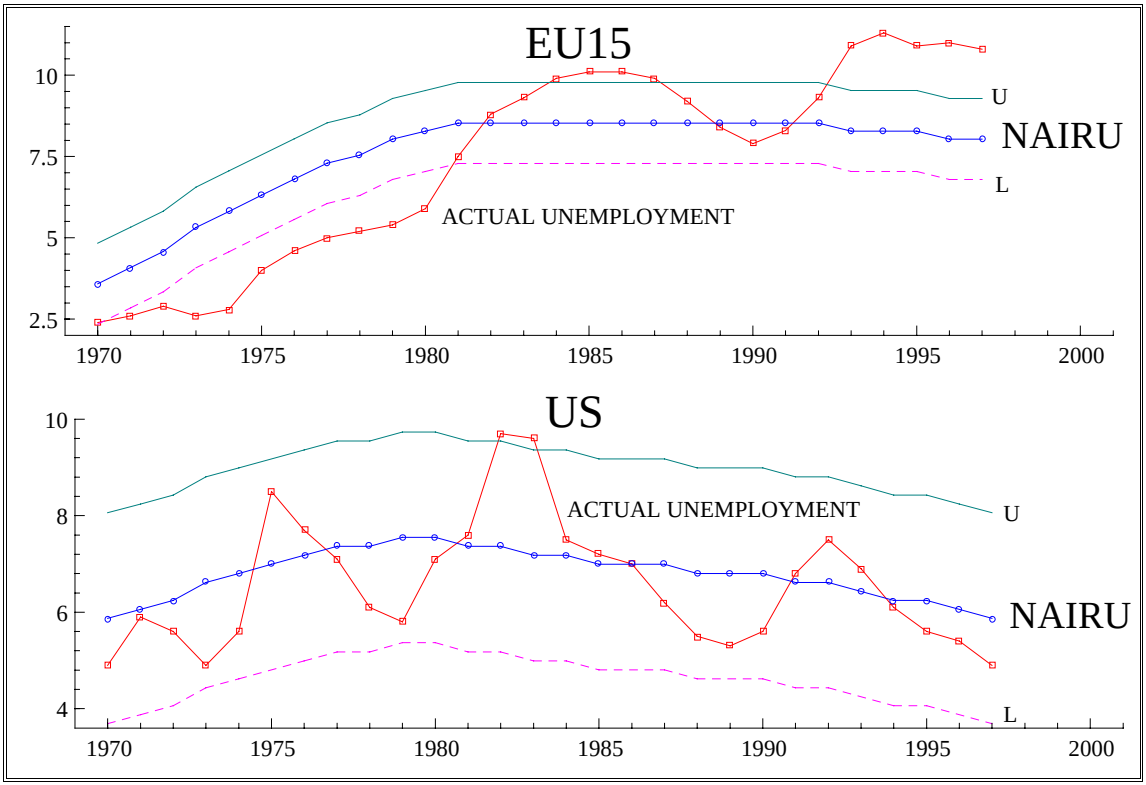
NUMERICAL RESULTS Table 5 presents the time-varying Nairu estimates and their associated confidence intervals for the EU, the US and Japan for the year 1997. Graph 5 in turn shows the time varying confidence intervals surrounding the NAIRU point estimates for the EU15 and the US, over the period 1970-1997, based on the above non-linear parameterisation. While the confidence intervals surrounding the EU15 point estimates are again, as with the Fieller method, shown to be tighter than those in the US, this should be largely discounted because of the possible aggregation bias discussed earlier. This view is again corroborated by the fact that the confidence intervals surrounding the point estimates for the individual Member States are in most cases substantially greater than those for the Community aggregate. This is an important point to note in the context of using the aggregate NAIRU estimate as a potential policy guide at the Community level.

TABLE 5 : NAIRU'S FOR 1997, 95% CONFIDENCE INTERVALS CALCULATED USING THE DELTA METHOD APPROXIMATION

	LOWER LIMIT	*NAIRU*	*UPPPER LIMIT*
EU15	**6.8**	**8.0**	**9.3**
US	**3.7**	**5.9**	**8.1**
JAPAN	**2.0**	**2.4**	**2.8**

[14] For an earlier application of this Delta method approximation see Roeger and in't Veld (1996).

Graph 5 :NAIRU Estimates, Actual Unemployment and Time-Varying Confidence Intervals



While the above « Delta » method generally produces smaller confidence intervals, compared with the Fieller method, this is not entirely surprising since the NAIRU is estimated directly using the non-linear method rather than indirectly from the parameters. However, while this may be true, the confidence intervals still remain unacceptably large from the point of view of their potential usefulness in the macro policy arena.

It would appear therefore from the above analysis that while different methods exist for the construction of NAIRU confidence intervals, the same conclusion, i.e. that the intervals are quite wide, applies irrespective of which method is ultimately chosen. All methods in fact suffer from the same underlying problem that even though in all cases the coefficient on the unemployment term (i.e. the Phillips curves' slope coefficient) is statistically significantly different from zero, it is nevertheless small, and imprecisely measured, in a lot of cases. Use of the latter, poorly determined, coefficients lead in turn to imprecise point estimates for the NAIRU and to large confidence intervals surrounding those estimates, irrespective of which method is used to calculate those intervals. Consequently, while the unemployment rate still remains a useful predictor of future changes in inflation, it is nevertheless difficult to accurately measure the value of unemployment which approximates to a stable rate of inflation.

3.2: Results from US and Canadian NAIRU Studies

The problems highlighted above, in relation to imprecise coefficient estimates acting to ensure, in combination with potential mis-specifications in the wage / price equations, that the confidence intervals surrounding the NAIRU point estimates are likely to be large, is one shared by similar studies in the literature. The following examples from studies carried out to calculate the NAIRU for the US and Canada highlight equivalent problems regarding the NAIRU estimates produced:

- Estimates of the US NAIRU reported in **Staiger, Stock and Watson (1997),** and constructed using a range of plausible specifications, give point estimates for 1994 in a relatively tight band of 5.6 to 5.9. While this degree of relative precision may go some way to explaining the continuing enthusiasm for the NAIRU concept in the US, Staiger et al are at pains to point out the degree of uncertainty surrounding the estimates. The authors stress firstly that as regards the 95% confidence intervals surrounding the point estimates, the tightest range for 1994 was 4.8 to 6.6 percent and secondly that given the supplementary uncertainty surrounding the issue of model selection, it would be prudent to allow for the possibility of greater sampling imprecision.

- **Setterfield, Gordon and Osberg (1992)** produced various point estimates for the NAIRU for Canada using a total of nearly 70 different model specifications, all of which had desirable econometric properties, which ranged from 4.4 to 9.9 percent. The authors drew attention to the unfortunate finding that variable specification issues, such as the modelling of inflationary expectations, as well as the length of the estimation period used, impacted significantly on the results obtained. Given such sensitivities Setterfield et al stated that a clear implication of their analysis is that "whilst the selection of a particular NAIRU may impose enormous costs on an economy, both in the form of costs borne by unemployed individuals and in terms of foregone output, the NAIRU in use may depend to an unwarranted degree on how econometricians resolve technical issues of estimation"

CHAPTER 4 : THEORETICAL WEAKNESSES : THE NOTION OF HYSTERESIS COMPLICATES THE INTERPRETATION OF CHANGES IN THE NAIRU

Interpreting changes in NAIRUs should always be done with caution not only because of the unreliability of the estimates themselves, which was discussed in the previous chapter, but also, and very importantly here in Europe, because of the notable feature that NAIRUs appear to have increased the most in those countries where the actual unemployment rate has also increased by the greatest amount. This appears to suggest that the NAIRU gravitates towards the prevailing rate of unemployment and therefore that the downward pressure which high rates of unemployment exert on wages tends to decline over time.

A large number of commentators have been puzzled by this phenomenon and have found it hard to accept that the substantial deterioration in structural unemployment in the Community which has occurred, as measured by the NAIRU, could be due totally to changes in the determinants of the equilibrium rate of unemployment. Their suspicions have led to an alternative thesis being put forward which suggests that the past level of actual unemployment may strongly influence the current rate of equilibrium unemployment i.e. the idea of hysteresis, with increases in actual unemployment causing a rise in equilibrium unemployment.

Hysteresis, it is postulated, can occur for a large variety of reasons including the erosion of human skills, as a result of long periods without employment, insider-outsider phenomena[15] and the "screening device" phenomenon i.e. "unemployed seen as unemployable". The essential point is that if one accepts the idea of hysteresis then one would have to be sceptical about whether NAIRUs provide good guides to inflationary pressure. In addition, it must be said that interpreting changes in NAIRUs in the Member States of the Community in conditions of hysteresis is particularly difficult, if not impossible.

Acceptance of the hysteresis concept also complicates the textbook decomposition of changes in unemployment into cyclical changes emanating from shifts in aggregate demand and equilibrium changes resulting from shifts in the supply-side factors underlying the NAIRU such as mark-up (i.e. price) or wage-setting behaviour. The hysteresis view was born out of the difficulty in identifying specific changes in the supply-side determinants of the NAIRU which were large enough to explain actual developments. If, as is postulated, hysteresis mechanisms have the effect of

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[15] Insider-outsider phenomena are frequently highlighted as a potential explanation for hysteresis. This view suggests that growing "insider" power has reduced the fear of unemployment among the employed and the social protection/tax system has operated in a way which has diminished the competition for jobs from the unemployed outsiders. Consequently, the whole dynamics of the adjustment process to temporary or permanent shocks has been significantly changed. The wage bargaining process involves parties which primarily reflect the interests of the insiders (the employed), the process does not allow the outsiders (the unemployed) to influence the wage negotiations. Consequently, the greater the prevalence of such a system of wage bargaining the weaker the effect of unemployment on wage growth with high unemployment persisting since it has only a weak tendency to correct itself by means of wage restraint. Therefore any measures which increase the wage bargaining power of insiders will probably result in an additional delay in the adjustment of wages to adverse labour market conditions. For example, more generous levels of social protection have the effect of reducing the intensity of job search of the unemployed and in this way discouraging outsiders from exerting a major downward influence on wages, thereby slowing the adjustment of unemployment and increasing persistence.

translating demand induced changes in unemployment into longer run, supply side, induced changes in equilibrium unemployment then attributing shifts in unemployment to either cyclical or equilibrium factors becomes highly problematic.

DISTINCTION BETWEEN "PURE" AND "PARTIAL" HYSTERESIS: It is important from an analytical and policy point of view to distinguish clearly between "pure" hysteresis and "partial" hysteresis. As high unemployment persists it is conceivable that its wage moderating impact is diminished (i.e. partial hysteresis) or may even disappear (i.e. full hysteresis).

- ***"Pure" hysteresis*** effectively means "no adjustment" and calls into question the idea that a unique level of equilibrium unemployment exists since a rise in actual unemployment would provoke a rise in equilibrium unemployment. In circumstances of "pure" hysteresis, the NAIRU concept is rendered useless as a macro policy tool since the level of unemployment has no effect on wage and price developments i.e. there is no specific rate of unemployment that is consistent with constant inflation. If this happens then the level of unemployment follows a random walk with no long-run anchor.

- ***"Partial" hysteresis*** on the other hand is a "disequilibrium" phenomenon and is a more appealing explanation for the trend rise in Community unemployment because it retains the theoretically sound principle of an equilibrium rate of unemployment. "Partial" hysteresis refers essentially to "slow adjustment" processes where unemployment persistence mechanisms result in unemployment remaining above its long-run equilibrium level for a long period following a disturbance. Persistent unemployment, under this definition, will be gradually removed over time through a slow process of real wage and employment adjustment which will eventually result in equilibrium being restored to the labour market. Since the duration (and the costs) of the adjustment process is longer than in the past, this has led commentators to misinterpret this slow adjustment of the labour market as being an equilibrium as opposed to a disequilibrium phenomenon.

IS THE COMMUNITY AFFLICTED BY PURE OR PARTIAL HYSTERESIS ? DO SLOW ADJUSTMENT / PERSISTENCE MECHANISMS PLACE "SPEED LIMITS" ON UNEMPLOYMENT REDUCTION ?

In the context of the bargaining framework, hysteresis can be viewed as a process or processes through which unemployment perpetuates itself. Hysteresis mechanisms were incorporated into European models of the NAIRU in the 1980's in the context of distinguishing between the short-term and the long-term NAIRU with the extreme case of full or pure hysteresis indicating that no long-term NAIRU existed. The essential difference between the long and short-run NAIRU concepts is that the former is characterised by stability in terms of both inflation and unemployment whereas for the short-run NAIRU, only inflation is stable. This latter stability is fragile, however, since hysteresis type mechanisms impose limits on the speed with which the economy can return to the long-run NAIRU, with, for example, policies aimed at rapidly reducing unemployment being potentially costly in terms of inflation. Once unemployment has risen, persistence mechanisms (erosion of human

skills/human capital investment, insider/outsider mechanisms) will ensure that it cannot immediately be brought back to the NAIRU without a permanent rise in inflation.

To prevent the outbreak of the latter inflationary pressures, it is necessary to gradually reduce unemployment, thus introducing the idea of "speed limits" on growth. These speed limits on unemployment reduction could well reflect the relatively weak impact on wage formation processes of the long-term unemployed[16]. The average length of the unemployment period experienced undoubtedly plays a large role in the whole phenomenon of hysteresis. As the period of removal from the labour market lengthens, the greater the risk of the main hysteresis/persistence mechanisms coming into play. In fact all the main explanations for the existence of persistence mechanisms draw a clear distinction between the long and short-term unemployed in terms of their effectiveness as inflation-reducing agents, with the former affecting aggregate wage growth less than the latter. Consequently, the greater the share of long-term unemployment in the overall total, the less the downward pressure on wages for any given level of unemployment. The high proportion of long-term unemployed in the overall unemployment total for the Community is suggestive of growing mismatch problems, reduced intensity of job search and the decay of human capital. Human capital wastage occurs because of both increasing difficulties in gaining relevant work experience and due to the increasing average duration of spells of unemployment.

In terms of incorporating hysteresis or “speed limit” mechanisms in the wage-price model set out in chapter 2, the most usual form of embodying such persistence channels is by including the change in unemployment as well as the level of unemployment as an explanatory variable in the structural wage equation. The coefficient on the change variable provides a measure of the strength of the hysteresis effects as a determinant of wage adjustments. The expected sign on the coefficient would be negative implying that a decline in the unemployment rate would result in an overshoot of wages and consequently could represent a potentially serious obstacle

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16 Hysteresis effects start operating once people are out of work for a prolonged period of time, with their effect on wage bargaining diminishing either because of an erosion of skills or a reduction in their job search effectiveness. Research efforts into the persistence of high levels of unemployment in the Community can be grouped under two broad headings : wage setting - including insider-outsider mechanisms, efficiency wage theories, bargaining models of wage determination, etc.; and search effectiveness theories - focussing on those factors which impact on the ability and the desire of the unemployed to fill the available vacancies i.e. skill mismatches in the labour market resulting from structural change, disincentive effects emanating from the interplay of the taxation / social welfare system and hysteresis effects linked to the duration of unemployment.

Given that the 1970’s oil shocks were followed by the disinflationary policies of the early 1980’s, Europe was indeed faced by a protracted period of high unemployment. However, whether the persistence mechanisms associated with a growing proportion of the long-term unemployed in the Community’s jobless totals can really explain the hysteresis evident in Community unemployment over the last decade is still an open question. In relation to the point regarding the search effectiveness of the unemployed it is important to underline the determining role played by the institutional features of the respective labour markets. The generosity and coverage of the benefit system, the success of the training system in rectifying skill deficiencies etc. all impact on the ability and the desire of the unemployed to actively seek out the vacancies which arise. Consequently, these institutional factors determine to a large extent a country’s relative success in ensuring that their respective unemployment pools retain the ability to influence the wage bargaining process in an effective way (i.e. high levels of unemployment should lead to a lowering in wage demands but this may not be the case if a high proportion of the unemployment pool have been without work for a protracted period of time and have lost the skills and incentive to reintegrate into the world of work).

As regards policy, it is clear that any solution to the problem of long-term unemployment must be multi-faceted with action needed on both welfare benefits/employment taxes and active labour market policies in order to increase the pressure on, the incentives for, and the ability of this group of workers to obtain employment.

to a rapid reduction in the unemployment rate, with a slower pace of decline necessary to avoid a derailing of the policy course due to the acceleration in inflation.

This latter variable when introduced in the basic equation was found to be statistically insignificant and incorrectly signed in most cases, with the notable exceptions of the Community as a whole and Italy, where significant and correctly signed coefficients were found. In addition, even though changes in unemployment have an influence on wages in some countries, the coefficient on the overall level of unemployment was significant in virtually all of the countries, which indicates that overall unemployment continues to put downward pressure on wage developments in the countries concerned. This evidence in relation to the influence of changes in unemployment on wages suggests that the upward trend in unemployment is not totally an equilibrium phenomenon since if the upward movement was totally due to equilibrium factors, then wages should only be responsive to deviations of unemployment from the trend. This is not the case given that the coefficient on the level of unemployment variable continues to be statistically significant in virtually all cases.

Consequently, while on the basis of the above evidence the extreme form of "pure" hysteresis (i.e. the random walk model) can be largely discounted, nevertheless, given the small absolute size of the level coefficient and the fact that in some European countries the coefficient on the change in unemployment is statistically meaningful would suggest that some less extreme form of hysteresis may be evident in some of the latter labour markets[17]. If this is the case then the assistance provided by the labour market in returning an economy back to equilibrium following an adverse shock is rather limited.

Normally, the higher level of unemployment associated with such a shock helps the adjustment process by putting downward pressure on wages, but with hysteresis present this downward pressure is rather muted and the economy takes considerably longer to return to its original equilibrium.

This view of "partial" as opposed to "pure" hysteresis being evident is also supported by wage-share developments and the appearance of negative real wage gaps in a number of Member States. While both these latter developments are, of course, interrelated, they nevertheless justify separate discussion:

- As regards wage-share developments these have declined steadily over the 1980s in a large number of Community countries. This large shift in income distribution induced by unemployment being above its equilibrium level has not as yet led to a corresponding increase in the demand for labour as the latter factor of production has become cheaper. Consequently, the impact of the downward adjustment of

[17] It is highly significant in this regard that for the Community as a whole that the size of the coefficient on the change in unemployment variable is virtually identical to that of the coefficient for the level of unemployment. This is also the situation pertaining in Italy where the change in unemployment is substantially more important than the level of unemployment as an explanatory variable in wage developments. These developments would suggest that the change in the unemployment variable has an independent and significant influence on wage developments and that therefore "speed limits" on growth could be a problem in some Community countries.

real wages on unemployment has not yet been felt since the employment response is occurring with a long lag.

- In addition to the wage share trend, there is evidence of slower adjustment in the negative real wage gaps opening up in some Member States between real wage and productivity developments. In relation to the classical view of labour demand, since the demand for labour by firms depends on its marginal productivity, with firms recruiting up to the point where the marginal productivity is equal to the real wage, one would expect therefore that with a negative real wage gap that the enhanced attractiveness of labour would soon be reflected in reduced capital/labour substitution and reduced unemployment.

HOW SHOULD POLICY REACT TO THESE PERSISTENCE MECHANISMS ?

The evidence presented above suggests that the upward trend in Community unemployment may not totally be an equilibrium phenomenon, with slow adjustment mechanisms being an important factor in any meaningful explanation. It is important to stress however that, even though under this scenario the trend rise is not simply a structural problem, the slow adjustment problem also represents a serious deterioration in labour market flexibility and a slower and higher cost transition back to equilibrium. Consequently, although the question of whether the trend increase in Community unemployment is either an equilibrium or slow adjustment problem may not be that important analytically (since both problems indicate serious labour market malfunctioning) it does have critical implications in policy terms.

If one accepts the existence of hysteresis in the Community's labour markets then even temporary shocks can provoke permanent or persistent effects with regard to unemployment. Higher unemployment, both current and past, should aid the adjustment process back to equilibrium following such shocks but substantial intervention in the workings of the labour market appears to be clogging up these normal adjustment channels, thereby preventing the necessary degree of real wage adjustment from occurring i.e. wages are becoming less responsive to changes in unemployment.

While it can be argued whether the above factors fully explain the trend rise in Community unemployment over the last twenty years, it appears reasonable to conclude that the explanation for the bulk of the increase in the trend lies in some combination of equilibrium and slow adjustment effects. If the latter analytical conclusion is accepted it has important implications for the balance of macro/micro policies in any solution to the unemployment problem.

i) ***Firstly,*** it is clear that macroeconomic policy has an important role to play in preventing unemployment from rising in the first place thereby reducing the impact of hysteresis effects which have the effect of making it more difficult to get unemployment down once it has been allowed to rise.

ii) ***Secondly***, such an analytical distinction also supports the widely held contention that supply-side measures, both in terms of enhancing labour market flexibility and active labour market policies, must be an important part

of any policy programme aimed at both reducing the already high level of unemployment and of avoiding any further trend increases in the total. ***Flexibility enhancing measures*** are needed to reduce equilibrium unemployment and to speed up the adjustment process, whereas ***active labour market policies***, in combination with human capital policies, are in particular needed to act on persistent unemployment.

CHAPTER 5 : THE NAIRU CONCEPT, ITS PHILLIPS CURVE ORIGINS AND ITS EVOLUTION IN TERMS OF THE ECONOMIC POLICY DEBATE

The natural rate of unemployment, as explained earlier, is a long-run equilibrium concept which is determined by the underlying factors affecting the supply and demand for labour[18]. The extent of such "equilibrium" unemployment varies, of course, both over time and from country to country depending on changes in the complex microeconomics of national labour markets. The main underlying explanatory factors for these shifts over time and for divergences internationally are: differences in the flexibility and adaptability of national labour markets; insider/outsider phenomena; obstacles to geographical/occupational mobility; rigidities due to the organisation and duration of work; fiscal disincentives and the level of social welfare benefits; inadequate education and training - inappropriate qualifications (mismatch problems); and finally, employment policies too oriented towards passive, as opposed to active, support.

Given the extensive array of rigidities and inefficiencies described above it is clear that vigorous policy action would be needed over many years to substantially reduce equilibrium unemployment. In this regard, Phillips curve derived NAIRU calculations, such as those produced in Chapter 2, can be used to provide a very useful picture of the relative degree of rigidity or malfunctioning amongst the respective labour markets since the higher the level of the NAIRU the greater the labour market problems and difficulties that an individual country or region faces. The Phillips curve framework is particularly useful in highlighting the two essential features of the wage adjustment process in the Community namely the existence of a substantial degree of real wage rigidity and the related phenomenon of rising NAIRUs and hysteresis. In terms of the dynamics of the Phillips curve changes, the present paper restricts itself to only one of the latter underlying influences by providing internationally comparable estimates for NAIRUs (i.e. movements of the curve) and by examining the hysteresis issue. With regard to real wage rigidities (i.e. slope of the short-run curves), references are of a qualitative nature only.

PHILLIPS CURVE ORIGINS: The Phillips curve was the empirical and theoretical starting point for the creation of the NAIRU concept. It is a widely used and useful analytical tool for assessing both the extent and direction of structural change in the labour market and as a general indicator of the underlying health of the supply side of an economy. It traces the simultaneous evolution of the ultimate target variables of inflation and unemployment in the countries concerned, providing important information as to their relative performance. It is essentially a diagrammatic representation of the inflation-unemployment relationship, with demand side shocks expected to result in short-term movements along a negatively sloped curve (i.e. the

[18] The term "natural" or equilibrium rate of unemployment appears to suggest not only that the NAIRU calculations are constant but more importantly that they are incapable of being shifted due to economic policy changes. However, this view is misleading since the natural rate of unemployment is capable of being influenced by supply side policies and it is not immutable over time as proven by the experience of a large number of Community economies over the last number of decades.

short-run Phillips curve) and with structural, supply side, shifts being reflected in movements of the curve itself.

The elasticity of the short-run Phillips curve can be seen as representing the important structural characteristics or flexibility of the labour market at a particular point in time i.e. it is an indicator of the speed of adjustment of the labour market to shocks and policy changes. Over the longer-run, leftward or rightward movements of the curve can be seen as representing a change in the underlying structure of the economy as a result, for example, of experiencing substantial shocks or as a result of economic agents altering their behaviour when faced with substantial shifts in the existing macroeconomic policy environment, such as for example in monetary policy through the adoption of a hard currency stance.

Consequently, as a result of its construction, a Phillips curve analysis is useful not only for assessing the present degree of real wage flexibility/rigidity in an economy but also for assessing structural shifts over time, in the form of changes to the NAIRU[19].

HISTORICAL EVOLUTION OF PHILLIPS CURVE DEVELOPMENTS: Up until the late 1960s there appeared to be a stable trade-off between inflation and unemployment. However, just as policy-makers began their attempts to exploit this apparent trade-off, the historically very stable relationship between these two evils appeared to break down. Policies which aimed at moving a particular economy along the Phillips curve led in fact to an outward shift of the curve itself i.e. the rate of inflation associated with a given rate of unemployment was in fact rising, leading in the 1970s to instances of stagflation, where stagnant output and rising unemployment went hand-in-hand with rising inflation.

The 1970's was therefore characterised by a substantial outward movement of the Phillips curves for the European countries over the decade reflecting both rising inflationary expectations and the fact that the level of unemployment needed to contain inflation had risen. The onset of the 1980s brought about the introduction of a generally more non-accommodating policy stance which was reflected in reduced inflationary expectations. However, the enhanced credibility effects emanating from this change in the policy stance may have been counterbalanced by an increase in the degree of labour market rigidity in certain countries, as reflected in increasing rates of trend unemployment.

The spectacular breakdown of the Phillips curve in the 1970s posed the question as to why the curve had been so stable over the previous decades. The most plausible explanation put forward was that the relationship was an accident which resulted from the fact that inflation was both low and relatively stable over that period and consequently inflationary expectations were also low and stable. However, the apparently stable inverse relationship broke down as inflation became higher and

[19] It should be noted that while the Phillips curve is clearly downward sloping, it is often very difficult to estimate the level of unemployment at which it predicts a constant rate of inflation.

more volatile in the 1970s and inflationary expectations were subject to frequent shocks.

The empirical breakdown of the Phillips curve relationship had been impressively predicted by Friedman and Phelps. They argued that what was important to both workers and employers was what happened to real not money wages (i.e. economic agents lack money illusion) and that in the long-run the Phillips curve was in fact vertical with no trade-off between inflation and unemployment. However, they did accept that a short-run trade-off could exist when an economy was moving from one equilibrium to another such as for example in the case of an unexpected rise in inflation.

Friedman and Phelps introduced two key concepts into the traditional Phillips curve analysis i.e. inflation expectations and the natural rate of unemployment. These insights were quickly incorporated into mainstream thinking in the form of the expectations-augmented Phillips curve, a variant of which was used to calculate the NAIRU estimates in Chapter 2. In this view of the world, wage developments depended both on inflationary expectations and on the deviation of unemployment from the natural rate of unemployment with the price of any expansionary policy to reduce unemployment being an ever-rising or accelerating rate of inflation. If one accepts this thesis then the only way for governments to reduce unemployment is through a long-term commitment, at the microeconomic level, to improving the workings of the labour market and consequently reducing the "natural" rate.

THE PHILLIPS CURVE, THE NAIRU AND THE EVOLUTION OF THE ECONOMIC POLICY DEBATE: In the context of the charged debates in the 1960s between the monetarists and the Keynesians on the efficacy of demand management policies the slope of the Phillips curve was a highly contentious issue with the monetarists believing the curve to be quite steep, and consequently demand management policies were ineffective, and with the Keynesians arguing it to be quite flat with the implication being that reductions in unemployment had little effect in terms of increased inflation. The Friedman-Phelps hypothesis of a vertical long-run Phillips curve, with no trade off between inflation and unemployment, represented the culmination of the monetarists' challenge to the Keynesian view of the Phillips curve.

The modern day version of the latter curve in fact contains elements from both schools of thought, with the NAIRU or the natural rate being the unemployment rate at which the Keynesian's downward sloping, short-run, Phillips curve cuts the monetarist inspired long-run vertical curve. Interpretation of this « expectations-augmented » Phillips curve also divides along familiar lines with Keynesians arguing that a useful short-run trade-off between inflation and unemployment continues to exist because of money illusion, with the NAIRU being regarded as a constraint on policy makers to exploit that trade-off, whereas monetarists see no useful trade-off opportunities. There is a significant amount of empirical support, in fact, for the hypothesis of a non-vertical short-run Phillips curve, with quantifiable feedback effects being identified from deviations in the actual unemployment rate from the natural rate to changes in the rate of inflation.

While empirical support may exist for such a short-run trade-off, it would be misleading to infer from this evidence that such a trade-off could be exploited for policy purposes. In this regard, it took the neo-classical school of thought, and more specifically the Lucas critique, to weaken the potency of any such Keynesian notions of the Phillips curve. While the monetarists forced Keynesians to accept a long run constraint on demand management policies in the form of the natural rate of unemployment, it took the Lucas critique to suppress the belief that there still existed a possibility to exploit a short run trade off between inflation and unemployment. Lucas argued that even if a statistically robust and stable Phillips curve relationship existed in the short run, this was no guarantee that policy makers would be in a position to exploit such a relationship or indeed any similar statistical relationships between variables of policy interest, regardless of how reliable those empirical relationships appear to be. The Lucas critique was seriously damaging to the short run Phillips curve thesis, since it provided a reasonable explanation for the fact that the latter's breakdown, in the form of an erratic upward shift in the curve, coincided with policy makers attempts to use the curve as a policy tool to guide fiscal and monetary policy changes.

CAN THE NAIRU STILL BE USED IN THE MACRO POLICY FIELD OR AS AN INDICATIVE TOOL TO GUIDE STRUCTURAL REFORM?

MACRO POLICY ROLE: As the previous chapters have highlighted, the combination of theoretical (eg hysteresis) as well as significant measurement uncertainties (i.e. large variety of feasible models for estimation purposes allied to statistical imprecisions with regard to the resultant point estimates)[20] renders the NAIRU concept problematic in terms of macro policy formation. A lot of these problems emanate from the fact that observable information on a number of the key variables used in the NAIRU calculations, such as inflation expectations and the degree of excess demand, just does not exist and consequently one must be careful in assessing the policy message from estimates derived in this way. In overall terms, it is difficult to avoid the conclusion that the NAIRU estimates are simply not reliable enough to be used, at least in isolation, in a macro policy setting.

MICRO POLICY ROLE: While the NAIRU's empirical difficulties, such as the inaccuracies in measuring it and its variability over time, limits its usefulness in terms of macroeconomic policy-making, the concept clearly should not be dismissed easily given that it can still be used in combination with a range of other indicators to inform

[20] Measurement problems are hardly surprising given the well documented instabilities in the Phillips curve for the Community countries. While statistically significant NAIRU estimates can be obtained, the latter point estimates are not very precise, with relatively large confidence intervals reducing their usefulness as policy guides. The Community's Member States have experienced significant upward shifts in their Phillips curves, and consequently in the NAIRU estimates, over the period in question reflecting significant changes to the structure of the respective labour markets since the early 1970s. Structural or equilibrium unemployment in the Community has in fact been steadily rising from cycle to cycle, with a deterioration in the underlying responsiveness of the labour market being reflected in rising NAIRU's and persistence mechanisms.

the policy debate and given the fact that other analytical policy tools such as output gap measures etc are not without their own set of problems. In addition, it is clear that the NAIRU has a potentially important contribution to make in the area of the microeconomics of labour markets, an area of considerable interest here in the Community given the pressing need to find explanations for, and solutions to, the problem of persistently high levels of unemployment which continues to plague many of its Member States.

NAIRU estimates can be used as a meaningful overview measure of cross-country differences in the functioning of labour markets since they embody all possible institutionally-based labour, and to some extent product, market differences between countries. NAIRU calculations, however, can only be interpreted in such a manner on the assumption that the expectations-augmented Phillips curve for each of the countries concerned has been estimated using the same functional form, has comparable data sets for the variables (i.e. there are no definitional differences), and uses the same estimation period. If these requirements are respected and if attention is focussed on the relative, not the absolute, performance of the countries concerned, then despite the empirical difficulties in measuring this theoretical concept, the NAIRU can still be a useful pointer to where attention should be focussed in any international comparisons of labour market performances.

CONCLUDING REMARKS

The NAIRU, as an indicator of the equilibrium rate of unemployment, is undoubtedly useful in conceptual terms since it directly focusses on the ultimate targets of macroeconomic policy, namely inflation and unemployment. However, its theoretical uncertainties combined with extensive measurement problems, which ensure that no consensus value emerges from the various estimation methods, emasculates its usefulness as a structural parameter in the macro policy making arena. A lot of the problems with the NAIRU stem from the fact that it is not a directly observable variable and must consequently be estimated as a structural, endogenous, parameter of the price and wage formation system. Any NAIRU estimate produced in this way is surrounded by a number of sources of uncertainty including the statistical inexactness with which the point estimate is produced and more fundamentally the fact that different model specifications produce different point estimates. Given these latter uncertainties, it is hardly surprising to find that the NAIRU is increasingly been seen not as a robust point estimate but as a zone.

While it is accepted that the NAIRU cannot be regarded as a "universal constant", thereby restricting its use in the macro area, a case can still be made for its continued use at the micro level as a cross country indicator of the malfunctioning of the respective labour markets and therefore as an important tool for targetting structural reform efforts in the respective countries. While the empirical estimation of the NAIRU maybe fragile at the individual country level, as long as the estimation is carried out according to the guidelines described earlier in the paper, the NAIRU can still be used for cross-country comparisons as a summary statistic of institutional differences between the respective labour markets. This is eminently possible for comparisons between Member States of the Community where differences in the national institutional frameworks are not of the fundamental variety. However, one suspects that less credence could be attached to comparisons of NAIRU's between the Community and, for example, the United States since the institutional differences are substantially greater.

This latter lack of comparability may suggest problems in relation to the universal applicability of the concept, with the underlying structural determinants of the NAIRU differing dramatically across certain countries. By way of example, if one has a bilateral monopoly type of bargaining system, similar to that which operates in a number of European countries, compared with the less institutionalised, more market-based approach operating in the United States, then the link between unemployment and notions of inflation, as reflected in the NAIRU concept, are of a qualitatively different nature. These fundamental differences in the architecture of the respective labour markets may go some way in explaining the difficulties experienced in transposing the NAIRU concept to a continental European type bargaining system.

Despite all the problems highlighted above, there is still no doubting the broad conclusion to be drawn from the NAIRU estimates generated in this paper, namely that the NAIRU has risen substantially in the Community over the last number of decades i.e. the level of unemployment consistent with stable inflation is now much higher than before the shocks of the 1970s. It is clear that this latter trend rise in EC

unemployment emanates from no one single factor. It is undoubtedly partially the result of a diverse range of adverse shocks which had a particularly pronounced effect on EC countries, compared with the US and Japan, because real wage rigidity in the Community was internationally comparatively high. However, these adverse shocks alone were not large enough to explain the observed trend increase in actual unemployment during the 1980s. Consequently, other factors such as hysteresis effects, would appear to have been at play.

Hysteresis has the effect of preventing the necessary degree of real wage adjustment from occurring with the result that temporary shocks have permanent or persistent effects on unemployment. When an economy's labour market has been slack for some time, it becomes less flexible and more inefficient through skill loss, reduced search effectiveness etc. Consequently, hysteresis is an important consideration for such labour markets in the sense that their present performance is to an extent dictated by the shocks they have been subjected to in the past. These hysteresis effects or inefficiencies place « speed limits » on the pace of recovery from any downturns i.e. inflation responds not only to the size of the unemployment or output gap, but to the speed at which the gap is closed, with the faster the recovery phase, the greater the risk that inflation will accelerate before the NAIRU is reached. The difficulty however is establishing a robust estimate of the NAIRU in order to be able to distinguish between short term increases in inflation resulting from hysteresis type « speed limits » on growth and a long-term change in inflation due to running the economy beyond its potential.

Finally, it is disappointing to note that while at a theoretical level, the economics profession has made a substantial degree of progress in recent decades in terms of understanding labour market developments, at the empirical level, as evidenced by the experience with the NAIRU, things have not advanced so rapidly. While conceptually the determinants of the natural rate appear to be well documented, it has not yet been possible to quantify, with any degree of certainty, the relative importance of the individual root causes thereby leading to an incomplete understanding of the differences in the natural rate between countries and indeed across time periods. This problem is particularly acute in Europe where many theories have been put forward to explain the sharp rise in structural unemployment since the 1970's, including the oil price and productivity shocks of that latter decade, a deterioration in labour market flexibility, the counter inflationary demand policies of the 1980s, a shift in the relative demand for unskilled labour and finally hysteresis effects[21]. While theories abound,

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[21] In the late 1970s – early 1980s research efforts were focussed on the oil price explosion and the slowdown in productivity. However, this explanation was always difficult to accept given that the US was equally affected by these supply side shocks. In addition, in explaining the present high level of the NAIRU in Europe, these factors clearly lose force since oil prices are now back to their pre-shock levels in real terms and since it is widely accepted that productivity changes can have no long run effects in terms of the NAIRU whereas any short run effects resulting from workers real wage aspirations reacting slowly to the productivity slowdown having by now fed through. This latter expectational adjustment could have temporarily increased the NAIRU but not permanently.

The next line of inquiry emphasised the disinflation policies of the early 1980s. This however would be expected to increase only the actual rate of unemployment not the NAIRU and in any case over the last number of years with a relatively stable rate of inflation in the Community one would have expected the actual rate of unemployment to decrease but it hasn't. Given the fact that inflation has been roughly constant in the Community in recent years despite the fact that unemployment rates in excess of 10 percent still persist is suggestive that the NAIRU in the Community is not far from the actual rate of unemployment.

no definitive answers have, as yet, been provided. This is a highly unsatisfactory situation and indeed is one which, if the empirical difficulties in calculating the NAIRU highlighted in the present paper are anything to go by, does not look likely to be resolved in the near future.

The main focus of research interest over the last decade has been labour market rigidities and hysteresis effects. While factors most normally pinpointed as adding to labour market rigidities appear to have become less onerous as the 1980's progressed, it is purported that the unemployment cost of the rigidities that remain has actually become heavier due to the competitive forces unleashed by technological progress and the rising trend toward globalisation. In relation specifically to technological progress, it is contended that relatively compressed wage distribution structures in Europe, allied to more generous social welfare provisions have resulted in higher levels of unemployment amongst the unskilled cohorts of the workforce relative to those in the United States. This type of skilled-biased technological progress explanation may offer some insight regarding the performance of the Community as a whole relative to that of the US but has less success in explaining the relative performance of individual Member States within the Community.

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