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Pollan, Wolfgang

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Wolfgang Pollan

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E-mail address: Wolfgang.Pollan@wifo.ac.at
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Incomes Policies, Expectations and the NAIRU

Revised Version

Wolfgang Pollan*

One of the few good ways we have to test analytical ideas is to see whether they can make sense of international differences in outcomes by appealing to international differences in institutional structure and historical environment. The right place to start is within each country separately, studied by someone who knows the peculiarities of its history and its data.

You might think that this (...) ought to be obvious. But in fact the usual approach is just the opposite. More often than not we fail to take institutional differences seriously. One model is supposed to apply everywhere and always.

Robert M. Solow (1986)

1. Introduction

According to the mainstream view of macroeconomics, the Phillips curve remains an important concept in business cycle models, both theoretically and empirically (*Ball – Mankiw,* 2002, *Blinder,* 1997). In the sixties and seventies the concept of the Phillips curve constituted a platform for the discussion of labour market problems and seemed to offer the choice between various combinations of unemployment and inflation. Within this framework, the persistent rise in unemployment and in inflation in the seventies was, however, unexpected and unexplainable, prompting the evaluation by *Lucas – Sargent* (1979) that the Phillips curve was a terrible failure.

Since the first empirical applications, the Phillips curve has been developed further. Modern versions of the model contain an expected inflation or inertial inflation term on the right hand side of an equation describing the current rate of wage or price inflation.

At the theoretical level, a change took place with *Friedman's Presidential Address* (1968) and the contribution by *Phelps* (1968), who challenged the idea that government faced a trade-off between inflation and unemployment. The demand and supply of labour depends on changes in real wages and not money wages. In wage bargaining, workers, being only interested in real wage developments, will try to anticipate future price increases in order to protect their real wage. Thus, expected price increases are a crucial variable in the wage setting process, as changes in inflationary expectations enter into workers' pay demands.

* I would like to thank Fritz Breuss and Thomas Url for helpful comments.

Equilibrium can only be obtained when the inflation expectations of workers turn out to be correct. Real wages and employment are constant in equilibrium, but nominal variables may well be changing. In this type of equilibrium, the Phillips curve is vertical because real variables such as employment and unemployment are not changing regardless of the rate of inflation. At the market clearing rate, all workers who are willing to take jobs at the prevailing real wage are employed. This rate has been termed the 'natural rate of unemployment' or 'structural unemployment' or the 'non-accelerating-inflation rate of unemployment' (NAIRU). There is a baseline rate of unemployment at which inflation tends to remain constant. If the actual rate of unemployment is below this baseline, inflation tends to accelerate over time; if it is above this rate, inflation tends to slow down. Any attempt by the government to reduce unemployment below the natural rate of unemployment can be achieved only at the cost of increased inflation in the short run and ever-increasing inflation in the long run.

The mainstream consensus, which underlies much of the literature on the Philips curve and the natural rate of unemployment, views the economy as imperfectly competitive labour and goods markets (*Bean,* 1994, *Layard et al.,* 1991; *Morgan – Mourougane,* 2001; *Beissinger,* 2003). Workers, say, through the intermediation of labour unions, bargain with firms over wages, with the level of wages linked to the relative bargaining power of unions and employments. Firms, on the other hand, exploit their market power in setting prices. Inflation reconciles the competing claims on overall output in the short run, in the long run this balance is accomplished by unemployment. This theoretical framework of the economy has been termed 'the battle of the mark-ups' (*Layard et al.,* 1991). It was this very view of the economy which persuaded many economists and policy makers in the early sixties that incomes policies were needed to control the discretionary market power of business firms and unions (*Ulman,* 1969, p. 195; *Flanagan et al.,* 1983, pp. 1-5). This view then gave rise to the celebrated U.S. Guideposts for Noninflationary Wage and Price Behavior in the United States. Similar wage policies were adopted in several European countries. This point seems to have been forgotten: A reading of the NAIRU literature does not let one suspect that incomes policies designed to control price and wage inflation were ever implemented.

The NAIRU has been given a prominent place in the research of policy making institutions such as the OECD, the European Commission, the European Central Bank, the U.S. Council of Economic Advisors, and the Federal Reserve Board; estimates of the NAIRU have been used as an important indicator in the analysis of macro and structural economic developments. Several prominent economists, such as *Stiglitz* (1997), *Ball – Mankiw* (2002) and *Gordon* (1997), have characterised the NAIRU as a useful tool in forecasting.

But there exists considerable controversy surrounding the measurement and policy use of the natural rate of unemployment. Estimates of NAIRU have been criticised as being too vague to be a useful guide to macroeconomic policy (*Staiger et al.,* 1997; *Franz,* 2001; *Atkeson – Ohanian,* 2001). Another line of criticism concerns the stability of the natural rate, an issue implicitly acknowledged in Friedman's characterisation of the 'natural unemployment rate' as being ground out by the set of Walrasian microeconomic relations in the economy; these

microeconomic relations include the structure and institutions of product and labour markets. If they change, the natural rate of unemployment changes. Empirical work has responded to this criticism by estimating a natural rate of unemployment that changes over time. But allowing the NAIRU to follow the actual time path of the unemployment rate by estimating a time-varying NAIRU on the basis of a number of arbitrary decisions tend to make the natural rate hypothesis devoid of empirical content and policy relevance (*Stanley,* 2002).

The question of what factors are behind the development of the natural rate of unemployment over time is left unanswered, however. If institutional factors of the labour market are important for the development of inflation and unemployment, as is asserted by many economists[1], then the question arises how these institutions have changed over time. This may be a particularly important issue for the Austrian economy, which has been characterised as a highly corporatist economy, i.e. as an economy in which labour market outcomes, in particular, are strongly influenced by the actions of institutional actors (*Crouch,* 1985, *Bruno –Sachs,* 1985, *Calmfors – Driffill,* 1988, *OECD,* 1994, *Pollan,* 1997; *Calmfors,* 2001).

Moreover, if institutions do indeed play an important part in determining the unemployment rate then one must ask the question whether it is the expectations of *individual* actors in the goods and labour markets that count or rather the expectations with regard to future price and wage developments held by *institutional* actors.

This paper has two objectives. The first one is to show that in the past corporatist policy making, with its focus on incomes policies, has substantially interfered with the movement of the variables that figure prominently in the discussion of the natural rate thesis; this point would seem obvious were it not for the fact that it is neglected in the empirical literature on the natural rate hypothesis. The second purpose of this paper is to draw attention to the consequences of incomes policies, interpreted broadly as encompassing price, wage and employment policies, on the estimation of the non-accelerating rate of unemployment.

The paper is organised as follows. Section 2, after sketching the well known theoretical basis of the NAIRU (for recent expositions see, for example, *Ball – Mankiw,* 2002, *Franz,* 2001; *Beissinger,* 2003), presents preliminary estimates of the Phillips curve for the Austrian economy, which when extended to include expectational terms would lend itself to the calculation of the non-accelerating inflation rate of unemployment. But the impact of the rate of unemployment on the rate of inflation is rather tenuous and the estimates of the NAIRU vary depending on the specification of the time period chosen. Section 3 briefly discusses previous NAIRU estimates for Austria.

NAIRU estimates for Austria turn out to be unstable. But there are more serious objections to the calculation of a natural rate of unemployment in Austria. As in most other countries, the unemployment rate has changed substantially from the sixties to the nineties. In the empirical literature this is taken to indicate that the economic environment has changed. In a

[1] See, for example, *Nickell* (2003), *Beissinger* (2003) and *Nickell et al.* (2005) and the literature cited there.

corporatist economy, this environment includes the policy measures taken by economic policy makers[2]. Section 4 raises some methodological issues by contrasting the approach underlying the NAIRU papers with the theoretical and empirical literature focusing on the importance of institutions. Section 5 discusses the various policy measures used by Austria's Social Partners in tandem with the government to keep wage and price inflation under control, mainly as a way of achieving or maintaining full employment and external stability. Significantly, some of these measures were designed to prevent the emergence of inflationary expectations and the development of an inflationary spiral in certain time periods. These policies include price policies, policies to regulate the inflow or outflow of foreign workers and, most importantly, the implementation of wage policies. Section 6 raises the question whether the kind of incomes policies practiced in Austria has been subject to change or has broken down altogether. This question can easily be answered for some types of economic policies, such as price policies, but not so readily for wage policies. There are indications that wage policies have changed over time, but an in-depth analysis of this issue is beyond the scope of this paper. Section 7 contains some policy conclusions for estimating a NAIRU for Austria as well as for other countries.

2. Preliminary results

The expectations-augmented Phillips Curve

A standard formulation of the inflation – unemployment trade-off is written in the following way:

(1) $\Pi = \dot{\Pi}^e - aU + bv + constant$

Π is the rate of inflation; $\dot{\Pi}^e$ is the expected rate of inflation, and U is the rate of unemployment. v is called the supply shock and is normalised in such a way that the mean of this variable is equal to zero[3]. Note that in this formulation the coefficient of $\dot{\Pi}^e$ is equal to 1.

Two hypotheses regarding the formation of expectations are offered by mainstream economics. According to the adaptive expectations hypothesis (Friedman 1968), inflation of the last period is extrapolated, i.e., $\dot{\Pi}_t^e = \dot{\Pi}_{t-1}$. The Phillips curve can then be written as

(2) $d\Pi_t = \dot{\Pi}_t - \dot{\Pi}_{t-1} = -aU + bv + constant$

A reformulation yields:

(3) $d\dot{\Pi}_t = -a(U - U^*) + bv,$

---

[2] This observation, of course, applies to any economy, but is most relevant in an economy where policy makers have interfered with the wage and price setting system in such a massive way. The set of countries to which this criticism applies includes all countries that have implemented incomes policies of one sort or another, such as Germany, the Netherlands, France, the United Kingdom and the Scandinavian countries (*Fallick et al.,* 1981, *Flanagan et al.,* 1983, *Soskice,* 1990; *OECD,* 1997; *Visser,* 1998; *Wallerstein,* 1999; *Watson et al.,* 1999).

[3] Thus, in a regression, the coefficient of the variable v does not enter the constant term.

where U* can be called the natural rate of unemployment or the non-accelerating inflation rate of unemployment (NAIRU). The constant term is equal to *aU**, and the ratio of this term to the (absolute) value of the coefficient of *U* yields an estimate of *U**.

An equivalent derivation starts from the condition that in the steady state, with $v = 0$,

(4) $\dot{\Pi}_{t-1} = \dot{\Pi}_t$, and

so that

(5) $d\dot{\Pi}_t = 0 = constant + aU$.

The unemployment rate that corresponds to the condition that inflation neither decelerates nor accelerates is then obtained by solving for *U*, the non-accelerating inflation rate of unemployment (NAIRU):

(6) $U^* = -constant/a$.

The second approach argues that in the long run expectations are rational, i.e., forecasts are not systematically biased, or the average of expected inflation is equal to the average of actual inflation (*Phelps,* 1968, p. 682): $\dot{\Pi}^e = \Pi$.

Preliminary NAIRU estimates

This section discusses preliminary results of NAIRU estimates for Austria. These results are called preliminary because the parameter estimates are unlikely to be identified, as will be argued in a later section: they are presented here because they can serve to highlight some of the problems encountered when estimating a Phillips curve for Austria[4].

The parameter estimates are based on a Phillips curve regression over the last four decades, estimated according to the standard approach as used by *Gordon* (1997). The inflation rate according to the consumer price index is regressed on an expectational term, the rate of unemployment and on a variable representing external price shocks. Given the lack of reliable import prices, the index of raw material prices of the HWWA was used to represent external shocks[5].

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[4] The question of identifiability of the parameter estimates has been raised in the context of reduced structural equation (*Manning,* 1993; *Bean,* 1994, *Chiarini – Piselli,* 2001), but not with regard to policy measures.

[5] The index of raw materials prices is calculated on the basis of the US dollar. To represent the direct impact of changes in prices of raw materials on domestic consumers and firms that process raw materials, the index needs to be converted from a dollar to a schilling (euro) basis (the raw materials index is multiplied by the dollar exchange rate; in the log form this amounts to an addition). But there are also indirect effects of the exchange rate. If changes in exchange rates affecting the Austrian economy are simply represented by the schilling/dollar (euro/dollar) exchange rate as a separate variable, the fit of the inflation equation improves substantially, with a surprising result: the coefficients of the dollar exchange rates (including lagged terms) are close to those of raw material prices (on a schilling/euro basis), with the opposite signs, so that the conversion of the raw materials prices from a dollar to a schilling/euro basis is reversed. For the sake of parsimony, the variables raw material prices on a schilling basis and the schilling/dollar exchange rate are combined and the index of raw material prices enters the inflation equation on a dollar basis. For more details see *Pollan* (2004, 2005).

The inflation rate is a function of the rate of inflation lagged one period, the change in raw material prices (up to a lag of two periods), and the rate of unemployment.

The basic inflation equation estimated with annual data is as follows:

Sample period: 1963-20002:

(I) $\Pi_t = 0.027 + 0.45\Pi_{t-1} + 0.029HW_t + 0.030HW_{t-1} + 0.012HW_{t-2} - 0.0085\log(U_t)$

3.6 4.0 2.9 3.1 1.1 –2.5

R2 adj = 0.83; D-W = 1.8

The numbers in italics below the coefficients are *t-values*.

Sample period: 1963-1994, 1999-2002:

(II) $\Pi_t = 0.026 + 0.43\Pi_{t-1} + 0.031HW_t + 0.033HW_{t-1} + 0.014HW_{t-2} - 0.0065\log(U_t)$

3.3 3.5 3.0 3.3 1.2 –1.7

R2 adj = 0.82; D-W = 1.9

Π = inflation rate according to the consumer price index

HW = HWWA index of raw material prices, dollar basis

U = unemployment rate (according to the traditional Austrian definition: ratio of the number of unemployed to dependent employment plus unemployment).

Π denotes (absolute) changes in the logarithm of the consumer price index, HW is in the form of (absolute) changes in the logarithm of the HWWA index. The unemployment rate enters the equation in logarithmic form. For details see appendix.

It is remarkable that changes in world market prices plus the lagged endogenous variable explain four fifth of the variance in the inflation rate (world market prices alone account for 60 to 75 percent of the variance, more for the earlier period, less for the full period 1963-2002).

Entering the unemployment rate as an additional explanatory variable adds very little to the explanatory power of the regression equation. The best fit is obtained if the unemployment rate is entered in the regression in logarithmic form[6].

Even in this functional form, the influence of the unemployment rate on the rate of inflation is weak, close to zero for the period 1963-1994, 1999-2002, somewhat higher for the full period (including the years 1995-1998), but still marginal; for the period 1963-2002, a rise in the unemployment, say, from 5 to 6 percent, lowers the rate of inflation by only 0.16 percentage point. In other words, the costs of disinflation are very high: reducing inflation by *one tenth of one percentage point* requires a rise in the unemployment rate by 0.6 percentage point.

[6] The unemployment rate varies between 1½ percent in the early seventies and 7 percent in the late nineties; taking the logarithm reduces the difference between the high and low values, which may account for the better fit of the unemployment rate in the logarithmic transformation. See appendix.

Can the NAIRU be estimated for the Austrian economy?

If the Phillips curve approach to estimating the natural rate of unemployment is to be fruitful two conditions have to be met: The first condition is that unemployment is a major determinant of inflation. The second condition is that the expected inflation rate (usually approximated by past lagged inflation rates) enters the expectations-augmented Phillips curve with a coefficient of 1 (the sum of the coefficients of the lagged inflation rates is 1). If the results of the Philips curve regressions as reported above are taken at face value, the first condition is only weakly fulfilled, the second not at all.

For the US economy, the sum of the coefficients of lagged inflation rates is close to one, so that the argument that inflation expectations are a crucial variable in explaining shifts in the inflation-unemployment trade-off is supported by empirical evidence (*Gordon,* 1997). This, however, is not the case for Austria: in most of the regressions estimated, the coefficient of the lagged inflation rate (or the sum of the coefficients of the lagged inflation rates, not shown) does not exceed the mark of 0.50[7].

Higher estimates of the coefficients are obtained if the inflation forecasts of the Austrian Institute of Economic Research are used as proxies for inflation expectations, but then, depending on the time period, the coefficient of the unemployment rate turns *positive* and the empirical basis for estimating the 'natural rate of unemployment' vanishes altogether (see appendix).

3. Previous NAIRU estimates for Austria

One of the first papers to estimate the natural rate of unemployment by statistical methods allowing a time-varying NAIRU is due to *Hahn – Rünstler* (1996). On the assumption that there is a stable set of wage and price equations and a stable relationship between GDP and unemployment, they derive an estimate of the natural unemployment rate as a smooth trend, that does not, however, incorporate any structural information (such as policy measures or structural changes), with the price equation neglecting any influence of the two energy shocks which occurred during the sample period considered (1967-1994).

The OECD (*Richardson et al., 2000, Turner et al.,* 2001) derives time-varying estimates of the natural rate of unemployment (the structural rate of unemployment in OECD terminology) using the Kalman filter for the OECD countries, with the sum of coefficients of past inflation forced to be one for Austria. No account is taken of Austria's accession to the EU (which significantly lowered the inflation rate) or other policy measures, even though for other countries the estimates are adjusted to allow for the effects of policy reforms.

[7] For similar findings for Germany, see *Franz* (2001,2005).

The same kind of criticism applies to the NAIRU estimates produced by the EU (*McMorrow – Roeger,* 2000), even though their equations for Austria include the tax burden (and the real interest rate) as structural variables.

4. Methodological issues

How important are institutions of the labour market?

Almost 40 years ago *Friedman* (1968) and *Phelps* (1968) developed the concept of the 'natural rate of unemployment'. Since then the empirical and theoretical literature has developed further, but two main issues have remained the same: The NAIRU concept refers mainly to the labour market, and the natural rate of unemployment is an equilibrium concept for a market which is cleared by the price of labour in the interaction between workers and enterprises. Despite this emphasis on the functioning of the labour market, the empirical literature pays little attention to the institutions of the labour market, almost none to economic policy.

In most OECD countries, the NAIRU varies considerable over time, but the factors which might cause these movements receive little attention. *Gordon* (1997, p. 30), in his exposition of the standard estimation procedure for the US economy, lists some of these factors only as an afterthought (changes in labour militancy, in the minimum wage, changes in the supply in product and labour markets in the form of increased global competition and immigration of unskilled labour). A similar list is given by *Ball – Mankiw* (2002), who also mention, without further elaboration, government policy as playing a role in causing the NAIRU to change over time.

The *OECD* (2000), while acknowledging in principle that the NAIRU depends on a wide range of institutional and economic factors, takes account of changes in these factors (such as labour market reforms) only as revisions to preliminary estimates by judgmentally adjusting the NAIRU estimates for a few countries (but not for Austria).

As *Solow* (1986, pp. 31-32) remarks, a paradox arises here. "Those who estimated the natural rate in this way occasionally go on to discuss events or policies that might possibly change the natural rate. . . . But those factors have played no role in the estimation. It seems rather a bold leap, calling for more justification that it gets."

This neglect in the NAIRU literature is the more astounding as analyses of the labour markets have tended to point to the importance of labour market institutions and of changes in these institutions in explaining cross-country differences and changes over time.

Differences in national labour market institutions have been invoked to explain the divergence in the labour market performance in industrialised countries. The favourable development of the US labour market in recent years has been attributed to the great flexibility of the labour market, while the bad performance of some European labour markets

has been explained with institutional rigidity (*Garonna – Sica,* 1997, *Siebert,* 1997, *Saint-Paul,* 1997, *Nickell,* 1997, *Nickell – Van Ours,* 2000; *Nickell,* 2003).

There is also a large body of literature linking the macroeconomic performance in terms of inflation, growth as well as unemployment to labour market institutions and regulations (*Calmfors – Driffill,* 1988, *Rowthorn,* 1992, *OECD,* 1997, *Nickell,* 1997, *Nickell – Layard,* 1999, *Blau – Kahn,* 1999, *Flanagan,* 1999, *Blanchard – Wolfers,* 2000, *OECD,* 2001, *Calmfors et al.,* 2001, *OECD,* 2004). Here, the emphasis is on institutional actors and their ability to restrain wage demands in the pursuit of macroeconomic goals.

Wage bargaining institutions have also attracted a great deal of attention in the literature investigating the interaction between the degree of centralisation/coordination of wage bargaining and central bank independence and credibility and the effects of monetary policy on inflation and unemployment (*Hall – Franzese,* 1998, *Cukierman – Lippi,* 1999, *Soskice – Iversen,* 2000, *Calmfors,* 2001), with the rankings developed to describe various characteristics of wage bargaining (*Bruno – Sachs,* 1985, *Calmfors – Driffill,* 1988, *OECD,* 1997, *Wallerstein,* 1999, *Iversen,* 1999) forming the basis for empirical work. This literature on the economic policy games between a central bank and wage bargainers focuses on the question of which actors, individual workers, individual unions or peak labour organisations are more inclined to take the (negative) external effects of high wage increases into account and thus bring about a favourable macroeconomic performance.

Economic policymakers as actors on the labour market and their expectations

If indeed institutions of the labour market are important determinants of economic performance then the field of actors whose behaviour is described in the empirical model needs to be enlarged. It is not sufficient to model the behaviour of workers and firms as individual actors as if the economy conformed to the neo-classical market model. An economic model linking unemployment to inflation must also incorporate the behaviour of organised groups. In Austria, such groups include, on the labour side, the Austrian Trade Union Confederation, the individual unions, the works councils and, on the employers' side, the Economic Chambers, as well as the government. This requires that all policy measures are incorporated into the analysis. This is particularly clear for Austria but applies also to other European countries.

Expectations play a crucial role in the estimation of the NAIRU in the form of an expectations-augmented Phillips curve. Thus, if the field of economic actors is enlarged by the group of economic policy makers, then the range of expectations has to be widened to encompass the price and wage expectations of economic policymakers as well as the impact of economic policies on the formation of expectations, a point that has been taken into account in the literature modelling the interaction between a central bank and unions, but not in the NAIRU literature.

The NAIRU model is conventionally based on the expectations-augmented Phillips curve. Thus, expectations held by economic actors play a crucial role in the determination of the unemployment rate. As *Carlson – Parkin* (1975, 124) point out, if the actual inflation rate depends partly on expectations, then "means of lowering those expectations are potentially useful devices for controlling inflation". Thus, "if . . . wage-price guidelines or exhortation affect expectations in an important and lasting way, then they become useful instruments of inflation control". In a market economy, the expectations of employees and employers are important. In a mixed economy, however, where various institutions, be it the government or peak organisations of labour and capital play an important role in the wage and price setting system, it is not so much the price and wage expectations of individual workers and of individual firms that count but those of the institutional actors. In Austria, where the employers' and employees' organisations, the so-called Social Partners, are entrusted with managing the social and economic agenda (*Pollan,* 1997), the wage and price expectations formed by the employers' and employees' organisations may be more important than those of individual actors. A second equally important point follows immediately from this: while individual actors in the labour and goods market have little or no incentive to take actions not in accord with those expectations, institutional actors, in the pursuit of macroeconomic goals, are likely to take measures to counteract inflationary expectations, which, if successful, will produce a non-vertical Phillips curve.

5. Economic policies and the NAIRU

This section sketches some economic policy measures and points out some of the difficulties caused by such actions in the estimation of price and wage inflation equations. In principle, any kind of economic policy will have an impact on the development of prices, wages and unemployment. In the present context, however, attention has to be restricted to the direct interference with the process of wage and price formation and with the development in the labour market.

In Austria, a broad array of policy measures has been employed to control wage and price inflation and to influence the labour market[8]. Three main types of policy measures can be distinguished: policies to influence wages, policies to influence prices, and policies to influence the supply of labour.

[8] Based on a study of the development of contractual wage rates, *Breuss* (1980) claims that economic policies were designed to maintain a stable (non-vertical) Phillips curve; in other countries, by contrast, there were indications of instabilities in the Phillips curves over the same sample period. In a wider context, *Tichy* (1982) argues that the main merit of what has been caalled Austro-Keynesianism was the stabilisation of expectations.

(1) Policies to influence the movement of prices and wages directly

In a typical regime of wage moderation, the Phillips curve is closer to the origin, as policy makers react strongly to small increases in unemployment by moderating wage increases or enforcing wage stops. In Austria, this form of anti-inflation policy was, as a rule, supported by measures to control price inflation in a variety of forms.

Throughout most of the post-war period, policy makers (the Social Partners, the federal government) have attempted to directly influence the rate of inflation by changing a wide array of *regulated* prices (basic food stuff, public charges, energy prices, custom tariffs) in an anti-cyclical manner, with the express purpose of breaking inflationary expectations (*Spitäller,* 1973, *Flanagan et al.,* 1983, *Pollan,* 1992), so as to achieve external and internal stability and low unemployment. To be sure, such policy measures were not always successful because they were implemented during the 'wrong' phase of the business cycle, but over all the movement of regulated prices was strongly *negatively* correlated with the movement of cyclical determined prices in the sixties and seventies (*Pollan,* 1978, 1980)[9].

Policy measures to raise *regulated* prices in periods of low wage and price inflation and to restrain (or reverse) price increases in periods of high wage and price inflation will help to break inflationary expectations and prevent or slow down the development of a wage-price spiral. In terms of the Philips curve (as a relation between the unemployment rate and price inflation), such measures will reduce the effect of past inflation rates on current price inflation and may also, depending on the configuration of the parameters, alter the effect of unemployment on price and wage inflation.

Control of *regulated* prices was one instrument used to directly influence price inflation. A more broad-based instrument, that was used from time to time, was the Social Partners' agreements on wage and price stops. These wage and prices stops were, however, often implemented in the form of wage pauses only (*Pollan,* 1992). In such cases, a period of high price inflation was followed by a period of low wage inflation, as the wage pause took effect. Estimates of the coefficient of past price inflation on wage inflation which does not take into account such policy measures would be biased downwards, as this procedure relates high price inflation in period t-1 with low wage inflation in period t[10].

To the extent that price inflation depends on current wage inflation (say, through service prices), this kind of policy intervention will also impart a downward bias to the coefficient of past inflation in a price inflation equation.

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[9] In the 1990s such policy measures were discontinued, partly because a much smaller part of the items in the consumer price index basket were then under the control of policy makers, partly because agreements between the Social Partners and various government levels proved ineffective (*Pollan,* 1993).

[10] Indeed, a wage equation (with an index of collectively bargained rates as the wage variable) estimated for the years 1954-1968 does yield a negative coefficient (–0,44) for the lagged inflation rate (*Nowotny et al.,* 1972, pp. 129-132).

One may think of two versions of this type of interference in the price-wage setting process (direct control of prices, wage and price moderation and wage and price stops):

In the first version, the size of the inflation adjustment depends on the distance between the actual rate of inflation and the desired rate of inflation.

(7) $\Pi(\tau) = \alpha + \beta*(\Pi^* - \Pi(\tau-1)) + \gamma*1/\cup(\tau) + \delta*\Pi(\tau-1),$

where Π^* is the desired rate of inflation.

For $\beta > 0$, this proportional adjustment rule is equivalent to a reduction of the coefficient of the expectational term:

(8) $\Pi(\tau) = \alpha + \beta*\Pi^* + \gamma*1/\cup(\tau) + (\delta-\beta)*\Pi(\tau-1).$

Thus, a countercyclical price and wage policy, according to which the policy measures implemented are proportional to the deviation of actual inflation from the desired rate, serves to break the force of inflationary expectations. In terms of the expectations-augmented Phillips curve, the coefficient of past inflation is reduced.

In the second version, policy makers respond by reducing the rate of inflation by a certain percentage point when the inflation rate surpasses a certain threshold, and increase the rate of inflation by a certain percentage point otherwise.

The following example illustrates the lump sum version.

(9) If $\Pi(\tau-1) < \varepsilon$

(10) $\Pi(\tau) = \alpha + \beta 1 + \gamma*1/\cup(\tau-1) + \delta*\Pi(\tau-1)$

else

(11) $\Pi(\tau) = \alpha + \beta 2 + \gamma*1/\cup(\tau) + \delta*\Pi(\tau-1)$

The illustration uses the following parameters:

$\varepsilon = 3.0$, $\alpha = -0.8$, $\beta 1 = 1.0$, $\beta 2 = -1.0$, $\gamma = 6.0$, $\delta = 0.9$.

Consider the value of γ, with inflation expectations unchanged.

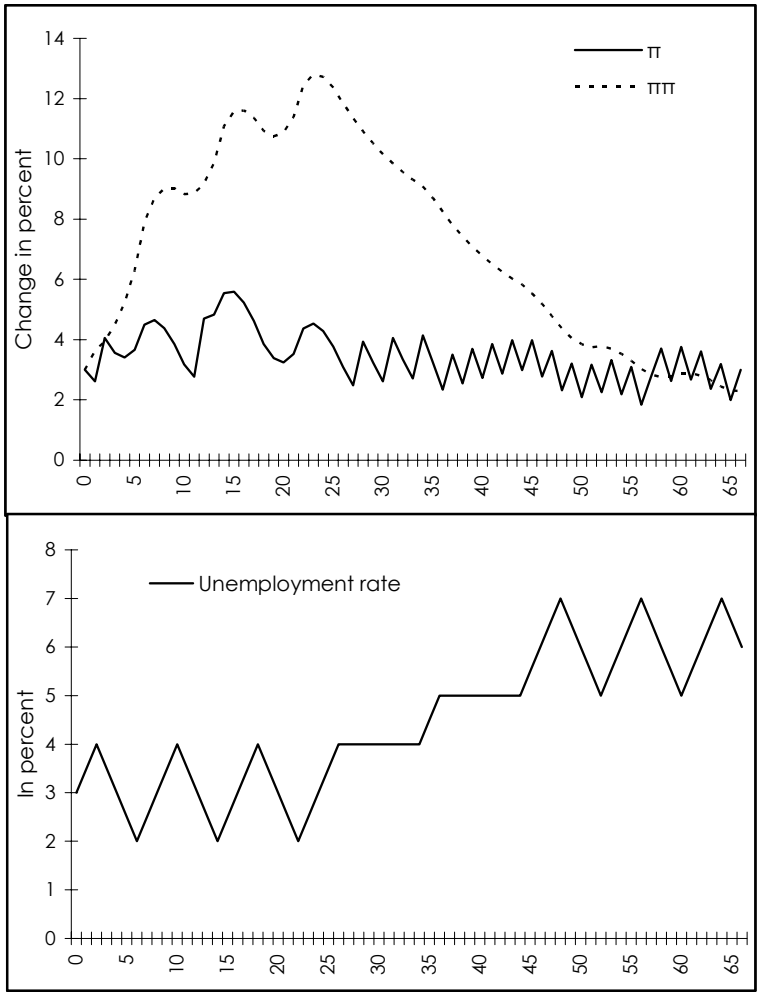
As unemployment rises from 2 percent to 3 percent, inflation slows down by 1 percentage point, while at higher unemployment rates, say at 5 percent, the inflation response is much weaker (0.2 percentage point), with inflation expectations unchanged. Thus, the size of the coefficient γ yields reactions of the inflation rate that bracket the reaction estimates given by *Staiger et al.* (1997, 36).

Consider now equations (9), (10) and (11): When inflation in period $\tau-1$ is below the threshold of 3 percent, policy-makers increase inflation by 1 percentage point ($\beta 1 = 1.0$) by, say, raising prices of goods and services subject to price regulation. But if inflation is above this threshold, policy-makers lower current inflation by 1 percentage point.

The path of unemployment is given in the lower panel of Figure 1. At first, unemployment fluctuates between 2 and 4 percent, then rises to a plateau of 4 and 5 percent, and finally fluctuates between 5 and 7 percent. The starting value of inflation is 3 percent; and so is the starting value of unemployment. δ is set at 0.9, i.e., at a value less than 1; if γ were 1, inflation would either accelerate or decelerate without bounds.

Figure 1:

Development of U, π, and ππ



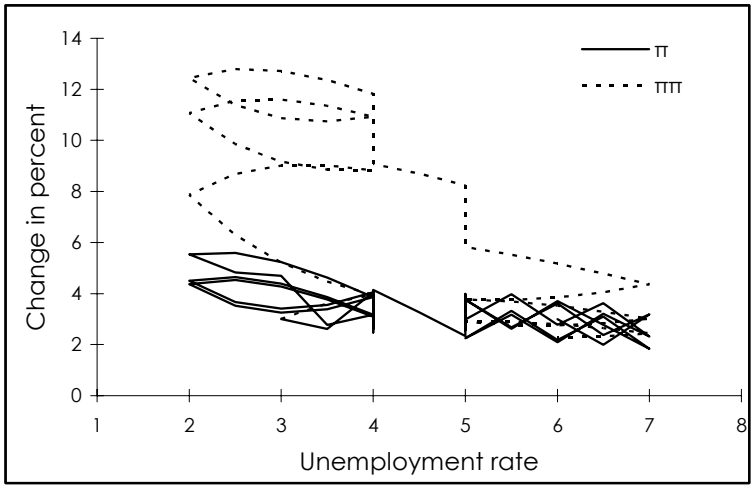
Without policy interference, equation (12) holds:

(12) $\Pi\Pi(\tau) = \alpha + \gamma * 1/U(\tau) + \delta * \Pi(\tau - 1)$

Inflation accelerates very quickly to a point around 12, where the Phillips curve traces out a clockwise circle, as unemployment fluctuates between 2 percent and 4 percent[11]. Then, as unemployment rises und finally fluctuates between 5 and7 percent, inflation stabilises around a value of 2[12].

Figure 2:

PHILLIPS CURVE



By contrast, with discrete policy measures to control inflation, the explosive behaviour is contained at a much lower rate of inflation, as these policy measures in effect break the expectational impact at low rates of inflation, while at higher rates of unemployment policy makers are able to increase prices without setting off an inflationary spiral.

While the regression of $\Pi\Pi$ (i.e., without policy intervention) on unemployment and past inflation returns the estimates as used in the simulation, the Phillips curve with Π (i.e., with policy intervention) as the dependent variable yields an estimate of the expectational term that is much lower than that in the formula used in the simulation. In the case at hand, the coefficient of the lagged inflation rate is close to zero (.07), while the coefficient of the inverse of the unemployment rate is close to the value used in the simulation.

(2) Policies to control the supply of labour

Throughout the sixties to the nineties, policy-makers have controlled the supply of labour, first to restrain wage inflation (by allowing an influx of foreign labour in the sixties and first half of the seventies), then to reduce unemployment by partially reversing the inflow of foreign labour (in the second half of the seventies and in the eighties), by government-sponsored

[11] If U were fixed at 3 percent the inflation rate would converge to 12 percent.

[12] If U were fixed at 6 percent the inflation rate would converge to 2 percent.

labour hoarding in state-owned companies, and by pushing large groups of employees into early retirement from the early eighties onward. As such policy measures were intended to soften the impact of supply or demand shocks on unemployment, Phillips curve estimates that do not take account of these policy measures will therefore be biased, with the bias depending on the reaction of other policy makers, such as the labour unions, to these efforts to keep the unemployment rate low (or in the case of labour immigration to keep the rate of wage inflation low by allowing more foreign workers to enter the country).

(3) Changes in economic policy

If policy makers can be assumed to pursue a certain strategy then a standard device in empirical work is the estimation of a reaction function, a function which identifies the objectives of the policy makers. Examples are the estimation of the targeting rules of monetary authorities[13]. Difficult as it is to identify the objectives of one policy actor, say the central bank, such an approach faces great obstacles when one tries to incorporate the policy measures described above into the estimation of the Phillips curve.

First, there is not just one policy maker but several actors, the federal government and the various Social Partners that need to be considered; this would call for the estimation of several policy reaction function, and perhaps even the interaction of these policy makers. Second, some of the policy measures described above have been implemented in later years in weaker form than in earlier years or discontinued altogether[14]. While it is clear that some of the policy measures have been phased out, it is not so clear when other policy measures have been discontinued or weakened. Direct price controls were gradually discontinued in the eighties[15] and so were policies to change public charges in an anticyclical way. The case is not so clear for wage moderation: there are some indications that wage restraint weakened in the early eighties and that this change contributed to the rise in unemployment as the labour movement found it more and more difficult to hold the individual unions to a policy of wage moderation (*Pollan,* 2005). Another policy interference in the labour market and wage formation involves control over the supply of labour, which is based on several policy measures; here too, it would prove very difficult to pinpoint changes that have occurred at specific dates.

On top of these difficulties, there is the question of how the structure of the economy, of the labour market in particular, has changed over time. Prominent examples of regime changes are the collapse of Austria's state-owned industries, Austria's accession to the EU, and Austria's adoption of the common currency. Hence, Phillips curve estimates are subject to the Lucas critique.

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[13] See, for example, *Surico* (2003) and the literature cited there.

[14] For details see *Pollan* (2005, pp. 18-23).

[15] Austria's entry into the EU in 1995 put an end to Austria's agricultural market regime and the price system governing agricultural products.

6. Concluding remarks

In the sixties, several countries adopted incomes policies to control inflation that was interpreted as the result of a distributional struggle between business and labour unions. Incomes policy was viewed as a tool of stabilisation policy that would avoid the increase in unemployment that would result from tight monetary and fiscal policy designed to curb inflation (*Flanagan et al.,* 1983). Some thirty or forty years later, the effects of incomes policies on inflation seem to have been neglected in recent writings on the natural rate of unemployment and on the conduct of monetary policy, even though a large body of literature deals with the strategic interaction between monetary authorities and the economic agents conducting wage bargaining. It is paradoxical that the literature on the NAIRU, an economic indicator that has been developed explicitly to guide economic policy, ignores past policy interventions.

There seem to be significant differences between the US economy and the economies of Europe. While it may be appropriate to model anti-inflationary policy for the USA as if the central bank were the only policy maker of importance, this approach will not suffice for Europe. There, incomes policies, in various forms, have been implemented again and again as a way of stabilizing the economy[16].

As *Solow* (1986) notes, this criticism can be expanded to encompass any kind of policy measures that affect the labour market and the wage and price setting system. Disregard of these policy measures in the estimation of the natural rate of unemployment will yield biased estimates of this variable and its relation to unemployment, which itself should be regarded as subject to the impact of various policy measures.

These points have been elaborated for the Austrian economy, which has been characterised by a strong degree of policy interference in the wage and price setting system as well as in the labour market directly. Parameter estimates concerning the Philips curve and the natural rate of unemployment are likely to be biased in ways that are difficult to pinpoint, given that the economy has been subject to interference, in varying degrees, by several policy makers. Of course, this creates a dilemma for the builder of macroeconomic models: parameter estimates that are based on a long sample period are likely to be more affected than those based on shorter sample periods, even though the last decade also saw several changes (accession to the EU, introduction of the euro), that might have produced breaks in the structural relationships. Clearly, these caveats apply not only to the estimation of the natural rate of unemployment but to the estimation of structural relationships in the price-wage setting system and the labour/goods market in general, such as price and wage functions as well as relations involving employment, productivity and output.

[16] In Europe, as the literature on the strategic interaction between central banks and major wage bargaining groups argues, even central banks have been an active paticipant in incomes policies. In Germany, for an example, the Bundesbank was instrumental in launching the celebrated productivity guidelines for wage increases (*Flanagan et al.,* 1983, 278).

The difficulties of estimating and interpreting structural relationships when policymakers interfere with the working of the price-wage-employment sector have been illustrated by reference to the Austrian economy, but these points apply equally well to other European economies.

Appendix

Institutional changes affecting the rate of inflation

Tax changes and Austria's accession to the European Union

Before an inflation regression can be run, two points have to be considered. The first point concerns the increase in the value-added tax. At the beginning of 1984 value-added tax rates were raised. In view of the large current account deficit in previous years, this measure was intended to dampen consumer expenditures and to reduce imports. This administrative measure was supported by the Social Partners, the Austrian Trade Union Federation in particular, and thus is unlikely to have produced an acceleration of inflation through higher wage demands. The effect of the rise in the value-added tax on the inflation rate (1.9 percentage points) is therefore eliminated from the inflation rate for the year 1984. A similar argument applies to the year 1978, when a third value-added tax rate was introduced on 'luxury items'; then the effect amounted to 0.4 percentage point.

The second point concerns Austria's entry into the EU in 1995. Membership in the EU had the effect of reducing the inflation rate, first of agricultural, then of industrial products, and finally of services (*Pollan,* 1996). Clearly, these price reductions are the result of institutional changes and should not be attributed to the standard determinants of inflation in Austria, i.e., raw material prices and unemployment.

For several years following Austria's accession to the EU, unemployment happened to rise in Austria. Thus, with no reason to suspect a causal relation between the change in unemployment and the change in inflation during these years, the inverse relation between inflation and unemployment during these years could suggest a closer relationship between unemployment and inflation over the whole period under consideration than is warranted. Therefore, in some of the equations presented below the years 1995 to 1998 are omitted from the sample period. Clearly, if these years are not excluded from the sample and the inflation components resulting from the tax changes are not eliminated from the inflation series, misleading results will be obtained.

How much of the long-term trend should be taken out of the unemployment rate?

In one formulation of the expectations-augmented Phillips curve, the change in the inflation rate is a function of the difference between the natural rate of unemployment and the actual rate of unemployment (equation (3)). This version of the Phillips-curve suggests the

possibility that the natural rate of unemployment, dependent on the structure of the labour (and goods) market, may change over time.

The problem then is to find the 'natural rate of unemployment'. One way of doing this is to identify the time-varying natural rate of unemployment with a long-term trend and allow the unemployment rate to enter the regression equation as the (relative) deviation of the actual rate of unemployment from the long-term rate of unemployment.

The preferred method of extracting a long-term trend has been the Hodrick-Prescott filter (*Hodrick – Prescott,* 1997). Such a trend does not deviate much from a natural rate of unemployment as derived by more complicated (and perhaps more arbitrary) statistical methods (*Ball – Mankiw,* 2002; *Staiger – Stock – Watson,* 2001). But, of course, one need not subscribe to the 'natural unemployment rate' story to suspect that the unemployment-inflation relation has shifted over time and that such a structural shift can be captured by the long-term trend in unemployment.

The HP filter was calculated with a smoothing parameter of 1000. In the traditional approach, simple (absolute or relative) deviations from the HP trend are defined as a new labour market variable. But there is considerable flexibility in the application of this method. Here, the HP trend (*hp*) is entered into the calculation of the deviations, in logarithmic form, in the form of $\log(u/hp^{b)}$, where b can vary between 1 and zero. The value of b can be estimated in the regression analysis. The highest value of the coefficient of the unemployment variable was obtained when b was around 0.75.

Sample period: 1963-1994, 1999-2002:

(A1) $\dot{\Pi}_t = 0.020 + 0.48\dot{\Pi}_{t-1} + 0.028HW_t + 0.031HW_{t-1} + 0.012HW_{t-2} - 0.0128\log(u/hp^{0.75})$

3.4 4.2 2.2 3.0 1.0 –1.4

R2 adj = 0.81; D-W = 2.0

The numbers in italics below the coefficients are *t-values*.

hp = long-term trend in the unemployment rate.

The coefficient of the (adjusted) unemployment variable is now twice as large as before, but still small; the coefficient of the lagged inflation rate is slightly larger, the coefficients of the raw materials prices are slightly lower. The fit of the equation remains unchanged.

The Social Partners' inflation expectations in the Phillips curve

Since the fall of 1963, the Austrian Institute of Economic Research (WIFO) has made forecasts for the Austrian economy. As the Social Partners are involved in the process of arriving at these forecasts, it is likely that these forecasts guide the expectations of those actors in the Austrian economy that have claimed responsibility for making price and wage decisions in a macroeconomic context. Thus, WIFO's inflation forecasts may be better proxies for inflation

expectations on the part of the Social Partners than past inflation rates. In these regressions (equation 12 and 13 in appendix), the coefficient of the variable 'expected inflation' is slightly larger, 0.54. These estimates turn out to be unstable, however. If the sixties and the high-inflation years of the first half of the seventies are omitted (sample period: 1976-1994; 1999-2002), the coefficient of the expected inflation rate rises to 0.75, but the coefficient of the unemployment rate turns *positive*.

A restricted regression equation

To be sure, the coefficient of the lagged inflation variable can be forced to equal 1 by estimating a regression which has the change in the inflation rate as the dependent variable.

(A2) $\Delta\Pi_t = -0.0048 + 0.0011\, U_t + 0.0394\, HW_t + 0.0154\, HW_{t-1}$

$\quad\quad -1.17 \quad\quad 1.11 \quad\quad 3,43 \quad\quad 1.31$

R2adj = 0.242; D-W= 1.98

The variables HW are normalised in such a way that the mean is zero. Note that the coefficient of the unemployment rate is positive (though with a large variance); this would imply, if the NAIRU estimation procedure were followed mechanically, that an unemployment rate above the natural rate causes inflation to accelerate!

Expectations-augmented Phillips curves for Austria

	Sample period	Const.	P_{t-1}	HW_t	HW_{t-1}	HW_{t-2}	U	Functional form of u	R^2 adj $D-W$
(1)	1963-1994	2.1	0.37	4.3	3.7	2.5			0.81
		4.3	2.9	4.4	3.2	1.9			2.0
(2)	1963-1994	2.3	0.36	4.2	3.6	2.5	–0.039	u	0.80
		3.1	2.7	3.7	3.1	1.8	–0.3		2.0
(3)	1963-1994	2.7	0.33	3.8	3.6	2.5	–0.38	$\log u$	0.80
		3.5	2.5	3.2	3.0	1.9	–0.9		2.0
(4)	1963-1994, 1999-2002	3.2		4.47	5.56	4.83		$\log u$	0.67
		15.5		3.4	5.0	4.0			0.83
(5)	1963-1994, 1999-2002	1.4	0.54	4.0	3.5	1.1			0.81
		3.5	4.9	4.2	3.4	0.9			2.0
(6)	1963-1994, 1999-2002	2.6	0.43	3.1	3.3	1.4	–0.65	$\log u$	0.82
		3.3	3.5	3.0	3.3	1.2	–1.7		1.9
(7)	1963-1994, 1999-2002	2.3	0.46	9.5	3.4	1.3	0.14	u	0.81
		3.0	3.8	3.4	3.3	1.1	1.4		1.9
(8)	1963-1994, 1999-2002	2.0	0.48	2.8	3.1	1.2	–1.28	$\log u/hp^{0.75}$	0.81
		3.4	4.2	2.2	3.0	1.0	1.4		2.0
(9)	1963-2002	2.7	0.45	2.9	3.0	1.2	–0.85	$\log u$	0.83
		3.6	4.0	2.9	3.1	1.1	–2.5		1.8
(10)	1963-2002	2.0	0.51	2.4	2.6	0.8	–1.81	$\log u/hp^{0.75}$	0.83
		3.4	4.9	2.0	2.6	0.8	–2.2		1.9
(11)	1963-1994, 1999-2002	2.6	0.43*	3.2	3.6	1.5	–0.6	$\log u$	0.82
		3.1	2.1	3.0	3.1	1.2	–1.4		1.8
(12)	1963-1994, 1999-2002	2.2	0.54	2.8	2.4	1.8	–0.62	$\log u$	0.87
		3.4	5.4	3.2	2.7	2.1	–2.0		1.8
(13)	1976-1994, 1999-2002	–0.0	0.75	3.7	2.8	1.9	0.3	$\log u$	0.86
		–0.0	5.3	3.1	3.1	2.3	0.6		1.5

P . . . consumer price index. W . . . HWWA index of raw material prices, dollar basis. U . . . unemployment rate (according to the traditional Austrian definition: ratio of the number of unemployed to dependent employment plus unemployment). P and HW are in the form of changes in logarithms.

The constant, the coefficients of HW_t, HW_{t-1}, HW_{t-2} and the coefficient of the unemployment variable are multiplied by 100. In equation (11), the coefficient of the expectational term refers to the sum of the coefficients of P_{t-1} and P_{t-2}; *t*-statistics refers to coefficient of P_{t-1}. In equations (12) and (13), the expectational term is the WIFO inflation forecast (made in the fall of the preceding year).

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