Do changes in structural factors explain movements in the equilibrium rate of unemployment?

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Movements in the unemployment rate relative to its equilibrium level are potentially an important indicator of inflationary pressure. The equilibrium unemployment rate is, however, unobservable and can vary over time in response to changes in an economy's structure. In this paper we follow the approach of Layard, Nickell and Jackman (LNJ) to examine the extent to which movements in the equilibrium unemployment rate can be explained by changes in the structure of the UK economy since the early 1960s. In the LNJ model the equilibrium unemployment rate is determined by the interaction of the price and wage-setting behaviour of firms and workers. The price-setting curve is determined by firms' mark-up over their unit labour costs, while the wage-setting curve is determined by the wage bargaining of firms and workers. The natural rate of unemployment is a function of exogenous structural variables such as the replacement ratio and union power that affect the size of firms' and workers' mark-ups. In theory, this framework can be used to determine the contributions of each of these structural variables to movements in the natural rate.

There are well-known problems identifying the price and wage equations separately and, given that we are interested primarily in the model's solution for equilibrium unemployment, we estimate a reduced-form equation in which the natural rate is a function of exogenous structural variables such as the replacement ratio and union density. Dynamic adjustment terms capture the divergence between the actual unemployment rate and the natural rate in an error-correction model. To estimate the model we construct a database for the period 1960–98. Most of the structural variables are unobservable or difficult to measure, so we produce a range of proxy variables to approximate the variables in the theoretical model.

A wide range of specifications for the estimated models were tested. Overall, the empirical results can be summarised with three main findings. First, the coefficient on the unemployment rate was often statistically insignificant, indicating that the unemployment rate was not cointegrated with the structural explanatory variables. Second, in many of the equations tested the long-run coefficients on structural variables were statistically insignificant or did not have the expected sign. Finally, equations in which the long-run coefficients were statistically significant generally included variables with a positive trend over the sample period. One example was the owner-occupied housing rate, which can be used as a proxy for the degree of labour mobility. However, typically, re-estimating the equation with a linear trend rather than the trended variable produced similar results, suggesting that these variables are simply capturing the upward trend in actual unemployment over most of the sample period, rather than capturing a structural link.

The finding of a lack of a robust and significant relationship does not necessarily mean that the natural rate does not exist, or that it is unaffected by structural economic changes. Rather, it highlights the difficulty in identifying the relationship, possibly due to the difficulty in accurately measuring structural changes, and is consistent with the findings of several other recent studies. We suggest that future work aiming to model movements in the natural rate should concentrate on alternative techniques, for example using the Kalman filter.

A monetary model of factor utilisation

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The current workhorse for the study of monetary policy is a sticky-price stochastic general equilibrium model. A central component of this 'New-Keynesian' framework is that monetary shocks have real and protracted effects, which can be achieved by assuming a relatively high degree of nominal rigidity. Alternatively, the introduction of real rigidities may serve to amplify a low degree of nominal rigidity and the non-neutrality of monetary shocks. A related issue is the importance of investment in the transmission mechanism of monetary policy. A problem with sticky-price models which include capital is that output becomes excessively responsive to monetary shocks if capital can be costlessly adjusted. In order to generate realistic dynamics, sticky-price models with capital typically introduce a real rigidity in the form of capital adjustment costs—in essence making these models behave similarly to sticky-price models without capital.

The aim of this paper is to investigate the persistence properties of a sticky-price model in which variations in the intensity at which labour and capital are used in the production of goods and services. To this end we consider a dynamic stochastic general equilibrium model, modified to incorporate factor hoarding in the form of variable capital utilisation rates and labour effort, due to Burnside and Eichenbaum (1996). We build on the existing literature by introducing nominal rigidities in the form of Calvo (1983) price setting. In order to draw out the implications of nominal rigidities in the model, we compare our results to other sticky-price models both with and without capital and capital adjustment costs. We calibrate the model and examine its response to shocks to both technology and the money supply. In addition, we examine the relationship between real marginal cost and output across the model variants, and compare the persistent response of output to an unanticipated monetary policy shock.

Our key results may be summarised as follows. First, contrary to standard sticky-price models both with and without capital, a model of time-varying factor utilisation can generate a significant and relatively persistent response to monetary policy shocks, even at low levels of assumed price rigidity. The impact effect of a shock is enhanced because firms have an additional margin by which they can respond to unanticipated shocks, namely capital utilisation. Although fluctuations in capital utilisation affect depreciation, thereby introducing an additional propagation mechanism in the model, persistence is driven by the assumption of labour hoarding.

Second, stochastic simulations indicate that investment becomes even more sensitive to monetary policy shocks in a model with time-varying factor utilisation compared with standard models, which include capital. The enhanced sensitivity of investment reduces the model's reliance on nominal rigidities. This allows for a reduction in the assumed degree of nominal rigidity without sacrificing the model's response to monetary policy shocks.

The assumption of labour hoarding is therefore crucial for generating persistence, while the assumption of variable capital utilisation allows us to generate realistic investment volatility without having to introduce capital adjustment costs. These are the mechanisms that a model of time-varying factor utilisation exploits to generate real and persistent effects of nominal shocks at relatively low degrees of nominal rigidity.

Finally, the introduction of variable factor utilisation reduces the sensitivity of real marginal cost to changes in output, thereby introducing the possibility of endogenous price stickiness in a staggered price-setting. This is because firms are better able to control their marginal costs by varying the utilisation of their physical inputs in production, and so have less of a need to adjust their prices to restore their mark-up.

Monetary policy and stagflation in the UK

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The volatile data for inflation, output, and interest rates in the United Kingdom prior to the 1990s, and the relative macroeconomic stability associated with inflation targeting, provide a rich basis for discriminating between rival explanations for the outbreak of stagflation. We examine alternative hypotheses with a New Keynesian model of aggregate demand and inflation determination, estimated on quarterly UK data for 1959–2000. Our model features IS and Phillips curves based on optimising behaviour, and fully incorporates the distinction between detrended output and the output gap stressed by optimising analysis. The parameters, dynamics, and definition of natural levels of output and interest rates in this model are all rigorously based on optimising behaviour. This model is suitable for monetary policy and business cycle analysis.

The particular application of the model pursued in this paper is to the 'Great Inflation' of the 1970s in the United Kingdom. We supplement the quantitative analysis with documented statements by UK monetary policy makers. Such an approach has been used previously to inform analysis of the US experience. Using simulations of our model as well as information on the 'real-time' views of policy-makers, we test alternative explanations for the outbreak of inflation in the United Kingdom in the 1960s and 1970s.

Our analysis emphasises other causes of the Great Inflation from those stressed in other studies. The evidence we present here suggests that 'monetary policy neglect'—the failure in the 1960s and 1970s to recognise the primacy of monetary policy in controlling inflation—is important in understanding the Great Inflation in the United Kingdom. Evidence from UK policy-makers' statements as well as our estimated policy reaction function for the 1970s are consistent with inflation control being delegated to devices beside monetary policy.

Our model simulations suggest that the inflation outcomes of the 1970s can be understood as a combination of monetary policy neglect—which implies that policy-makers did not let interest rates respond strongly to the take-off of inflation—and mismeasurement of the degree of excess demand. The latter factor is stressed by Orphanides (2000) for the United States, and implies that policy-makers were slow to recognise the 1970s productivity slowdown, and accordingly used out-of-date and over-optimistic estimates of productive potential when setting policy. For the United Kingdom, this measurement problem was, if anything, larger than in the United States (see Nelson and Nikolov (2001)).

Our results provide support for the ability of monetary policy to deliver stable inflation, even in the face of very large shocks, provided policy follows an inflation-targeting framework.

Equilibrium exchange rates and supply-side performance

Working Paper no. 156

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How do changes in supply-side behaviour and market structure affect equilibrium exchange rates? Much discussion of exchange rate movements in recent years has linked exchange rate appreciations with beneficial supply-side developments, but to date there has been relatively little careful evaluation of the proposition. To address this issue, we propose a two-country dynamic stochastic general equilibrium model of the real exchange rate building upon Obstfeld and Rogoff's 'New directions for stochastic open economy models' paper. Our model allows us to analyse the theoretical implications of steady-state shocks to the degree of monopolistic distortion in both the goods and the labour markets as well as improvements in total factor productivity. We model each of our two economies as having two production sectors, one producing traded goods and the other producing non-traded goods. We also assume that firms producing tradable goods are able to price discriminate between the home and the foreign market for their products. A further assumption that is crucial to our results is that agents are assumed to have a bias for traded goods produced in their own country. These three modelling choices allow us to isolate three commonly used concepts of the real exchange rate, the relative price of non-traded to traded goods, the law of one price for traded goods and the relative price of imports over exports. Our analysis shows that, depending on the source of the shock, deviations of these three definitions of the real exchange rate can move in opposite directions from one another, with the deviation of the consumption-based real exchange rate equal to the sum of the individual deviations.

Given the relative weight of the euro in the ERI, we calibrate our model to match some of the salient characteristics of the United Kingdom and euro-area economies. Conditional on our calibration, we find that increases in competitiveness, in either the goods or the labour market, brought about by a reduction in the degree of monopolistic distortion that pushes the affected sector closer towards a perfectly competitive allocation, results in a real exchange rate depreciation. This result holds for both economy-wide as well as sector-specific shocks. Increases in total factor productivity that shift the economy-wide production possibility curve outwards also result in a real depreciation. This result holds even in the case where the productivity improvement is concentrated in the traded goods sector. In this case, a model that assumes that all domestic producers of traded goods are price takers would predict a real appreciation. In our case, the fact that firms act monopolistically ensures that the domestic price of traded goods falls, resulting in a real depreciation working through the terms of trade, which, conditional on our calibration, outweighs the real appreciation that arises from our non-traded to traded goods price measure of the real exchange rate.

Having established that, for our calibration, the model predicts a real depreciation when supply-side improvements result in immediate increases in output, we examine the model's response to an anticipated future increase in total factor productivity concentrated in the United Kingdom's traded goods sector. Here, the anticipated increase in total factor productivity immediately raises the discounted value of the representative consumer's human wealth, while the productive capacity of the economy stays initially unchanged. Under certain conditions, we show that the transitional dynamics associated with such a shock result in an initial real exchange rate appreciation, followed by a real depreciation in the new equilibrium. Our paper concludes by pointing towards possible extensions to our analysis that might offer interesting avenues for future research.