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ABSTRACT

Using annual data we estimate an econometric model of the interwar labour market in Britain. The model determines aggregate employment, unemployment, the working population and wage rates. The latter are determined via an augmented Phillips Curve, in which the 'natural' rate of unemployment is hypothesised to be influenced, inter alia, by the real level of unemployment benefit. Various counterfactual simulations are conducted to explore the effects of social security policy, monetary policy and the state of the world economy on domestic labour market developments. We find that much, though not all, of the rise in interwar unemployment was an equilibrium phenomenon.

JEL classification: 044, 212, 824

Keywords. Labour market, UK econometric model.

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NON-TECHNICAL SUMMARY

In recent years two major controversies have arisen regarding the behaviour of the British economy during the interwar period. The first controversy has arisen from arguments that unemployment increased during this period in large part because people became "work-shy", as unemployment benefits rose in real terms or relative to wages. According to this view the increase in unemployment arose from a deficiency of supply rather than a deficiency of aggregate demand as was commonly supposed.

A second controversy has been sparked by the claim that excessive growth in real wages created unemployment during the interwar period. Mrs Thatcher and Mr Lawson have advanced a similar argument, claiming that real wage growth has created unemployment in the 1980s.

We suggest that both of these controversies are related, as Keynes himself was well aware. If the social security system encouraged people to join the dole queues, the supply of labour was reduced. This in turn put upward pressure on real wages which in turn reduced the level of employment that firms found profitable. As firms cut back on employment output fell.

We explore these issues empirically and we find evidence for both propositions. Not only did real wages affect unemployment in interwar Britain, but real wages behaved as they did in part because unemployment benefit became more generous. In these respects our findings are quite similar to those that we have reported elsewhere for postwar Britain.

Our results also indicate that the level of aggregate demand had an independent influence on the behaviour of employment: employment suffered from the collapse of world trade in the early 1930s. We find that in addition the equilibrium level of

unemployment was influenced not only by employment benefit arrangements, but also by frictional factors. "Discouraged worker" effects also influenced the behaviour of labour supply during the interwar period.

It is often argued that the disparity between the high unemployment in the 1930s and the low unemployment in the late 1940s is a reflection of the success of the Keynesian revolution. We conclude our study by showing that the underlying level of unemployment in the late 1930s was in fact not so greatly different to the actual level of unemployment ten years later.

I. Introduction

Previous Research

In a previous paper, Beenstock and Warburton (1986), we presented econometric evidence to support the hypothesis that in interwar Britain the demand for labour varied inversely with own product real wages while the supply varied directly with disposable real wages expressed in terms of consumer prices. Those results suggested that a large part of the increase in unemployment during 1930-1932 was attributed to real wage growth while the abatement of unemployment during 1933-36 reflected real wage moderation.

The missing link in our earlier account is the behaviour of wages which we did not seek to explain. If wage behaviour had such a major influence upon interwar unemployment why did wages behave as they did? In this paper we extend our previous work by filling in this gap in the story. In doing so we report an econometric model of the interwar labour market which is complete in the sense that it solves jointly for employment, unemployment, the working population and wages.

In addressing the question of wage determination with the context of a complete model of the labour market we are forced to consider the determinants of the equilibrium or 'natural' rate of unemployment in interwar Britain. This is the rate of unemployment at which the demand for labour equals the supply and therefore all the unemployment is voluntary. It was Benjamin and Kochin (1979) who recently suggested that much of interwar unemployment can be understood in

terms of increases in unemployment benefits. However, this hypothesis was mooted much earlier by a distinguished antecedent.

> 'The existence of the dole undoubtedly diminishes the pressure on the individual man to accept a rate of wages or a kind of employment which is not just what he wants or what he is used to.
>
> In the old days the pressure on the unemployed was to get back somehow or other into employment and, if that was so today, surely it would have more effect on the prevailing rate of wages than it has today, so that the power of industry to absorb would be much greater than we have experienced.
>
> I cannot help feeling that we must partly attribute to the dole, the extraordinary fact - at present it is an extraordinary fact - that in spite of the fall in prices, the fall in the cost of living, and the heavy unemployment, wages have practically not fallen since 1924.'
>
> J.M. Keynes
>
> The Collected Writings, Vol. XX, pp 318-9

Keynes clearly ennunciates the transmission mechanism through which unemployment benefit affects unemployment. Higher benefits reduce pressure on wages to fall so that simultaneously the equilibrium rate of unemployment rises,

real wages rise and employment falls. In Beenstock, Dalziel, Lewington and Warburton (1986), we have found that a model of the type described by Keynes appears to apply in postwar Britain. One of the objectives in this paper is to report broadly similar results for the interwar period. However, we do not believe that the issue can be decided simply by regressing unemployment rates on GDP and replacement ratios (defined as the ratio of net income from employment to unemployment benefit) as Benjamin, Kochin and their numerous critics have done. In contrast, our approach is structural rather than reduced-form and exposes the transmission mechanism which Keynes indicates.

Lay-out

As stated, our main objective is to estimate a complete model of the interwar labour market in the process of which we corroborate the analysis suggested by Keynes. The paper is divided into five sections. In the remainder of this section we provide a brief description of social security arrangements as they applied during the interwar period. This is important because in contrast to the postwar period the system was evolving in the aftermath of the pioneering National Insurance Act of 1911. In section II we describe our main theoretical premises and discuss various issues in econometric methodology that apply to the dynamic estimation of the kind of model we propose. In section III we report the estimation of the model itself which consists of the main behavioural equations and identities and which is estimated by non-linear three

stage least squares (NL3SLS). In section IV we report a variety of simulations of the model that we have estimated. We begin by carrying out a full dynamic simulation of the model which tests the tracking performance of the model as a whole over the period 1923-1938. We find that it tracks all the endogenous variables quite impressively. Secondly, we carry out a number of counter-factual simulations to explore what might have happened to the interwar labour market had certain events not occurred. Section V concludes the paper.

Milestones in Unemployment Insurance Policy

Unemployment insurance was first introduced in Britain under the National Insurance Act of 1911. This provided covenanted benefit for workers in engineering, construction and shipbuilding only. This choice reflected the intention of the Act to cover seasonal unemployment risks to which these sectors were particularly prone. 2¼ million men were covered and they could draw up to 15 weeks benefit in any 12 month period. During World War I coverage was extended to munitions workers in 1916.

When the war ended unemployed ex-servicemen and civilian workers received a non-contributory out-of-work donation. The universality of this dole payment meant that in future unemployment benefit could not be limited to a small proportion

of workers. Accordingly the Unemployment Insurance Act of 1920 raised the coverage to about 11 million workers excluding domestic servants, civil servants, agricultural labourers and workers earning more than £250 per year. Initially benefits were limited to 15 weeks per 12 month period but in 1921 this was extended to two 16 week periods. Excluded workers had recourse to the Poor Laws as did insured workers who had utilized all their benefits. Thus it was not until 1921 that the basic arrangements for unemployment benefit that prevailed during the interwar years were established. Scale rates were lower for women than for men and reflected the number of dependents of the claimants.

By 1924 the required gap between spells of unemployment had been abolished so that permanent benefits were paid to the insured unemployed. Acting on the recommendation of the Blanesburgh Committee the Unemployment Insurance Act of 1927 abandoned actuarial principles so that benefits were de facto uncovenanted and applicants' sole requirement was that they were 'genuinely seeking work'. In 1930 the burden of proof of the work test was switched to the administrators of the benefit system and transitional benefits were extended considerably. The effects tended to raise registered unemployment from 1930.

The National Government initially curtailed benefits but reforms followed the Gregory Report as embodied in the Unemployment Act of 1934. As far as we are concerned,

the main feature of this Act was the establishment of the Unemployment Assistance Board which took over the last vestiges of the Poor Law reliefs available to the uninsured unemployed. However, it was not until 1937 that this change was actually implemented.

Thus throughout the period there were two benefit systems running in parallel, the insured system and the Poor Law system. While we have been able to obtain scale rates for the insured benefits (table 1) we have been unable to obtain comparable scale rates for Poor Law relief. This means that we cannot calculate an average scale rate. However, the data in table 1 suggest that most probably the Poor Law scales were kept in line with the insured scales since the average level of benefit received under the two systems were broadly comparable. As Gilbert (1970) points out, the reasons for this were obvious enough.

Table 1 : Unemployment Benefits

Insured Benefits

	Weighted scale rates *1 (sh./wk.)	Average benefit paid *2 (sh./wk.)	Average benefit paid to all recipients *3 (sh./wk.)
1921	18.317	14.24	-
22	17.48	15.42	18.93
23	17.48	13.57	15.10
24	18.859	17.78	17.92
25	21.17	17.12	17.63
26	21.17	17.76	17.69
27	21.17	16.02	18.07
28	21.082	16.09	18.34
29	20.96	17.30	17,07
1930	21.89	16.41	18.35
31	21.599	16.85	19.08
32	20.006	17.02	17.96
33	20.006	18.04	17.75

Table 1/contd...

(Table 1 Continued)

1934	21.039	19.97	19.72
35	22.278	20.33	21.00
36	22.902	21.83	21.02
37	22.902	24.80	21.41
38	23.00	22.10	22.22

Notes:

1. Scale benefit rates are weighted according to the family circumstances of unemployment beneficiaries. The weights, which can be found in Hatton (1979) are as follows: 0.75 adult men; 0.15 adult women; 0.05 men aged 18-20; 0.02 women aged 18-20; 0.02 boys; 0.01 girls; .49 adult dependents and .78 child dependents.

2. The average benefit paid to recipients of unemployment insurance (including transitional payments) in Great Britain. The amounts refer to financial years beginning in April of the year concerned. The data source is Burns (1941).

3. The average benefit paid to recipients of unemployment insurance and Poor Law relief on account of unemployment in Great Britain. Burns' (1941) estimates of the numbers of claimants receiving both benefits have been used to eliminate double counting in the denominator. The data refer to financial years beginning in July for 1922 to 1926 and in April from 1927 onwards.

As the actuarial principles upon which the insured benefits were supposed to be financed increasingly fell into disuse and as transitional benefits which were uncovenanted became more widespread it became increasingly difficult to justify lower Poor Law scale rates. Secondly, it would have been politically inexpedient had Poor Law rates exceeded the 'covenanted' scale rates: there would have been pressure to claim under the Poor Law instead. Indeed, the Unemployment Assistance Board sought to keep the two sets of rates in line with each other. Accordingly, in section III we represent the level of unemployment benefit by the insured scale rate and we take account of the fact that

since 1930 the burden of proof of the work test was switched from claimants to officials.

II. Theory

Demand for Labour

In Beenstock and Warburton (1986) we investigated empirically a number of alternative specifications of labour demand both for manufacturing employment and employment as a whole. Here we focus on the latter rather than the former. We discussed 'Keynesian', neoclassical and imperfectly competitive labour demand schedules. Space prevents an elaboration of these issues here, and in any case the interested reader may refer to our previous efforts.

The main implication of our previous analysis was that the demand for labour may be hypothesised to vary inversely with the own product real wage (the ratio of wage rates to output prices) and a vector of other variables (Z_1), i.e.

$$L^D = F_1(W/P_0, Z_1) \qquad (1)$$

where

L^D = demand for labour

W = money wage rate

P_0 = index of output prices

The signs of partial derivatives are indicated, where appropriate, over the variables to which they refer. In our previous paper we suggested that if Z_1 includes

the level of effective demand equation (1) has a 'Keynesian' interpretation based upon cost-minimising behaviour by firms. If instead Z_1 includes the capital stock and other factor prices it has a neoclassical interpretation based upon profit-maximising behaviour. If in addition Z_1 includes variables such as the volume of world trade which influence the position of the aggregate demand schedule for goods and services, then equation (1) is consistent with the behaviour of profit-maximising firms engaged in imperfect competition rather than the strict neoclassical assumption of perfect competition.

Thus equation (1) allows for a broad class of hypotheses depending upon the exclusion restrictions applied to Z_1. In section III we base these restriction upon our earlier findings.

Supply of Labour

The working population is defined as the employed plus the unemployed, i.e.

$$L^S = L + U \qquad (2)$$

where

L^S = working population

L = employment

U = unemployment

In our previous paper we suggested that the working population

depended upon a participation decision which in turn was influenced by disposable real wages (net wages relative to consumer prices) and a vector of other variables Z_2, i.e.

$$\frac{L^S}{POP} = F_2(\overset{+}{W/P_c}, Z_2) \qquad (3)$$

where

POP = population of working age

P_c = consumer price index

If e.g. Z_2 includes a term in the rate of unemployment we argued that this was consistent with the 'discouraged worker' hypothesis according to which registration rates fall as higher unemployment discourages people from entering the labour market because they think job prospects are lower. In our earlier work we reported evidence in favour of equations (1) and (3).

Wages and Equilibrium Unemployment

The rate of unemployment is defined as

$$u = U/L^S$$

In equilibrium we do not expect that u = 0. Typically the demand for labour equals the supply of labour at a positive rate of unemployment which implies that some of the working population will be voluntarily unemployed (or unemployable). We denote the equilibrium rate of unemployment by u^* in which case voluntary unemployment may be defined as

$$U^* = u^* L^S$$

We adopt the Phillips Curve hypothesis (reflected in the quotation from Keynes) according to which for given expectations

of inflation (Π) and the underlying rate of equilibrium real wage growth (g), money wage growth accelerates when the actual rate of unemployment falls below the equilibrium rate of unemployment, i.e.

$$\Delta \ln W = F_3(u^* - u, \Pi) + g \qquad (4)$$

Provided there is no money illusion and expectations of inflation equal actual inflation ($\Pi = \Delta \ln P$) equation (4) states that in equilibrium (i.e. when $u = u^*$) real wages grow at their equilibrium rate (i.e. $\Delta \ln W - \Pi = g$). However, if unemployment exceeds its equilibrium rate expected real wages will decelerate and vice-versa. In the steady state we assume that $\Delta \ln P_0 = \Delta \ln P_c = \Delta \ln P = \Pi$.

The equilibrium rate of unemployment is hypothesised to depend on unemployment benefits (B) either in terms of the replacement ratio (B/W) as suggested by Benjamin and Kochin or in terms of the absolute level of benefit in real terms (B/P_c) as suggested by Minford (1985). Here we focus on the latter approach since, as we report in the next section, it appears to be more empirically relevant to interwar Britain. Our hypothesis concerning the equilibrium rate of unemployment may therefore be written as

$$u^* = F_4(B/P_c, Z_3) \qquad (5)$$

where Z_3 is a vector of variables that influences the equilibrium rate of unemployment independently of the real level of benefit. For instance Z_3 may include the replacement ratio, or some index of union power. Or, as Layard and Nickell (1985) suggest, it might vary directly with the frictional and 'mismatch' unemployment that is usually associated with structural change in the economy.

In his quotation, Keynes was suggesting that an increase in B in equation (5) raised u^* which via equation (4) put upward pressure on real wages which via equation (1) reduced the demand for labour.

Market Behaviour

Equations (1) to (5) describe a complete model of the labour market. To indicate how such a market might operate we assume the following simplified specification in continuous time:-

$$\ln L^D = -\alpha_1 \ln w + \alpha_2 \ln Z_1 \qquad (6)$$

$$\ln L^S = \beta_1 \ln w + \beta_2 \ln Z_2 + \ln POP \qquad (7)$$

$$\frac{d\ln w}{dt} = \gamma(u^* - u) + g \qquad (8)$$

where

$$w = W/P_c$$

$$P_c = P_0$$

$$\Pi = \Delta \ln P_c$$

Equation (8) can be written in the form of an 'error correction mechanism' if we assume that in the short run employment is demand determined, i.e. $L = L^D$. Substituting for u in equation (8) in terms of equations (6) and (7) implies (when $g = 0$)

$$\ln w_t = Ae^{-\lambda t} + (u^* - \ln POP - \beta_2 \ln Z_2 + \alpha_2 \ln Z_1)/(\alpha_1 + \beta_1) \qquad (9)$$

as the general solution for real wages, where

$$\lambda = \gamma(\beta_1 + \alpha_1) > 0$$

and A is an arbitrary constant. Equation (9) states that

real wages tend to converge on their equilibrium solution which in turn varies directly with the equilibrium rate of unemployment and Z_1, and inversely with population size and Z_2. The speed of adjustment varies directly with the elasticity of the Philips Curve, γ. As γ tends to infinity, so the system converges upon an equilibrium model of the labour market, i.e. in which the demand for labour always equals the supply of labour and unemployment is always voluntary. To calculate the demand for labour and the working population it is necessary to substitute equation (9) into equations (6) and (7) respectively. Further clarification of the workings of the model are postponed until section IV where we present empirical rather than analytical illustrations of its properties.

Econometric Considerations

Equation (4) cannot be estimated because u^* is not observable. For similar reasons we cannot estimate equation (5). However, if equation (5) is substituted into equation (4) and we estimate the resulting equation we may make inferences about the determinants of equilibrium unemployment. For example, suppose equation (5) is of the form

$$u^* = \delta_1 \ln B/P_c + \delta_2 \ln Z_3 \qquad (10)$$

it may be substituted into equation (8) so that

$$\frac{d\ln w}{dt} = \gamma\delta_1 \ln B/P_c + \gamma\delta_2 \ln Z_3 - \gamma u + g \qquad (11)$$

By estimating equation (11) we may obtain indirect estimates of δ_1 and δ_2 from the direct estimates of $\gamma\delta_1$, $\gamma\delta_2$ and γ. In this way our methodology identifies equation (10) even though u^* is not observable.

It should also be noted that although equation (11) does not incorporate any terms in the level of real wages this does not imply that the level of real wages is arbitrarily determined. This would be so if only equation (11) were estimated. However since u depends on the level of real wages via the other equations in the model and since we jointly estimate these equations it must be the case that the wage level is determined as equation (9) indeed confirms. In section III we therefore estimate equation (11) jointly with the other equations in the model.

III. Model Equations

The estimated equations are detailed in Table 2. Apart from the method of estimation (NL3SLS) and the introduction of the dummy variable BDUM into the labour supply equation, both demand (proxied by actual total employment) and supply equations are carried over from Beenstock and Warburton (1986). The systems method of estimation becomes appropriate because a Phillips-type wage adjustment equation has been added to the model presented in the earlier paper. The idea of the dummy variable for labour supply in the 1930s is not new; Irish and Winter (1981) included it after finding conflicting parameter estimates for the two halves of the interwar period. However, we were persuaded of its relevance, not by evidence of structural instability in our own labour supply equation, but by the significance attached to the shift in the burden of proof of benefit entitlement as noted above. In the event, its inclusion lowers the real wage elasticity and weakens its significance, whilst lowering the equation standard

Table 2 : Estimated Relationships of the Model by Three Stage Least Squares for the Years 1923-1938

Behavioural Equations

Labour Demand

$$\ln EM_t = \underset{(1.9)}{2.001} + \underset{(4.2)}{0.693}\ \ln K_t - \underset{(7.5)}{0.168}\ \ln(W/P_Q)_t + \underset{(4.1)}{0.209}\ln(MON3/P_Q)_t + \underset{(4.3)}{0.106}\ \ln WT_t$$

S.E. = 0.64%, DW = 2.20, BP (3) = 4.44, W(1) = 1.6, JB(2) = 0.36

Labour Supply

$$R_t = \underset{(1.2)}{-0.7} + \underset{(7.9)}{0.674}\ R_{t-2} + \underset{(7.7)}{3.483}\Delta\ln L^S_{t-1} + \underset{(1.5)}{0.185}\ \ln\left(\frac{W^*\Pi}{P_c}\right)_t - \underset{(2.5)}{0.256}\ (U_{t-1}/L^S_{t-2}) + \underset{(3.3)}{0.0397}\ BDUM$$

S.E. = 0.87%, BP(1) = 4.87, W(1) = 1.77, JB(2) = 0.05

Wage Adjustment

$$(\Delta\ln W_t - X_t) = \underset{(1.9)}{0.014} - \underset{(1.3)}{0.214}\ (\Delta\ln W_{t-1} - X_{t-1}) + \underset{(5.2)}{0.712}\ \Pi_{Qt-1} - \underset{(6.4)}{0.399}\ \Pi_{Qt-2} - \underset{(4.5)}{0.558}\ (U_t/L^S_t) + \underset{(2.4)}{0.072}\ [1/3 \sum_{i=1}^{3} \ln(B/P_Q)_{t-i}] + \underset{(3.3)}{0.463}\ \sum_{j=0}^{2} SC_{t-j} + \underset{(2.1)}{0.0151}\ BDUM$$

S.E. = 0.55%, BP(2) = 4.87, W(1) = 0.05, JB(2) = 0.06

Table 2/...2

Instrument List (12)

$$\ln K_t,\ \ln(MON3/P_Q)_t,\ \ln WT_t,\ R_{t-2},\ \Delta\ln L^S_{t-1},\ (U_{t-1}/L^S_{t-2}),$$

$$\ln P_{ct},\ \ BDUM\ ,\ D_t,\ X_{t-1},\ \Pi_{Qt-1},\ [1/3\sum_{i=1}^{3}\ln(B/P_Q)_{t-i}]$$

Identities

$$U_t = L^S_t - EM_t$$

$$R_t = \ln[(L^S_t/POP_t)/(1-(L^S_t/POP_t))]$$

$$\Pi_{Qt} = \Delta\ln P_{Qt}$$

Variable Definitions (full descriptions and sources given in apendix)

EM : Total Employment

K : Gross Capital Stock

W : Money Wage Index

P_Q : Wholesale Price Index

MON3 : Money Stock (M3)

PQ : GDP Deflator

WT : World Trade Index

R : Logit transformation of the Participation Rate

L^S : Labour supply

TT : Index of (1 - National Insurance contribution rate)

P_c : Consumer Price Index

U : Unemployment level

BDUM : Dummy Variable representing the shift in the burden of proof from claimants to officials in 1930.

Table 2/...3

X : Centred 5-year moving average of labour productivity growth.

Π_Q : Inflation of GDP deflator

B : Weighted scale benefit rate for the insured unemployed (see column 1 of Table 1)

SC : Structural Change Index

Test Statistics

SE : Estimated Standard Error

DW : Durbin-Watson Statistic

BP(x): Box-Pierce (1970) portmanteau autocorrelation test with x degrees of freedom

W(1) : White (1980) test for residual heteroscedasticity using the composite right-hand side variable.

JB(2): Jarque-Bera (1982) residual normality test.

Critical values for the BP, W and JB tests at the 5% significance level are 3.84, 5.99 and 7.81 for Chi-squared with 1, 2 and 3 degrees of freedom, respectively.

error appreciably.

The estimation of a wage adjustment equation is therefore the innovative feature of the model. In a recent survey of empirical work on interwar Britain, Hatton (1985) dismisses existing attempts at the competitive market-clearing approach as inadequate characterisations of the period. It is our contention that this model, of market-clearing pedigree, provides a more than adequate characterisation of the evolution of employment, unemployment and wages between the wars. The advantage of a specification such as (11) is that the speed of adjustment to the steady state solution is itself estimated, not imposed. Thus Hatton's conclusions essentially relate to static representations of the market-clearing paradigm.

In order to relate the wage adjustment equation of Table 2 to that of equation (11), we must note that the treatment of time is discrete, that X is a proxy variable for the unobservable, g, and that Z_3 contains the structural change variable, SC and the 'burden of proof' dummy, BDUM. The sum of the coefficients on inflation is significantly less than unity, implying that the Phillips Curve is not fully augmented for the interwar period. To pursue this issue further would require some inflation expectations generator to be specified, a task which was considered beyond the scope of this paper. In any case, the non-homogeneous result is not unusual for this period, a recent

example being Thomas' (1985) re-estimation of Phillips' original specification, which yielded a highly significant coefficient of 0.636 on inflation for the sub-period 1923-1939.

The implied equilibrium for the unemployment rate can be derived by setting $\Delta \ln W = \Pi_Q + X$, collapsing all lag structures and solving the result for $u = U/L^S$ from the third equation in table 2. The result is the empirical version of equation (10) that is implicit in the model described in table 2. It is equal to:

$$u^* = (U/L^S)^* = 0.0256 + 0.128 \ln(B/P_Q) + 2.489\ SC + 0.027\ BDUM - 1.231\ \Pi_Q$$

Substituting the mean values of $\ln(B/P_Q)$, SC, BDUM and Π_Q for the 1920s and 1930s separately yields an average equilibrium unemployment rate of 6.2% for 1923-1929 and of 10.8% for 1930-1938. These compare with actual average unemployment rates of 7.7% and 11.7% for the two sub-periods. These two series are graphed in chart 1. It can be seen that actual unemployment fluctuated around the equilibrium unemployment rate. This implies, quite correctly, that productivity adjusted real wages (expressed in terms of the GDP deflator) were adjusting to clear the labour market throughout the period. In a nutshell, the embedded unemployment rate function attributes the rise in unemployment between the two sub-periods to increases in the real value of scale benefits paid (3.5%), to the major change in the administration of benefits in 1930 (2.7%), to a greater degree of structural change (0.8%) and offset by a lower rate of deflation of the price level (-2.5%). The elasticity of the unemployment

Chart 1

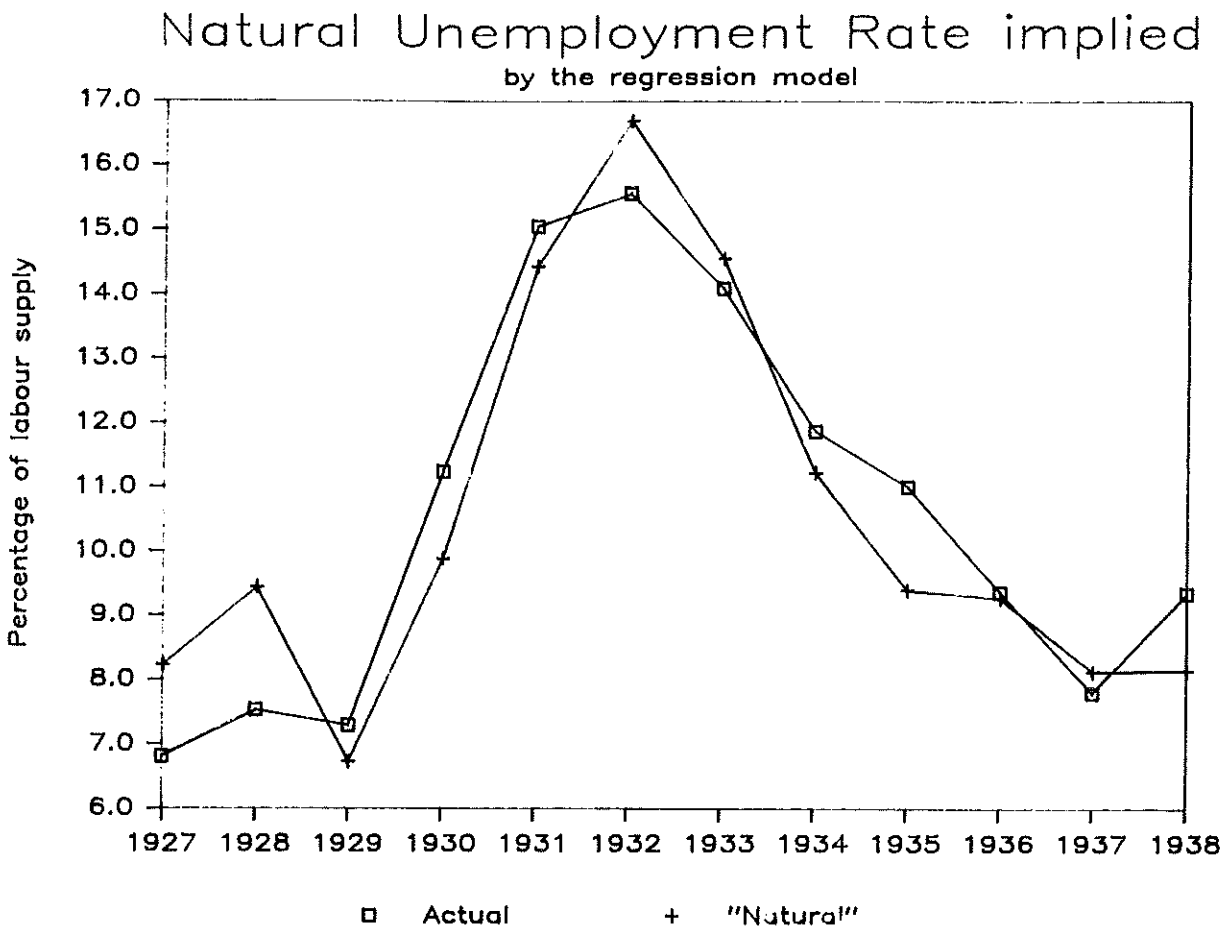

Natural Unemployment Rate implied
by the regression model
Percentage of labour supply
17.0
16.0
15.0
14.0
13.0
12.0
11.0
10.0
9.0
8.0
7.0
6.0
1927 1928 1929 1930 1931 1932 1933 1934 1935 1936 1937 1938
Actual
"Natural"

Chart 2


Total Employment
Results from the dynamic simulation
Millions of employees
21.50
21.00
20.50
20.00
19.50
19.00
18.50
18.00
17.50
1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934 1935 1936 1937 1938
Actual
+

Chart 3


Labour Supply : Results from
the dynamic simulation
Millions
23.5
23
22.5
22
21.5
21
20.5
20
19.5
19
1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934 1935 1936 1937 1938
Actual
Predicted

Chart 4

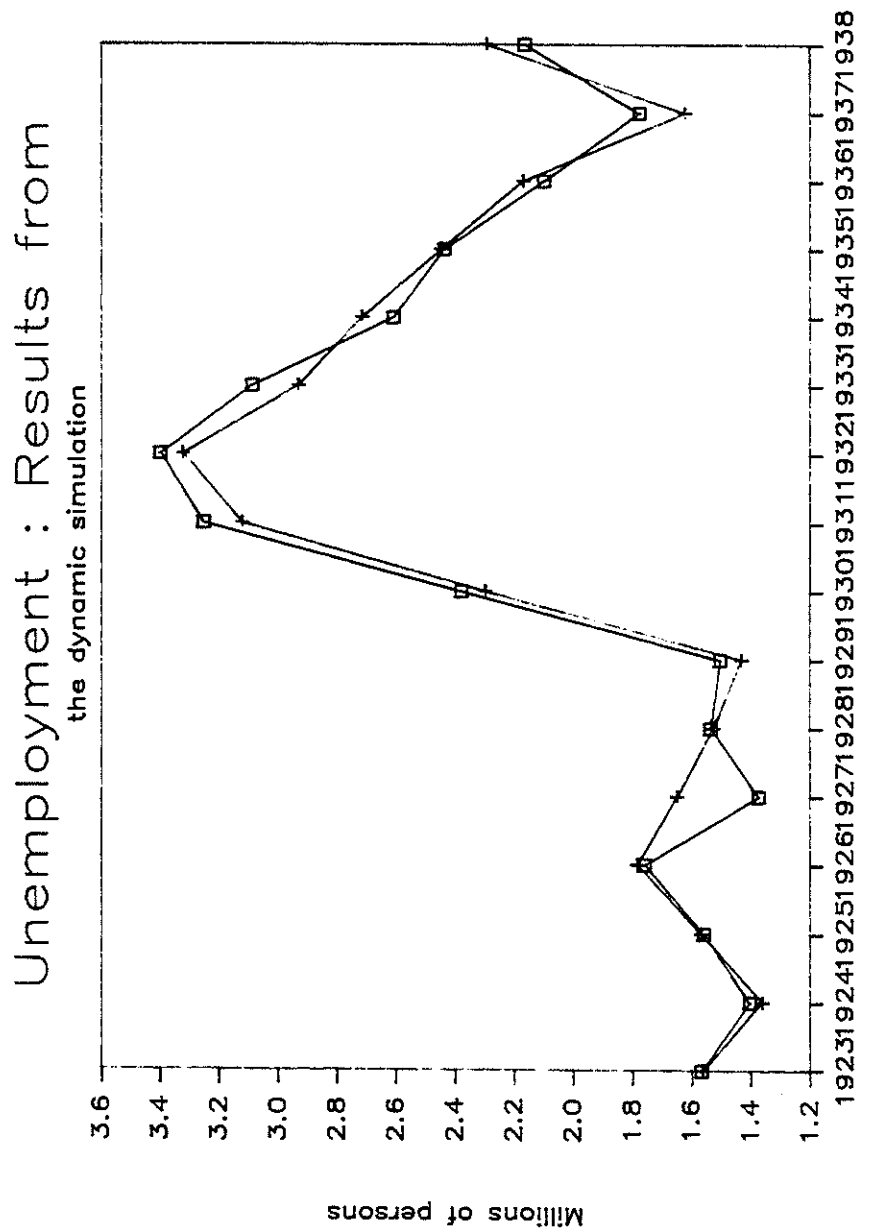
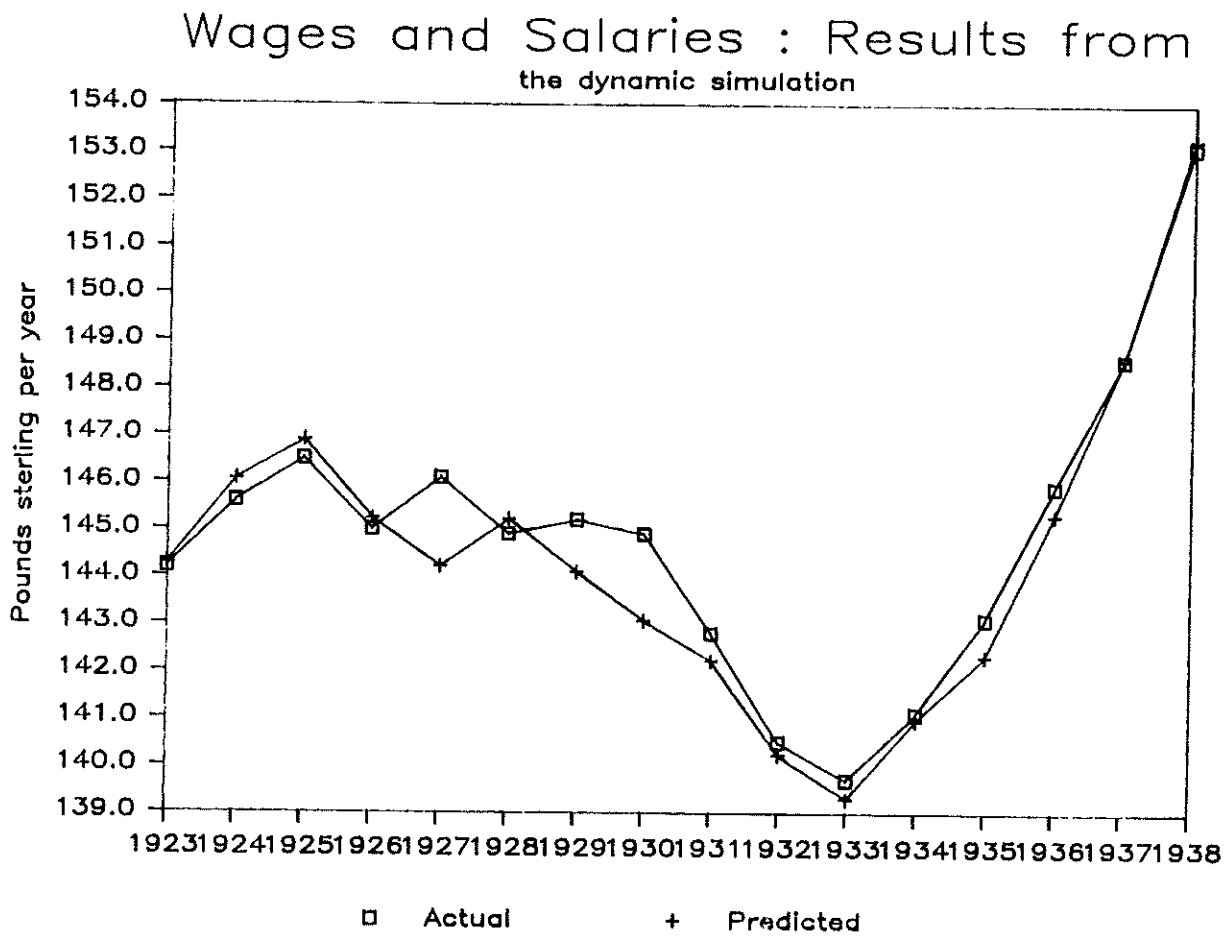

Unemployment : Results from
the dynamic simulation
Millions of persons
3.6
3.4
3.2
3.0
2.8
2.6
2.4
2.2
2.0
1.8
1.6
1.4
1.2
1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934 1935 1936 1937 1938
Actual
+ Predicted

Chart 5


Wages and Salaries : Results from
the dynamic simulation
Pounds sterling per year
154.0
153.0
152.0
151.0
150.0
149.0
148.0
147.0
146.0
145.0
144.0
143.0
142.0
141.0
140.0
139.0
1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934 1935 1936 1937 1938
Actual
Predicted

rate to real benefit rates is therefore comparable to that obtained by Matthews (1983). Even allowing for the additional effect of the dummy, the total benefits elasticity lies beneath that of Benjamin and Kochin (1979) and Smythe (1983).

IV Simulation Exercises

A dynamic simulation of the model was performed and the simulated and actual values of the endogenous variables are plotted in charts 2 to 5. In a simulation of this type the model is provided initial conditions for the endogenous variables in 1922 and it solves for the subsequent values of the endogenous variables in terms of the exogenous variables. Thus it first solves for 1923 and it uses these values to calculate 1924 solutions, and so on until 1938. The 1938 solution is therefore equivalent to a conditional 15 year ahead projection. Correspondingly the dynamic simulation checks the model's ability to track the data. Charts 2 - 5 indicate that the model tracks the data quite impressively.

In no case is there a systematic over- or under-prediction of the actual values for longer than a four-year interval. A by-product of this structural approach to modelling the labour market is the potential for high percentage errors to occur in the modelling of unemployment. With possibly one exception (1927) the dynamic simulation errors for employment are all within one standard error bank for the difference between L^S and L^D. The remainder of this section is devoted to a series of simulation exercises designed to shed light on the reasons for the dramatic

surge in unemployment and its subsequent decline.

In chart 1 a highly tentative profile for the natural rate of unemployment during the interwar years was presented. The presence of the inflation term is responsible for the rather unstable behaviour of the natural rate in the first few years. Thereafter the actual and natural rates are highly correlated, implying that the prevailing benefit arrangements, the pace of structural change and the rate of inflation/deflation together offer an adequate explanation for the massive surge in unemployment, and its subsequent decline. Lest it be considered that the world trade and real money variables have no part to play in this episode, a series of counterfactual simulations were carried out and the results are reported in Table 3.

Columns one and two show the actual and model simulated unemployment rates. When the level of benefit is held constant, the rate of unemployment follows the profile in column three. It is apparent that, despite the 2.67% reduction in the peak year, 1932, it is impossible to attribute the rise in unemployment to a single source. Adding in the effects of not implementing the change in the 'burden of proof' regulations makes a sizeable dent in the rate of unemployment that is implied by the model. From column four it can be seen that the cumulative effect of these changes is over 5% in 1932.

World trade volume grew rapidly during the 1920s on the rebound from the First World War. Rather than extrapolate

an inflated figure for world trade growth, a modest growth of 2 per cent per annum was simulated in place of the slump which actually occurred. The result of adding in this simulation can be seen in column five, from 1930 onwards. A further 2.4% is removed from the peak year unemployment rate as a consequence.

Arguably the effects of worldwide protectionism were felt not only in volumes but in prices. The price of UK wholesale goods collapsed as a result of the lack of overseas demand. If this effect is removed in addition, then the profile becomes that of column six. By now the unemployment rate has assumed a steady downward trend from 1923 to 1930, with a levelling off after 1930 at about 4 per cent.

Finally, if a smooth profile of real money growth is applied rather than the actual one, a seventh column is derived in which all previous adjustments remain in effect. The net result is, for the later years, a rate of unemployment not dissimilar from that experienced after the Second World War. This is no coincidence. Although unemployment benefit levels were rather higher in real terms after 1944, world trade growth was also very much higher, as was wholesale price inflation. The unemployment experience of the interwar period was perhaps not as extraordinary as previously thought. When the benefit changes, world trade and monetary policy shocks are removed, an economy emerges in the late 1930s with an unemployment rate of about 3% instead of an actual rate three to four times as large.

Table 3 : Counterfactual Simulations of the Unemployment Rate using the Inter-war Labour Market Model

Year	Actual	Simulated by the model[1]	Adjusted for constant benefit rate[2]	Further adjusted for the change in the 'burden of proof'[3]	Further adjusted to exclude the slump in world trade[4]	Further adjusted for divergent behaviour of whole-sale prices[5]	Further adjusted for for variations in the growth of the money stock[6]
1923	8.1	8.1	8.1	8.1	8.1	11.0	10.7
1924	7.2	7.0	6.9	6.9	6.9	10.4	9.9
1925	7.9	7.9	7.7	7.7	7.7	10.1	9.1
1926	8.8	8.9	8.5	8.5	8.5	9.7	8.6
1927	6.8	8.2	7.4	7.4	7.4	8.1	7.6
1928	7.5	7.5	6.4	6.4	6.4	7.1	6.7
1929	7.3	6.9	5.6	5.6	5.6	5.9	5.5
1930	11.2	10.9	9.0	7.9	7.0	5.4	4.7
1931	15.1	14.5	12.2	10.0	8.4	5.3	4.5
1932	15.6	15.2	12.6	9.8	7.4	4.9	4.7
1933	14.1	13.4	10.3	7.6	5.6	3.6	4.6
1934	11.9	12.4	9.0	6.6	5.3	4.0	4.1
1935	11.0	11.1	7.3	5.4	4.6	3.6	3.9
1936	9.4	9.7	5.6	4.1	3.5	3.5	4.4
1937	7.8	7.1	2.7	1.7	1.8	3.4	3.8
1938	9.4	9.9	5.4	4.6	3.6	3.5	2.9

Notes to Table 3

1. The result of a dynamic simulation, in which the values of all the exogenous variables are assumed known.

2. The 1923 weighted average benefit level of 16.32 shillings per week is assumed to be maintained throughout the simulation period. By 1938, this represents a 30% cut in benefits.

3. The dummy variable, BDUM, which stands for the shift in the burden of proof of eligibility for unemployment benefit around 1930, is omitted in this simulation. The old system is assumed to remain in force throughout the inter-war period.

4. From 1930, world trade volume is assumed to continue to grow but at the modest rate of 2 per cent per annum, rather than slump by 25% as it did in fact. By 1938 world trade is therefore assumed to be 34.3 per cent higher than was actually the case.

5. In this simulation both wholesale and consumer price indices are constrained to follow the course of the GDP deflator throughout the period. The result is to pull wholesale prices down in the early 1920s and up in the crisis period 1929/1932.

6. To the extent that the rate of real monetary growth was influenced by policy changes, this would be expected to affect the labour market. In place of the actual path of real money stock, this simulation includes a constant 2½% per cent per annum real growth path throughout 1923 - 1938.

V. Conclusions

The main conclusions are as follows:-

1. Interwar wage behaviour in Britain is consistent with an expectations augmented Phillips Curve. Increases in the demand for labour tended to increase wages; increases in the supply had the opposite effect.

2. The equilibrium rate of unemployment was increased by the real level of unemployment benefit. However, the effects are considerably smaller than those suggested by Benjamin and Kochin (1979). Had benefits in real terms remained at their level in 1922, the unemployment rate ten years later would have been about 3 percentage points lower than was the case.

3. However, changes in the burden of proof of the 'work test' raised the rate of unemployment in the 1930s by about 2 percentage points.

4. The slump in world trade added about 2 percentage points to the rate of unemployment in the early 1930s but monetary policy had only minor effects.

5. When all shocks are removed the unemployment rate as Britain entered World War II appears not so greatly out of line with its behaviour afterwards.

Data Appendix

B — Benefits payable in shillings per week to the insured unemployed, weighted according to the family status composition of the unemployed as indicated in column 1 of table 1.
Source: Hatton (1979).

BDUM — 'Burden of proof' dummy. Takes the value 1 post-1929, elsewhere zero.

EM — Total in civilian employment, millions.
Source: Feinstein (1972), table 57.

EMM — Manufacturing employees in employment, millions.
Source: Chapman and Knight (1953), table 1.

GDP — Gross Domestic Product at constant factor cost index, 1913=100.
Source: Feinstein (1972), table 24, column 5.

K — Gross capital stock (excluding housing) at constant 1938 £m.
Source: Feinstein (1972), table 43, columns 5 and 1.

L^S — Labour supply, millions.
Calculated as (EM + U)

MON3 — Money stock (M3 definition), £m.
Source: Capie and Webber (1985), table I(3).

P_C Deflator for total final expenditure, 1938=100.
Source: Feinstein (1972), table 61, column 5.

P_O Wholesale price index, 1938=100
Source: Capie and Collins (1983), table 2.1.

P_Q GDP deflator, 1913=100
Source: Feinstein (1972), table 61.

POP Population of working age (15-64 years), millions.
Source: Feinstein (1972), table 56.

R $\ln[L^S/POP)/(1-L^S/POP)]$

SC Proxy variable for structural charge.
Calculated as the absolute annual difference in the logarithm of the ratio of EMM to EM.

TT Ratio of national insurance contributions to average earnings, 1938=100.
Source: London and Cambridge Economic Service (1972), table H.

U Unemployment of insured and other persons, millions.
Source: Feinstein (1972), table 56.

W Annual average wages and salaries £ p.a.
Source: Chapman and Knight (1953), tables 4 and 1.

WT World trade volume index. Constructed for the period 1921-24 by weighting together the export volume indices for US, UK, Germany, Canada, India, Japan, Italy, China, Argentina and Australia, using 1913 weights. From 1925 the definition is the average of exports and imports volume indices.
Sources: League of Nations (1925-33), various issues and League of Nations (1936).

X Centred moving average of the growth rate of labour productivity.
Calculated as $\frac{1}{4}\left(\ln\left(\frac{GDP}{EM}\right)_{t+2} - \ln\left(\frac{GDP}{EM}\right)_{t-2}\right)$

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