A MODEL OF UNION BEHAVIOUR AND BENEFITS UNDER UNCERTAINTY
Did Thatcher's benefits policy increase employment and reduce union power?

By

Bruno Chiarini* and Massimo Giannini**

Abstract for press

This paper offers some results on the relationship between unemployment benefits and employment in a stochastic framework. The intention is not to provide an exhaustive analysis of this relationship but, rather, to investigate the effects of uncertain unemployment insurance in a unionised economy. Uncertainty about the system of unemployment benefits may be important for those entering unemployment. There are indeed a number of features of the model of benefit incentive effects that may be discussed, but we have looked at only one aspect of the problem: the effect of compensation uncertainty on employment and union power in a unionised economy. Consider an economy with a monopoly union (a monopoly model). The union with identical individuals-members maximises an objective function taking into account the effects of its wage-setting on the employed union members. In this context, literature shows that an increase in wages reduces employment in the unionised sector, and each worker therefore faces a greater chance of being unemployed whereas the members which remain employed will achieve a higher wage. This model, where membership is endogenous and, therefore, included in the union objective function, produces, in the long run (steady state), a higher employment level: as union membership is conditional upon employment, this implies that the union prefers higher employment. In any case, the exogenous impact of a higher reservation wage (benefit in our case), affects union preferences increasing union wage. Unemployment benefits reduce the cost of becoming unemployed, leading the union to take greater risks over its wage claims. Is this theoretical result robust in a stochastic environment? In a context where there is uncertainty about unemployment benefits, the monopoly union model shows that the union moderates its wage claim and this moderation increases both employment and, in a closed-shop mechanism, membership. This theoretical result has been tested for the U.K. labour market during the 1980s. In particular, we estimate a VAR model for employment, real wage and membership (that is the variable defined by the theoretical model) and carry out dynamic simulations by increasing the volatility of the benefit variable. We find that an increasing volatility (uncertainty) in the benefit variable yields, in the long-run, a higher employment level (a result which is consistent with our theoretical prediction) and a drop in union membership (a result which contrasts with the theoretical prediction). Although the employment result seems coherent with the theoretical model (and the stylised facts), the membership effect moves in a perverse direction, since the closed-shop arrangement used to model the membership dynamics yields higher union power. The model's result is, therefore, conditioned by the degree of closed-shop arrangement. In fact, one of the key determinants of union membership used by literature as an explanation of the fall in union members during the 1980s is the government behaviour which significantly influenced workers' choice to become union member or to renew membership.

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Abstract: **In this paper we emphasise the variability of the unemployment benefit system as a measure of benefit uncertainty and analyse its effects on the labour market. Higher unemployment benefits gives stronger power to the union in collective bargaining over wages. We suppose that a higher uncertainty of the insurance system determined an improvement in the working of the UK labour market and reduced union strength in the 1980s. We investigate these issues with a theoretical stochastic union model of the Kidd-Oswald-Jones' type, randomising the benefit variable and setting up empirically testable predictions of the model for UK data. The model solution turns out to be confirmed by the data generation process (a VAR model) of the variables involved.**

Key words: stochastic dynamic union models, benefit policy, uncertainty.
JEL: J32; J51; J65.

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Introduction

The discussed feature of how unemployment interacts with the government fiscal policy concerns the effect of the benefits conferred to those out of work on the labour supply. In unemployment benefit models, government benefits may impinge on the supply curve of unemployment, determining an indifference condition: wage offered to unemployed in the market place may turn out to be so low that the employed are better off not working. Search theory models show important implications. Unemployment benefits change the cost of search, modifying also the relative costs of on-the-job and full-time search. The higher the unemployment benefits the higher the unemployment level is a solution which has generated considerable debate involving the magnitude of the fall in unemployment that would result, the externality that a higher pressure to accept the first job offered would produce and the inequalities in the distribution of incomes across the labour market population that would generate, say, a cut in the benefits.

When the labour market context concerns itself with the behaviour of trade unions, unemployment benefits may affect unemployment in a further way. In these circumstances, the union optimises a well-defined utility function (the sum of the utilities of its members) by choosing a wage rate for its members, given unemployment benefits for the workers not employed. All of the models of union behaviour predict a positive relationship between benefits and union optimal wage. Thus, also in a non-competitive labour market context, a cut in the benefit level should improve employment. Since it is assumed in these models (monopoly, efficient bargaining, median voter models) that unions do not affect the benefit levels, the latter are always treated by the union as a constant. The comparative static predictions of the union models may be defined by shocking the parameters of the problems such as union strength and benefit. It is straightforward to show that as the benefit level increases, the union wage increases.

In this article we use a dynamic union model of the Kidd-Oswald-Jones' type, randomising the benefit variable. With higher unemployment benefits, employed people may take greater risk with the security of their jobs. This gives stronger power to the union in collective bargaining over wages. Thus a reduction in unemployment benefits raises the cost of search, pressing more people to accept employment at any real wage but there is also an argument that goes directly from the level of benefits to the bargained real wage. In this context we emphasise the variability of the insurance system as a measure of uncertainty and its effects on union behaviour. The hypothesis is that the higher uncertainty of the benefit system has affected the working of the UK labour market in the 1980s. Our secondary purpose concerns the relationship between unemployment insurance uncertainty and union strength and, in particular, whether the benefits uncertainty succeeded in weakening union power. We investigate these issues with a theoretical stochastic union model, setting up empirically testable predictions of the model for UK.

In British case the empirical significance of the effects of benefits is hotly disputed, and the question of whether unemployment benefits are high or not is a complex matter which involves a wide range of aspects. Here, we follow many authors (see, for instance, Blanchflower and Freeman 1993) claiming that the main reason for reforming the unemployment benefit system in UK during the 1980s, was not the high budgetary cost of the benefits but the change in the UK labour market conditions. However, we stress that this policy has determined further effects, raising uncertainty in a unionised labour market. It is worth stressing, however, that our analysis assumes a positive rather than a normative point of view; our end is just to investigate in which way a higher uncertainty in the benefit system, whatever the source, affects a unioninized labour market.

The paper is organised as follows. Section 1 deals with the complexity of the UK benefit system. Section 2 reports a dynamic monopoly union model while section 3 defines a stochastic version of the model, where benefits are assumed to follow a Brownian process. Section 4 shows the empirical evidence for some British aggregates highlighting their behaviour during the 1980s.

Sections 5 and 6 show simulation results obtained with a cointegrated VAR model where a measure of variability of unemployment benefits is included. Some conclusions are drawn at the end of the paper.

1. A complex unemployment benefit system

The prevailing wisdom concerning the relationship between the unemployment benefits (unemployment insurance and unemployment assistance) and unemployed states that higher benefits lead to higher levels of unemployment as well as to a longer duration. A less tight hypothesis is that unemployment benefits may contribute to exacerbate or prolong the unemployment.

In general economic research assumes a link between unemployment benefits and unemployment. The benefit system may affect unemployment through different channels. The search theory provides well suited models which stress this relationship. However, often, empirical evidence does not confirm the qualitative prediction. The statistical significance of the econometric models is often weak and even the expected signs of the relationships are not robust. It is not surprising that in Britain, countless studies on unemployment benefits, both time series and cross-section-longitudinal data, do not yield a clear-cut qualitative prediction. The benefit system is characterised by several types of benefits. Moreover the calculation of the earning-related supplement to national insurance benefit requires some assumptions that may not to be close to reality. Finally, in addition to the national insurance benefits there is also a stream of supplementary and family allowances-child benefits. Since many aspects play a part in the unemployment-benefit relationship, weighting the various influences is a difficult task.

The British unemployment benefit systems are multidimensional and, therefore, difficult to characterise in a single indicator (see OECD 1994). In fact the type of benefits are not quantifiable with certainty at all, both conceptual and measurement problems make it very difficult to define an aggregate measure of the unemployment benefits. As strongly emphasised by Atkinson and Micklewright (1991), empirical works use highly simplified versions of the unemployment benefit system based upon unrealistic assumptions about the duration of benefits, the behaviour of individual workers and firms and the share of unemployed which receive benefits. The study of the relationship with unemployment, requires detailed entitlement conditions and institutional factors to be taken into account. The level of entitlements are correlated to some factors as duration and employment record. Moreover, age and family circumstances may be important. Yet, the degree of generosity of a benefit system may rely upon a system of assistance, in turn determined by several characteristics (earnings, family size, family employees). A measure of benefit entitlements should be attributable at least to duration categories and family circumstances.

In their survey of empirical results, Atkinson and Micklewright (but see also the recent works of Blanchflower and Freeman 1993, Blondal and Pearson 1995, Martin 1996, OECD 1997a, b), emphasise the potential danger of over-simplification and aggregation in representing a complex benefit system by a simple replacement ratio index or the level of benefits. The problem is even worse with cross- and multy-country studies: since the unemployment insurance systems are determined by national institutional characteristics, these results comparing simple measures of benefit generosity might be misleading.

Nevertheless, in this paper we evaluate the effect of unemployment benefits expenditure on wage and unemployment in a bargaining context using an aggregate statistic of the unemployment benefits. Our hypothesis is that the change in the UK benefits system in the 1980s caused an improvement in the workings of the labour market, reducing union bargaining power. We put emphasis on the volatility of the benefits rather than the levels effect, using aggregate statistics and relying on detailed changes of the complex benefits system. Unemployment benefits may influence the cost of becoming unemployed and, therefore, lead unions to take greater or lower risk in bargaining over wages.

Since our model is embedded firmly in a macroeconomic framework, our purpose is not to investigate the particular changes in legislation which have characterised detailed circumstances during the period examined, but to verify whether the alteration of the benefit system and in particular its *variability*, determined by a stream of changes in benefits for unemployed caused a weakening of union power. A detailed description of the change in unemployment benefits is reported in Atkinson and Micklewright (1989) and Blanchflower and Freeman (1993). In the following table 1 we report a catalogue of the main changes described by the cited authors during the period examined.

Table 1: Main changes in unemployment benefits in UK 1979-1988

Abolition of earnings related supplement	Supplementary benefit 1980 reform
Taxation of unemployment benefit: unemployment benefit and supplementary benefit (SB) became taxable	Long-term supplementary benefit rate (SB)
Suspension of statutory indexation	Non-householder fixed housing cost addition (SB)
Changes in the uprating of short-term national insurance benefits.	Voluntary unemployment deductions (SB)
Abolition of child additions.	Board and lodgings (SB)
Abolition of lower rate benefits	School leavers entitlements reduced: more stringent entitlement conditions (SB)
Earning rule	Part-time study (SB)
Equal treatment provisions (NI and SB)	Changes in income support for school-leavers aged under 18: 16 & 17 years olds entitlements removed (SB)
Linked spell rule	Social fund. In 1988 Social fund payments (in most cases loans) replaced supplementary benefit single payments (SB)
Abatement for occupational pensioners	Heating additions (SB)
More stringent administration procedures (NI and SB)	Income support (SB)
Definition of voluntary redundancy	Social security and housing benefits act 1982
Disqualification period increased: the period of benefit disqualification (for quitting or loss a job or refuse offers) has been extended (NI) and (SB)	Minimum payments (HB)
Full extent normal rule	Changes in needs allowances (HB)
Student entitlements removed	Changes in tapers (HB)
Tight contribution conditions	Non-dependent deductions (HB)
Mortgage interest deductions reduced (SB)	Payment of rates and poll tax: claimants had to pay a portion, and subsequently all, of their poll/council tax (HS) and (IS).
Payment of benefits	
Sources: Atkinson and Micklewright 1989; Blanchflower and Freeman 1993.	

During the ten years examined, Atkinson and Micklewright (1989) detect at least 38 relevant changes, which altered significantly the structure of benefits for unemployed and provided a smaller proportion of claimants and a fall in the value of benefits relative to average earnings. Thus, the microeconomic effects of unemployment benefits cannot be ascertained by reference to the amount of money paid to the unemployed in a given period. They are difficult to characterise with a single indicator. However, in this work we are interested in evaluating the effects of the dynamic and variability of the unemployment expenditure on aggregate outcomes. We do not consider uncertainty about the system of unemployment compensation at the individual level; the uncertainty of their entitlement, means-tested benefit and other anxieties as described in Atkinson

and Micklewright and several other studies (see, for instance Jenkins and Millar 1989) are not the object of this analysis neither do we consider the subject in the search theory context**.** We deal with this problem contrasting some model simulations for (theoretically) selected variables from 1979 to 1989. Our problem is to assess the macro-consequences of the plethora of micro-reforms.

2. A dynamic union model

Our interest is in whether the presence of benefits uncertainty causes unions to moderate their wage premium more than they would otherwise. Our starting point is the intertemporal monopoly union model set out by Kidd, Oswald and Jones (see, Kidd and Oswald 1987; Jones 1987). Union has to select a time path for employment n (and, implicitly, the wage rate w):

$$\max_{n} \int_0^{\infty} U e^{-\rho t} dt; U = u(w, m, \theta); \quad w = pf'(n)$$
$$s.t. \dot{m} = n - m; \qquad m(0) = m_0 \tag{1}$$

where n, w and m are, respectively, employment, wage and membership. The former two variables may alternatively represent the control variable whereas m is the state variable; m_0 is the initial membership.

Considering a utilitarian union $U=u(w)n+(m-n)u(\theta)$, where $u(\,.\,)$ is a non-negative and concave increasing utility function with outside opportunities (here, unemployment benefits) θ. The evolution of membership in a *post-entry closed shop* union model, constrains $(m-n)$ to be non-negative. The solution procedure for (1) generates two differential equations:

$$\dot{n} = \frac{1}{d\beta(n)/dn}\left[(1+\rho)\beta(n) - \rho u(\theta)\right]; \quad \beta(n) = \left\{u(w) + u'(w) n p f''(n)\right\} \tag{2}$$

$$\dot{m} = n - m \tag{2.1}$$

and the steady state conditions:

$$\beta(n^*) = [\rho/(1+\rho)]u(\theta); \qquad n^* = m^* \tag{3}$$

Kidd and Oswald show that there is only one path to this steady state equilibrium.

3. A union model with uncertainty in benefits

Often replacement rates cannot be identified with certainty. Predicting the net incomes of the unemployed, considering a host of unclear factors such as family allowance, the tax system, regulations, earning entitlements, complex administrative procedures, etc. may not turn out to be easy even for a union organisation. The picture may be worsened if the benefits system undergoes frequent modifications. If the net incomes of out-of-work people may not be defined, the workers' risk aversion may also be affected.

The lack of understanding of the provision of the benefits system can entail a misperception of the unemployment effects of a certain wage policy, adding uncertainty to the union strategies. Here we are interested in the impact of the reforms on aggregate outcomes of altering unemployment benefits. Our hypothesis is that higher benefits uncertainty, with increasing complexity and variability of the systems, encourages wage moderation.

Stochastic optimal control may provide a useful framework for assessing this argument.[1] This section examines the effect of benefits uncertainty in a dynamic context by treating the benefit variable in the union utility function as a stochastic process.

Consider now, a union that faces the Kidd-Oswald membership function. However, here $\theta(t)$, the benefit variable, evolves according to the stochastic process:

$$d\theta = -\lambda(\theta - \theta_0)dt + \sigma dW; \qquad dW = \varepsilon(t)(dt)^{1/2}$$

where W is a Wiener process, with $\varepsilon(t)$ serially uncorrelated and normally distributed random variable ($E(dW) = 0$; $E[(dW)^2] = dt$) and θ_0.is the deterministic value of the reservation wage. In this model, the unemployment benefits are exogenous, but they are specified by a Brownian motion, that is by a continuous-time scalar stochastic process with instantaneous mean $\lambda(\theta-\theta_0)dt$ and variance $\sigma^2 dt$; in the long run $\theta(t)$ is a *n.i.i.d.* ($\theta_0.,\sigma^2$) random process. Technically speaking, this type of stochastic process is an Ornstein-Ulembeck diffusion process whose main feature is to achieve, in the long run, a stationary random process. The choice of this particular process has been motivated by empirical observations: the analysis of the benefit time series does not show any particular trend of cyclical regularity, whilst behaving as random fluctuations around a well given mean value. The Ornstein-Ulembeck process can successfully approximate such dynamical behaviour.

The dynamic optimization problem may be reformulated as:

$$\underset{n}{Max}\, E_t\left[\int_o^{\infty} e^{-\rho t} U(n,m,\theta)dt\right] \qquad (4)$$

subject to:

$$dm = (n-m)dt$$

$$d\theta = -\lambda(\theta - \theta_0)dt + \sigma dW \qquad (5)$$

$$w = f'(n)$$

In the following we set $U^d = e^{-\rho t}U(n,m,\theta)$ and $\theta_0 = 0$ for simplicity. Notice that now the movement of the state variable is not fully deterministic but it is subject to stochastic disturbance. Moreover, unlike the deterministic Kidd-Oswald control problem, benefits cannot be known in advance by the union**.** The value function of the stochastic optimal control problem is:

$$V(t,m,\theta) = \underset{n}{Max}\; E_t\left[\int_t^{\infty} U^d(n,m,\theta)d\tau\right]$$

where $V(t,m,\theta)$ is the maximised expected discounted utility stream with respect to the employment level $n(t)$; in other words it represents the total mean return, in utility terms, of a given hiring choice. The value function satisfies the following optimality condition:

$$\rho V(t,m,\theta) = \underset{n}{Max}[U(n,m,\theta)dt] + E_t(dV) \qquad (6)$$

which requires equality between the total mean return required by the union over the interval *dt* (left hand side) and the expected total return (right hand side) consisting in the maximum discounted utility flow plus the expected gain or loss *E(dV)*.

Stochastic dynamic programming allows us to show how desired wage and employment change as the level of uncertainty over future benefits grows. The union knows the current value of θ and, therefore, the proportion of employees that join the union, but it does not know the future values of θ. A change in unemployment insurance and the governments' determination to weaken union power (at least in some sectors) tend to create a climate characterised by a higher uncertainty, increasing the prospect of further change in benefits. The union agenda for the future periods is therefore likely to be influenced by these factors. Optimal decisions, under these conditions, may be figured out using the Bellman equation to solve the stochastic version of the Kidd -Oswald model.

In order to solve the stochastic control problem entailed in (4) and (5), the unknown value function must satisfy the following *Hamilton-Jacobi-Bellman* equation, which comes directly from (6) by applying Ito's lemma:

$$0 = \underset{n}{Max}\left[U^d + (n-m)V_m\right] - \lambda\theta V_\theta + \frac{1}{2}\sigma^2 V_{\theta\theta} + V_t$$

By maximising the *HJB* equation we obtain the first order condition:

$$V_m(m,\theta) = -U_n^d$$

which shows the classical condition of equality between the shadow price of the state variable V_m and the discounted marginal utility; stated differently it says that the shadow price of an additional worker joining the union, an additional unit in *m*, must be equal to (minus) the change in the discounted utility flow caused by this additional unit.

By applying Ito's lemma to V_m, recalling that $dt^2=0$, $E(dtdW)=0$, $E(dW)=0$, $E(dW)^2=dt$ and $E(d\theta)^2=\sigma^2 dt$, we have:

$$dV_m = V_{mt}dt + V_{mm}dm + V_{m\theta}d\theta + \frac{1}{2}V_{mmm}(dm)^2 + \frac{1}{2}V_{m\theta\theta}(d\theta)^2$$

Hence:

$$\frac{E(dV_m)}{dt} = V_{mt} + (n-m)V_{mm} - \lambda\theta V_{m\theta} + \frac{1}{2}\sigma^2 V_{m\theta\theta} \qquad (7)$$

Using the *HJB* equation:

$$0 = Max\left[U_m^d + (n-m)V_{mm}\right] - V_m + V_{tm} - \lambda\theta V_{\theta m} + \frac{1}{2}\sigma^2 V_{\theta\theta m} \qquad (8)$$

and by substituting equation (7) in (8) we obtain:

$$0 = Max\left[U_m^d - V_m + \frac{E(dV_m)}{dt}\right] \qquad (9)$$

From the first order condition we can write:

$$\frac{E(dV_m)}{dt} = -\frac{E(dU_n^d)}{dt}$$

which along with equation (9) provides the *Euler equation* for the discounted stochastic problem:

$$\frac{E(dU_n^d)}{dt} = U_m^d + U_n^d \qquad (10)$$

which simply states that the instantaneous expected change in the discounted utility results from a linear combination of marginal utilities. By applying Ito's lemma to U_n^d and ignoring higher order terms with respect to *dt*, we have:

$$dU_n^d = U_{nn}^d dn + \frac{1}{2} U_{nnn}^d (dn)^2 \qquad (11)$$

Generally speaking, along the transition path the optimal control *n* depends on the state variable *m* and benefit variable θ. In the following we refer to such a relationship by writing $n=g^*(m,\theta)$. From here we have: $dn = g_m^* dm + g_\theta^* d\theta + g_{\theta\theta}^* (d\theta)^2 \Rightarrow (dn)^2 = \left(g_\theta^* d\theta\right)^2$, since $(dm)^2=(n-m)^2dt^2$ and $(d\theta)^2$ can be neglected because of the square on the infinitesimal term *dt*. Using this relationship we finally obtain:

$$E(dn)^2 = g_\theta^{*2} E(d\theta)^2 = g_\theta^{*2} \sigma^2 dt \qquad (12)$$

From equation (11) and (12) we obtain:

$$E(dU_n^d) = U_{nn}^d E(dn) + \frac{1}{2} U_{nnn}^d E(dn)^2 = U_{nn}^d E(dn) + \frac{1}{2} U_{nnn}^d g_\theta^{2*} \sigma^2 dt \qquad (13)$$

Applying the *1/dt* operator to both sides of (13) and by substituting it in (10), we have:

$$\frac{E(dn)}{dt} = \frac{U_n^d + U_m^d - 1/2 U_{nnn}^d g_\theta^{*2} \sigma^2}{U_{nn}^d} = \frac{(1+\rho)U_n + U_m - 1/2 U_{nnn}^* g_\theta^{*2} \sigma^2}{U_{nn}} \qquad (14)$$

which is analogous of the deterministic law of motion (2); the only difference we observe between (14) and (2) is the extra-term on the right hand side of the former equation whose sign depends on the third derivative of U. It should be noted that this derivative is positive for conventional well-behaved utility functions. For instance, if we assume $L(w)=w^\alpha/\alpha$, $\alpha<1$, $f(n)=n^\beta$ and $L(\theta)=\theta$, the third derivative of U with respect to employment is:

$$U_{nnn} = \frac{(1-\beta)\beta^\alpha n^{-\alpha(1-\beta)}}{n^2}\left(1-\alpha^2(1-\beta)^2\right) > 0.$$

The extra term is, therefore, $U_{nnn} g_\theta^{*2} > 0$.

By imposing $E(dn)/dt=0$ in equation (14) we can compare the steady state in presence of a stochastic shock on the unemployment benefits with respect to the standard case:

$$\frac{E(dn)}{dt} = 0 \Rightarrow L_w f_{nn} n^* + L(w) = \frac{\rho}{1+\rho} L(\theta) + \frac{1}{1+\rho} U^*_{nnn} g^{*2}_{\theta} \sigma^2$$

In terms of equation (3) notation, we have the following steady state:

$$\beta(n^*) = \frac{\rho}{1+\rho} u(\theta) + \frac{1}{1+\rho} U^*_{nnn} g^{*2}_{\theta} \sigma^2 \qquad (15)$$

Equation (15) says that, for the case $U'_{nnn} > 0$, the effect of introducing unemployment benefit uncertainty shifts the curve *(1/dt)Edn=0* upward, providing a higher employment level with respect to the deterministic case. The union's target employment (or wage) is related to σ in a way dependent on $U'_{nnn} > 0$. Above we have shown that this condition is met when the underlying functions are *well behaved*. Thus, the benefit uncertainty, measured by the coefficient σ^2, will lead the monopoly union to claim moderate wages, increasing the steady state employment.

The following pictures show, respectively, the phase diagram in the deterministic and stochastic case (Figure 1) and the dynamics of the stochastic process *n(t)* along the optimal path in the neighbouring of the steady state and its expected value (Figure 2). As the figures show, the introduction of uncertainty in benefits makes the optimal employment higher than the deterministic case, inducing random fluctuations of *n(t)* around the deterministic steady state $n^*(t)$, stylised by the cloudy area in the phase diagram.

HERE FIGURES 1-2

Although the model forecasts employment improvements particularly well, the solution depicted in Figure 1 leaves the question of how to explain the underlying increase in membership (and union power) open. This is due to the post-entry closed-shop model of endogenous membership. We have included membership in the trade union objective function as a variable in addition to wages and employment. This dynamic model assumes that this period's employment exactly determines the next period's membership. This dynamic formulation, however, may well have different degrees of importance in different periods. It is therefore, useful to delineate the outlines of a model that encompasses exogenous factors, which are able to shift the 45° closed-shop line in Figure 1 upwards.This, for instance, may occur if a hostile attitude (a restrictive legislation) to trade unionism undermines the closed-shop arrangements. Within our framework (equations 14 and 15) it is apparent that this modification does not affect the results.

4. Empirical evidence for UK

The Thatcher government is widely thought to represent a structural break in welfare state policy. We examine here the welfare expenditures over the period 1960-89. What we are showing in Figures 3 and 4, albeit imperfectly, is the benefit expenditure on unemployment as a percentage of total social insurance benefit expenditure per unemployed. We stressed in the previous section the difficulties in interpreting the statistical evidence of a complex and dynamic benefits system. The introduction of categories of benefit and provisions have changed frequently and significantly over time during the period examined. From this it is clear that it may be misleading even to regard the

figures as a continuous series. This is particularly true also for the proportion of the unemployed receiving benefit and other entitlements of the benefit structure. However, keeping these things in mind and considering that often these series show the same pattern with slight changes in levels, we can attempt to provide some helpful explanations. The figures show that the gradual upward trend in unemployed benefits expenditure became quite marked after 1978, when Mrs Thatcher took office. Thus, the change has in part occurred due to the concerns of the previous governments. The policy was, however, distinctive in that following the objective of reducing inflation, the government reduced employment, allowing unemployment to grow at an alarming rate and, therefore, increased the entitlements to benefits. The OECD (1994) figures (not reported here) show that the number of assistance and insurance beneficiaries in the United Kingdom, doubled in 1980 and the proportion of beneficiaries of a guaranteed income of all unemployment beneficiaries also reports a remarkable increase after 1979.

The relevant series is for aggregate unemployment (Figure 6). Other studies have pointed out that the huge build-up of the unemployed during the 1980s came about at least partially through an increase in the duration of unemployment and an increase of the number of women in the labour force. Unemployment has risen without a break since 1979 to a level without precedent in the UK (Buiter and Miller 1983). While inflation has fallen from an average rate of about 14 percent in 1979 to an average of about 4 percent in 1984, unemployment increased rapidly to more than 12 percent of the labour force and the number of unemployed rose from 1.2 million in 1979 to more than 3.2 million in 1984. The main objective of the government's macroeconomic policy were to control inflation and to encourage growth and it is explicitly stated that of these twin objectives of high growth and lower inflation the government put the inflation target first whilst the maintenance of high employment could not be ensured by the government: "Governments can create the conditions in which it can be achieved, but whether it is achieved depends on the responses of management and labour" (Treasury and Civil Service Committee on Monetary Policy, June 1980).

As Figures 3-5 show, the last part of the period examined has seen many changes in both insurance and income-tested benefits for unemployed workers. The major unfavourable measures for the unemployed cover the period 1985-89 (see Atkinson 1989). Measures and regulations were made under the supplementary and National Insurance benefits to remove entitlement or restrict benefits. From 1984, a series of cuts in housing benefits have more than offset some change in the opposite direction, contributing to reduce the unemployment benefit expenditure.

In the empirical analysis, we use the benefit aggregate variable per unemployed reported in Figure 5. The movement over time in the real value of the aggregate variable shows, for the period considered, that the unemployment benefits have declined markedly, in particular in the later years, when both, the unemployed people and the nominal value of the benefit expenditure was reduced.

Our hypothesis, however, is that the way benefits are administrated is relevant for the labour market; in particular, the uncertainty engendered by the government's benefit policy may play a key role. To this end we approximate the uncertainty variable from the theoretical model with a measure of the benefit volatility.

HERE FIGURES 3-10

Figure 7 shows the volatility of the unemployment benefits which we use to model uncertainty in the empirical model. This measure represents the distance between the log value of real benefit per unemployed and its smoothed component derived using the Structural Time Series Analysis method (see Harvey, 1989); the dashed line refers to the shock profile for dynamical simulations (higher volatility). Differently from the traditional ARIMA methodology, the fundamental components of a time series are treated as stochastic rather than deterministic processes, providing better predictions and smoothing as well. In particular we have used the local level *random walk* plus *noise* model, namely:

$$y_t = \mu_t + \varepsilon_t \qquad \varepsilon_t : NID(0, \sigma_\varepsilon^2)$$
$$\mu_t = \mu_{t-1} + \eta_t \qquad \eta_t : NID(0, \sigma_\eta^2)$$

where μ_t is the level component of the observed time series y_t. Instead of assuming an invariant level coefficient, the approach used here, models it by means of a random walk process.

Using Kalman's filter algorithm to estimate the above model in the space states form, provides a smoothed version of y_t very close to the original one; fluctuations of the original series around the smoothed component must be considered in the same way of exogenous randomly perturbed *news* striking y_t. This leads us to use such fluctuations as a measure of uncertainty about future benefits.

5. An econometric evaluation

Macroeconomic time series studies have produced varying results. Mainly, they focus on whether a reduction in the level of unemployment benefits, exert some downward pressure on unemployment rates. Much attention has been paid to this possibility during the high unemployment period of the 1970s and 1980s. The macro evidence has been provided by means regressions of national average unemployment rates upon benefit levels and other labour market variables. Since the work of Gujarati (1972), most macro-investigations have found a significant positive effect of benefits levels or replacement ratios on the unemployment rate for different spans of years. However, these macro-tests have generated a considerable discussion about the robustness of the estimates (especially regarding the set of the models' explanatory variables) and the magnitude of the effect. Atkinson (1981), Atkinson et al. (1984), Andrew and Nickell (1982), Minford (1983; 1985) and Layard and Nickell (1985), among others, have disputed the *ad hoc* nature of the equation estimated, the appropriateness of the proxies for unemployment benefits used in the models and the elasticity found for this relationship. This has provided a highly contentious conclusion, in part because of the problem of measuring the variable benefits accurately, in part because of the econometric methodology and strategy used to test the effects of the benefit system on the behaviour of unemployed workers.

-*Variables*

In this paper we use a multivariate statistical model with the purpose of investigating some issues of the impact of unemployment benefits on unemployment in order to assess if uncertainty, proxied by a measure of variability of benefits, has characterised the labour market during the Thatcher government. To this end, we use a multivariate cointegration model. Data are annual over the period 1960-1989. The system is in three stochastic variables, $x' = [(w-p), n, m]$, respectively, real wage, employment and union membership. The VAR is augmented by the benefit variable θ and a measure of variability of unemployment benefits $\tilde{\theta}$, which are included in the cointegration space, as exogenous variables, and a shift dummy variable *D*. Moreover, a trend variable *T*, is restricted to lie in the cointegration space *Sp(β)*. The model is conditioned on a variable for the working days lost in labour disputes Λ. This variable is presumed to be weakly exogenous and to have only short-run effects. All the variables are logs of non-stationary time series with the exception of the benefits variability measure. It is worth noting that we distinguish between the theoretical model and the statistical model although the theoretical meaning is derived by the selection of the variables involved and the imposition of theory induced restrictions.[2] We emphasise that the results of a further model specification, where the benefit variable is an endogenous variable, highlight that benefits do not Granger cause the three dimensional wage-

employment-membership system whereas, of course, the converse is not true. This leads us, at this stage, to use the benefit variable as exogenous.

-Data and sources

We use as wage variable, earnings per employee in the British manufacturing industry. The price variable used to deflate earnings is the consumption prices index and the labour variable is employment in industry (all these variables are source OECD). The benefits variable used in the model is the unemployment benefit expenditure in real terms and per unemployed person. The original source of the single variables is ILO while the data set employed is the *Comparative Welfare States Data Set*. The data set provides also the working day lost variable (original source, ILO) and the net union membership (source: Visser 1996). The model has been formulated and estimated using a modelling sequence developed by Johansen (1988; 1995) and Johansen and Juselius (1988).[3]

-Cointegration analysis

We conduct our analysis using a VAR with 2 lags on all stochastic variables. The estimation is carried out over the period 1961-1989 using OLS, recursive least squares (model with I(1) variables and cointegration analysis) and ML estimators (parsimonious VAR model and "structural" model). Diagnostic tests (both, uniequational and multivariate tests for parameter constancy, normality, autocorrelation and homoskedasticity) show good descriptive power of the systems and models (the full set of tests is provided upon request).

Testing for cointegration suggests that there is evidence of two cointegrating vectors. Identification restrictions were attempted on the unrestricted cointegrating vectors. In particular we test a number of structures, theoretically motivated on,

$$\{(w-p), n, m, \theta, \tilde{\theta}, T\} \in Sp(\beta)$$

to end up with the following description of the cointegrating space (three restrictions were imposed on the first stationary relation and two on the second cointegrating vector):

$$\beta_1: \quad m - 0.509n - 0.5097(w-p) - 0.01368T + 0.055D$$

$$\beta_2: \quad -0.924m + n - 0.384(w-p) + 0.0313T - 1.94\tilde{\theta} + 0.384\theta$$

where β indicates a cointegration vector. The LR test for these hypotheses, distributed as a $\chi^2(1)$ under the null gives a value of 2.5995 [0.1069].

As stressed by Lutkepohl (1994), the coefficients of the cointegrating space must not be interpreted as elasticity. Nevertheless, some interpretation of the relationships may be attempted. We find that restricting the closed-shop hypothesis in all of the cointegrating vectors is rejected by the data. Moreover, the long-run equilibria require a negative relationship between real wage and employment. The hypothesis that real wage positively cointegrates with the level of unemployment benefits cannot be rejected by the data, as well as the assumption that there exists a positive relationship between employment and benefit uncertainty.

In the restricted system VAR estimator of Johansen, emphasis is not placed on tests of individual coefficients, but on the implications that restrictions on individual coefficients have for the system as a whole. The impulse responses may give a better picture of the relationships between the variables. The responses of the endogenous variable of the cointegrated VAR system to a standard error shock in employment and are plotted in figures A1 and A2 in the Appendix (the

innovation covariance matrix shows no relevant correlations between the residuals of the variables). All the differenced variables die away quite rapidly due to the stability of the system. The system provides empirical evidence for the theoretical model predictions, showing an inverse relationship between real wages and employment and a positive relationship between employment and membership. Figure A3 and A4 shows the accumulated effects of the innovation in the variables over *n* periods. These quantities may be considered as *n-th* interim multipliers. The one-time impulse is seen to have lasting effects on employment, membership and wages, as consequence of the unit root in the system the impulse response function does not return to zero, although the accumulated results remain consistent with the model theoretical predictions.

6. Simulation results

The impact and the "long-run" effects of a benefit policy change on employment and union power has been investigated raising the volatility of the benefits variable by ±2% during 1980-85 (see the dashed line in figure 7). Figures 8, 9 and 10 show this outcome. The most prominent feature of the early simulation period is the increase in unemployment level and a successive deterioration. In fact, a striking feature of the figures is the dynamic effect of the shock. According to the theoretical model, increasing unemployment benefit uncertainty would undoubtedly reduce unemployment. The figure portrays a persistent increase in the employment level while trade unions would gradually adjust wage demands downwards. The chief concern is the dramatic reaction of workers joining the union. The membership drops slightly in the first periods and then increases, following the employment dynamics for five years; subsequently, while employment achieves a new long-run level and real wage reduces, membership falls abruptly (figure 9).

Since utilitarian union is concerned about the utilities of current and future members, the union dynamic model assumes a direct relationship between membership and employment. The model predicts that the union prefers to moderate its wage in order to raise employment and membership in the steady state. In such a context, the simulation does seem to provide support for the theoretical model but the decline in union membership (in absolute and relative terms) remain unexplained. It is straightforward to show that the theoretical prediction is more consistent with our simulations if the closed-shop rule is removed or made less restrictive. One of the most important and questioned measures over the period considered is in fact the striking reduction of the closed shop arrangements: in the decade examined, these arrangements dropped from about 30% to 4-5%, becoming illegal practice.

The key determinants of union membership used by literature as explanations of the fall in union members during the 1980s are the business cycle and the employer policies and government action. In the early 1980s, union membership (and density) fell sharply. Often unemployment is viewed as the major determinant in this reduction. However, many authors have emphasised that employer attitude and government behaviour significantly influenced workers' choice to become union member or to renew their membership. More specifically, Towers (1989), Freeman and Pelletier (1990), Booth (1995) and many others, stress the role of industrial relation legislation, claiming that legal climate became more unfavourable to unions. In particular, 1980-88 Thatcher legislation shift of the legal balance against unions, raising hostile political pressure, was the major cause of the membership downturn. The key labour market outcomes change post 1979, characterising an increased market flexibility and reduced union power. The government brought in several rounds of restrictive legislation against trade unions. The 1980 Act restricted the right to picket and outlawed most actions in support of workers in dispute. The 1982 legislation made political strikes, "blacking" and other forms of actions illegal, weakened the union closed-shop arrangements and removed some union immunities. The employment Act of 1984 strengthened

employer power to get injunctions while the 1988 legislation removed further union immunities and extended individual rights to work against unions. These issues along with the other goals of the Thatcher labour market reforms such as the increase of the work incentives and self-employment, and the reduction of the government role in the markets, have had a role in determining the size of membership.[4]

Conclusions

The purpose of this paper is to examine aggregate labour market outcomes of the bulk of the unemployment benefits changes and reforms implemented in the 1980s in the UK. In particular, whether the impact of the benefits uncertainty entails positive effects on employment and adverse effects on the membership size. To evaluate the variability of the unemployment benefit reforms on aggregate labour market outcomes we employ a dynamic monopoly union model, randomising the benefit variable. Union solves an intertemporal maximisation problem in which unemployment benefits follow a stochastic (Ornstein-Ulembeck) diffusion process. The main finding of this model's solution is that benefits uncertainty provides a higher steady state employment level with respect to that achieved by the deterministic model solution, reducing the monopoly union distortionary effects. Although this result seems coherent with the stylised fact, the membership effect moves in a perverse direction, since the closed-shop arrangement used to model the membership dynamics, yields a higher union power. This result is, therefore, conditioned by the degree of closed-shop arrangement.

The aggregate evidence on the examined relationship has been investigated estimating and simulating a vector error correction model. From the econometric point of view, the cointegration analysis suggests that there are two stationary relationships between wage, employment, membership, benefits level and a measure of benefit uncertainty. From the economic point of view, the main result is that higher benefits uncertainty produces higher long-run employment level whereas membership drops. The model's simulation provides further interesting insights in the transmission mechanisms of the uncertainty shock, showing a complex dynamic path for employment and membership variables.

A novelty of our theoretical model is the identification of benefits uncertainty as a further effect that the Thatcher government might have caused during the 1980s, increasing employment and weakening the union membership. A result which is confirmed by the data generation process (the VAR model) of the variables.

References

-Andrews M.J. and Nickell S.J. (1982), Unemployment in the United Kingdom since the War, *Review of Economic Studies*, 49,

-Atkinson A.B. (1981), Unemployment benefits and incentives, in J. Creedy (ed), *The Economics of Unemployment in Britain*, London: Butterworths.

-Atkinson A.B., Gomulka J., Mickelewright J. and Rau N. (1984), Unemployment benefits, duration and incentives in Britain: how robust is the evidence?, *Journal of Public Economics*, 23.

--Atkinson A.B. and Micklewright I. (1989), Turning the screw: benefits for the unemployed, 1979-1988, in Atkinson A.B. (ed), *Poverty and Social Security*, London Harvester Whetsheaf.

-Atkinson A.B. and Micklewright I. (1991), Unemployment compensation and labour market transition: a critical review, *Journal of Economic Literature*, N.4, 1679-1727.

-Blanchflower D. and Freeman E.B. (1993), Did the Thatcher reforms change British labour performance?, *NBER Working Paper* No. 4384.

-Blondal S. and Pearson M. (1995), Unemployment and other non-employment benefits, *Oxford Review of Economic Policy*, 11, 136-169.

-Booth A.L. (1995), *The Economics of the Trade Union*, Cambridge University Press: Cambridge.

-Brown W. and Wadhwani S. (1990), The economic effects of industrial relations legislation since 1979, *National Institute Economic Review*, n. 131, pp. 57-70.

-Buiter W. H. and Miller M..H. (1983), Changing the rules: economic consequences of the Thatcher regime, *Brookings Papers on economic Activity*, 2, 305-365.

-Carruth A. and Disney R. (1988), Where have two million trade union members gone?, *Economica*, pp. 1-19.

-Chow G.C. (1979), Optimum control of stochastic differential equation systems, *Journal of Economic Dynamics and Control*, 1, pp. 143-75.

-Dixit A.K. and Pindyck R.S. (1994), *Investment under Uncertainty*, Princeton University Press: Princeton.

-Freeman R. and Pelletier J. (1990), The impact of industrial relations legislation on British union density, *British Journal of Industrial Relations*, 28, pp. 141-64.

-Harvey A.C. (1989), *Forecasting, Structural Time Series Models and the Kalman Filter*, Cambridge University Press: Cambridge.

-Jenkins S. P. and Millar J. (1989), Income risk and income maintenance: implication for incentives to work, in *The Economic of Social Security*, (eds. A. Dilnot and I. Walker), Oxford: Oxford University Press.

-Johansen S. (1988), *Statistical analysis of cointegration vectors, Journal of Economics Dynamics and Control*, 12, 231-54.

-Johansen S. (1995), *Likelihood-Based Inference in Cointegrated Vector Autoregressive Models*, Oxford: Oxford University Press.

-Jones S.R.G. (1987), Union membership and employment dynamics, *Economics Letters*, 25, pp.197-200.

-Kidd D.P. and Oswald A.J. (1987), A dyanmic model of trade union behaviour, *Economica*, 54, pp. 355-65.

-ILO (International Labour Office) (1997), *World Labour Report 1997-98. Industrial Relations, Democracy and Social Stability*, Geneva.

-Layard R.G.D. and Nickell S.J. (1985), The causes of British unemployment, *National Institute Economic Review*, 111, 62-85.

-Lutkepohl H. (1994), Interpretation of cointegrating relations, *Econometric Review*, 13, 391-394.

-Malliaris A.J. and Brock W.A. (1982), *Stochastic Methods in Economics and Finance*, North-Holland: Amsterdam.

-Martin J.P. (1996), Measure of replacement rates for the purpose of international comparisons: a note, *OECD Economic Studies*, ….

-Mason B. and Bain P. (1993), The determinant of trade union membership in Britain: a survey of the literature, *Industrial and Labor Relations Review*, 46, 332-51.

-Metcalf D. (1989), Water notes dry up: the impact of the Donovan reform proposals and Thatcherism at work on labour productivity in British manufacturing industry, *British Journal of Industrial Relations*, 27, 1-31.

-Metcalf D. (1990), Union presence and labour productivity in British manufacturing industry: a reply to Nolan and Marginson, *British Journal of Industrial Relations*, 28, 249-66.

-Minford P. (1983), Labour market equilibrium in an open economy, *Oxford Economic Papers*, 35, (November supplement), 207-44.

-Minford P. (1985), *Unemployment: Cause and Cure* (2nd edn). Oxford: Basil Blackwell.

-Mishel L. (1986), The structural determinants of union bargaining power, *Industrial and Labor Relations Review*, 40, pp. 90-104.

-OECD (1994), *The OECD Job Study*, Paris: OECD.

-OECD (1997a), *The OECD Job Strategy. Member Countries' Experience*, Paris: OECD.

-OECD (1997b), *The OECD Jobs Strategy. Making Work Pay*. Paris:OECD.

-Pencavel J. (1997), Regulating collective bargaining in developing countries: lessons from three developed countries, Working Paper n. 025, Stanford University.

-Spanos A. (1989), On re-reading Haavelmo: a retrospective view of economic modelling, Econometric Theory, 5, 405-29.

-Stewart M.B. (1990), Union wage differentials, product market influences, and the division of rents, *Economic Journal*, 100, pp.1122-37.

-Towers B. (1989), Running the gauntlet: British trade unions under Thatcher, 1979-1988, *Industrial and Labor Relations Review*, 42, 163-88.

-Visser J. (1996), Unionisation trends. The OECD countries union membership file, Amsterdam: University of Amsterdam, Centre for Research of European Societies and Labour Relations.

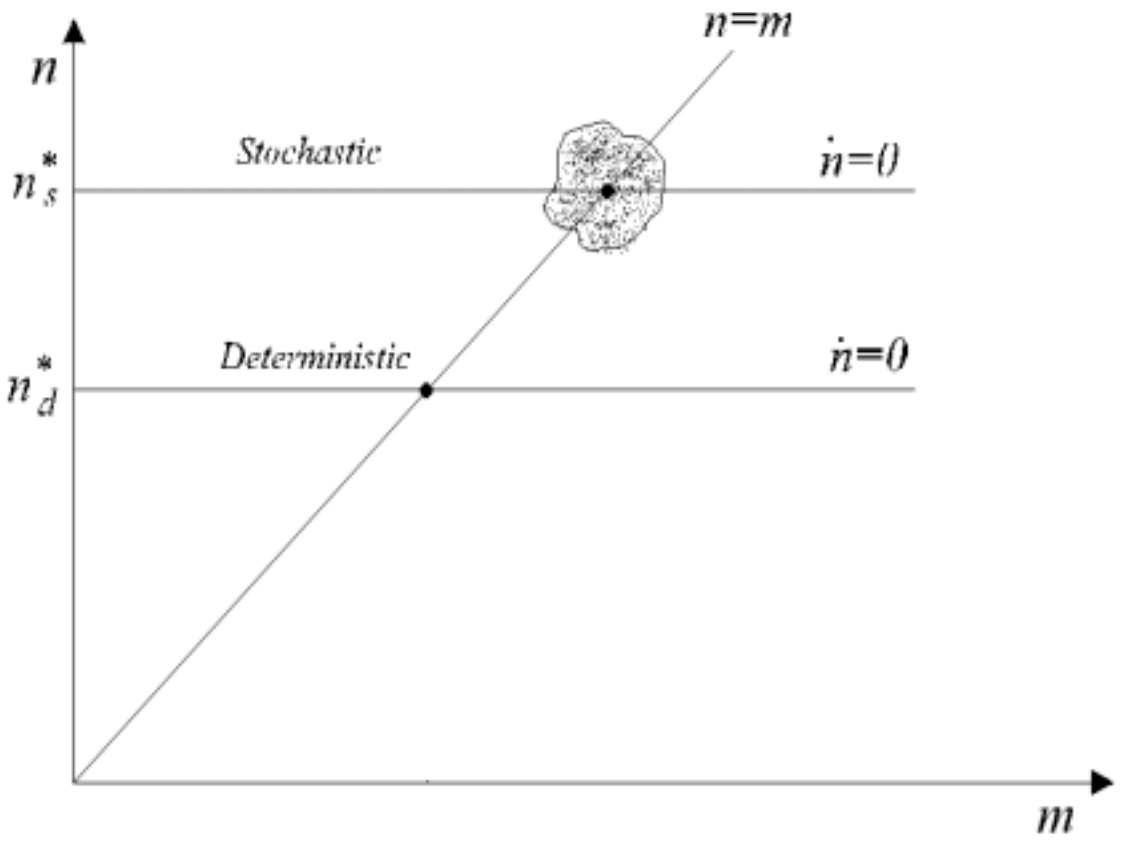


Figure 1: Phase Diagram in the Stochastic and Deterministic Case

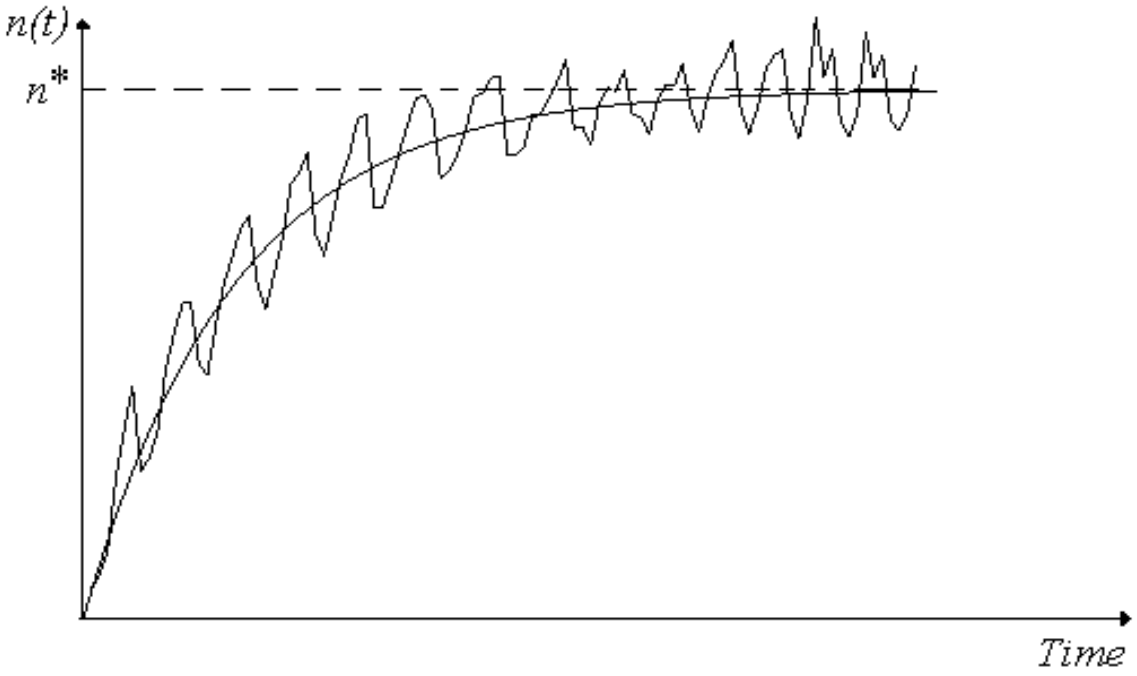


Figure 2: Stochastic and Deterministic Employment Optimal Path

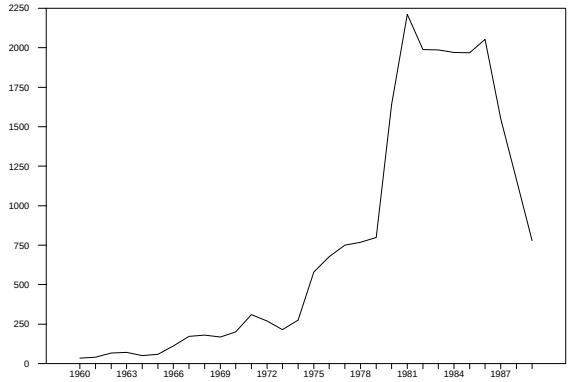


Figure 3: Benefit Expenditure on Unemployment (£ million, cash terms) (Source: ILO)

Figure 4 : Benefit Expenditure on Unemployment (Real Terms)

Figure 5: Real Benefit Expenditure per Unemployed

Figure 6: Unemployment (Source: OECD)

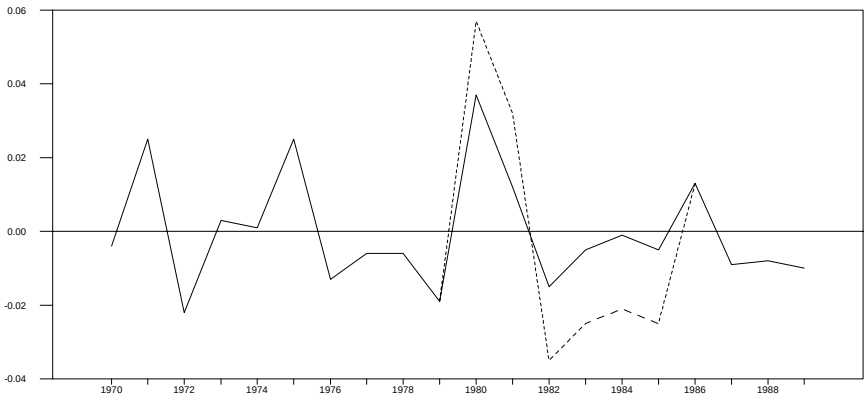


Figure 7: Filtred Volatility on log-Benru (ex-post shock in dash)

Figure 8: Employment Response

Figure 9:Membership Response

Figure 10: Wage Response

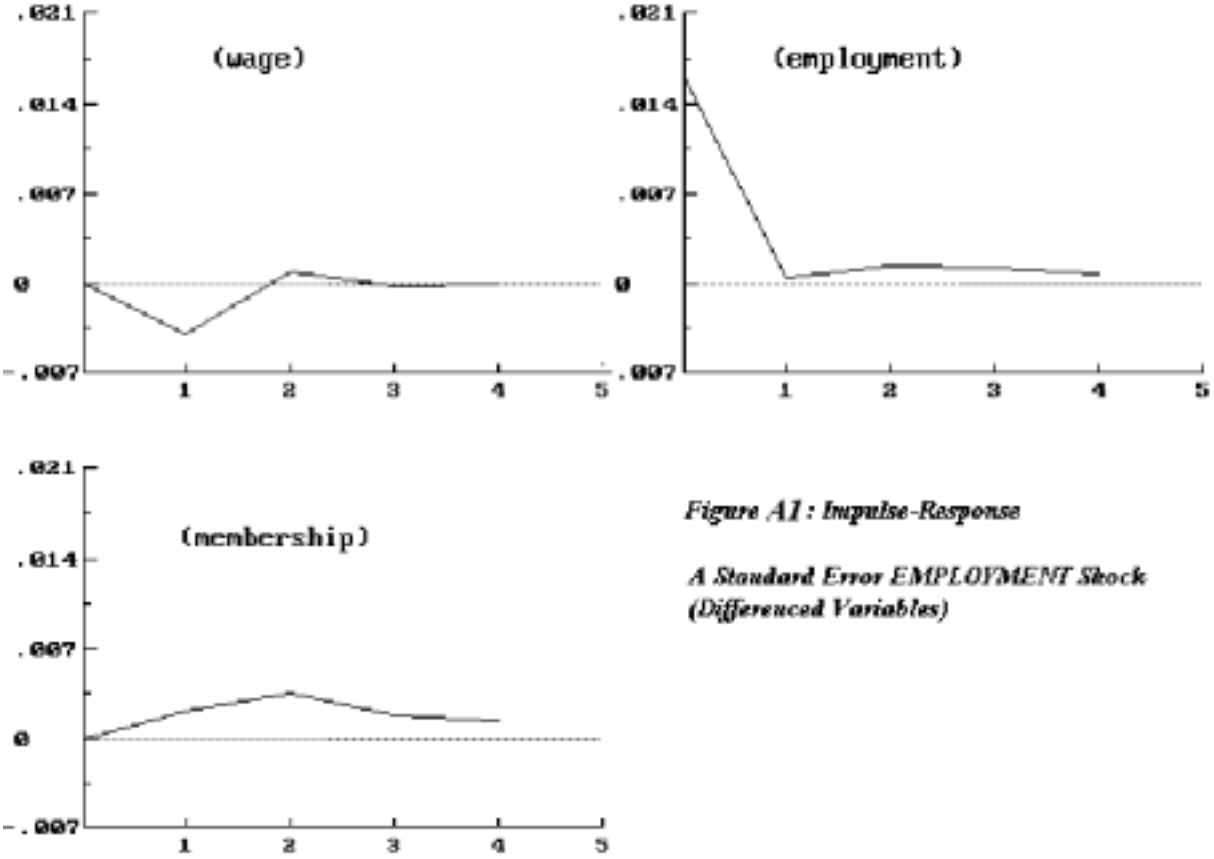


Figure A1 : Impulse-Response

A Standard Error EMPLOYMENT Shock
(Differenced Variables)

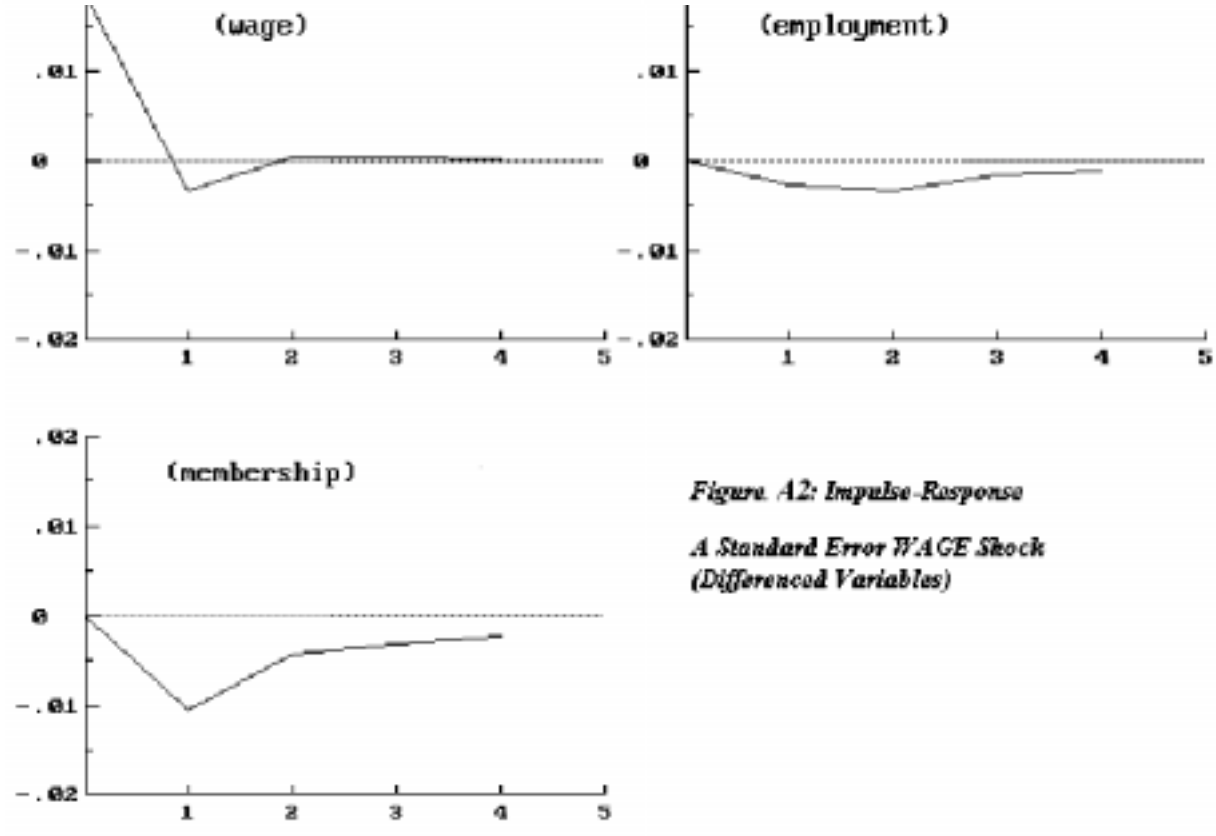
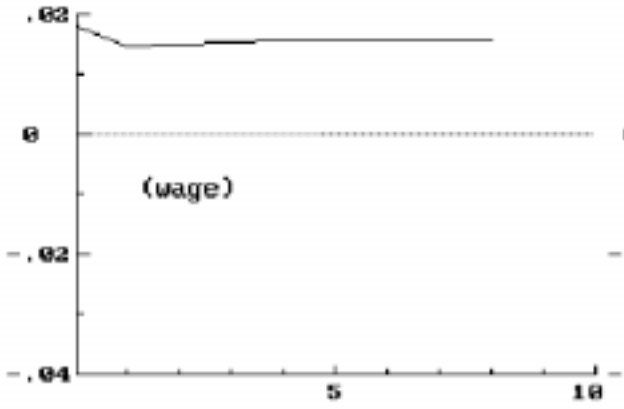
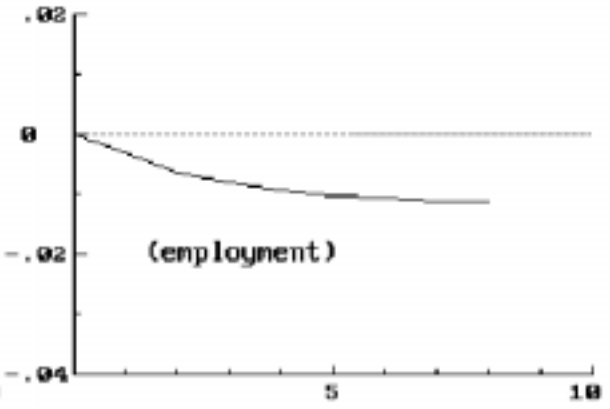


Figure A2: Impulse-Response

A Standard Error WAGE Shock
(Differenced Variables)





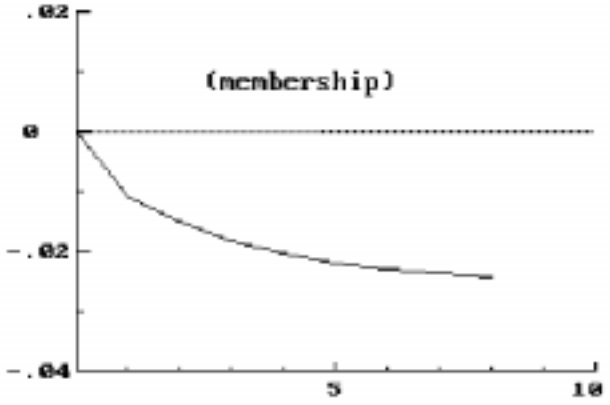
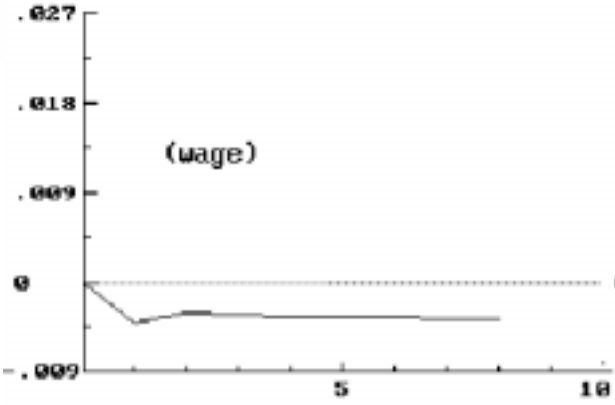
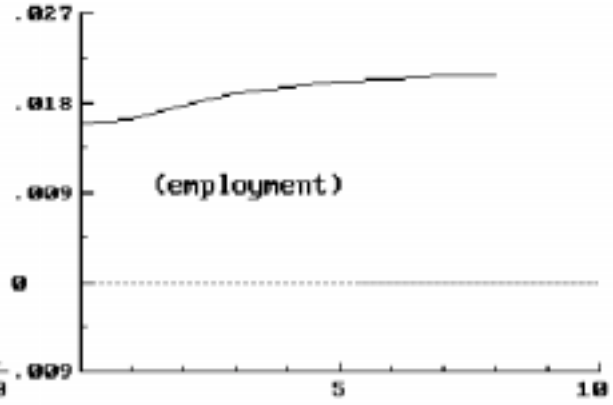


Figure A3 : Impulse-Response

Accumulated Responses to an Standard Error in WAGE





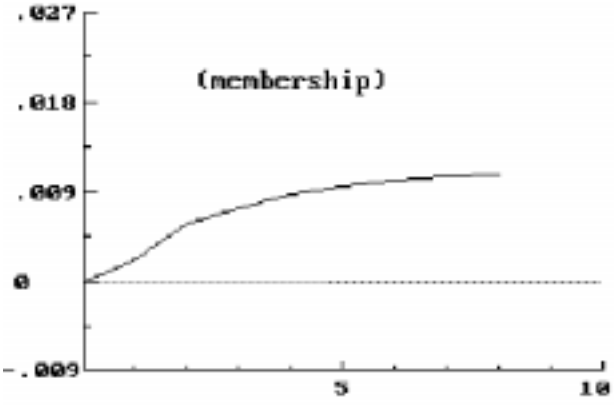


Figure A4 : Impulse-Response

Accumulated Responses to an Standard Error in EMPLOYMENT

Notes

[1]See, among others, Malliaris and Brock (1982), Chow (1979), Dixit and Pindyck (1994).

[2] An extensive discussion of the relationship between the statistical model and the theoretical model and the inadequate attention paid to the question of *statistical adequacy* is in Spanos (1989).

[3] First, the unrestricted VAR is estimated by OLS and the number of cointegrating regression and common stochastic trends is established. Then, the system is re-estimated, imposing the cointegrating vector restrictions. The restrictions on the loadings of the cointegrating vectors can be tested by the likelihood ratio test.

[4] Freeman and Pelletier (1990), have shown that changes in UK labour law in the 1980s reduced union density by 1-1.7% per year. A series of Acts passed by the Conservative government has hampered union activity, shifting the legal balance against unions. See, among others, Mason and Bain (1993), Blanchflower and Freeman (1993), Carruth and Disney (1988), Brown and Wadhwani (1990).