ISSN 0013-0427

ECONOMICA

Vol. 53 Supplement: 1986 No. 210(S)

UNEMPLOYMENT

CONTENTS

Published Quarterly by

THE LONDON SCHOOL OF ECONOMICS

AND POLITICAL SCIENCE

PRICE OF UNEMPLOYMENT SUPPLEMENT £12 POST FREE

Introduction

The rise of unemployment in Europe is one of the main economic problems of our time. It is also not easy to explain. Though unemployment has risen in most countries, the size of the increase differs greatly. There is much to be learned from a simultaneous attempt to explain the experience of different countries.

A conference on the topic of rising unemployment was therefore held at the White House Conference Centre, Chelwood Gate, Sussex, England, on 27–31 May 1985. This special issue of *Economica* contains the proceedings of that conference.

The bulk of the volume contains detailed studies of the unemployment experience of most of the major developed economies. In addition, there is a keynote address by Robert Solow and two multi-country studies: one by Michael Bruno and a second by the Editors, which seeks to draw together a few of the strands that emerged over the course of the conference.

The conference would not have been possible without generous financial assistance from the Commission of the European Communities (DG V), the Economic and Social Research Council, the Department of Employment, and Her Majesty's Treasury. We are also grateful to all the participants and discussants at the conference who helped to make it a success.

The London School of Economics

CHARLIE BEAN
RICHARD LAYARD
STEPHEN NICKELL

Economica, **53**, S1-S22

The Rise in Unemployment: A Multi-country Study

By C. R. BEAN and P. R. G. LAYARD

The London School of Economics

S. J. NICKELL

Oxford Institute of Economics and Statistics

INTRODUCTION

One of the most remarkable features of recent economic history has been the remorseless rise in unemployment throughout the industrialized countries. However, while the trend to higher unemployment is universal, the experience of individual countries also differs widely. The increase is especially marked within the European Community, where unemployment rates rival those reached in the interwar years. By contrast, in the Scandinavian countries and Japan unemployment is lower and has risen very much less. Experience in the United States lies somewhere between these extremes, and in the last few years unemployment there has fallen sharply.

This picture is documented for 19 OECD countries in Table 1. Unemployment rates in 1984 exceeded 10 per cent of the workforce in Belgium, Canada, Italy, Netherlands, Spain and the United Kingdom, with Australia, France and even the virtuous German economy not far behind. At the other end of

TABLE 1

OECD STANDARDIZED UNEMPLOYMENT RATES, 1956-1984
(period average)

	1956-66 (%)	1967-74 (%)	1975-79 (%)	1980-83 (%)	1984 (%)
Australia	2·2	2·1	5·5	7·2	8·9
Austria	2·4	1·5	1·9	3·0	3·8
Belgium	2·6	2·6	7·0	11·5	14·0
Canada	4·9	5·2	7·5	9·4	11·2
Denmark	2·3	1·3	6·5	9·9	n.a.
Finland	1·6	2·5	5·1	5·4	6·1
France	1·5	2·5	4·9	7·5	9·7
Germany	1·4	1·1	3·5	5·4	8·6
Ireland	5·4	5·6	7·0	9·7	n.a.
Italy	6·5	5·6	6·8	8·6	10·2
Japan	1·7	1·3	2·0	2·3	2·7
Netherlands	1·2	2·2	5·3	9·9	14·0
New Zealand	0·1	0·3	1·0	3·6	n.a.
Norway	2·3	1·7	1·9	2·4	3·0
Spain	2·1	2·7	5·8	14·6	20·1
Sweden	1·7	2·2	1·9	2·8	3·1
Switzerland	0·1	0·0	0·4	0·5	1·2
United Kingdom	2·5	3·4	5·8	10·9	13·2
United States	5·0	4·6	6·9	8·4	7·4

Sources: All except Denmark, Ireland and New Zealand: OECD *Economic Outlook*; Denmark, Ireland and New Zealand; Grubb (1984).

the spectrum, Austria, Japan, Norway, Sweden and Switzerland were still experiencing unemployment rates around the 3 per cent mark, although even these modest levels represent a marked deterioration compared with their performance earlier in the postwar era.

One popular explanation that is sometimes advanced to explain the rise in unemployment is that it is primarily a consequence of rapid labour force growth with the supply of jobs lagging behind the demand for them. While it is true that female participation has risen in many countries, particularly among married women, as attitudes towards the role of women in the economy and society have altered,[1] nevertheless the growth in the labour force in recent years has not in general been markedly faster than in the 1960s, as Table 2 amply demonstrates. While discouraged worker effects may render the exact interpretation of these figures open to question, they do weigh heavily against the view that rapid labour supply growth is at the root of the unemployment problem.

But if labour force growth is not the culprit, what is? The widespread upward trend in unemployment rates suggests that there may be common factors at work. Much of the debate, at both an academic and a political level, has focused on the role of real wages. One view is that much of the current unemployment is the result of an excessively high level of real wages. The commodity and oil price shocks of the 1970s necessitated a fall in real consumption wages to restore equilibrium in the labour market, but this adjustment took place only slowly. The result was a period of prolonged 'classical' unemployment. The converse of this view is that aggregate demand has been too low and that the unemployment is therefore 'Keynesian' in nature. The

TABLE 2

OECD LABOUR FORCE AVERAGE GROWTH RATES, 1961–1984
(per cent per annum)

	1961–71	1977–82	1977–82	1982–84
Australia	2·8[a]	2·0	1·5	1·5
Austria	−1·2[a]	0·0	1·7	0·9
Belgium	0·7	0·8	0·7	0·4[b]
Canada	2·8	3·3	2·6	1·8
Denmark	1·3[a]	0·9	1·2	1·2[b]
Finland	0·3	1·5	1·2	0·9
France	0·9	1·0	0·7	0·2
Germany	0·2	−0·3	0·7	−0·1
Ireland	0·3	0·8	2·0	1·0[b]
Italy	−0·7	0·9	0·8	1·0
Japan	1·3	0·8	1·2	1·3
Netherlands	1·1	0·4	2·5	1·6[b]
New Zealand	2·2	2·3	1·0	1·7[b]
Norway	1·0	2·3	1·5	0·8
Spain	0·8	0·3	0·2	0·3
Sweden	0·8[a]	0·9	0·9	0·4
Switzerland	1·2	−1·3	0·7	−0·9[b]
United Kingdom	0·0	0·7	0·4	0·6
United States	1·8	2·5	2·1	1·5

Source: OECD *Labour Force Statistics*.
[a] Australia from 1964, Austria from 1968, Denmark from 1960, Sweden from 1962.
[b] 1982–83.

demand deficiency in turn is largely attributed to a shift in government priorities, away from maintaining full employment and towards containing inflation, which has resulted in the widespread adoption of contractionary monetary and, outside the United States, contractionary fiscal policies.

There are two problems with this general line of approach. The first is the artificial dichotomy between explanations relying on excessively high real wages and those relying on deficient aggregate demand, which stems from the assumption that firms are price-takers. While the assumption of perfect competition is often a convenient fiction, it is here distinctly misleading. Within such an environment the 'Keynesian' explanation can be rationalized only if prices do not clear the product market, yet it is difficult to see what impediments could prevent opportunities for gains from trade being realised, except perhaps in the very short run. In reality, however, prices are set by firms in markets that are less than fully competitive. Under imperfect competition firms can be optimizing in their pricing and employment decisions, yet the demand for labour will depend on both the level of real product wages and the level of real aggregate demand. This approach underlies a number of papers in this volume.

The second problem, emphasized in Solow's opening address to the conference, is that an explanation of current unemployment levels in terms of an excessive level of real wages is at best incomplete since it fails to explain the exogenous factors that have brought real wages to their present level. Only in the Soviet bloc countries can the real wage be considered exogenous. In OECD countries it is an endogenous variable, which is the outcome of the process by which nominal wages are set in the labour market and prices are set in the product market. These in turn will reflect a variety of factors such as the generosity of unemployment benefits, trade union strength, skill mismatch and the like. Similarly, the assertion that the way to reduce unemployment is to reduce real wages—as advanced for instance by the current British Chancellor of the Exchequer—is vacuous unless it details how such a reduction in labour costs is to be brought about.

I. A Theoretical Framework for Analysis

In order to shed further light on the data in Table 1, we present for each country estimates of a simple structural macroeconomic model centred on the labour market. The model assumes an imperfectly competitive environment and is spelt out in much greater detail in the Layard–Nickell paper on the United Kingdom in this volume. Here, therefore, we shall simply provide an outline of the theoretical structure, and refer the reader to that paper for a fuller discussion of the optimization problem and aggregation assumptions underlying the model. The paper on Spain by Dolado, Malo and Zabalza utilizes an identical theoretical structure, and the model in the paper on Italy by Modigliani, Padoa Schioppa and Rossi, although differing in details, is very similar in philosophy. In schematic form, the model consists of the following four equations:

Labour demand

$$(1) \qquad \frac{N}{K} = f^1\left(\frac{W}{P}, A, \sigma\right)$$
$$- \; ? \; +$$

Price-setting

$$(2) \qquad \frac{P}{W} = f^2\left(\frac{K}{L}, A, \alpha, \frac{W}{W^e}\right)$$
$$- \; ? \; + \; -$$

Wage-setting

$$(3) \qquad \frac{W}{P} = f^3\left(\frac{N}{L}, \frac{K}{L}, A, \frac{P}{P^e}, Z^s\right)$$
$$+ \; + \; ? \; - \; +$$

Aggregate demand

$$(4) \qquad \sigma = f^4\left(\frac{M}{P}, \frac{eP^*}{P}, Z^D\right)$$
$$+ \; + \; +$$

where

N = employment
L = the labour force
K = the capital stock
W = hourly labour cost (including employment taxes)
P = the GDP deflator
A = an index of technical progress
σ = an index of real aggregate demand (relative to potential output)
M = the money stock
eP^* = the level of competitors' prices in domestic currency
Z^s = a set of wage push factors (e.g. benefit levels)
Z^D = a set of demand shift factors (e.g. fiscal variables)

An 'e' superscript denotes an expected variable. In the absence of wage and price surprises, the model solves for the employment rate (N/L), demand (σ), the real wage (W/P) and the price level (P) as functions of the capital–labour ratio (K/L), technical progress (A), the money stock (M), competitors' prices (eP^*) and the supply demand shift variables (Z^s, Z^D), which are all treated as exogenous. Since σ is demand relative to potential, real balances and the demand shift variables also should be measured relative to potential.

Our focus is on the first three equations, which describe the supply side of the model, and especially on the employment and wage equations. The derivation of these equations is as follows. First, the firm decides on a pricing strategy. Once the firm has set its price, output is determined by demand, which depends on the price of its output relative to its competitors' output and the level of real demand in the economy as a whole. Employment is then determined through the production technology, which is assumed to exhibit constant returns to scale and to be separable in value added and raw materials. (The empirical results suggest that the latter assumption is approximately satisfied for most countries.) If prices are set as a mark-up, $\nu(\sigma)$, on marginal cost, then it follows immediately that the marginal product of labour is equal to the product of this same mark-up and the real wage.[2] So under perfect

competition, or under imperfect competition with a constant elasticity demand curve, the price mark-up on marginal cost is independent of demand and the employment-capital ratio depends only on the real wage ($f^1_\sigma = 0$).[3] At the other extreme, however, if prices are set as a mark-up on normal cost, independent of demand σ, then the mark-up on marginal cost, $\nu(\sigma)$, must be decreasing in demand since marginal costs are increasing. So the marginal product of labour must be decreasing in demand for a fixed real wage, and thus employment must be increasing in σ ($f^1_\sigma > 0$). So if there is any element of normal cost pricing behaviour in the economy, we must expect the employment-capital ratio to depend on both demand and the real wage as in (1).

The price equation (2) then follows immediately from the general pricing rule that prices are some mark-up on marginal cost where output is eliminated from marginal cost by setting it equal to the firm's demand. It is worth noting that the net impact of demand on prices is a combination of the upward pressure exerted by increasing marginal cost and the downward pressure exerted by the falling marginal cost mark-up. Under perfect competition the latter effect is absent and $f^2_\sigma > 0$, whereas under normal cost pricing the two effects exactly cancel and prices do not vary with the state of the cycle ($f^2_\sigma = 0$). Finally, the presence of the wage surprise (W/W^e) in (2) allows for the fact that some prices may have to be set before the outcome of wage negotiations is known.

The wage equation (3) encompasses four possible mechanisms by which wages may be set: (i) supply and demand in a competitive market; (ii) firms; (iii) unions; and (iv) bargaining between firms and unions.

If $f^3_{K/L} = f^3_A = 0$, then (3) is simply a labour supply curve relating the proportion of the labour force who are willing to work with the real wage and a set of shift factors which might include taxes, relative import prices and any other variables affecting search intensity and willingness to work, such as the size and availability of unemployment benefit.

The class of models in which firms set wages include those of the efficiency wage type (surveyed in Stiglitz, 1984, and Johnson and Layard, 1986). These models have the property that, for one reason or another, an increase in the wage paid generates a benefit to the firm that partially offsets the cost. For instance, increasing wages might reduce quits (Pencavel, 1972; Weiss, 1980), reduce vacancies (Jackman, Layard and Pissarides, 1984) or increase work effort (Shapiro and Stiglitz, 1984). In all these models the wage is set to equate marginal benefit to marginal cost, and in general will reflect the attractiveness of outside opportunities, including alternative wages, the unemployment rate and benefit levels.

In the monopoly union model (Dunlop, 1944) unions and firms bargain over wages knowing that employment will be determined according to the labour demand schedule (1), and this is taken account of when they evaluate their welfare and profit functions. If union welfare depends on both the level of wages and the employment rate of its members, the final level of real wages will depend on all the variables in the firm's labour demand function, the employment rate and the shift variables Z^s, which might now include proxies for relative bargaining strength. However, such an equation would, in the aggregate, be under-identified, so (3) also substitutes out σ from the bargaining solution using the labour demand function. Alternatively, it could be regarded

as a structural relation if unions and firms bargain in the light of the 'normal' level of demand. (For further discussion of union or bargaining models of wage determination, see Layard and Nickell, 1985a.)[4]

Equations (1) and (3) can be used to eliminate the real wage and give the employment rate in terms of its proximate determinants:

$$(5) \qquad \frac{N}{L} = g^1\left(\frac{K}{L}, A, \frac{P}{P^e}, \sigma, Z^s\right).$$

Equations (2) and (3) can also be combined to eliminate the real wage:

$$(6) \qquad \frac{N}{L} = g^2\left(\frac{N}{L}, A, \frac{P}{P^e}, \frac{W}{W^e}, \sigma, Z^s\right).$$

If there are no surprises, (5) and (6) solve jointly for the 'natural' rate of unemployment in terms of the capital-labour ratio, technical progress and the shift variables. However, in the empirical work that follows we shall not estimate the price equation (2) and instead shall concentrate on an appraisal of the relative importance of demand and supply shift factors as proximate causes of the rise in unemployment.

II. Empirical Results

Our comparative approach owes a great deal to the work of Bruno and Sachs (1985) and Newell and Symons (1986), both of which report and compare wage and employment equations for a number of OECD countries.

The data set for Spain is unfortunately incomplete but otherwise our estimates cover the remaining 18 countries whose unemployment history is described in Table 1. The data are annual and the sample period runs from 1953 to 1983.[5] Our aim has been to estimate a common specification across all countries. Obviously there are likely to be special factors operating in many of the countries whose incorporation would enhance the explanatory power of the model, and a more comprehensive search over the dynamic specification for individual countries might also prove fruitful. However, it is precisely a discussion of those specific factors that constitutes the aim of the various country papers that make up the bulk of this volume. Further, by maintaining the same general specification across all countries, we hope to demonstrate both the robustness of the model and its usefulness as a general framework. It also makes clearer the *differences* in structure between countries, which are the concern of Section IV.

Turning now to the shift factors Z^s in the wage equation, we include first the variables defining the total wedge θ between the consumption wage and the product wage:

$$(7) \qquad \theta = t_1 + t_2 + t_3 + S_M \log (P_M/P)/(1+S_M)$$

where

t_1 = the employment tax rate
t_2 = the income tax rate
t_3 = the consumption tax rate
S_M = the share of imports in value added
P_M = the price of imports in domestic currency

For most countries the restriction that the tax rates and the import price term enter with the same coefficient is not rejected statistically.

Second, we want variables reflecting unemployment benefit levels, search intensity, etc. The effect of the level and duration of unemployment benefit on unemployment is, of course, a contentious issue. However, deriving series that adequately capture the multi-dimensional complexity of the benefit system for all 18 countries is a truly Herculean task which is well beyond the scope of this exercise. As an alternative, we therefore adopted the expediency of including a variable designed to capture the outward shift in the unemployment-vacancy relationship that has occurred in many countries. Specifically, we estimated for each country the relationship

$$(8) \qquad \Delta U = \gamma_0 + \gamma_1 \Delta V + \gamma_2 \Delta U_{-1} + \gamma_3 U_{-1} + \gamma_4 V_{-1} + \gamma_5 t + \gamma_6 t^2$$

where

$U = 1 - N/L$ = the unemployment rate
V = the vacancy rate
Δ = the difference operator

The linear and quadratic time trends capture this outward shift in the unemployment-vacancy relationship and reflect the increasing generosity of the unemployment benefit system and other changes in labour market structure, while the remaining terms capture the dynamics in the relationship associated with the business cycle. We then constructed[6] a variable

$$(9) \qquad \phi = (\gamma_5 t + \gamma_6 t^2)/\gamma_3$$

which gives (subject to a constant and a change of sign) the equilibrium unemployment rate associated with a given vacancy rate as a 'catch-all' variable for these factors. We shall refer to ϕ as the 'search' variable, although, of course, it may reflect a number of factors entirely unrelated to the search intensity of the unemployed.

Finally, we also tried including a measure of strike activity and, for those countries when it was available, a time series of the unionization rate as proxies for bargaining strength. However, in general we were unable to obtain significant effects from these variables, and they are omitted from the results reported below. In other work (Layard and Nickell, 1985b) we have been able to obtain significant effects for a number of countries using the union/non-union mark-up as well as strikes data, but such information is not readily available for all 18 countries studied here.

Turning now to the demand shift variables (Z^D), in previous applications of this model we have usually used cyclically and inflation-corrected budget deficits as a measure of domestic fiscal impact. This is not readily available for all the countries in the sample.[7] Instead, we simply enter the level of government spending and the tax wedge separately. To capture foreign demand we use GDP in the rest of the OECD: i.e. for each country we subtract its own GDP from total OECD GDP.

In previous applications we have also usually implicitly substituted out σ using (4), including our demand variables directly in the employment and price equations. However, this is rather profligate with degrees of freedom, as

we have four demand variables (government spending, the tax wedge, foreign output, and competitiveness),[8] which doubles up to eight if lags are allowed for. Since the effect of these variables is only via their effect on aggregate demand, we constructed a single index of aggregate demand by regressing (the logarithm of) GDP on (the logarithm of) each of these four variables, current and lagged, and a lagged dependent variable, and then taking the predicted value of this regression as a measure of σ. Since σ represents demand relative to potential output, GDP, government spending and foreign output were all first normalized on the capital stock as a proxy for the size of the economy.[9] Thus our σ variable is a particular linear combination of the exogenous demand factors.[10]

Capital accumulation and technical progress is likely to lead to shorter working weeks and may affect participation. However, given the definition of the labour force, it is reasonable to suggest that they do not affect the equilibrium unemployment rate, and our estimates are constrained to satisfy this requirement. Technical progress is here proxied by a simple linear and quadratic time trend (this seems to work as well as an index of total factor productivity). We also need to dynamize the system to allow for lags. After a little experimentation with the dynamic specification, we settled on the following (log-linear) representation of equations (1) and (3):

$$\text{(10a)}\quad \Delta \log N = \alpha_0 + \alpha_1 \log\left(\frac{N_{-1}}{K}\right) + \alpha_2 \log\left(\frac{W}{P}\right) + \alpha_3\sigma + \alpha_4 \Delta \log N_{-1} + \alpha_5 t + \alpha_6 t^2$$

$$\text{(10b)}\quad \Delta \log\left(\frac{W}{P}\right) = \beta_0 + \left(\frac{\beta_1}{\alpha_2}\right)\left\{\alpha_1 \log\left(\frac{L}{K}\right) + \alpha_2 \log\left(\frac{W}{P}\right)_{-1} + \alpha_5 t + \alpha_6 t^2\right\} + \beta_2 \log\left(\frac{L}{N}\right) + \beta_3\theta + \beta_4\phi.$$

The term in braces is a sort of 'error correction' term, and the coefficient restrictions ensure neutrality with respect to the capital stock and technical progress. We tried proxying price 'surprises' in (10b) by $\Delta^2 \log P$, but for most countries this was insignificant. Under rational expectations, the price 'surprise' should be white noise and orthogonal to the information set. If all the exogenous variables are included in this information set, then its omission should not bias the remaining coefficients.

Table 3 presents maximum likelihood estimates of the parameters of system (10) for each country and their standard errors.[11] For brevity, the constants and technical progress terms are omitted. We also report the long-run wage elasticity $(-\alpha_2/\alpha_1)$ and its associated standard error.

For most countries the estimates are fairly sensible. Wages have a depressing effect on employment in all countries except the United States, and their effect is generally quite well defined with most of the long-run elasticities somewhere between one-half and unity in absolute value. The finding of a 'perverse' response for the United States accords with a certain amount of other research (e.g. Bruno and Sachs, 1985, p. 173) and may account for the common assertion that real wages have little impact on employment. Table 3 reports an alternative estimate for the United States including lagged real wages and replacing the

TABLE 3

ESTIMATES OF LABOUR DEMAND AND WAGE-SETTING EQUATIONS (10)

	Labour demand					Wage-setting			
Independent variables Parameter	Lagged employment α_1	Wage α_2	Demand α_3	Lagged change in employment α_4	Long-run wage elasticity $-\alpha_2/\alpha_1$	Lagged wage β_1	Unemployment β_2	Wedge β_3	Search β_4
Australia	−1·43 (0·41)	−0·44 (0·07)	−0·37 (0·33)	0·54 (0·43)	−0·28 (0·10)	−0·03 (0·32)	−2·77 (1·0)	0·48 (0·55)	−1·71 (2·2)
Austria	−0·44 (0·10)	−0·32 (0·07)	0·32 (0·13)	0·03 (0·22)	−0·50 (0·12)	−0·48 (0·22)	−10·2 (3·2)	−1·18 (0·45)	−7·89 (4·4)
Belgium	−0·24 (0·12)	−0·21 (0·04)	0·54 (0·22)	0·08 (0·30)	−0·87 (0·47)	−0·07 (0·11)	−2·28 (0·48)	0·24 (0·11)	−1·68 (0·50)
Canada	−0·83 (0·30)	−0·35 (0·11)	0·60 (0·08)	0·23 (0·25)	−0·42 (0·20)	−0·19 (0·16)	−0·79 (0·47)	0·28 (0·24)	0·12 (0·18)
Denmark	−0·74 (0·18)	−0·45 (0·15)	0·39 (0·11)	0·07 (0·22)	−0·61 (0·12)	−0·19 (0·07)	−0·49 (0·15)	−0·22 (0·10)	−0·13 (0·10)
Finland	−0·68 (0·22)	−0·48 (0·10)	0·47 (0·19)	0·36 (0·16)	−0·71 (0·16)	−0·70 (0·19)	−2·10 (0·70)	0·17 (0·21)	−0·59 (0·90)
France	−0·28 (0·08)	−0·17 (0·05)	0·14 (0·11)	0·22 (0·21)	−0·62 (0·15)	−0·39 (0·09)	−2·93 (0·82)	0·20 (0·08)	−2·17 (1·5)
Germany	−0·64 (0·30)	−0·53 (0·15)	0·46 (0·34)	0·51 (0·29)	−0·47 (0·29)	−0·05 (0·24)	−3·31 (0·76)	−0·42 (0·50)	−4·28 (1·5)
Ireland[a]	−0·29 (0·09)	−0·30 (0·07)	0·25 (0·07)	0·50 (0·29)	−1·03 (0·20)	−0·51 (0·23)	−2·83 (0·54)	0·70 (0·25)	0·17 (0·15)
Italy[a]	−0·35 (0·17)	−0·13 (0·05)	0·10 (0·13)	0·14 (0·34)	−0·37 (0·08)	−0·46 (0·17)	0·03 (0·83)	0·15 (0·20)	0·45 (0·38)
Japan	−0·35 (0·07)	−0·36 (0·07)	−0·01 (0·02)	−0·43 (0·19)	−1·02 (0·05)	1·29 (0·53)	−41·0 (8·6)	−0·92 (0·83)	−42·7 (12·0)
Netherlands	−0·10 (0·12)	−0·11 (0·10)	0·21 (0·23)	0·31 (0·69)	−1·15 (1·05)	−0·36 (0·15)	−0·77 (0·61)	0·15 (0·29)	−0·25 (0·86)
New Zealand	−1·03 (0·16)	−0·23 (0·07)	0·19 (0·07)	0·13 (0·22)	−0·23 (0·06)	−0·45 (0·13)	−0·84 (0·88)	0·02 (0·23)	0·00 (0·50)
Norway	−0·93 (0·29)	−0·18 (0·06)	0·39 (0·15)	0·78 (0·29)	−0·14 (0·07)	−0·55 (0·19)	−5·93 (2·1)	−0·13 (0·13)	1·97 (5·5)
Sweden	−0·84 (0·18)	−0·55 (0·12)	−0·17 (0·25)	0·85 (0·47)	−0·66 (0·11)	−0·97 (0·40)	−7·77 (2·0)	0·48 (0·21)	−9·64 (4·4)
Switzerland	−0·88 (0·13)	−0·83 (0·09)	0·55 (0·14)	0·79 (0·22)	−0·94 (0·09)	−0·44 (0·23)	−23·3 (3·9)	−0·63 (0·48)	−3·78 (3·3)
United Kingdom	−0·63 (0·13)	−0·40 (0·20)	0·50 (0·07)	0·45 (0·20)	−0·63 (0·20)	−0·03 (0·19)	−0·53 (0·46)	0·04 (0·10)	−0·23 (0·72)
United States	−0·59 (0·15)	0·92 (0·28)	0·51 (0·12)	−0·09 (0·23)	1·57 (0·31)	−1·15 (0·24)	0·38 (0·19)	0·38 (0·14)	0·96 (0·45)
United States[b]	−1·28 (0·34)	−0·61 (0·19)	0·19 (0·13)	0·42 (0·27)	−0·48 (0·17)	−0·16 (0·17)	−0·28 (0·21)	0·33 (0·14)	0·92 (0·39)

Notes: Asymptotic standard errors in parentheses.

[a] Search variable is a simple time trend (× −0·001).

[b] With lagged wage and split time trends (see text).

quadratic time trend by split time trends starting in 1975 and 1980. While this produces a negative effect of wages on employment, we remain somewhat unhappy with the data mining necessary to unearth it.[12] Nevertheless, we use these estimates in what follows. It appears that a crucial ingredient is the use of lagged rather than current real wages. This may reflect institutional differences in the labour market, but we conjecture that it may be a consequence of the fact that, of all the countries studied, the United States is the nearest to a closed economy. If the marginal propensity to consume out of wages is higher than that out of profits, an increase in real wages will boost demand, and this may be swamping the direct negative effect on labour demand. In the other 17 countries, which are rather more open, this effect is likely to be much less pronounced. Demand has a positive effect on employment (α_3) everywhere except Australia, Japan and Sweden, and in these cases the negative effect is insignificant.

Turning to the wage equation, unemployment has a depressing effect on real wages (β_2) everywhere except Italy, where there is a quite insignificant positive effect, and the basic estimates for the United States, where the interpretation is in any case open to question. The estimates for Japan are slightly peculiar since there is a positive 'error correction' coefficient (β_1). This does not imply that the estimates are dynamically unstable, however, since there is a very powerful unemployment term that offsets it. In general, the estimates of β_1 and β_2 are strongly negatively correlated and these slightly strange estimates for Japan are therefore likely to represent sampling error. The wedge variable is positively signed for two-thirds of the countries (β_3) and the sign of the search variable (β_4) conforms with prior expectations (negative) for a similar proportion of the countries in the sample.

III. Accounting for the Rise in Unemployment

We shall now use the empirical results to investigate the proximate causes of the rise in unemployment using the empirical counterpart of equation (5). Equations (10a) and (10b) may be combined to give

$$(11)\quad (\delta_0+\delta_1 B+\delta_2 B^2+\delta_3 B^3)\log N=(\alpha_2\beta_0-\alpha_0\beta_1)+(\alpha_1\beta_1+\alpha_2\beta_2)\log L$$
$$+(1+\beta_1)\Delta(\alpha_5 t+\alpha_6 t^2-\alpha_1\log K)$$
$$+\alpha_3\{1-(1+\beta_1)B\}\sigma+\alpha_2\beta_3\theta+\alpha_2\beta_4\phi$$

where

$$\delta_0=1+\alpha_2\beta_2$$
$$\delta_1=-(2+\alpha_1+\alpha_4+\beta_1)$$
$$\delta_2=(1+\beta_1)(1+\alpha_1+\alpha_4)+\alpha_4$$
$$\delta_3=-\alpha_4(1+\beta_1)$$

and B is the backward shift operator.[13] This gives the level of employment conditional on the labour force, capital stock, technical progress, demand, taxes, relative import prices and search intensity. It can then be used to derive the predicted behaviour of the unemployment rate over the sample period.

Some of the countries display quite long and complex dynamics. In order to sidestep this and present the results in an easily digestible manner, we focus on the effects of changes in the independent variables over a long time period, utilizing the long-run coefficients generated by equation (11). However, to make some allowance for sluggish adjustment the independent variables are first appropriately lagged using the mean lag of the filter $(\delta_0+\delta_1 B+\delta_2 B^2+\delta_3 B^3)^{-1}$ as a criterion (see Table 6).

Table 4 gives the results of a historical breakdown of the causes of the rise in the unemployment rate between 1956-66 and 1980-83 using this procedure. Thus, for Australia the mean lag is 1·07 years and the effect of changes in search intensity on the unemployment rate is calculated as $-\alpha_2\beta_4(\phi_{79\text{-}82}-\phi_{55\text{-}65})/(\delta_0+\delta_1+\delta_2+\delta_3)$, where $\phi_{79\text{-}82}$ is the average value of the search variable over the period 1979-82. Although our philosophy has been to avoid searching widely over specifications in pursuit of the most favourable results, there are a number of countries in Table 3 with perverse signs for the effect on wages of the wedge (β_3) and the search variable (β_4). Rather than present a breakdown of the rise in unemployment with possibly nonsensical numbers, we have re-estimated the model for these countries setting the relevant coefficients to zero. For most countries this does not result in a significant deterioration in fit (Austria and the United States are the chief exceptions). These constrained estimates, presented in Table 5, were then used in the compilation of Table 4 rather than the unrestricted estimates.

These estimates are for the most part fairly sensible and confirm the importance of demand in the rise in unemployment, especially in the European

TABLE 4

BREAKDOWN OF THE CHANGE IN UNEMPLOYMENT, 1956-66 TO 1980-83
(percentage points)

	Taxes	Import prices	Search	Demand	Total	Actual
Australia	2·56	−0·03	2·44	−0·28	4·69	4·98
Austria	—	—	—	0·09	0·09	0·57
Belgium	1·41	−0·04	5·28	2·53	9·15	8·93
Canada	1·34	0·02	—	4·59	5·95	4·56
Denmark	—	—	0·00	5·40	5·40	7·56
Finland	1·02	0·13	1·04	1·48	3·66	3·79
France	0·46	−0·04	3·27	2·39	6·08	5·98
Germany	—	—	3·68	−0·03	3·65	4·02
Ireland	3·73	−0·38	—	2·29	5·65	4·33
Italy	1·12	−0·02	—	−1·68	−0·58	2·09
Japan	—	—	0·59	0·06	0·65	0·63
Netherlands	2·93	−1·38	−3·41	9·68	7·84	8·77
New Zealand	0·08	0·01	0·00	2·28	2·38	3·48
Norway	—	—	—	0·50	0·50	0·11
Sweden	1·70	0·12	−0·47	−0·49	0·85	1·04
Switzerland	—	—	0·18	0·29	0·48	0·41
United Kingdom	2·06	−0·05	2·25	5·33	9·60	8·33
United States	1·30	0·19	—	0·48	1·97	3·35

Note: Australia, Belgium, Canada, Denmark, France and New Zealand: independent variables lagged once; Italy, Netherlands, United Kingdom, United States: independent variables lagged twice.

TABLE 5

RESTRICTED LABOUR DEMAND AND WAGE-SETTING EQUATIONS (10)

	Labour demand					Wage-setting			
Independent variables Parameter	Lagged employment α_1	Wage α_2	Demand α_3	Lagged change in employment α_4	Long-run wage elasticity $-\alpha_2/\alpha_1$	Lagged wage β_1	Unemployment β_2	Wedge β_3	Search β_4
Austria	−0·37	−0·21	0·34	−0·01	−0·56	0·03	−2·09	—	—
	(0·09)	(0·07)	(0·11)	(0·19)	(0·09)	(0·03)	(0·62)		
Canada	−0·89	−0·38	0·63	0·27	−0·43	−0·19	−0·94	0·14	—
	(0·23)	(0·10)	(0·08)	(0·23)	(0·19)	(0·14)	(0·42)	(0·12)	
Denmark	−0·74	−0·50	0·33	0·16	−0·68	−0·23	−0·45	—	0·00
	(0·02)	(0·16)	(0·13)	(0·24)	(0·12)	(0·10)	(0·20)		(0·10)
Germany	−0·66	−0·58	0·47	0·52	−0·87	0·07	−3·02	—	−3·32
	(0·30)	(0·15)	(0·34)	(0·30)	(0·39)	(0·11)	(0·61)		(0·78)
Ireland	−0·35	−0·32	0·25	0·62	−0·93	−0·44	−2·53	0·51	—
	(0·08)	(0·07)	(0·07)	(0·28)	(0·17)	(0·21)	(0·49)	(0·18)	
Italy	−0·30	−0·11	−0·05	0·17	−0·38	−0·47	0·24	0·05	—
	(0·21)	(0·08)	(0·12)	(0·35)	(0·09)	(0·18)	(0·71)	(0·14)	
Japan	−0·35	−0·37	−0·03	−0·43	−1·06	0·44	−25·4	—	−20·8
	(0·07)	(0·07)	(0·04)	(0·17)	(0·05)	(0·33)	(5·5)		(6·7)
Norway	−1·26	−0·29	0·53	1·11	−0·23	−0·78	−8·38	—	—
	(0·34)	(0·08)	(0·19)	(0·35)	(0·07)	(0·20)	(2·1)		
Switzerland	−0·91	−0·83	0·59	0·84	−0·92	−0·33	−26·8	—	−6·46
	(0·13)	(0·09)	(0·16)	(0·28)	(0·08)	(0·21)	(3·1)		(3·9)
United States[b]	−1·17	−1·24	0·25	0·34	−1·06	−0·66	−0·05	0·07	—
	(0·28)	(0·26)	(0·14)	(0·25)	(0·15)	(0·08)	(0·16)	(0·06)	

Notes: See Table 3.

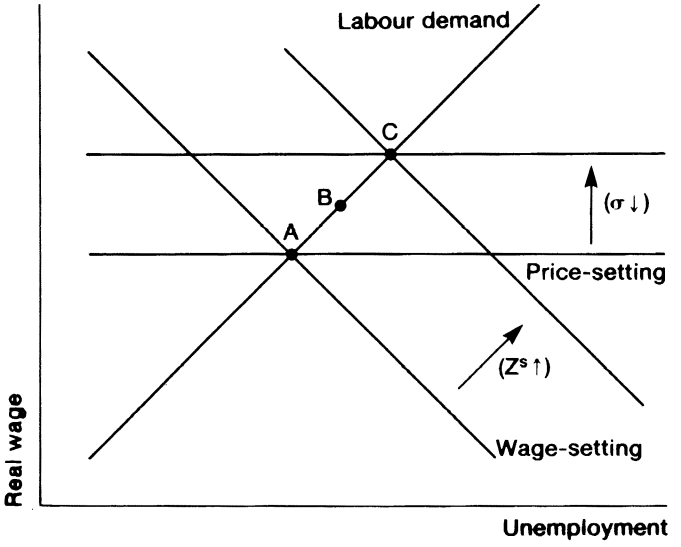


FIGURE 1. Perfect competition.

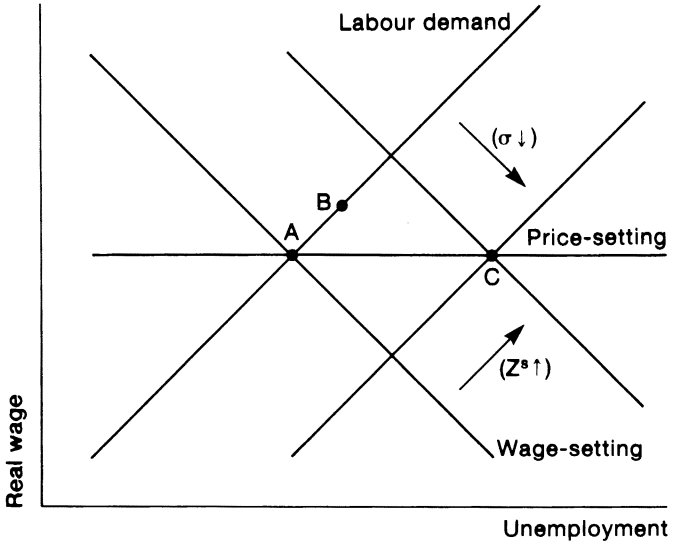


FIGURE 2. Normal cost pricing.

Community. However, in most cases there is also a significant contribution from reduced search intensity (recall that this will pick up the effect of unemployment benefits, etc.) and a higher tax burden. Import prices play a small role overall, although they have a significant effect in the immediate aftermath of the commodity price boom of the early 1970s and the two oil shocks.

How do these results tie up with those of Bruno in this volume? First, it is helpful to recast the story told in his Figure 2 in our framework. In Figures 1 and 2 we have drawn the employment, price and wage equations (1), (2) and (3) in unemployment–real-wage space, assuming that wage and price

expectations are fulfilled. A supply shock, such as the oil price hike, shifts the wage function to the right. If we hold the level of real demand, σ, constant, the economy will move from the initial equilibrium A along the labour demand curve to a point such as B, where there is (unanticipated) inflation in wages and consumer prices. This extra inflation ensures that the realized real wage is lower than that bargained for in the labour market and higher than that implicit in the planned price-setting behaviour of firms.

In order to reach a new equilibrium in which expectations are fulfilled, real demand must fall. This can happen both automatically, as a result of the real balance effect and a decline in competitiveness, and autonomously, as a result of changes in fiscal and monetary policy. However, the effect on employment depends crucially on the pricing strategy of firms. Figures 1 and 2 present the two polar cases of perfect competition and normal cost pricing, respectively. Under perfect competition the price function shifts upwards (recall that $f^1_\sigma = 0$ and $f^2_\sigma > 0$ under competitive pricing) and a new equilibrium is established at C with higher real wages and higher unemployment. Under normal cost pricing the labour demand function shifts rightwards (recall that $f^1_\sigma > 0$ and $f^2_\sigma = 0$ in this case) and the new equilibrium is at C with unchanged real wages but higher unemployment.

The 'wage gap' methodology of Bruno (see also Bruno-Sachs) starts by calculating the difference between actual wage and the full employment marginal product of labour. If the economy is deemed to be at full employment initially, then this gap is given by the excess of the current wage, say at B or C in Figure 1, over the full employment wage at A. Bruno finds that the wage gap rose during the latter half of the 1970s, but since 1980 has been declining in most countries. Given our finding that demand has a positive effect on employment in most countries, this suggests that we may be observing something closer to the normal cost pricing case portrayed in Figure 2 than the competitive case of Figure 1.

Bruno's decomposition of the rise in unemployment in terms of the wage gap and aggregate demand (his Table 8) seems to support our own findings that lack of demand has been a proximate cause of the rise in unemployment. However, statistical quibbles aside, there is an important methodological difference between the two approaches, stemming from the fact that the wage gap is an endogenous variable which in general will be affected by the level of real demand. Thus, suppose the economy is at the final equilibrium C in Figures 1 and 2 and the government undertakes a fiscal or monetary expansion, reversing the previous contraction in demand. In the competitive case of Figure 1, this produces a downward shift in the price function and takes the economy to a temporary equilibrium like B, where there is a fall in the wage gap and unanticipated inflation. By contrast, in the normal cost pricing case of Figure 2, the labour demand function shifts leftwards and again at the new temporary equilibrium B there is unanticipated inflation—but now there is a *rise* in the wage gap. Because demand has an indirect effect via the wage gap as well as a direct effect, that portion of the rise in unemployment which is attributed to demand will be different in the two approaches.

It is perhaps also worth adding a note of caution on the policy implications to be drawn from Bruno's Table 8 and our own Table 4. The fact that demand may have played a role in the rise of unemployment does not necessarily imply

that this can be entirely reversed by expansionary fiscal or monetary policy, other than in the short run. The model of equations (1)-(4) possesses a 'natural' level of real demand as well as a 'natural' level of unemployment, or NAIRU. This 'natural' level of demand is obtained by solving equations (5) and (6) for σ assuming that expectations are fulfilled. Attempts to raise σ above (below) this level will raise (lower) employment only so long as the wage and price expectations of firms and workers differ from the levels actually realized. In that sense the model of equations (1)-(4) has much in common with equilibrium business cycle models of the Friedman-Lucas variety. Only if an expansion of demand has a minimal effect on wages and/or prices, as in disequilibrium models of the Barro-Grossman-Malinvaud fix-price type, can unemployment be permanently reduced.

The ad hoc rigidity of wages and prices in disequilibrium models is one of their least satisfactory features in anything other than the very short-run. An alternative approach taken by Driehuis, Malinvaud and especially Sneessens and Dreze, is to focus on limited short-run substitution possibilities between labour and capital as the source of disequilibrium, rather than wage and price rigidity *per se.* In the model of Sneessens and Dreze, wages and prices are flexible and respond to economic conditions, but real wages do not directly affect employment because the capital-labour ratio is fixed in the short-run. Labour demand is, in essence, determined by either the capital stock or the demand for domestically produced goods, whichever is the smaller, and Keynesian, Classical and Repressed Inflation regimes can arise as in the first generation fix-price disequilibrium models. However the differences between the disequilibrium approach and the model which appears in this paper and a number of the other contributions to this volume are less pronounced than they appear. Factor proportions are flexible in the Sneessens-Dreze model in the medium/long-run and such factors as benefit levels, union power, mismatch, etc. will play a central role in determining the equilibrium level of unemployment. Conversely the sluggish adjustment evidenced by the lags in the labour demand equations in Table 3 could be rationalized as representing short-run behaviour in disequilibrium as well as equilibrium behaviour with convex adjustment costs. Rather the differences are primarily in emphasis: the Sneessens-Dreze disequilibrium model focuses on the short-run, whereas the Layard-Nickell imperfect competition approach is directed more closely at medium term issues. In both models expansionary fiscal or monetary policy may be able to affect the level of unemployment temporarily, but should not affect the equilibrium unemployment rate.

There is, however, another way in which an expansion in demand could permanently lower the level of unemployment, and that is through hysteresis effects. If the current NAIRU depends on past levels of unemployment, then demand management will be able to affect the future NAIRU's. While a rigorous theoretical framework for such hysteresis effects has yet to be spelt out, one can suggest a variety of ways in which they might arise: the 'discouraged worker' effect leads marginal workers to quit the labour force; the human capital of the unemployed may depreciate rapidly, making it difficult to find a suitable job match; the unemployed lose workplace contacts which are the source of information on new jobs for many workers; finally, firms may use unemployment experience as a screening device for identifying low

productivity workers. In the paper on the United Kingdom in this volume we find that unemployment excluding the long-term unemployed performs better in wage equations than the overall unemployment rate which lends some credence to the idea of a state-dependent NAIRU.[14] This possibility is explored in much greater depth in the paper on Australia by Gregory. He shows that overtime/short-time data are a much better explanation of wage behaviour than unemployment, and cites social survey evidence to support the argument that it is conditions inside the firm rather than outside that matter. If this dichotomy between insiders and outsiders can be shown to generalize to other countries, it must surely have important implications for both macroeconomic theory and policy. Clearly this is an area where further research is warranted.

IV. The Role of Institutions: A Comparative Assessment

The empirical results of Sections II and III suggest that this approach provides a useful analytical framework. However, the cross-country differences in the coefficient estimates appearing in Table 3 indicate that the heterogeneity in unemployment experience manifested in Table 1 arises not only from a differing contribution by the exogenous variables—demand, taxes, import prices, search intensity and so forth—but also as a result of differences in structure. In this section we shall try to relate this cross-country variation in labour market behaviour to institutional factors.

Recently a number of writers (Cameron, 1982; McCallum, 1983, 1984; Tarantelli, 1982; Bruno and Sachs, 1985) have focused especially on the effect of 'corporatism' on macroeconomic performance. Corporatism is identified as a mode of social organization in which groups rather than individuals wield power and transact affairs. In the context of labour markets, several structural characteristics have been used as indicators of corporatism. These are: whether negotiations take place at a national or local level; the power of national *vis-à-vis* local labour organizations; the extent of employer co-ordination; and the power of local union stewards. Nations are deemed to be corporatist if wage bargaining is highly centralized, wage agreements do not have to be ratified at a local level, employers are organized, and local union officials have limited influence. Bruno and Sachs report a corporatism rank ordering of 17 of our 18 countries (Ireland is not included) based on these criteria. This index is reported in Table 6. The ranking is intuitively plausible, with Austria, Germany, The Netherlands and the Scandinavian economies being classified as most corporatist, the United States and Canada as least corporatist, and Japan and the remaining European economies somewhere in between.

Most of the authors cited above relate indices of corporatism to overall measures of macroeconomic performance such as unemployment and inflation (and especially their sum—the so-called 'misery index'). However, these reflect not only the underlying structure of the economy, but also macroeconomic policy choices. We shall be particularly concerned with relating various parameters describing the functioning of the labour market *per se* to the degree of corporatism.[15] Corporatism could be associated with a number of features of the labour market. If there is greater consensus in corporatist economies, then disequilibrium may be eliminated more rapidly. This is reflected in the coefficient on unemployment in the wage equation, β_2, which gives the short-

TABLE 6
CORPORATISM RANKING, UNIONIZATION RATE AND LABOUR MARKET MEAN LAG

	Corporatism ranking	Unionization rate (%)	Mean lag (years)
Australia	15	46·1	1·07
Austria	1	52·6	0·14
Belgium	9	68·0	0·55
Canada	16	28·3	1·52
Denmark	7	52·9	1·76
Finland	8	43·4	0·12
France	13	20·0	0·60
Germany	2	31·8	0·34
Ireland	—	—	0·24
Italy	14	32·3	2·70
Japan	10	22·6	−0·04
Netherlands	3	35·5	2·26
New Zealand	11	36·7	0·75
Norway	4·5	64·2	0·02
Sweden	4·5	70·1	−0·13
Switzerland	6	29·4	−0·12
United Kingdom	12	45·5	2·64
United States	17	28·2	3·56

Source: Bruno and Sachs (1985, Table 11.3) and Table 3 above.

run effect on wages of a perceived disequilibrium in the labour market. One might also be interested in the long-run effect of unemployment on wages, $-\beta_2/\beta_1$, and in the sluggishness of adjustment to that long-run equilibrium, which is measured here by the mean lag, $-(1+\beta_1)/\beta_1$. Finally, real-wage resistance to increases in taxes and import prices might be expected to be less pronounced in economies that are corporatist and exhibit a high degree of consensus. The short-run effect of tax and import price shocks is given by the coefficient on the wedge, β_3, and the long-run effect is given by $-\beta_3/\beta_1$.

All of these coefficients relate to the characteristics of the wage equation *per se*. More generally, the degree of corporatism may influence not only wage-setting behaviour but also employment directly. In terms of the labour market as a whole, a sensible question to ask is how quickly the effects of a temporary shock to employment or wages are eradicated from the system. An efficiently functioning labour market will presumably ensure that the effects of a transitory shock are short-lived. Equation (11) gives the dynamic equation relating employment to a wage (tax, import prices or search) shock, and the mean lag in the response is given by

$$(12) \quad -(\delta_1+2\delta_2+3\delta_3)/(\delta_0+\delta_1+\delta_2+\delta_3) = (\alpha_4\beta_1-\alpha_1\beta_1-2\alpha_1\beta_1)/(\alpha_1\beta_1+\alpha_2\beta_2).$$

This is also the mean lag between an employment (demand) shock and the wage, and therefore provides a single summary statistic of the efficiency of the labour market as a whole. Table 6 also includes the mean lag for each country in the sample, based on the estimates of Table 3.

Because the measure of corporatism is qualitative rather than quantitative, non-parametric methods are needed to assess the degree of association between the various coefficients and the corporatism ranking in Table 6. In each case we have computed the coefficient in question and then ranked the countries in the order, most responsive/shortest mean lag to least responsive/longest mean lag.[16] Table 7 gives the value of Kendall's tie-adjusted τ statistic (Kendall, 1970) between each of these rankings and the corporatism ranking.[17] For comparison, we have also included the τ statistics for the association between the degree of corporatism and the average level of unemployment over 1980–83 and with the change in the average level of unemployment between 1956–66 and 1980–83 in the table.

The results support the idea that the functioning of the labour market is related to the degree of corporatism. Wages in the more corporatist economies display a greater response to unemployment in both the long and (especially) the short run. Even more pronounced is the association with the response to changes in the wedge between consumer and product wages, with the effect of changes in taxes or import prices on the wage, and hence on unemployment levels, being significantly smaller in corporatist economies. Finally, adjustment, not only of wages but especially of the labour market as a whole, is faster in corporatist environments. In comparison, the association with the average level

TABLE 7

ASSOCIATION WITH CORPORATISM INDEX (KENDALL'S τ)

		Partial τ	
	τ	With corporatism, controlling for unionization	With unionization, controlling for corporatism
Short-run effect of unemployment on wage (β_2)	0·391	0·391	−0·061
Long-run effect of unemployment on wage ($-\beta_2/\beta_1$)	0·199	0·186	0·018
Short-run effect on wage of tax and import price wedge (β_3)	−0·435	−0·478	0·231
Long-run effect on wage of tax and import price wedge ($-\beta_3/\beta_1$)	−0·524	−0·530	0·113
Speed of adjustment in wage equation $\{(1+\beta_1)/\beta_1\}$	0·258	0·197	0·206
Overall speed of adjustment of employment $\{(\delta_1+2\delta_2+3\delta_3)/(\delta_0+\delta_1+\delta_2+\delta_3)\}$	0·406	0·377	0·067
Average level of unemployment, 1980–83	0·244	0·268	−0·123
Change in average level of unemployment between 1956–66 and 1980–83	0·125	0·149	−0·100

Note: 1 per cent significance level = 0·426, 5 per cent significance level = 0·309, 10 per cent significance level = 0·250.

of unemployment since the start of the 1980s, and more especially with the rise in unemployment since the 1950s and 1960s, is rather weak. Thus, more corporatist economies may possess labour markets that function more efficiently in the face of shocks, but this does not imply that their unemployment experience has necessarily been less unpleasant. For that, one needs to look at both the shocks that have impinged on the economy and the response of governments, in both their demand management and their tax policies.

It could be objected that corporatism matters only in economies that are already highly unionized. A perfectly competitive labour market should also function efficiently, while high unionization without a corporatist consensus is the worst of all worlds. Table 7 therefore also includes values of Kendall's partial τ statistic,[18] conditional on the unionization rate (given in Table 6). It can be seen that the correlation coefficients are hardly altered by controlling for the degree of unionization. The converse of this is that the unionization rate has very little effect on the efficiency of the labour market or its responsiveness to shocks once the degree of corporatism has been controlled for (again, see Table 7). Of course, the unionization rate may mean different things in different countries, and may not be a good guide to the relative importance of unions in the wage-setting process. Nevertheless, the results are not very supportive of the notion that unions *per se* inhibit the efficient functioning of the labour market.

Concluding Remarks

Unemployment has risen markedly in most of the OECD countries during the past decade or so. Is this the result of supply or demand factors? Our answer is that it is six of one and half a dozen of the other. The estimated wage and employment equations confirm the view that for most countries both demand and the level of real wages affect employment. The decline in demand, relative to potential, seems to have been an important proximate cause of the rise in unemployment, especially in the European Community. However, it is clear that supply-side factors have also played a significant role. This is a broad conclusion that seems to be shared by many of the authors who have contributed to this volume, even if the details are often different.

The evidence also seems to support the notion that structural differences in labour markets can be related to national differences in institutional and social characteristics. In particular, wages seem to be more responsive to labour market disequilibrium and less responsive to tax and import price shocks, and the labour market as a whole seems to adjust more quickly in economies that are more corporatist in nature. However, our analysis of international differences in labour market performance is perforce very crude. The impact of different modes of labour market organization across the developed countries can be fully appreciated only by reading the various country papers which reveal a rich variety of customs and institutions. An unanswered question is the extent to which these institutional arrangements are themselves a response to the economic environment.

Although institutional characteristics seem to be important in explaining differences in labour market behaviour, it appears that more corporatist economies have not necessarily fared better with respect to the rise in unem-

ployment. There is, however, some suggestion that the overall level of unemployment is lower in these countries, perhaps because there is more 'disguised' unemployment. In order to explain international differences in unemployment performance, therefore, one also needs to look at both the external shocks impinging on the economy and the stance of government policy. The latter includes not only the macroeconomic impact of fiscal and monetary policy, but also the microeconomic effects of the tax and benefit system and of labour market policy.

ACKNOWLEDGEMENTS

This paper is largely the work of Charlie Bean who must therefore take the blame for errors. Statistical advice from Jan Magnus is gratefully acknowledged.

APPENDIX: DATA SOURCES

N Total employment (including armed forces). *Source*: OECD *Labour Force Statistics.*

U Standardized unemployment rate. *Source*: OECD *Economic Outlook* (various) and Grubb (1984).

L Labour force; defined as $N/(1-U)$.

K Capital stock; calculated from investment data by perpetual inventory assuming a depreciation rate of 5 per cent per annum and no trend in the capital–output ratio between 1950 and 1974. *Source*: OECD *National Accounts.*

W Labour costs; calculated as $W_H(\hat{H}/H)^{0.25}(1+t_1)$, where W_H is hourly earnings in manufacturing, H is average weekly hours and $\hat{H}$ is a proxy for normal hours, obtained as the fitted value from a regression of $(H-4)$ on a constant and trend. *Source*: OECD *General Statistics*; OECD *Main Economic Indicators*; and International Labour Office (ILO) *Yearbook of Labour Statistics.*

P GDP deflator at market prices. *Source*: OECD *National Accounts.*

P_M Import price deflator. *Source*: OECD *National Accounts.*

S_M Share of imports in GDP. *Source*: OECD *National Accounts.*

t_1 Employment taxes on firms; ratio of employers' contributions to social security and pensions to the wage bill. *Source*: OECD *National Accounts*; ILO *The Costs of Social Security.*

t_2 Tax rate on household income; household contributions to social security and direct taxes as a proportion of receipts. *Source*: UN and OECD *National Accounts.*

t_3 Indirect tax rate; calculated as indirect taxes (net of subsidies) as a proportion of consumers' expenditure. *Source*: OECD *National Accounts.*

Data for government expenditure and GDP used to construct σ (see text) are also taken from OECD *National Accounts.* The data set is described in Grubb (1984).

NOTES

1. See for instance the special issue of the *Journal of Labour Economics*, (January 1985).
2. This follows the fact that marginal cost is always equal to the wage divided by the marginal product of labour.
3. In general, demand will have the same qualitative effect on employment as it has on the elasticity of demand. It is sometimes suggested that the elasticity of demand rises in booms, which would lead to $f_\sigma^1 > 0$, but $f_\sigma^1 < 0$ is a logical possibility.
4. Note that this model does not encompass efficient contracting models of the McDonald–Solow (1981) variety. In these models firms and unions bargain over both wages and employment. Equation (3) will still describe wage-setting behaviour, but the employment function (1) now also depends on outside opportunities, including the shift variables Z^s.
5. For the Netherlands, estimation over the full sample yields a root almost on the unit circle—the system mean lag is 22 years! This appears to be associated with some parameter instability

at the very start of the period. The sample for the Netherlands omits the first two observations and runs from 1955 to 1983.

6. For a number of countries vacancy data are available only over a sub-sample. For these countries (8) was estimated over this sub-sample and the resulting coefficient estimates were used to construct ϕ over the full sample. For Ireland and Italy no vacancy data are available and ϕ is a simple linear trend for these countries.
7. Its appropriateness as a measure of fiscal impact is in any case open to question (see Buiter, 1985).
8. Real balances are not available for all countries and were generally insignificant for those countries where data were available.
9. The capital stock series are constructed from investment data so as to ensure no trend in the capital-output ratio between 1950 and 1974. Hence, our measure of demand relative to potential is approximately trendless over this period. We also constructed a measure of potential output along the lines of our previous work and used this as a normalizing factor. It made little difference to the results.
10. Strictly speaking, current competitiveness is, of course, endogenous and we could either estimate the complete model in equations (1)–(4) or else substitute out current competitiveness, replacing it by all the other exogenous variables in the system. The first is beyond the scope of this introductory paper, although we intend to pursue it in the future. The second is rather profligate with degrees of freedom, and our approach is likely to perform better in small samples. (Recall that our objective is to obtain a measure of σ that is largely independent of the error in the employment and price equations.)
11. The standard errors are not strictly valid since σ is a generated regressor. Pagan (1984) provides a comprehensive discussion of the use of generated regressors.
12. Layard and Nickell (1985b) report a significant negative wage elasticity using a slightly different specification, as do Newell and Symons (1986). Both of these papers use lagged real wages in their employment equation for the United States.
13. For the United States, $\delta_0 = 1$, $\delta_1 = \alpha_2\beta_2 - (2 + \alpha_1 + \alpha_4 + \beta_1)$, and (10) becomes

$$(\delta_0 + \delta_1 B + \delta_2 B^2 + \delta_3 B^3) \log N = (\alpha_2\beta_0 - \alpha_0\beta_1) + (\alpha_1\beta_1 + \alpha_2\beta_2) \log L_{-1} + \Delta(\alpha_5 t + \alpha_6 t^2 - \alpha_1 \log K) + \alpha_3\{1 - (1 + \beta_1)B\}\sigma + \alpha_2\beta_3\theta_{-1} + \alpha_2\beta_4\phi_{-1}.$$

14. Such hysteresis effects might also be modelled by entering the change rather than the level of unemployment in the wage equation. However, for most of the countries in our sample the change in unemployment is insignificant when added to equation (10b). It may be that such an effect is too subtle to be modelled in such a simple way.
15. McCallum (1984) also relates the degree of real-wage rigidity in the Phillips curve to the level of corporatism.
16. With respect to the wage–unemployment trade-off, Japan and Italy, both of whom display perverse estimated trade-offs, are ranked top and bottom, respectively.
17. Kendall's τ ranges between plus and minus unity like an ordinary correlation coefficient.
18. The distribution of partial τ is not known. It is, however, asymptotically equivalent to the distribution of τ when the controlled-for ranking is independent of the other two rankings. See Kendall (1970) and Moran (1951).

REFERENCES

BRUNO, M. and SACHS, J. (1985). *The Economics of Worldwide Stagflation.* Oxford: Basil Blackwell.

BUITER, W. H. (1985). A guide to government debt and deficits. *Economic Policy*, **1**, 13–61.

CAMERON, D. R. (1982). Social democracy, corporatism, and labor quiescence: the representation of economic interest in advanced capitalist society. Paper presented at the conference on Governability and Legitimacy in Western European Democracies, Stanford University.

DUNLOP, J. T. (1944). *Wage Detrmination Under Trade Unions.* New York: Macmillan.

GRUBB, D. (1984). The OECD data set. London School of Economics, Centre for Labour Economics, Working Paper no. 615.

JACKMAN, R. A., LAYARD, P. R. G. and PISSARIDES, C. (1984). On vacancies. London School of Economics, Centre for Labour Economics, Discussion Paper no. 165.

JOHNSON, G. and LAYARD, P. R. G. (1986). The natural rate of unemployment and labor market policy. In O. Ashenfelter and P. R. G. Layard (eds), *Handbook of Labor Economics.* Amsterdam: North-Holland.

KENDALL, M. G. (1970). *Rank Correlation Methods.* London: Charles Griffin.

LAYARD, P. R. G. and NICKELL, S. J. (1985a). The causes of British unemployment. *National Institute Economic Review*, **111**, 62–85.

—— (1985b). Unemployment, real wages and aggregate demand in Europe, Japan and the US. *Journal of Monetary Economics*, Supplement, 143–202.

MCCALLUM, J. (1983). Inflation and social consensus in the seventies. *Economic Journal*, **93**, 784–805.

—— (1984). Unemployment in the OECD countries in the 1980s. Unpublished paper, University of Quebec (mimeo).

MCDONALD, I. and SOLOW, R. M. (1981). Wage bargaining and employment. *American Economic Review*, **71**, 896–908.

MORAN, P. A. P. (1951). Partial and multiple rank correlation. *Biometrika*, **38**, 26.

NEWELL, A. and SYMONS, J. S. V. (1986). Wages and employment in the OECD countries. *Economic Journal* (forthcoming).

PAGAN, A. R. (1984). Econometric issues in the analysis of regressions with generated regressors. *International Economic Review*, **25**, 221–48.

PENCAVEL, J. H. (1982). Wages, specific training, and labor turnover in US manufacturing industries. *International Economic Review*, **13**, 53–64.

SHAPIRO, C. and STIGLITZ, J. E. (1984). Equilibrium unemployment as a worker discipline device. *American Economic Review*, **74**, 433–44.

STIGLITZ, J. E. (1984). Theories of wage rigidity. Paper presented at the conference of Keynes's Economic Legacy, Delaware.

TARANTELLI, E. (1982). The economics of neocorporatism. Chapter 1 of unpublished book. Rome: Bank of Italy.

WEISS, A. (1980). Job queues and layoffs in labour markets with flexible wages. *Journal of Political Economy*, **88**, 526–38.

Economica, **53**, S23–S34

Unemployment: Getting the Questions Right

By Robert M. Solow

Massachusetts Institute of Technology

In my opinion, the form and conception of this conference exemplifies the right instinct for modern macroeconomics. There is a fact, a big unmistakable unsubtle fact: essentially everywhere in the modern industrial capitalist world, unemployment rates are much higher than they used to be two or three decades ago. Why is that? If macroeconomics is good for anything, it ought to be able to understand and explain that fact. We should be able to produce a fairly convincing analytical account of the occurrence and persistence of unusually high unemployment rates.

You might think that to be a mere commonplace. To what other sort of end would anyone organize a conference? My experience, however, is that most high-powered academic conferences are stimulated by purely technical developments, or—less often—by ideological or political promotion, rather than by the need to deal with an outstanding fact. I do not blame anyone for this state of affairs. We may not be blessed with many significant observations too big to be quibbled over. And technical innovations do need to be thrashed out by experts. Anyway, it is good to be faced by a brute fact that needs explanation. It is what macroeconomics ought to be about.

I compliment the organizers also on a second aspect of the agenda: the country-by-country organization of the papers. We can all hope to learn something from cross-country comparisons. One of the few good ways we have to test analytical ideas is to see whether they can make sense of international differences in outcomes by appealing to international differences in institutional structure and historical environment. The right place to start is within each country separately, studied by someone who knows the peculiarities of its history and its data.

You might think that this too ought to be obvious. But in fact the usual approach is just the opposite. More often than not we fail to take institutional differences seriously. One model is supposed to apply everywhere and always. Each country is just a point on a cross-section regression, or one among several essentially identical regressions, leaving only grumblers to worry about what is exogenous and what is endogenous, and whether simple parametrizations do justice to real differences in the way the economic mechanism functions in one place or another.

I have no way of knowing whether this organized effort will get anywhere in explaining high unemployment, but it seems to be set up to give itself the best chance.

For better or worse, probably for the better, theoretical and empirical work are closely intertwined in macroeconomics. Scratch a macro-theorist and you find a casual econometrician. Scratch a macro-econometrician and you find a casual theorist. Usually you do not have to scratch very hard. Thus, the discussion of the issues central to the conference has already hardened into certain characteristic forms. There are questions already lying on the table that the individual country papers will be trying to answer. I suspect that some

of these questions are badly or carelessly posed. Answers to badly posed questions usually have corresponding problems of their own.

Perhaps I had better say what I mean by a badly posed question: I mean that it is hard to imagine a plausible theoretical framework in which the question makes sense, or in which any answer can sensibly and unambiguously be interpreted. So I propose to raise and discuss some theoretical issues suggested by the form that the analytical debate has already taken.

For example, if past performance is any sort of a guide, many of the papers at this conference will be preoccupied with the relation between real wage rates and employment, and more particularly with the question of whether unemployment rates in Europe are currently unusually high mainly because 'real wages are too high'. I want to argue that much of this argument lacks an acceptable theoretical framework (or makes sense only in a theoretical framework that many of those who make the argument would not really wish to accept). It is not my intention to prejudge the answer, but rather to clarify the question. To be specific, I want to propose that the useful questions are better phrased in terms of nominal wage behaviour even when the desired answers relate to real wages. There is no implication here that anyone 'cares' about the nominal wage. The point is rather the old one that groups of workers and employers cannot bargain over the real wage.

The second issue I want to nominate for discussion is more of an old chestnut and is usually taken as essentially settled in current research and policy analysis. it has to do with the 'natural rate of unemployment'. I do not want to question what appears to be a robust finding of recent research on the Phillips curve: that the term that is usually identified as either a forward-looking 'expected rate of inflation' or a backward-looking carrier of 'inertial inflation' enters with a coefficient very near to one. I shall not even ask why that was not so during a sample period running from 1950 to the mid-1960s and what one is to make of that fact, if it is a fact. But I do want to suggest that the usual, if casual, interpretation of the 'natural rate' has very little basis either in theory or in data analysis. In a sense, it is not clear what we are talking about when we talk about the natural rate.

Finally, I want to say a word about the concept of 'involuntary unemployment' because I think that there has been a loss of analytical clarity in recent years. There is no real intellectual difficulty here, only a kind of careless backsliding into vagueness. One needs to be reminded only because otherwise the lack of clarity tends to affect other aspects of the ongoing discussion.

I. Real and Nominal Wages

What does it mean to say that high unemployment is caused by high real wages? Are not real wage rates and unemployment both endogenous variables in any reasonable picture of a modern capitalist economy? The father of the contemporary discussion of this question is probably Edmond Malinvaud, and he, characteristically, is completely clear about what is required for this manner of speaking to make analytical sense, and about the possibility that the requirements will not be meant in any concrete instance:

> The subject (i.e. why unemployment may result from inappropriate real wages) would not arise if the evolution of real wages was strictly determined by the growth

process and had no autonomy with respect to other determinants of this process. But some of the questions now raised precisely assume such an autonomy, and I shall take it to exist, even though I easly recognize that the evolution of real wages is mostly induced. Malinvaud, 1982, p.1]

When might an analytical observer find it useful to treat an economy's real wage as given? I suppose the simplest case would be that of an economy whose internal prices are largely determined in international markets via a fixed exchange rate and whose nominal wages are imposed on it by a more or less omnipotent trade union movement or perhaps a government agency. The wage-setting agency has to be more than omnipotent: it has to be in a sense arbitrary. If there is a structural equation—a sort of 'deep structure' or reaction function—underlying the behaviour of nominal wages, then the real wage is endogenous after all. If, for instance, the union or wage board cares about unemployment (has a Phillips curve in its head), then it is no longer meaningful to say whether the real wage causes unemployment or unemployment causes the real wage. We have to adopt the right procedure, which is to look for the true exogenous variables.

Another story I have heard tells of an economy in which prices are exogenous and nominal wage rates are tightly and fully indexed. Then the real wage is not only exogenous but more or less constant, except for bias built into the indexing formula. This may have been the case for some periods in some European economies—Italy, for example. It seems unlikely, however, that the real wage will stay constant for ever. There must be some endogeneity somewhere, if only through wage drift, and the right strategy is to bring it into the open.

There may be other stories that lead to predetermined prices and nominal wages, and therefore to predetermined real wages. They all seem pretty special, which is not to deny that they may be true from time to time and place to place. But I imagine that the general theoretical picture in the minds of most macroeconomists is rather different. Let me try to reconstruct it in static terms, trying not to be so specific as to evoke disagreement on particular points.

Usually both the real wage and the level of employment are endogenous variables. A well specified aggregative model will have some exogenous variables as well. It will also have an equilibrium concept, perhaps more than one, each appropriate to a particular 'length of run'. The model will map each possible configuration of the exogenous variables into an equilibrium configuration of the endogenous variables. If one of the equilibrium conditions of the model says 'Employment (or demand for labour) equals supply of labour', that equation should be omitted or suspended. Otherwise the model is not suitable for studying the problem of unemployment, at least not for the length of run under consideration.

This set-up can be exemplified in terms of the simplest version of the model in the back of everyone's mind. Imagine an economy consisting of a fixed number of firms, identical except that each is the sole producer of a slightly differentiated product. The demand function facing the ith firm is $A(\ldots, \ldots)D(p_i/p)$. Here A is an aggregate demand factor. It is written as a function of unspecified variables to indicate that it depends on one or more exogenous policy variables, such as tax rates and the money supply. A may also be a function of some endogenous variables—the real money supply, for

example. The multiplicative form has the symmetric implication that any change in aggregate demand shifts the demand curve facing each firm in the same proportion and isoelastically. The fraction of aggregate demand flowing to each firm falls as the ratio of its price to the appropriately defined price index rises. The demand curves are identical from firm to firm. In a moment I will make the same assumption about the technology. Thus, in symmetric equilibrium, each $p_i = p$.

These monopolistically competitive firms set their own prices as profit-maximizers. They are, however, price-takers in the labour market, where they face the common nominal wage w. All I need from the common technology is a common demand function for labour, denoted $N\{w, AD(p_i/p)\}$. The wage is inserted as an argument of this function to allow informally for substitution possibilities, so the partial derivatives are negative and positive, respectively. I am fudging here about capital and other inputs, but that is only to avoid unnecessary complications. In the standard short-run case, when labour is the only variable input, the demand for labour is $F^{-1}\{AD(p_i/p)\}$, where $y_i = F(N_i)$ is the short-run production function.

The ith firm chooses p_i to maximize its profit $p_i AD(p_i/p) - wN\{w, AD(p_i/p)\}$, ignoring of course the effect of its own decision on p. In a symmetric Nash equilibrium in prices, therefore, $(1-j^{-1})/N_2 = w/p$, where j is the elasticity of $D(\cdot)$ evaluated at $p_i/p = 1$, taken to be positive and assumed for the usual reason to exceed unity. The employment offered by the representative firm is simply $N\{w, AD(1)\}$. Obviously there are loose ends to be tied up, but this is enough to make the main point. In this model the exogenous variables are the nominal wage and whatever exogenous factors determine the level of aggregate demand. There are two equations to determine the endogenous variables: the common price p, and the level of employment N.

For a finger exercise, take the case already mentioned, where labour is the only variable input. In addition, specify $A = A(M, p) = M/p$: aggregate demand is given by the quantity theory of money with constant velocity, set equal to one by choice of monetary unit. The two equations of the model become:

$$(1) \qquad kF'(N) = w/p$$

and

$$(2) \qquad F(N) = (M/p)D(1) = (M/w)(w/p)D(1)$$

where

$$k = 1 - j^{-1}.$$

In what follows, I am going to assume that k is more or less constant, or, more precisely, that variations in the elasticity of demand along the demand curve are not so large as to undermine simple qualitative presumptions. If they were, that would only strengthen the larger case I am trying to make.

Equation (1) defines a negatively sloped curve in the plane of w/p and N. It looks like the 'demand curve for labour'. It does, in fact, say that the wage

equals the marginal revenue product of labour. It would be the ordinary demand curve for labour *if w and p were exogenous to the representative firm.* Suppose, as in Figure 1, that the economy were at point *A*, to the left of the vertical corresponding to the supply of labour. It would be tempting to say that unemployment of the amount $N^s - N_0$ occurs because the real wage is too high. But the causal statement is fundamentally misleading. In the model, firms do not 'face' the real wage w/p: they face the nominal wage w, and they *choose* the real wage by choosing p. There is no point in wishing that w/p were at the level corresponding to full employment because w/p is not available for wishing: wishing should be reserved for exogenous variables or for parameters, and, at least in this model, w/p is endogenous.

The correct way to read the figure is different. From (1) and (2) it is clear that the two exogenous variables M and w affect the outcome only through the single exogenous factor M/w, the money supply in wage units. Substitution of (1) into (2) yields:

$$(3) \qquad kD(1)(M/w) = F(N)/F'(N).$$

Thus, N is an increasing function of M/w. Then (1) says that w/p must be a decreasing function of M/w. In the figure, then, the economy traverses from north-west to south-east along the curve as M/w rises. The meaningful causal statement is that, at point A, unemployment occurs because the money supply is too low and/or the nominal wage is too high. That is what I meant earlier by the remark that the focus should be on the nominal wage even if the real wage is higher than its full-employment level. If the nominal wage were lower than it is at *A*, the price level would be lower too, but not by so much as to keep the real wage from being lower and employment from being higher. (Please note: these are statements about 'lower' and 'higher'—'falling' and 'rising' are a much more complicated dynamic story.)

It goes without saying that a serious macro-model would add a lot of complications. I shall mention only some of the more important possibilities.

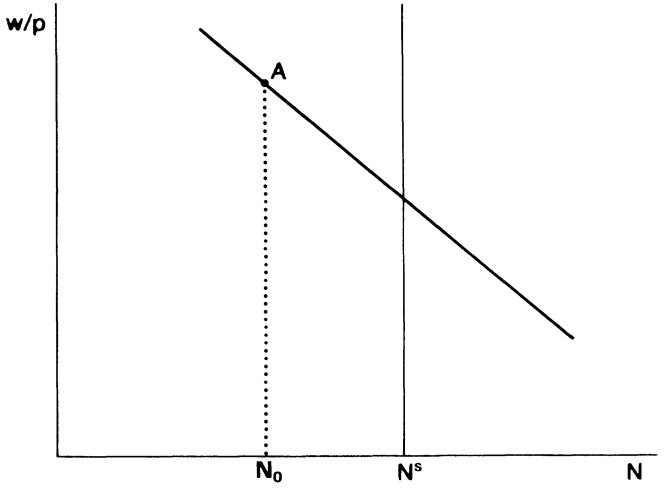


FIGURE 1. An equilibrium locus.

First of all, the two key simplifying assumptions—that aggregate demand is governed by a childishly simple quantity theory, and that employment is determined uniquely by the level of output—combined to reduce the effective number of exogenous variables to one, the money supply in wage units. A model of aggregate demand complex enough to interpret the real world would certainly involve a considerably larger number of exogenous variables: fiscal policy variables, open-economy variables, and probably others. For example, as soon as there are two variables, the real wage–employment plane is covered by a family of equilibrium loci, each describing how the equilibrium point varies with one of the exogenous factors for prescribed setting of the others. Questions of policy mix arise, and multiple causation will be the rule. Full employment may be achievable with a range of real wage rates. Statements about the real wage being 'too high' will have to be qualified still further.

A secondary easy finger exercise will clarify the situation. Suppose now that the capital stock is fixed in the short run, but there is another variable factor—imported raw materials, say, whose domestic currency price is constant throughout, and can thus be suppressed. Shephard's Lemma applied to the capital-restricted cost function gives the conditional demand function for labour, $N(w, y)$. Let this have the form $w^{-a}y^{b}$, as for a Cobb–Douglas technology, or a valid local approximation to almost any smooth technology. Here y will be replaced by $AD(1) = A$ in symmetric equilibrium; a and b are positive constants and the unit cost curve is locally falling or rising according as $b<1$ or $b>1$.

For simplicity, if no one will laugh, I hold to the quantity theory specification, $A = M/p = (M/w)(w/p)$. Then it is easy to solve the model; i.e. write down the mapping from the exogenous variables (M, w) to the endogenous variables $(N, w/p)$:

$$N = (k/b)(M/w) \tag{4}$$

and

$$w/p = (k/b)^{1/b} w^{(a+b-1)/b} M^{(1-b)/b}. \tag{5}$$

Thus the money supply and the nominal wage determine the price of goods and the level of output, and therefore the level of employment and the real wage. Output and employment are no longer uniquely related on account of the second variable factor.

Now fix M and treat w as a parameter to get the representation:

$$w/p = (k/b) M^{b/a} N^{(1-a-b)/b}. \tag{6}$$

Assuming that $a+b>1$, this defines a family of negatively sloped curves in the real-wage–employment plane, as in Figure 2. Two of the curves are drawn, with $M_1 > M_0$. (Changes in the domestic price of raw materials will shift the whole family of curves.)

Suppose that $M = M_0$, and the nominal wage is such as to put the economy at point A. It is certainly correct to say that a lower nominal wage would lead to a lower real wage and would achieve full employment at B. In that sense the real wage is too high. It is equally true, however, that full employment is

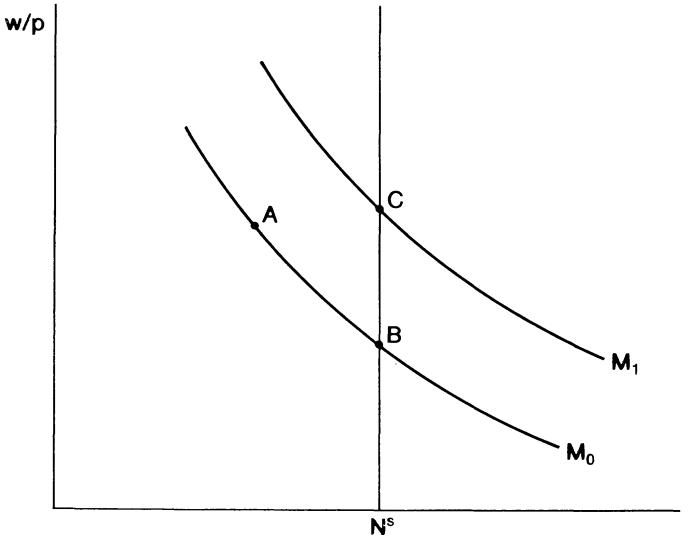


FIGURE 2. A family of equilibrium loci.

achievable at *C* with a larger money supply (read: aggregate demand), a higher nominal wage and the same real wage, or even a slightly higher one. Rational discussion of the choice requires both a more complete and sensible model than the sketch I have used and serious attention to the dynamics of wages, prices and employment. It is certainly inadequate, however, just to say that the real wage is too high, as if the real wage were 'everywhere and always' an exogenous variable.

Substitution possibilities in production offer still other variations on the basic theme. If persistent under-utilization and unemployment reduces investment and the stock of capital, then an equilibrium locus, like that in the diagram, may shift to the left, lowering the real wage corresponding to full employment.

Mention of capital accumulation is a reminder that up until now the discussion has been confined to the short run, with a fixed number of firms. A short-run equilibrium—a point on (one of) the equilibrium locus (loci)—could yield positive or negative profits for each identical firm. A natural longer-run equilibrium concept could be Chamberlinian: positive or negative profits evoke entry or exit, until the number of firms is such that equilibrium profits are zero. If firms typically operate along U-shaped cost curves, entry of optimum-sized firms could even be the vehicle by which investment occurs.

But then a quite remarkable configuration can easily arise. A long-run equilibrium locus, analogous to the short-run curve in the figure, can turn out to be positively sloped. A model along these general lines can be constructed with the following property: with a fixed number of firms, exogenous variations in aggregate demand cause employment and the real wage to move in opposite directions, one rising while the other falls; but variations in aggregate demand sustained long enough for entry and exit to eliminate profits will trace out a long-run equilibrium locus along which employment and real wages rise and fall together. The underlying idea is that higher aggregate demand induces

both an increased number of firms and an increase in the size of each firm. As firms move down the falling branch of their U-shaped cost curves, with competition eliminating pure profits, the equilibrium real wage can easily rise. That is certainly a powerful blow to simplistic statements about 'classical unemployment'.

It seems pretty clear that this sort of model could be adapted to describe an open economy in which the domestic market is shared by foreign and domestic firms. That will make it more likely that higher real wages—or, better still, relative wages—will be associated with domestic unemployment. But the range of exogenous variables driving the real or relative wage will be correspondingly enlarged.

My object in this section was not a particular explanation of the recent shift to higher unemployment rates. But I hope to have made a case that one of the currently popular ways of asking and answering the question is improperly formulated and therefore unlikely to lead to clear thinking. The proper strategy is to focus on the exogenous variables (and of course on the equilibrium conditions themselves). Whatever one may believe about the nominal wage, the real wage is unlikely to be exogenous, except under special circumstances.

II. The Natural Rate of Unemployment

Milton Friedman, it will be remembered, originally defined the 'natural rate of unemployment' as the unemployment rate 'ground out by the Walrasian equations', or words to that effect. The concept, or a concept going under that name, has become firmly established in the literature. But I doubt that many of those who use the concept would accept Friedman's definition, or would imagine econometric estimates of the 'natural rate' to be estimates of a component of Walrasian equilibrium, or would regard the Walrasian model as a valid representation of anything that a macroeconomist would be much interested in.

In practical terms, the 'natural rate' these days figures in two ways. It might appear as a NAIRU, an unemployment rate below which the economy can not stay without accelerating inflation. Or—in models that contain an 'expected inflation' or 'inertial inflation' term on the right-hand side with a coefficient of unity—it occurs as the unemployment rate compatible with a rate of inflation that does not deviate from the expected or inertial rate. This shift of meaning is important because it diminishes the temptation to ascribe optimality properties to the natural rate as one might automatically do with a Walrasian concept.

There is a minor ambiguity about the first—the NAIRU—definition. It is compatible with the idea of a long-run Phillips curve that slopes downward everywhere, but has a vertical asymptote at the left, at a positive unemployment rate, precisely the NAIRU. The second definition, however, insists on a vertical long-run Phillips curve, and defines the long run to be a state in which the actual and expected (or inertial) inflation rates are equal.

In recent years the vertical Phillips curve interpretation of the natural rate has come to dominate the literature. There seem to be two reasons for this. First, econometric Phillips curves estimated from post-965 sample periods

routinely produce near-unit coefficients on the expectational or inertial variable, so the empirical basis is there. The second reason is purely theoretical: if we imagine two otherwise identical economies, fully adjusted to different rates of inflation (and money supply growth, say), we see no reason for them to have different real outcomes. This is why, way back in 1969, I described the vertical long-run Phillips curve story as 'hard not to believe'. It does, however, put quite a lot of strain on the notion of 'fully adjusted'.

This version of the natural rate of unemployment also has one very uncomfortable implication that seems not to have been directly faced in the literature. Later on, in another connection, I am going to refer to some recent estimates of the natural rate in several OECD countries. One of these puts the current natural rate at 8·0 per cent in the Federal Republic of Germany and at 2·4 per cent in Austria. One might be prepared to agree that there would eventually be accelerating inflation in Germany if the unemployment rate were held below 8·0 per cent for a long time, and in Austria if the unemployment rate were held below 2·4 per cent for a long time. Would anyone, however, accept the symmetrical proposition: that there would eventually be accelerating deflation in Germany if the unemployment rate were above 8·0 per cent for a long time, and in Austria if the unemployment rate were to exceed 2·4 per cent for a long time? Somehow one doubts it. Yet that is an implication of the whole apparatus.

The easy dodge will not work. One is tempted to say, Oh, well, so the natural rate is a bit fuzzy, an interval rather than a point, and there is a band in which the Phillips curve slopes down, even in the long run. The trouble is that, if the band is very narrow, the discomfort remains: would one believe that Austria would have accelerating deflation if the unemployment rate were sustained at 2·6 per cent? If the band is fairly wide, however, then, in effect, the long-run Phillips curve is not vertical and one can talk about trade-offs within that 'fairly wide' zone.

If there is a natural rate of unemployment, then it is clearly important for policy purposes to know what it is. It would make a lot of difference to policy whether the high unemployment rates we are here to discuss occur because the natural rate is very high or because current unemployment is far above the natural rate. Of course, there are estimates of the natural rate, and this conference will undoubtedly produce more.

Estimates of the natural rate in the NAIRU tradition tend to emphasize changes in the composition of the labour force by demographic or skill category, obstacles to mobility, the size of unemployment insurance benefits, and such factors. In the vertical Phillips curve tradition, however, the estimated natural rate arises from the Phillips curve itself if the coefficient on the inertial-expectational variable is unity: one simply equates the current and expected inflation rates and solves for the implied natural rate of unemployment (which will then be a function of any other right-hand side variables). That is nowadays the common procedure.

A mild paradox arises here. Those who estimate the natural rate in this way occasionally go on to discuss events or policies that might possibly change the natural rate. When they do, they normally talk about the factors I mentioned earlier as figuring in the NAIRU tradition. But those factors have played no role in the estimation. It seems like rather a bold leap, calling for more

justification than it gets. One can always *define* the unemployment rate to be below the natural rate whenever inflation is accelerating. But then it is vacuous to say that inflation is accelerating because unemployment is below the natural rate.

The main point I want to make about estimates of the natural rate is rather different. For concreteness I turn to a recent Working Paper of the OECD Economics and Statistics Department (Coe and Gagliardi, 1985). I emphasize that I am not being critical of this paper, which seems to be an excellent and exceptionally thoughtful example of the genre: it is the genre I want to question.

The paper produces vertical Phillips curve estimates of the natural rate for nine or ten countries, and for three or four sub-intervals of the period since 1961 or 1967. Their Phillips curves are not really vertical because changes in unit labour costs need not be passed one-for-one into changes in domestic prices, with changes in import costs accounting for the difference. But the numbers seem to allow the point I want to make. As already mentioned, the current (early 1980s) natural rates range from 2·3 and 2·4 per cent in Japan and Austria to 8·0 per cent in Germany and 9·0 per cent in France. (Surprisingly, I guess, the estimate for the UK, which was 7·3 per cent in 1976–80, falls to 5·9 per cent in 1981–83; but there is a variant, with a different treatment of import prices, that gives a figure of 9·6 per cent for 1981–83. The alternative treatment of import prices gives more sensible-looking results for the United States too, but my argument does not depend on such details. Coe and Gagliardi are, however, calling attention to a neglected aspect of the NAIRU in an open economy.)

The country papers at this conference will very likely emerge with estimates of the natural rate that vary widely from place to place. Can we rationalize those differences in terms of labour market institutions and other factors in a convincing way? It is hardly enough to allow that there are unspecified 'differences' between countries: the differences have to be quantitatively adequate to the task.

It is even more striking that the estimated natural rates within countries vary widely from sub-period to sub-period. The estimate for Germany goes from 1·6 to 8·0 per cent in ten years; that for France goes from 3·3 to 9·0 per cent in five years; that for the UK, from 2·6 to 7·2 per cent between 1967–70 and 1971–75. Can those dramatic changes be rationalized in a satisfactory way?

Coe and Gagliardi take note of the possibility that the apparent 'natural rate' may be closely related to observed past rates of unemployment. They perform an interesting experiment; but my interpretation of the outcome is utterly different from theirs. They enter the unemployment rate in the Phillips curve as a deviation from its own four-year (occasionally eight-year moving average. Here is their summary:

> In the case of Australia the improvement relative to the equation with just the unemployment rate is dramatic. As well as improving the explanatory power of the equation, the coefficient estimates on both the activity variable and the inflation rate become significantly different from zero, and the coefficient on the inflation term corresponds more closely to *a priori* beliefs. For the United Kingdom there is a marginal improvement in the equation. For the other countries, incorporating a natural rate specified in this way makes little difference to the estimation results and hence the more straigthforward specification . . . is maintained.
>
> [Coe and Gagliardi, 1985]

I take this as saying that the data do not prefer the conventional, natural rate, specification to the one that looks at lagged unemployment rates. But the implications of those two alternative hypotheses differ radically. The lag interpretation says that there is yet another way to bring down the currently effective 'natural rate': just have low unemployment for a while. That would seem to be front-page news. It is hardly a natural-rate story at all.

The proper conclusion is not that the vertical long-run Phillips curve version of the natural-rate hypothesis is wrong. I would suggest instead that the empirical basis for that story is at best flimsy. A natural rate that hops around from one triennium to another under the influence of unspecified forces, *including past unemployment rates*, is not 'natural' at all. 'Epiphenomenal' would be a better adjective; look it up.

III. Involuntary Unemployment

A year or two ago I had a memorable conversation with a few of my teaching colleagues in macroeconomics. We are discussing the coverage of the course we teach together: what must all of our graduate students, whatever their specialities, know about macroeconomics? I offered the (casual) opinion that we could leave out any treatment of the supply of labour, on the grounds that one can assume the supply of labour to be inelastically given and constant in the short to medium run without losing anything of significance to macroeconomics. One of my colleagues objected that that was impossible. I asked why. Because then one could not explain fluctuations in employment. I explained that I thought employment could be a lot smaller than the supply of labour. The look I got in return could have signified amusement, disbelief, pity and—maybe?—the dawning of a new idea, in unknown proportions. I would rather not know.

Someone once defined an economist as a parrot trained to repeat 'Supply and demand, supply and demand'. There are many worse things you could teach a parrot to say—and we hear them every day—but I want to suggest that, in the case of the labour market, our preoccupation with price-mediated market-clearing as the 'natural' equilibrium condition may be a serious error.

For example, it is often argued that individual unemployed workers could accept lower-skill, lower-paid jobs than they are used to, because such jobs are usually available. Since they do not do so, their 'unemployment' should be regarded as 'voluntary'. (I think I once pointed out that, by this standard, all the American soldiers who were killed in Vietnam could be counted as suicides since they could have deserted, emigrated to Canada or shot themselves in the foot, but did not.) The key point here is that the notion of 'involuntary unemployment' is not metaphysical or psychological; it has little or nothing to do with free will. From the economist's point of view, there is involuntary unemployment whenever, for any substantial number of workers, the marginal (consumption) value of leisure is less than the going real wage in occupations for which they are qualified. That definition covers underemployment as well as total unemployment, and it covers both the skilled mechanic who does not take work as a sweeper and the one who does. It has empirical content.

There is a valid and important question of why workers who are involuntarily unemployed do not actively bid for jobs by nominal wage-cutting.

It is an equally interesting observation that employers do not usually encourage such behaviour. Economic theory is not without useful answers to that question: there are asymmetric information theories, efficiency-wage theories, relative-wage theories, bargaining theories, fairness theories, insider–outsider theories. Research has come to no firm conclusion yet; and the problem of empirical discrimination has not even been touched. International comparison may play an important part here.

Any interesting and useful solution to that riddle will almost certainly involve an equilibrium concept broader, or at least different from, price-mediated market-clearing. (I say 'almost' to allow for the possibility that slowly self-correcting disequilibrium may turn out to be a better idea.) That will mean taking seriously the problem of modelling the strategy sets actually seen by firms and workers as available to them, and their criteria of choice. In neither respect, it seems to me, has economic theory yet done justice to the institutional and affective complexity of the labour market. The conventional assumptions seem particularly implausible and unappealing there.

Once one starts down that line, other interesting possibilities open up. We are all used to the idea that non-cooperative games can have inefficient equilibrium points. The example of Nash equilibrium has, of course, been studied in detail. In such cases it is natural to ask if there are better allocations that are cooperatively attainable, and what mechanisms could most effectively achieve them. That is what the theory of economic policy is presumably about. I do not think it will prove useful simply to turn macroeconomics into game theory; but I think it will be useful to incorporate some game-theoretic habits of thought into the way we do macroeconomic theory. Keynes's idea that anything that could be accomplished by wage deflation could be accomplished more quickly and less stressfully by monetary expansion is, right or wrong, an example of the sort of thing that needs to be done, a bit more formally and on a broader front.

REFERENCES

COE, DAVID T. and GAGLIARDI, FRANCESCO (1985). *Nominal Wage Determination in Ten OECD Countries.* OECD Economics and Statistics Department Working Paper no. 19, March. Paris: OECD.

MALINVAUD, EDMOND (1982). Wages and unemployment. *Economic Journal*, **92**, 1–12.

Economica, **53**, S35-S52

Aggregate Supply and Demand Factors in OECD Unemployment: An Update

By MICHAEL BRUNO

Hebrew University of Jerusalem

INTRODUCTION

Unemployment in the OECD countries has continued to rise to unprecedented levels. The EEC countries, which on average ended the turbulent 1970s with an unemployment rate of close to 7 per cent, are now, in the mid-1980s, approaching an 11 per cent level. The United States is virtually the only country for which the changes in unemployment during the 1970s have not been systematically upward and for which the 1984 rate was, more or less, back to where it had been both ten years and five years earlier (see Figure 1).

The reasons for the sustained increase in unemployment during the 1970s as well as the possible reasons for differences in patterns across industrial countries have been studied, but question marks undoubtedly remain. Our own emphasis in an earlier study has been on the combination of the great supply shocks of the previous decade and the contractionary macro-policy response of most OECD countries to these shocks, as well as on the more recent policy coordination problem between the United States and Europe. With a few more years that have elapsed, and quite a few percentage points of additional unemployment, there is obviously room for both an update and a reappraisal.[1]

Starting from a fairly conventional aggregate supply (AS) and aggregate demand (AD) macro-framework, an increase in unemployment may come

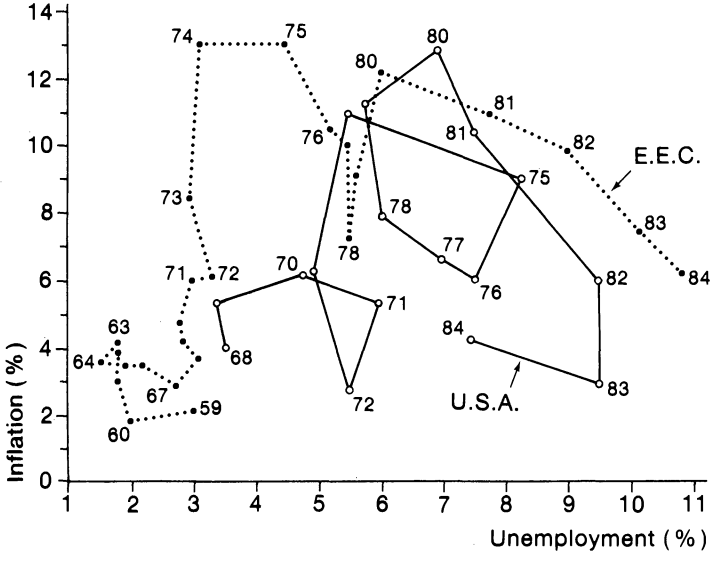


FIGURE 1. EEC inflation and unemployment, 1959-84, and US inflation and unemployment, 1968-84.

about as a result of a leftward shift of either the AS curve or the AD curve, or a combination thereof (see Figure 2). The first 'pure' case of a supply shock brings about both unemployment and inflation and is generally understood to have characterized the period both immediately before and after the first oil shock (1973–74), the extent of resulting stagflation in various countries depending on the extent of real-wage rigidity. Such shift from south-west to north-east in the unemployment–inflation framework (see Figure 1) has also characterized the second oil shock (1979–80). An added leftward bias of the AS curve in the 1970s may have been caused by the depressive effect of the profit squeeze on capital accumulation. All of these have imparted a 'classical' element to the unemployment which has certainly not been present in earlier, cyclical unemployment episodes. However, even the developments immediately following the two oil shocks cannot be understood without paying explicit regard to contractionary forces coming from leftward shifts in the AD schedules of countries (see Figure 2).

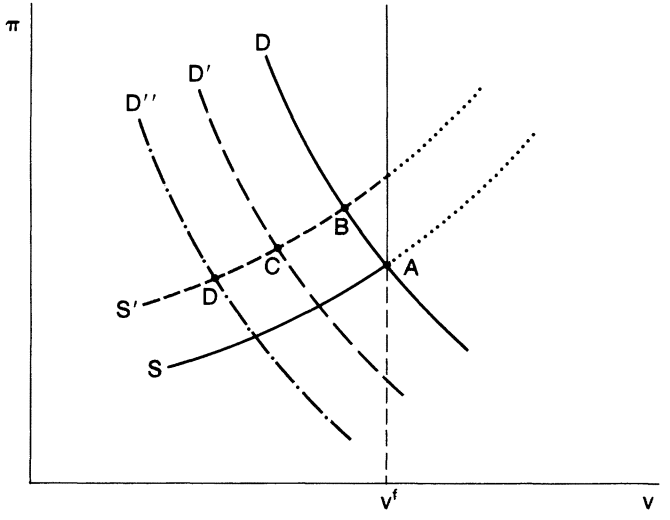


FIGURE 2. AD and AS framework for individual economy: π = final goods terms-of-trade; v = GDP.

The period immediately following the first oil shock (1974–77) certainly looks more like a conventional north-west-to-south-east movement down a short-run Phillips curve (see Figure 1). In terms of the story for the 1970s, this could be explained as a combination of the depressing effect of oil and raw material prices on real income, the anti-inflationary response of macro-policy to the first oil shock, and the interaction of depressed world markets on export demand in the individual countries. A similar story, with some variations, could still be told for 1980–81. From that phase onwards the differential movement of unemployment in the United States and Europe has become a central issue which requires analysis in its own right.

In the coming sections I shall take up the main issues pertaining to the role of AS and AD factors in the rise of unemployment. Section I reconsiders the concept of the real-wage gap, and applies alternative measures to the data up to, and including, 1983. The general finding is that, by the end of the period

considered, wage gaps for most countries recorded have come down from their peak levels in 1979–81, but are still sizeable on average in Europe. Section II takes up the role of the profit squeeze. We find that, while profits have played a very important role in the investment slowdown, the main reason for the profit squeeze has come from depressed demand conditions and less from the direct effect of high real wages. While the slowdown in capital growth may provide an eventual constraint on rapid growth in the manufacturing sector, it is unlikely to be an obstacle to expansion at the present moment owing to excess capacity.

Section III takes a summary overview of the demand for labour in the manufacturing sector, applying a neoclassical demand curve for labour with some Keynesian AD elements superimposed on it. Section IV reconsiders the overall unemployment performance of countries in terms of the basic underlying AS and AD components, reinforcing the argument that the more recent rise in unemployment is primarily an AD contraction phenomenon. The final section discusses the dilemma of individual country expansion and reconfirms the argument that there is a serious policy coordination problem between the United States and Europe in which the large US deficit, coupled with monetary restraint and the European fear of renewed inflation, have simultaneously provided the conditions for rapid US expansion and the sluggishness of revival in Europe. The policy proposals recently put forward,[2] calling for coordinated, more active, expansion in Europe with some incomes policy hedges, thus receive added support.

I. The Rise and Gradual Fall of Wage Gaps

Several studies have produced evidence that, for a number of countries during the 1970s at least, an important supply factor has been a persistent excess of real-wage levels above the marginal product of labour at full employment.[3] It is therefore important to update and reconsider the evidence from the vantage point of the mid-1980s.

Assume a well-behaved production function in terms of value added: $V = F(L, K; t)$; and suppose that one can measure the marginal product at full employment (L^f), $F_L(L^f, K; t)$. Under output-market-clearing and competitive firms, $(W/P_v)^f = F_L(L^f, K; t)$ is the level of product wage at which labour demand will equal L^f. The wage gap, w^x, is the percentage deviation of the actual product wage W/P_v over $(W/P_v)^f$; or, in log-linear approximation, $w^x = (w - p_v) - (w - p_v)^f$.

The notion that the marginal product of labour may mean something in the aggregate or that the aggregate demand for labour may depend on the real wage is, of course, controversial, mainly because of the competitive assumption implied for firms. We here proceed under the supposition that, like many artefacts in applied macroeconomics, the notion of a wage gap could, under certain circumstances and with some caveats, perform a useful diagnostic function. When based on a sub-sector like manufacturing, it may be less controversial than otherwise, since for most economies this is a highly tradable industry and one that is reasonably competitive.[4]

Under a CES production function with elasticity of substitution σ between L and K, the elasticity of demand for labour with respect to the product wage

is σ/s_k, where s_k is the capital share in value added. Thus, a log-linear approximation of the employment shortfall in the short run (i.e. at *given* capital stock,[5]) arising from a positive wage gap is given by

$$(1) \qquad l^d - l^f = -(\sigma/s_k)w^x \qquad (l^d = l^f \text{ when } w^x = 0).$$

The main problem of measurement lies in estimating the marginal product of labour at full employment. In principle, one could estimate the production technology directly and calculate F_L for L^f. Such estimates must usually assume market-clearing on a year-to-year basis, which is obviously problematic. The alternative procedure followed here is to suggest a range of estimates of w^x under alternative assumptions from which, it is argued, a general picture none the less emerges.

The simplest assumption for calculating w^x is the Cobb–Douglas technology ($\sigma = 1$), for which the marginal product moves parallel to the average product and the problem then boils down to measuring the gap between $(w - p_v)$ and the trend of the average product at full employment $(v^f - l^f)$, namely, a corrected relative wage share measure, normalized by some base-year benchmark. Table 1 gives this first measure for 12 OECD countries taking the

TABLE 1

WAGE GAPS, 12 OECD COUNTRIES, 1965–1983, UNADJUSTED
(percentages over 1965–1969 average)

	1965	1970	1973	1976	1979	1981	1982	1983	Country weights[a]
USA	1·2	−1·3	3·1	0·6	4·0	5·0	5·3	4·9	28·9
Canada	−1·7	1·5	−1·4	4·6	0·9	1·5	1·8	2·0	3·1
Japan	2·3	4·1	9·8	21·5	24·1	23·4	20·2	16·4	20·6
Europe									
UK	−1·5	1·5	3·1	8·1	9·3	14·3	13·9	13·9	11·0
Belgium	0·4	1·7	18·7	32·7	33·0	31·9	24·2	—	1·6
Denmark	−2·4	2·6	8·5	14·3	16·1	13·1	9·5	4·1	0·8
France	0·3	−3·8	−0·3	4·9	2·6	2·7	4·1	—	8·9
Germany	1·7	1·9	8·0	14·0	14·6	17·1	13·3	9·6	12·6
Italy	3·8	4·2	10·9	17·8	9·6	6·5	4·8	2·9	8·4
Neth.	2·1	0·2	−2·2	−1·5	−6·5	−16·1	−20·4	—	1·8
Norway	−3·2	−3·4	0·6	17·4	19·4	8·8	7·1	6·4	0·7
Sweden	3·4	−2·2	−7·4	3·3	−3·9	−7·6	−11·4	14·6	1·6
Mean (weighted)	1·2	1·7	5·3	10·1	10·7	11·1	9·7	—	100·0
Partial mean[b]	1·3	1·4	5·8	10·5	11·4	12·1	10·6	8·8	
Mean, 8 countries[c]									
$\sigma = 1$	1·0	0·6	4·7	9·1	10·7	11·7	10·5	—	
$\sigma = 0·7$	0·9	0·7	4·9	9·1	10·3	11·1	9·8	—	
$\sigma = 0·5$	0·8	0·9	5·3	9·0	9·8	10·3	8·9	—	

[a] Relative size, based on 1975 manufacturing employment levels (percentages).
[b] Weighted mean of nine countries for which 1983 observations are recorded.
[c] Weighted mean of eight countries (for which capital stock numbers exist) under alternative CES assumptions (countries excluded are Belgium, Denmark, Italy and the Netherlands).

benchmark for $w^x(=w-p_v-(v^f-l^f))$ to be 0 on average during the period 1965–69 and taking the average growth rates of $v-l$ during 1960–73 and 1973–85 to represent the respective 'full-employment' trend (v^f-l^f).[6]

The findings, based on the simplest measure of the gap, suggest that, after a rise in the gap in the early 1970s and a very sharp rise during the first oil shock, to a weighted average of 11 per cent by the end of the decade, there was a gradual fall in most countries from about 1980 onward. The move in a downward direction seems to have become more marked during 1982–83. The table also underscores the fact that there are sharp differences among countries, both for the peak years and for the deceleration. The United States and Canada, importantly, show very little variation during the oil shock, and only the Netherlands and Sweden were the exception to an otherwise real-wage-resistant Europe.[7] The UK and Belgium stand out as two countries with large remaining gaps by the end of the period. Japan's 1979 figure, one can argue, is misleading, since the reference period, 1965–69, probably did not reflect an equilibrium in its labour market.[8] Anyway, it shows substantial reduction after 1979.

We consider two major sensitivity tests for the basic measure used in Table 1, one having to do with the technology and the other with the hypothetical measure of v^f-l^f during the recent unemployment years.

The first argument against findings based on the simple measure of w^x comes from the assumed unitary elasticity of substitution. We know that, when $\sigma<1$, a rise in real wages will also result in a rising labour share in value-added, which would have nothing to do with disequilibrium. The sharpness of the rise in w^x in the mid-1970s and its subsequent fall towards the early 1980s would cast doubt on such explanation, but it is none the less important to see how sensitive this result is to the size of σ. Various recent studies of the production function for manufacturing across countries suggest the assumption of Harrod-neutral technical progress and a range of estimates of σ between 0·5 and 1, with an average of about 0·7.[9]

We recalculated v^f-l^f on the two alternative assumptions, $\sigma=0{\cdot}5$ and $\sigma=0{\cdot}7$, using the approximation formula[10]

$$(2) \qquad v_l=(v-l)+\{(1-\sigma)/\sigma\}\{s_k/(1-s_k)\}(k-v)$$

and again applying it to the trend between the 'peak' years 1960, 1973 and 1983.

The above approximation obviously requires a knowledge of capital stock figures, which were available for only eight of the countries in question. The last three lines of Table 1 give a summary average estimate for these eight countries (Belgium, Denmark, Italy and the Netherlands are excluded here) for the three assumptions on σ, from which we can see that the 1979 and 1981 peak estimates of w^x are only slightly modified. There is a somewhat larger difference in the subsequent years—the smaller is σ, the larger is the estimated reduction in the gap by 1982. There are, of course, differences for individual countries (these data are not reproduced here), but the general result holds on average.

The second sensitivity test involves an alternative estimate for v^f-l^f which attempts to correct for the effect of the unemployment level and changes thereof on full-employment productivity growth. The method used[11] was to run for each country a regression of labour productivity on unemployment, the current and lagged change in unemployment and time, with a time shift

factor after 1975:

$$(3) \qquad v - l = \alpha_0 + \alpha_1 t + \alpha_2 t_{7583} + \alpha_3 U_t + \alpha_4 \Delta U_t + \alpha_5 \Delta U_{t-1}.$$

Generally, as one would expect, $\alpha_3 > 0$ and α_4, $\alpha_5 < 0$ (the regressions are not reproduced here).

By setting $U_t = \Delta U_t = \Delta U_{t-1} = 0$ in the estimated equation, we get an estimate of $v^f - l^f$ which was used instead of the simple trend, again normalized to zero in 1965-69.

The resulting adjusted estimates are given in Table 2. It is interesting to note that, on the whole, the previous general finding remains intact, concerning both the size of the increase in 1976 and the gradual fall after 1979. The two extreme cases, Belgium and the UK, now look even worse, and it seems that France too is in much worse shape once the correction for unemployment is made. We note that the weighted mean for Europe, when Belgium and the UK are excluded, shows a lower peak but only a very mild slowdown.

An important question that arises relates to the sources of these changes in the measured wage gap. At least a partial answer is provided by a breakdown of changes in the wage gap ($\dot{w}^x$) into the parts attributable to the real consumption wage ($\dot{w}_c$), the changes in relative consumption to product prices ($\dot{p}_c - \dot{p}_v$), where the latter include changes in relative import prices, and the assumed productivity trend ($\dot{v}^f - \dot{l}^f$).

Table 3 provides a breakdown of $\dot{w}^x$ by sub-period (using the basic measure of Table 1), using the identity

$$(4) \qquad \dot{w}^x = \dot{w}_c + (\dot{p}_c - \dot{p}_v) - (\dot{v}^f - \dot{l}^f).$$

TABLE 2

ADJUSTED WAGE GAPS, 12 OECD COUNTRIES, 1965-1983
(percentages over 1965-1969 average)

	1965	1970	1973	1976	1979	1981	1982	1983
USA	0·2	0·1	6·0	2·9	6·8	8·1	8·6	8·4
Canada	−1·9	1·9	−0·5	3·3	0·8	2·2	2·9	3·5
Japan	2·2	4·3	10·1	18·2	20·7	19·8	16·6	12·7
Europe								
UK	−2·0	2·2	4·6	11·0	16·4	24·1	25·0	26·4
Belgium	2·1	−0·8	13·6	30·2	37·2	40·7	35·2	—
Denmark	−2·3	2·5	8·1	13·0	17·6	16·4	13·7	9·2
France	0·0	−3·4	−0·4	7·9	10·7	14·3	17·4	—
Germany	2·0	1·5	7·2	13·0	15·3	19·1	15·9	12·9
Italy	2·3	6·4	15·4	19·5	11·8	9·1	7·6	5·9
Neth.	2·8	1·0	−4·4	−6·7	−11·7	−21·3	−25·7	—
Norway	−2·5	−4·3	−1·3	13·9	17·3	7·7	6·4	6·2
Sweden	2·7	−1·1	−5·2	3·7	−1·6	−4·0	−7·1	−9·6
Mean (weighted)[a]	0·8	1·6	6·6	10·5	12·6	14·0	13·1	—
Partial mean[b]	0·8	2·2	7·4	10·8	12·8	14·2	13·0	11·6
Mean, Europe	0·7	1·4	5·9	12·3	13·3	15·8	14·9	—
Mean, Europe, Excl. UK and Belgium	1·5	1·2	5·9	11·9	11·2	12·0	11·3	—

[a] Weighted by 1975 employment levels.
[b] Mean of nine countries for which 1983 observations are recorded.

TABLE 3

DECOMPOSITION OF CHANGES IN THE WAGE GAP, 1964–1983
(annual percentage rates of change)

	1964–70				1970–74				1974–78				1978–80				1980–83			
	$\dot{w}^x$	$\dot{w}_c$	$\dot{p}_c-\dot{p}_v$	$-(\dot{v}^f-\dot{l}^f)$	$\dot{w}^x$	$\dot{w}_c$	$\dot{p}_c-\dot{p}_v$	$-(\dot{v}^f-\dot{l}^f)$	$\dot{w}^x$	$\dot{w}_c$	$\dot{p}_c-\dot{p}_v$	$-(\dot{v}^f-\dot{l}^f)$	$\dot{w}^x$	$\dot{w}_c$	$\dot{p}_c-\dot{p}_v$	$-(\dot{v}^f-\dot{l}^f)$	$\dot{w}^x$	$\dot{w}_c$	$\dot{p}_c-\dot{p}_v$	$-(\dot{v}^f-\dot{l}^f)$
USA	−0·8	1·5	1·2	−3·5	0·9	1·1	2·9	−3·1	−0·1	2·0	−0·1	−1·9	1·7	−1·5	5·3	−1·9	−0·2	0·6	1·1	−1·9
Canada	0·9	3·4	2·1	−4·7	−0·9	3·4	−0·4	−3·9	1·2	2·1	0·5	−1·5	−2·0	0·5	−1·0	−1·5	1·1	1·8	0·8	−1·5
Japan	0·4	8·6	2·1	−10·4	2·8	8·9	3·4	−9·5	1·9	2·3	6·2	−6·7	1·5	0·7	7·3	−6·7	−3·0	2·1	1·4	−6·7
Europe																				
UK	0·6	3·8	1·0	−4·3	2·2	5·0	1·0	−3·8	−2·2	2·3	−1·9	−2·6	4·2	5·0	1·9	−2·6	1·4	2·7	1·3	−2·6
France	−0·6	4·3	0·8	−5·8	1·9	5·6	1·8	−5·5	0·0	4·4	0·1	−4·5	0·0	2·6	1·9	−4·5	0·0	2·0	1·7	−4·5
Germany	0·5	6·3	−0·2	−5·5	2·3	7·0	0·6	−5·3	0·8	5·2	−0·2	−4·1	0·8	3·4	1·5	−4·1	−2·1	0·5	1·4	−4·1
Italy	−0·7	6·9	−0·4	−7·3	2·3	9·3	−0·6	−5·3	−0·4	4·0	−1·2	−3·2	−3·3	0·3	−0·4	−3·2	−0·7	2·9	−0·4	−3·2
Neth.	−0·6	7·2	−0·4	−7·4	0·4	8·0	−0·7	−6·9	−1·9	3·2	−0·4	−4·7	−2·9	1·1	0·6	−4·7	−4·5	−0·3	0·6	−4·7
Norway	0·0	5·1	−0·7	−7·4	2·0	5·8	0·0	−3·8	4·4	4·7	1·8	−2·1	4·4	0·1	−2·5	−2·1	−2·2	−0·8	0·7	−2·1
Sweden	−1·3	5·2	−0·2	−6·4	−0·1	5·5	−0·2	−5·4	0·4	4·1	−1·0	−2·7	−2·8	−0·9	0·8	−2·7	−2·6	−0·8	0·8	−2·7
Belgium	0·3	7·3	−0·1	−6·9	4·8	12·4	−0·5	−7·1	2·7	8·3	0·4	−6·0	1·0	5·6	1·2	−6·0	−4·8	−0·9	1·8	−6·0
Denmark	0·9	5·5	2·0	−6·5	2·6	7·1	1·4	−5·9	−0·1	2·7	0·8	−3·6	1·6	0·3	5·0	−3·6	−3·9	−0·6	0·3	−3·6
Mean (weighted)[a]	0·1	4·9	1·0	−6·0	1·8	5·5	1·8	−5·4	0·3	3·1	0·9	−3·7	1·0	1·1	3·6	−3·7	−1·1	1·4	1·1	−3·7

[a] Weighted by 1975 employment level.

The table suggests that real-wage moderation has attenuated the effect of real import prices (as reflected in $\dot{p}_c - \dot{p}_v$) on w^x in the second oil shock (see 1978–80, unlike 1970–74). The deceleration of relative import prices in 1980–83 is the main explanatory factor behind the concomitant fall in w^x. We shall come back to the role of this negative supply shock in Section V.

II. The Role of the Profit Squeeze

The general picture that emerges from the data shown in the last section suggests that, during the depression years of the early 1980s, the wage gap has most probably been reduced in all but two or three countries. What this implies is that, at given capital stock levels (provided the estimated wage gap is applicable to the whole economy, and not only to the manufacturing sector), the demand for labour would come closer to maintenance of full employment. The emphasis on the word *given* is important, because both the labour force and the capital stock normally grow at some balanced rate from which we have abstracted so far. The point is that, when the capital stock levels depart from their previous growth paths, this could be an additional argument for a gap between labour demand and full employment, quite apart from Keynesian arguments to which we turn later. A fall in investment demand could be linked to a profit squeeze, which, in itself, may have been caused by an increase in the price of other factors of production (material inputs and labour), by depressed demand conditions, or (as in fact was the case) by a combination of both.

In the absence of full-fledged investment demand functions based on a q-measure of rationally expected profits, we here apply a rather simple-minded approach in which capital stock growth is expressed as a function of past profits (a three-year average is used in the data below) and the real rate of interest. The real rate of profit, in turn, is expressed as a function of the real product wage (based on the factor price frontier) and a measure of demand pressure.

Let r denote the logarithm of the real rate of profit (where profits are deflated by GDP prices and the capital stock by investment goods prices) and w_v the logarithm of the product wage. A log-linear approximation of the factor price frontier (FPF) can be written in the form

$$(5) \qquad r = a_0 + a_1(w_v - \lambda t) + a_2 d$$

where a_1 should equal minus the ratio of the labour and capital shares, and λ is the labour-augmenting technical progress parameter (for the case of Harrod-neutral technical progress, which is assumed here).

For deviations from the FPF arising from short-term demand fluctuations, we add a term $a_2 d$ to equation (5) and also allow for a drop in productivity growth after 1974 by adding a slope dummy (D7582) to the equation for estimation. The regression equation and the estimates for eight countries are given in Table 4. For the d variable a proxy was used in the form of the ratio of manufacturing output over its ten-year moving average.[12]

For all countries, the a_1 coefficient comes out negative, as expected, though in the case of France and Italy it is statistically insignificant. As to its relative size, the average for the eight countries, 1·62, seems reasonable as it implies

TABLE 4

RATE OF PROFIT EQUATIONS FOR MANUFACTURING, EIGHT COUNTRIES, 1965-1982[a]

$(r = a_0 + a_1 w_v + a_2 d + a_3 t + a_4 D_{7582})$

Country	a_0	a_1	a_2	a_3	a_4	ρ	$\bar{R}^2$	DW
USA	2·88	−3·41	2·37	0·12	−0·05	0·57	0·90	1·87
	(0·22)	(1·26)	(0·44)	(0·05)	(0·02)	(0·30)		
Canada	−5·15	−2·28	2·96	0·15	−0·10	−0·03	0·84	1·65
	(2·94)	(1·06)	(0·50)	(0·05)	(0·04)	(0·48)		
Japan	4·48	−0·61	1·88	0·07	—	—	0·97	1·70
	(0·51)	(0·14)	(0·01)	(0·01)				
UK	0·87	−1·75	2·08	0·06	—	0·63	0·94	1·63
	(0·76)	(0·59)	(0·50)	(0·03)		(0·24)		
France	1·10	−0·21	3·48	0·04	—	—	0·78	1·97
	(0·66)	(0·67)	(0·53)	(0·04)				
Germany	1·51	−1·06	1·70	0·07	−0·01	0·43	0·95	1·73
	(0·35)	(0·46)	(0·27)	(0·03)	(0·01)	(0·31)		
Italy	4·33	−0·44	3·08	0·07	—	0·65	0·78	1·38
	(1·36)	(0·35)	(0·41)	(0·02)		(0·24)		
Sweden	12·48	−3·17	6·65	0·22	−0·07	—	0·95	2·23
	(3·08)	(0·82)	(0·81)	(0·05)	(0·04)			

[a] Numbers in brackets are standard errors.

Sources: Real rate of profit = r, calculated from operating surplus over capital stock in manufacturing, corrected for relative GDP to investment goods prices—all from OECD data (Chan-Lee and Sutch, 1985); real product wage = w_v, nominal wage in manufacturing, BLS data deflated by GDP prices—OECD; demand proxy = d, manufacturing output divided by ten-year moving average—OECD data.

a labour share of 0·62. The average elasticity for the d coefficient (a_2) is 3·02. The implied technical progress coefficients can be got from the ratio $-a_3/a_1$ (corrected by the slope a_4 after 1974) for the various countries. Running a cross-section regression for the first differences of all countries (with country intercept dummies) gives a lower coefficient for the wage elasticity (−0·82 with s.e. 0·27) and about the same for the output coefficient (2·69 with s.e. 0·19); the $\bar{R}^2$ for the overall regression (136 observations) is 0·62.

Next, consider the relationship between investment and profits. A glance at the average data by sub-period suggests that the slowdown in capital accumulation both across countries and over time is correlated with the extent of the profit squeeze. A cross-section regression of period averages for the rate of change of the capital stock with the average rate of profit and the real rate of interest gives the following two alternative regressions for a linear or logarithmic specification (the data are four-period averages for eight countries, i.e. 32 observations):

$$(6) \qquad \dot{k} = (\text{country dummies}) + \underset{(0\cdot062)}{0\cdot467} R - \underset{(0\cdot137)}{0\cdot098} i_r \qquad \bar{R}^2 = 0\cdot81$$

$$(6)' \qquad \ln(\dot{k}) = (\text{country dummies}) + \underset{(0\cdot272)}{1\cdot101} r + \underset{(0\cdot081)}{0\cdot077}\{\ln(1+i_r)\} \qquad \bar{R}^2 = 0\cdot64$$

Both equations show a very strong effect of the profit rate and an insignificant effect of the real rate of interest. The economic reasoning behind the former could be via the effect of present profit rates on the expectations

of future profits or else may be a result of financing constraints on firms, which enhances investment from retained earnings when the latter increase, Whichever the channel, it is obviously a strong relationship. It is further borne out by individual country regressions given in Table 5. These are based on annual data and a logarithmic specification (with the exception of the UK, in which only the linear form gave significant results). There the profit variable ($\bar{r}$) stands for the log average profit rate for the last three years.

Table 5 shows the elasticity of capital stock growth with respect to profits to be highly significant in almost all cases (the United States is a possible exception), the average value being 1·46. The coefficient for the real interest rate is significantly negative in only three cases.[13] (Only one case with a significantly positive coefficient, France, makes no economic sense.)

Writing the investment equation in the form

$$(7) \qquad \ln \dot{k} = b_0 + b_1 \bar{r} + b_2 i_r$$

and substituting for $\bar{r}$ from r in equation (5), we can express the growth in the capital stock as a function of the real product wage (level), the demand variable (d) and the real interest rate (leaving out time shifts):

$$(8) \qquad \ln \dot{k} = b_0 + b_1 a_0 - b_1 a_1 w + b_1 a_2 d - b_2 i_r.$$

Looking at the size of the implied elasticities and the actual change in the underlying variables, one major conclusion emerges—the real wage could not but have a relatively small direct role in the slowdown of capital accumulation, while the output contraction (from the demand side) played the dominant role in the profit squeeze and the resulting contraction in investment.

TABLE 5

INVESTMENT EQUATIONS FOR MANUFACTURING, EIGHT COUNTRIES, 1965–1982

($\ln \dot{k} = b_0 + b_1 \bar{r} + b_2 i_r$)

Country	b_0	b_1	b_2	ρ	$\bar{R}^2$	DW
USA	−0·90	0·79	−9·00	0·61	0·55	1·83
	(1·46)	(0·50)	(3·15)	(0·21)		
Canada	−1·30	1·07	2·95	0·55	0·60	1·29
	(1·23)	(0·47)	(3·06)	(0·23)		
Japan	−4·47	2·00	0·62	0·33	0·88	1·74
(1967–82)	(0·89)	(0·27)	(1·42)	(0·29)		
UK[a]	1·14	0·20	−0·77	−0·89	0·62	2·37
	(0·42)	(0·04)	(5·06)	(0·16)		
France	−1·57	1·13	10·60	—	0·65	1·82
	(0·68)	(0·25)	(2·41)			
Germany	−7·72	3·22	−0·47	0·64	0·91	1·32
	(1·41)	(0·51)	(6·03)	(0·21)		
Italy	−3·86	1·83	−6·29	0·85	0·78	1·70
	(2·74)	(0·96)	(2·00)	(0·14)		
Sweden	−1·81	1·45	−12·45	—	0·56	1·32
	(0·72)	(0·33)	(5·50)			

[a] The regression for the UK is linear in $\dot{k}$ and $\bar{r}$.

Source: $\bar{r}$ = log of three-year mean rate of profit, OECD *Economic Outlook* (rate of operating surplus over capital stock); i_r = log (1 + real rate of interest), where real rate equals nominal rate minus rate of consumer price inflation, IMF; $\dot{k}$ = percentage rate of change, real capital stock, OECD.

The product of the average a_1 (1·6) and the average b_1 (1·5) gives an elasticity of 2·4. A permanent increase in w_v of 5 per cent over its equilibrium level would thus imply a fall in $\dot{k}$ of 12 per cent.[14] We know from Section I that in the mid-1970 s there were temporary increases of w_v which on average were twice that, but by the beginning of the 1980s the gap for most countries had already come down substantially. At the same time, the rate of growth of the capital stock was cut to less than half its rate over the decade for most European countries for which data are recorded here. The total elasticity for the d variable, on the other hand (b_1a_2), amounts to 4·5, and the relative fall in its level over the period was of the order of 20 per cent, thus being capable of 'explaining' drops of up to 90 per cent in $\dot{k}$.

This general assessment of the relative importance of the two factors (as well as a minute role for the real rate of interest) also emerges when an analysis of components is carried out by individual country (not reproduced here). We may thus conclude that, while the profit squeeze probably played an important role in the investment slowdown, for most countries and for most of the time, high real wages played only a small direct role in the latter. Indirectly, of course, the contractionary bias of macroeconomic policy was probably related to wage rigidity (fear of inflation), but this is another matter to which we shall return. First, we take a summary overview of the factors affecting employment in manufacturing.

III. An Analysis of the Demand For Labour in Manufacturing

To take a summary view of the factors affecting employment in manufacturing, we modify the conventional demand curve for labour by assuming gradual adjustment ($l - l_{-1} = \beta(l^d - l_{-1})$ as well as a short-run role for aggregate demand factors. For the latter three variables were used: the government deficit (d_f, corrected for full employment and inflation), deviations from the trend in world trade (d_w), and the real money stock (m, lagged). For most countries there is a considerable positive correlation between the fiscal and monetary variables, and only for the United States, where the two conflicted, did the monetary variable play an important separate role. (M_2 was used and the world trade variable was not included.) The log-linear equation that was fitted for most countries (see Table 6) is the following:

$$(9) \qquad l - k_{-1} = c_0 + c_1(l_{-1} - k_{-1}) + c_2 w_v + c_3 d_f + c_4 d_w + c_5 t + c_6 D_{7582}.$$

We note that, with the exception of the United States and Canada, all other countries show significant negative coefficients for the product wage variable. The 'long-run' elasticity (but at given capital stock) of labour demand varies from about $\frac{1}{2}$ for Belgium and Norway to 2 and above for Japan, Denmark, France and the Netherlands (these values are obtained by dividing c_2 by $1 - c_1$). The implied elasticity of substitution can be obtained by multiplication of these values by the share of capital which for most countries is of the order $\frac{1}{3}$ (somewhat higher for Japan). The world trade variable is significantly positive in most cases, as is the deficit variable for those countries for which data could be included.

The direct role attributed to aggregate demand in these regressions is certainly not negligible, and if we add the indirect role working through the

TABLE 6

DEMAND FOR LABOUR IN MANUFACTURING, 1961-1982, ELEVEN COUNTRIES

$$(l - k_{-1} = c_0 + c_1(l_{-1} - k_{-1}) + c_2 w_v + c_3 d_f + c_4 d_w + [c'_4 m] + c_5 t + c_6 D_{7582})$$

Country	c_1	c_2	c_3	$c_4[c'_4]$	c_5	c_6	DH[a]	SE
USA	*0·34*	*0·17*	*1·16*	*[0·61]*	*−0·06*	*0·02*	*−0·84*	*0·0023*
	(0·13)	(0·30)	(0·80)	(0·10)	(0·01)	(0·05)		
Canada	1·12	−0·29	1·19	0·50	0·02	−0·014	−1·34	0·0037
	(0·16)	(0·25)	(0·55)	(0·18)	(0·01)	(0·010)		
Japan	0·62	−1·03	1·41	0·24	0·07	−0·02	−0·35	0·0033
	(0·20)	(0·35)	(0·73)	(0·16)	(0·03)	(0·01)		
UK	0·41	−0·59	0·46	0·26	−0·00	−0·022	1·41	0·0039
	(0·17)	(0·21)	(0·26)	(0·19)	(0·01)	(0·005)		
Belgium[b]	0·45	−0·25	—	0·53	0·015	−0·024	−0·01	0·0018
	(0·12)	(0·24)		(0·09)	(0·005)	(0·006)		
Denmark[b]	0·41	−1·20	—	0·61	0·08	−0·04	−1·88	0·0027
	(0·12)	(0·24)		(0·13)	(0·02)	(0·01)		
France	0·71	−0·57	0·67	0·23	0·017	−0·011	−1·40	0·0014
	(0·11)	(0·12)	(0·39)	(0·08)	(0·009)	(0·003)		
Germany	1·00	−0·64	1·98	0·70	0·044	−0·012	1·59	0·0026
	(0·18)	(0·22)	(0·74)	(0·16)	(0·021)	(0·008)		
Italy[c]	0·25	−0·76	−0·00	0·20	0·026	−0·04	1·30	0·0034
	(0·23)	(0·28)	(0·00)	(0·18)	(0·20)	(0·02)		
Neth.[b]	0·76	−0·40	—	0·28	0·019	−0·015	−0·169	0·0026
	(0·10)	(0·17)		(0·09)	(0·010)	(0·009)		
Norway[b]	0·79	−0·104	—	0·035	0·004	−0·008	1·17	0·0027
	(0·17)	(0·056)		(0·098)	(0·003)	(0·005)		

[a] Durbin H-coefficient.
[b] For these four countries there are no capital stock or deficit data in the regression.
[c] 1965-82.
Data in brackets are standard errors of coefficients.
Sources: l = (log) man-hours in manufacturing, BLS data; k = capital stock, see Table 3; w_v = product wage, see Table 3; d_w = deviations from world trade trend, see Layard and Nickell (1984); m = log of real money stock, IMF; d_f = inflation-corrected structural deficit, EEC data.

investment slowdown it is quite sizeable. In the way we have specified the model, it is constrained to show constant returns to scale in labour and capital; and thus any factor accounting for a 1 per cent cut in the rate of change of k also, *ceteris paribus*, indirectly accounts for the same in terms of the rate of change in man-hours. At the same time, the fact that the slowdown in demand played a direct role in the regression provides evidence that by the end of that period (after considerable demand slowdown) there was probably no capacity constraint. This is also borne out by direct measurements of capacity utilization (see European Community business surveys quoted in *European Economy*, 1983, and in Layard *et al.*, 1984).

IV. AN ANALYSIS OF OVERALL UNEMPLOYMENT

So far, the analysis has dealt only with the manufacturing sector. There are obvious advantages to a consideration of that sector, both for analytical reasons (a neoclassical labour demand framework is more defensible for this sector,

at least in a typical European open-economy context) and because such data as product wages and capital input are more readily available. We do not, at the moment, have a satisfactory aggregate macroeconomic model formally combining demand and supply factors in a way that could be used for econometric estimation of labour demand, especially in an imperfectly competitive setting. In the absence thereof, we make do with an *ad hoc* formulation, which follows the logic of the preceding discussion and could also be given justification on the basis of a gradual adjustment to aggregate demand and aggregate supply within a disequilibrium setting.[15]

We write down a reduced form in which unemployment is expressed as a function of the lagged real-wage gap, and the aggregate demand factors with two lags for each. The more distant lags could be rationalized on the basis of delayed effects working either on the aggregate demand schedule or via profitability and capital investment on the aggregate supply side. It is in that 'hybrid' sense that the results of Table 7 should be interpreted.

Table 7 presents unemployment regressions for eight countries. Only in the case of the United States do both the monetary and fiscal variables appear (without the world trade variable). In the case of the other countries, the addition of a fiscal variable did not make any significant difference and the lagged real-money stock variables seemed to do all of the action on the domestic demand side.[16] Note that the signs of coefficients are, in most cases, the 'right' ones,[17] although they are not always significant at the 1 per cent level.

Because of the statistical problems that are attached to this type of single-equation estimation for each country, there is some advantage to also taking an overall cross-section view of the rise in unemployment using the same

TABLE 7

UNEMPLOYMENT EQUATIONS FOR EIGHT COUNTRIES, 1962-1982

($U = h_0 + h_1 w^x_{-1} + h_2 w^x_{-2} + h_3 m_{-1} + h_4 m_{-2} + h_5 d_w + h_6 d_{w-1} (+ h'_5 d_{f-1} + h'_6 d_{f-2}) +$ time shift[a])

Country	h_1	h_2	h_3	h_4	$h_5[h'_5]$	$h_6[h'_6]$	DW	SE
USA	20·11	−1·44	−4·95	−11·05	[−0·27]	[−0·05]	1·76	0·051
	(4·06)	(4·89)	(1·66)	(1·67)	(0·11)	(0·11)		
Canada	20·34	8·52	2·31	−7·58	−7·01	1·02	1·99	0·069
	(7·32)	(8·47)	(3·01)	(2·68)	(5·57)	(5·25)		
Japan	2·46	1·44	0·26	0·01	−2·02	−0·83	2·49	0·035
	(0·70)	(0·76)	(0·45)	(0·34)	(0·48)	(0·62)		
UK	8·48	13·77	−3·27	−1·48	−10·03	−4·25	1·88	0·087
	(6·20)	(7·51)	(3·62)	(2·95)	(5·05)	(4·72)		
Belgium	3·67	7·32	−3·62	0·89	−11·76	−10·63	1·77	0·045
	(2·63)	(2·92)	(1·97)	(1·71)	(2·03)	(2·02)		
Denmark	1·70	45·03	−10·03	13·49	−17·12	−1·27	1·91	0·109
	(14·53)	(15·38)	(4·99)	(4·66)	(5·66)	(9·50)		
France	1·70	−5·91	−3·20	2·42	−2·38	−3·82	2·00	0·047
	(2·53)	(2·76)	(1·58)	(1·38)	(1·33)	(1·50)		
Germany	7·75	3·62	−4·83	−5·58	−7·27	−3·79	1·70	0·124
	(3·99)	(4·03)	(1·97)	(2·39)	(3·06)	(2·55)		

[a] The regressions include separate time shift factors for the period 1962–74 and 1975–82 and were run using AR_1.

Sources: Unemployment = U, OECD standardized unemployment data: Wage gap = w^x. See Table 1; Real-money balances = m, IMF data; for Canada and the USA, M2 (of the USA) was used; Government deficit = d_f, see Table 6; World trade = d_w see Table 6.

underlying model. The following is the resulting regression (20 years ×8 countries = 160 observations) of first differences:

$$(10)\quad \Delta U = \underset{(0\cdot08)}{0.32} + \underset{(2\cdot30)}{6\cdot84}\Delta w^{x}_{-1} + \underset{(2\cdot37)}{7\cdot47}\Delta w^{x}_{-2} - \underset{(1\cdot08)}{5\cdot75}\Delta m_{-1} + \underset{(1\cdot00)}{0\cdot61}\Delta m_{-2}$$
$$- \underset{(1\cdot57)}{9\cdot56}\Delta d_{w} - \underset{(1\cdot71)}{6\cdot26}\Delta d_{w-1} \qquad \bar{R}^2 = 0\cdot51$$

With the exception of the second lag on money (which could be left out), all coefficients have the right sign and are highly significant (numbers in brackets are standard errors of coefficients). The assumption underlying (10)—that the elasticities are the same across countries—is, of course, problematic, but it is reassuring to find such a strong overall qualitative result. If one adds dummy variables for countries and/or each time period, none of these dummies comes out significant, and the overall regression is not improved.

The average quantitative implications that could be read into the regression is that, for each 1 per cent rise (fall) in the wage gap, the unemployment rate rises (falls) by 0·15 per cent within two years, while for each 1 per cent drop in the rate of growth in real money stock unemployment rises by 0·06 per cent after a year.

Consider, for example, the average drop in real-money growth between 1974–78 and 1978–82, which was about 4 per cent in annual average terms. The regression would thus attribute an annual average rise of 0·24 per cent in the unemployment rate to this factor alone in the last period.[18]

TABLE 8

ADJUSTED ACCOUNTING FOR THE RISE IN UNEMPLOYMENT SINCE 1965–1969

	1970–74	1974–78	1978–82	1982	1970–74	1974–78	1978–82	1982
	USA				Belgium			
Total	*1·7*	*3·5*	*3·7*	*5·8*	*0·3*	*4·5*	*8·1*	*10·8*
Adj. wage gap	−0·1	0·1	−0·1	0·0	0·7	3·4	5·6	12·2
Aggregate demand	1·5	3·2	4·0	5·7	−0·2	1·3	2·3	−1·3
	Canada				Denmark			
Total	*1·9*	*3·7*	*4·4*	*7·0*	*0·6*	*8·0*	*8·2*	*10·2*
Adj. wage gap	0·4	0·1	0·3	0·4	2·5	7·8	11·0	6·3
Aggregate demand	1·5	3·4	4·3	6·2	−1·5	−0·5	−2·4	4·6
	Japan				France			
Total	*0·1*	*0·8*	*1·0*	*1·1*	*0·7*	*2·6*	*4·8*	*5·9*
Adj. wage gap	0·3	0·9	1·1	1·1	−0·2	0·6	1·4	1·6
Aggregate demand	−0·2	−0·1	0·0	0·9	2·0	2·0	3·3	4·3
	UK				Germany			
Total	*0·9*	*3·1*	*6·1*	*9·5*	*0·2*	*2·7*	*3·3*	*5·3*
Adj. wage gap	0·6	2·5	3·7	5·5	0·3	1·2	1·7	1·9
Aggregate demand	0·3	0·8	2·0	3·9	−0·1	1·4	1·6	3·4

Table 8 gives a summary analysis of the analogous regressions that were based on the adjusted wage gap measure (these regressions are not reported here). It indicates the role of the major factors accounting for the increase in unemployment in each country. For each period the average cumulative change in the average unemployment rate since 1965–69 is given, as well as the estimated role of the adjusted wage gap (with its two lags) and the sum total of the aggregate demand factors. The table reinforces the earlier finding that wages played an important role mainly in the mid-1970s and primarily for three of the countries recorded (the UK, Belgium and Denmark), and that its relative importance for most countries diminished during the last sub-period, 1978–82, where most of the *incremental* increase in unemployment can be attributed to aggregate demand shifts (substract the second column of Table 8 from the third or fourth column). However, by 1982 the average remaining effect of the wage factor was still high for the five European countries recorded in this table.

V. Inflation, Exhange Rates and the Coordination Problem

The discussion so for has highlighted the dominant role of contractionary macro-policy in the recent further rise of unemployment in Europe. The same framework is also consistent with the concomitant fall in unemployment in the United States, given the extensive fiscal expansion in that country since 1981. We conclude the discussion by noting that it is the combination of fiscal expansion and monetary contraction in the United States that, at least in part, may indirectly account for the reluctance to expand in Europe on account of sluggish inflation deceleration. The causal link is provided by exchange rate developments during the same period.

The rise in real interest rates and net capital flows into the United States account for the large dollar appreciation since the beginning of 1981 (of the order of 50 per cent nominal and 38 per cent in real terms). This has had a dramatic effect on the relative import price developments in the United States as compared to Europe, which, we would argue, is the dominant reason for the differential inflation performance on the two sides of the Atlantic (see Figure 1).[19] The evidence for this is so striking that it is hard to understand why it often gets overlooked.

In Table 9 the two sets of numbers for annual rates of change in import prices and consumer prices for the United States and the average for the EEC

Table 9

Movements in Import and Consumer Prices: USA and EEC

	1981	1982	1983	1984
Import prices:				
USA	5·5	−1·6	−3·7	0·3
EEC	15·6	7·1	4·2	8·5
Consumer prices:				
USA	10·4	6·2	3·2	4·3
EEC	11·1	9·8	7·5	6·3

countries since 1980. A simple reduced-form inflation equation for the years 1961–80 (based on a pooled regression prepared two years ago) gives a fairly close post-sample prediction of 1982–84 developments for both the United States and the EEC. It considers the inflation rate as a sum of lagged inflation (with a coefficient of 0·66) and current import price change (with a coefficient of 0·18) along with a capacity term which is ignored here. This gives the predicted rates of 7·1, 3·9, 2·7 for the United States during 1982–84 and 9·0, 7·6, 6·9 for EEC. The predicted mean inflation during 1982–84 is 4·6 and 7·8, respectively, while the actual rates were 4·6 and 7·9—not a bad fit, on the average.

The real depreciation of European currencies relative to the dollar thus explains why inflation slowed down so much less rapidly on the European continent. It may also help to explain why Europe as a whole was reluctant to expand and instead adopted contractionary macro-policies until very recently. These helped to support the slowdown in inflation, but at a formidable cost in terms of unemployment. Each country by itself will not expand because it risks running into balance of payments problems and added pressure on its exchange rate (with inflationary consequences), and for all countries to expand simultaneously requires more coordination than seems politically feasible, especially since the United States must agree to cut its own fiscal deficit *pari passu*. A turn-around in change rates, such as occurred in 1985, could of course alleviate some of the pressure. On the other hand, too rapid expansion in the OECD countries as a whole would risk the possibility that relative prices of industrial raw materials will rise again, but it is a trade-off worth considering.

ACKNOWLEDGEMENTS

I am indebted to Carlos Bachrach for very able research assistance, much of which was performed with the help of the DRI system. I also wish to thank Andrew Abel, Robert Gordon, Jeffrey Sachs and the Editors for valuable comments on an earlier draft.

NOTES

1. See Bruno and Sachs (1985). The period covered in that study extended only up to 1981, for which the coverage in terms of data for individual countries was still incomplete. It is worth pointing out that between 1981 and 1985 the number of unemployed in Europe increased by almost 50 per cent!
2. See, for example, Layard *et al.* (1984).
3. See Sachs (1979), Bruno and Sachs (1985), Artus (1984), Lipschitz and Schadler (1984), McCallum (1984), and OECD *Economic Outlook*, miscellaneous issues.
4. Note that, as long as marginal revenues of firms move with prices (i.e. there is a constant 'degree of monopoly'), the notion of a wage gap could still remain valid even under monopolistic competition.
5. The importance of this caveat will be further clarified below.
6. While 1960 and 1973 probably represented cyclical peaks, 1983, which is the last observation in our data, is obviously not. The alternative followed in Bruno and Sachs (1985) took 1979 to be a cyclical peak and extrapolated through that year. Both procedures are problematic, and an alternative trend measure of $v^f - l^f$ after 1973 is given in Table 2.
7. See Bruno and Sachs (1985) for an extensive discussion of the difference between nominal and real-wage rigidity. French data on the low wage gap shown here may be misleading (see the discussion in Bruno and Sachs and also Table 2).
8. See Lipschitz and Schadler (1984) for discussion of this point.
9. See Artus (1984), McCallum (1984), Sneessens (1984).
10. If l' is the (log) labour input in intensity units, we have

$$(v-l')=\{s_k/(1-s_k)\}(k-v).$$

But for CES, $v_{l'}=\sigma^{-1}(v-l')$, and thus:

$$v_l=(v-l)-(v-l')+v_{l'}=(v-l)+\{(1-\sigma)/\sigma\}\{s_k/(1-s_k)\}(k-v). \quad \text{Q.E.D.}$$

Under Hicks-neutrality, we would similarly get

$$v_l=(v-l)+\{(1-\sigma)/\sigma\}s_k(k-l).$$

Here the correction would be larger, since $k-l$ changed by more than $(k-v)$.

11. See Bruno and Sachs (1985, Chapter 9).
12. This procedure was followed in a recent OECD memo. We also experimented with monetary, fiscal and world-trade variables to represent aggregate demand (see below). For some countries the unemployment rate, as well as its first difference, using two-stage least squares for w_v, serves the same purpose. Broadly similar results are obtained, but d seems a better aggregate proxy for all countries. For the basis of adding a demand variable to the FPF see Bruno (1984); there, the ratio of hours worked to employment level was used as a proxy for d, which also works reasonably well.
13. The limited role of interest rates may be due to the fact that they are much more volatile than profits (see Ueda and Yoshikawa, 1986).
14. The average product of a_1b_1 (rather than the product of the averages) is 2·22. The highest product of a_1b_1 by half the wage gap in 1976 (see Table 1), from among the eight countries recorded, is 0.24 for Germany, with all other countries far below that.
15. See Bruno and Sachs (1985, Chapter 10).
16. We have no explanation as to why the fiscal variable seems to perform better in the manufacturing labour demand equation and the monetary variable works better here.
17. Only one of the 16 coefficients of the wage gap is significantly negative, for the case of the regression for France which is suspect anyway (see discussion below). Most of the coefficients on the demand variables are negative as expected.
18. The 'world trade' factor here appears separately, although it too could ultimately, in a world model, be attributed to 'domestic' contraction in all countries combined. Its implied response coefficient of 0·16 'explains' a rise in unemployment of 0·4 per cent annually during 1974–78 and 0·3 per cent during 1978–82.
19. The drop in world relative commodity prices is the dominant factor in the overall inflation slowdown, while exchange rates have respectively enhanced or weakened their effect. For cross-section analyses of inflation in the OECD countries emphasizing the key role of import prices and exchange rates, see Bruno (1980), and Beckerman and Jenkinson (1984); see also Gordon (1977).

REFERENCES

ARTUS, J. A. (1984). The disequilibrium real wage hypothesis: an empirical evaluation. *IMF Staff Papers*, **31**, 249–302.

BECKERMAN, W. and JENKINSON, T. (1984). Commodity prices, import prices and the inflation slowdown: a pooled cross-country time series analysis. Unpublished paper, Balliol College, Oxford.

BRUNO, M. (1980). Import prices and stagflation in the industrial countries: a cross-section analysis. *Economic Journal*, **90**, 479–92.

—— (1984). Raw materials, profits and the productivity slowdown. *Quarterly Journal of Economics*, **99**, 1–29.

—— and SACHS, J. (1985). *Economics of Worldwide Stagflation*. Cambridge, Massachusetts: Harvard University Press.

CHAN-LEE, J. H. and SUTCH, H. (1985). Profits and rates of return in OECD countries. OECD Economics and Statistics Department Working Paper no. 20.

GORDON, R. J. (1977). World inflation and monetary accommodation in eight countries. *Brookings Papers on Economic Activity*, no. 2, 409–68.

LAYARD, R., BASEVI, G., BLANCHARD, O., BUITER, W. and DORNBUSCH, R. (1984). Report of the CEPS macroeconomic Policy Group-Europe: the case for unsustainable growth. *ECE Economic Papers*, 31.

—— and NICKELL, S. (1984). Unemployment and real wages in Europe, Japan and the US. Centre for Labour Economics, LSE, Working Paper no. 677.

LIPSCHITZ, L., and SCHADLER, S. M. (1984). Relative prices, real wages and macroeconomic policies: some evidence from manufacturing in Japan and the UK *IMF Staff Papers*, **31**, 303–38.

MALINVAUD, E. (1980). *Profitability and Unemployment*, Cambridge: Cambridge University Press.

MCCALLUM, J. (1984). Wage gaps, factor shares, and real wages. Unpublished paper, University of Quebec.

SACHS, J. (1979). Wages, profits and macroeconomic adjustment: a comparative study. *Brookings Papers on Economic Activity, no.* 2 269–319.

SNEESSENS, H. (1984). Keynesian vs classical unemployment in western economies: an attempt at evaluation. Unpublished paper, Lille.

UEDA, K. and YOSHIKAWA, H. (1986). Financial volatility and the q theory of investment. *Economica*, forthcoming.

Economica, **53**, S121-S169

Unemployment in Britain

By RICHARD LAYARD and STEPHEN NICKELL

The London School of Economics, and Oxford University

Male unemployment in Britain has risen from around 2 per cent in the 1950s to around 17 per cent in 1985 (see Figure 1). (The figures are for male unemployment because there is no consistent series for women.[1]) Even more remarkably, unemployment has fallen in only three years out of the last twenty (1973, 1978 and 1979).

To account for this, we need a model that explains both changes in the natural (or non-accelerating inflation) rate of unemployment (NAIRU) and deviations from it. We use a three-equation supply-side model, centred on the labour market. This has two main features. The first concerns the determination of employment in the short run. The labour demand function that we use cuts through the fruitless debate now raging (especially in Europe) as to whether current unemployment is 'classical' or 'Keynesian'. According to the 'classical' view, employment is too high because real wages are too high. According to the 'Keynesian' view, real wages are not binding, and unemployment is high because the product market does not clear—with prices too high relative to nominal demand. The whole debate is set in the framework of perfect competition. Yet in perfect competition prices are set by impersonal forces, and it is not clear what could possibly stop prices clearing the market. It is much more reasonable to think of prices as being set by imperfectly competitive firms, existing prices being the best they can think of, given the demand they face. In this context, firms' demand for labour will depend on both the real product wage and the level of real aggregate demand. This is the demand function we estimate, and it conforms both to common sense and to the data.

However, this does not imply that employment can be made to grow without limit by pumping up real demand. For in the medium term, when price surprises are eliminated, our model determines three variables (employment, real wages and real demand) on the basis of three equations (an employment equation, a price equation and a wage equation). Thus in the medium term there is a 'natural' level of employment and, corresponding to this, a 'natural' level of real aggregate demand.

The second key feature of our model concerns the medium-term determination of unemployment. In the medium term the planned mark-up of wages over prices in wage settlements must be consistent with the mark-up of prices over wage costs in employers' pricing behaviour. For if wage-setters try to set real product wages higher than is consistent with employers' pricing behaviour, this generates ever-increasing inflation. Thus the key to understanding unemployment in the medium term is the behaviour of wage-setters. If events occur that push them towards too-high real wages, then unemployment has to rise to offset these influences. We shall call these influences 'wage pressure variables' or 'push factors,' and they are clearly crucial in understanding unemployment. The variables here include the social security system, employment protection

legislation, mismatch between unemployment and vacancies, union power, taxation, and real import prices.

To understand the actual course of unemployment, we have to operate in the short term, where employment is determined by both aggregate demand and real wages. Since real wages in turn depend on the 'push factors', unemployment depends on aggregate demand and on the 'push factors'. The prime purpose of this paper is to explain the course of unemployment in terms of these two groups of factors. In other words, we attempt to decompose the growth of unemployment into its originating causes. We also show how the push factors have affected the natural rate of unemployment.

A second purpose of the paper is to look closely at dynamics. In particular, we want to look at the joint movement of real wages and unemployment in response to shocks both to demand and to supply (i.e. to shocks adding to aggregate demand or to wage pressure).

We begin in Section I by reviewing the facts about unemployment, as well as the various wage pressure variables and the forces affecting real aggregate demand. In Section II we describe our model and in Section III we discuss its empirical counterpart.[2] In Section IV we estimate it on annual data and use it to perform the decomposition of the causes of increased unemployment.[3] In Section V we estimate the model on quarterly data, using the results to illuminate the dynamics of unemployment and real wages. Our conclusions are given in Section VI.

I. Trends in Unemployment and in Causal Factors

Unemployment

We have already shown the rise in aggregate male unemployment. This is due hardly at all to changes in the age structure of the labour force: unemployment

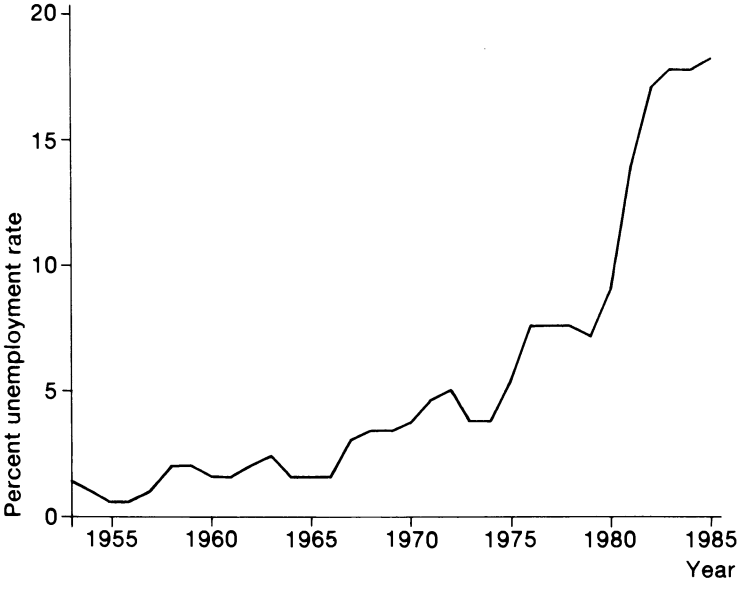


FIGURE 1. Male unemployment rate (mid-year), pre-1982 definition, 1953–1985. (*Source*: Data Appendix at the end of volume.)

has risen extremely sharply in all age groups. This emerges from Table 1. As the table shows, unemployment has risen rather more than average among those aged 18–19. (People younger than this have been protected by a guaranteed offer of a place on a public programme for school-leavers, operative in 1979 and after.[4]) But the striking point is the broad uniformity of the proportional rise in unemployment among all age groups.

Unemployment in Britain often lasts a very long time, and the main mechanism by which unemployment has risen is an increase in its duration. This is brought out clearly in Table 2. In fact, the flow into unemployment is not much higher than in the early 1970s and the numbers who have been unemployed for *under* six months are now somewhat lower than in 1981. As we shall argue later, this provides some clue as to why wage inflation is not falling as much as one might expect, given the high current level of total unemployment.

Even today, unemployment is basically a matter affecting manual workers and low-skilled non-manual workers, such as shop assistants. Taking the 1982 figures for men, 83 per cent of the unemployed were manual workers, compared with only 61 per cent of the labour force. The unemployment rate for semi-

TABLE 1

MALE UNEMPLOYMENT RATE, BY AGE, 1975–1984
(percentages)

	Under 18	18–19	20–24	25–34	35–44	45–54	55–59	All
1975	13·8	9·6	6·8	4·8	4·1	3·7	3·7	5·4
1980	21·0	13·8	11·2	7·3	5·8	5·6	6·6	8·2
1984	25·6	29·1	22·6	15·0	11·5	11·5	17·3	15·8

Note: Annual averages of January, April, July and October for 1980 and 1984; July only for 1975. The series is not strictly comparable pre- and post-1982, and changes in the 1983 budget reduced the numbers claiming benefit, particularly, but not exclusively, those aged over 60.
Source: Department of Employment *Gazette*.

TABLE 2

MALE UNEMPLOYMENT BY DURATION, 1965–69 TO 1984
(thousands)

	<2 weeks	2–26 weeks	26–52 weeks	52+ weeks	Average uncompleted duration of current spells (months)
1965–69	62	171	47	60	7·25
1970–74	88	278	81	120	7·95
1975–79	97	470	161	223	8·91
1980	104	603	189	289	9·60
1981	114	890	440	467	9·40
1982	101	837	475	818	11·53
1983	122	773	431	902	13·23
1984	121	724	399	953	15·85

Source: Department of Employment *Gazette*; Johnson and Layard (1986).

and unskilled workers was 22 per cent, compared with 5 per cent for non-manual workers.[5]

We turn now to the various possible causes of unemployment. We shall start with the medium-term causes—that is, the various push factors that may have tended to generate pressure for 'too-high' real labour costs. First, there are influences that might tend to reduce the effective supply of labour from the measured labour force. These fall under three headings: (1) unemployment benefit and social security, (2) mismatch between the unemployed and the available vacancies, and (3) employment protection legislation.

Unemployment benefits and social security

On this first point we have evidence on the ratio of unemployment benefits to net income in work—that is, of the 'replacement ratio' (ρ). In the Data Appendix at the end of this book we give the most reasonable index that we have of this. It shows a sharp rise from the late 1950s to the late 1960s with no trend since then. Unless the lags are very long, changes in the value of benefits do not seem to be a major explanation of the unemployment trend.

But there have been other changes in the benefit system. The tests for eligibility were steadily weakened from the 1960s (Layard, 1982, p. 43). In addition, there may have been changes in public attitudes to 'living off the state'. These things can never be quantified. But one possible way of trying to get some insight is to look at the movement of unemployment at given vacancies. As we shall argue, the matter is more complicated than that, but let us first look at the basic data on vacancies and unemployment. This is shown in Figure 2.[6] As can been seen, there have been two basic changes since the 1960s.

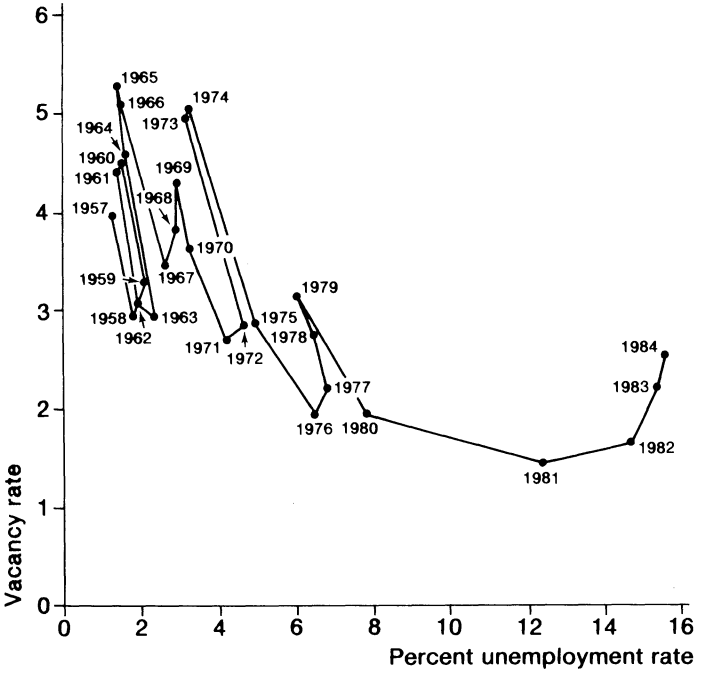


FIGURE 2. Vacancies and male unemployment. (*Source*: Jackman, Layard and Pissarides, 1984.)

Vacancies have fallen dramatically, and unemployment at given vacancies has risen dramatically. The latter phenomenon (i.e. the shift of the U/V curve) can be summarized in the following relationship:[7]

$$\log U = \underset{}{-1{\cdot}71} + \underset{(4{\cdot}9)}{0{\cdot}387 \log U_{-1}} - \underset{(4{\cdot}7)}{0{\cdot}549 \log V} + \underset{(0{\cdot}9)}{0{\cdot}0603 MM}$$

$$+ \underset{(2{\cdot}1)}{0{\cdot}023 t} + \underset{(0{\cdot}7)}{0{\cdot}00023 t^2}$$

where U is the male unemployment rate, V is the vacancy rate and MM is mismatch. Mismatch is measured indirectly by the turbulence in the economy, as indicated by the absolute annual change in the proportion of employees working in production industries. (There is no effect from lagged unemployment beyond the first lag.)

Mismatch

How are we to interpret the shift of the U/V curve? The rise in unemployment at given vacancies is certainly striking, with only a very little of it explained by changes in mismatch. We have better measures of mismatch for the period since 1962, based on the lack of congruence between vacancies and unemployment across sectors. Table 3 shows, for occupational groups, regions and industries, the index $\frac{1}{2}\sum|u_i/u - v_i/v|$ where u_i/u is the share of the sector in total unemployment and v_i/v is the share in total vacancies. The table shows no upward trend in mismatch, even in the 1960s. We are thus confident that increased mismatch is not an important part of the explanation for increased unemployment.

Employment protection

But can the whole shift of the U/V curve legitimately be attributed to a decrease in the willingness of unemployed workers to accept the available jobs? Clearly not. An equally possible explanation is that, owing to tighter employment protection laws, employers have been less willing to fill the available jobs from among the unemployed workers.[8] This second explanation is discussed at length in Jackman, Layard and Pissarides (1984). There are two basic points. First, employment protection laws should decrease the level of turnover in the economy. This has indeed fallen considerably since the late 1960s, but would of itself tend to shift the U/V curve inwards. Second, employment protection laws would, at a given level of turnover, tend to shift the U/V curve outward. Thus the net effect of employment protection on the U/V curve is uncertain. We are therefore inclined to attribute a substantial part of the U/V shift to a decrease in the willingness of workers to accept work. However, we make no guess as to proportions, and we simply attribute the shift of the U/V curve to decreased 'search intensity' (s) on the part of both workers and firms. Using the previous equation, s is computed as

$$s = \frac{-0{\cdot}023 t - 0{\cdot}00023 t^2}{1 - 0{\cdot}387}.$$

Union power

This is as far as we are able to take influences affecting the availability of suitable workers to employers. We turn now to other influences that might

TABLE 3

MORE STRUCTURAL UNEMPLOYMENT? BRITAIN, 1962–1982

	Mismatch of unemployment and vacancies			
	By occupation (24/18)	By region (10/11)	By region and occupation (198)	By industry (24)
1962	0·43	0·33		
1963	0·39	0·34		0·24
1964	0·42	0·38		0·24
1965	0·41	0·34		0·24
1966	0·42	0·28		0·23
1967	0·37	0·28		0·23
1968	0·38	0·30		0·27
1969	0·39	0·28		0·28
1970	0·38	0·24		0·25
1971	0·37	0·28		0·23
1972	0·37	0·34		0·21
1973	0·40	0·33		0·23
1974	0·41	0·32	0·49	0·23
1975	0·43	0·20	0·48	0·23
1976	0·38	0·17	0·42	0·19
1977	0·35	0·20	0·40	0·19
1978	0·35	0·25	0·42	0·18
1979	0·35	0·28	0·44	0·18
1980	0·37	0·27	0·44	0·23
1981	0·41	0·21	0·44	0·32
1982	0·37	0·21	0·41	0·30

Notes:

(i) The mismatch index is $\frac{1}{2}\sum|u_i/u - v_i/v|$.

(ii) Number in brackets indicate number of cells.

(iii) Before 1966 only 10 regions were identified (East Midlands and West Midlands were not separated); afterwards, 11. Also, definitions of present South-East and East Anglia regions differed. The break is not serious, however. The occupational index is based on totally different classifications before and after 1973; this is a serious break.

(iv) All vacancies are classified by industry but some unemployed are unidentified by industry and are omitted. (Unemployed unidentified by occupation are included in the 'miscellaneous' category.) In August 1981 684,117 people, or 24·1 per cent of total unemployed, were unclassified.

Source: (All data are annual averages unless indicated below.)

Occupation: 1962–73: September data from *British Labour Statistics, Historical Abstract* and *British Labour Statistics Year Books.* (Male and female are summed.) 1974–82: Department of Employment Gazette.

Region; 1962–82: unemployment from *Monthly Digest of Statistics.* 1982–82; vacancies from Department of Employment *Gazette,* but for Northern Ireland from *Annual Abstract of Statistics.*

Region by occupation: Department of Employment *Gazette.*

Industry: Department of Employment *Gazette.*

Employment data: Department of Employment *Gazette.*

tend to raise real labour costs and thus reduce employment.[9] The most obvious of these is union power. Trade union membership as a percentage of employed workers rose substantially from 1970 to 1980, since when it has fallen. The series is shown in Figure 3. However, we doubt whether this is the best index of union power. As an alternative, one can construct an index of the mark-up of wages set by collective bargaining over other wages. This is obtained by running for every year an industry cross-section of earnings on a number of factors including union coverage.[10] The series then consists of the union

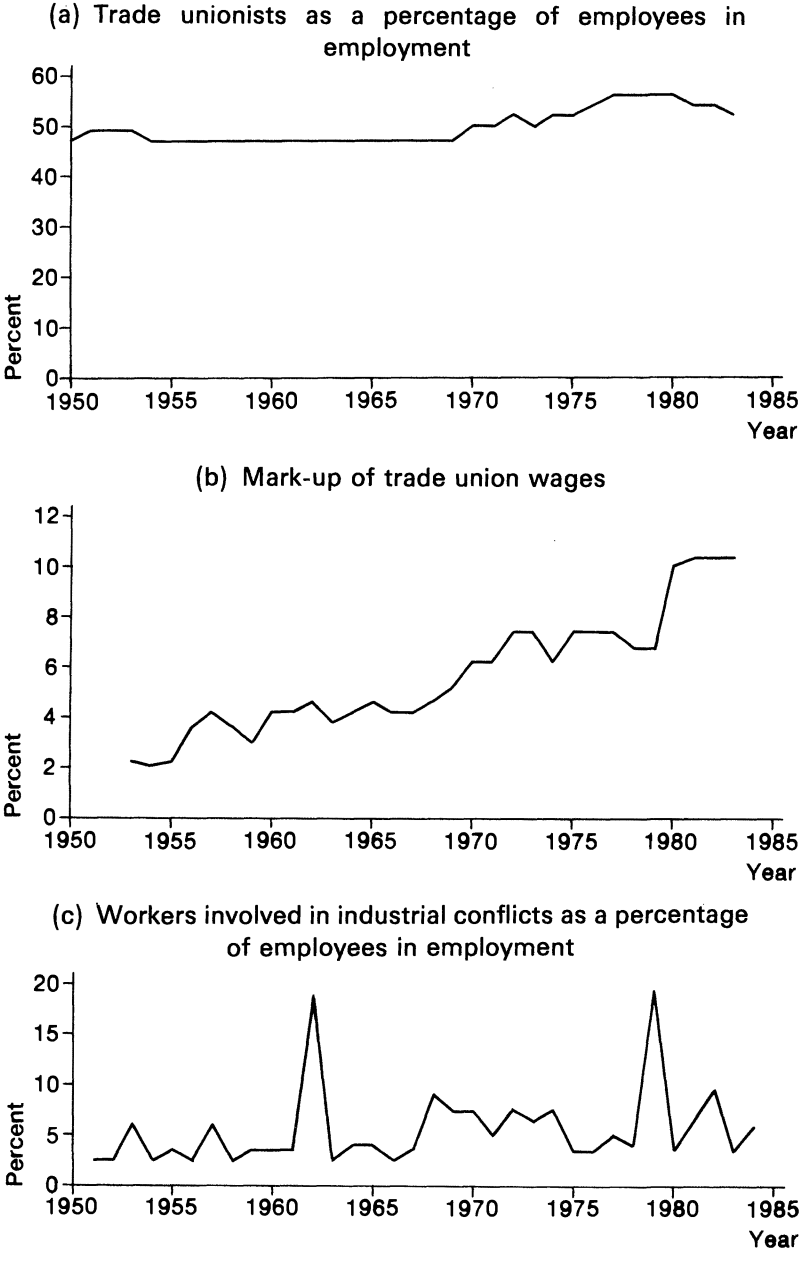


FIGURE 3. Union power, 1950–1984. (*Source*: Data Appendix at end of volume.)

coverage coefficient for each year. This is also shown in Figure 3 and rises sharply after the Paris events of 1968, as one might expect, and again (more surprisingly) after Mrs Thatcher's advent to power. A final index of interest is the number of workers involved in industrial disputes. This also shows a rise in the early 1970s. Clearly, none of the indices is totally exogenous, but we feel that the union mark-up variable (U_p) comes nearer than any other to reflecting the element in union behaviour that is affecting unemployment rather than being affected by it. This is the one we use.

Taxation and relative import prices

Other influences that might generate wage pressure are taxation and relative import prices. These introduce a 'wedge' between employers' real labour costs (relative to the GDP deflator) and workers' real take-home pay (relative to consumer prices).[11] But in our analysis employers' real labour costs are determined essentially by the pricing policy of firms.[12] Thus, increases in the 'wedge' must be borne by labour. If increases in the wedge generate wage pressure, they must therefore cause offsetting unemployment.

Figure 4 shows the various elements of the wedge. There have been striking increases in both employers' taxes (t_1) and employees' taxes (t_2). Increases in indirect taxes (t_3) have been much less. The behaviour of real import prices weighted by the share of imports in GDP has been uneven—down until 1972, then up, down, up and down. Some of the movements of import prices (but not all) are mirrored in the course of unemployment.

Productivity downturn

We turn now to a rather different line of thought. If productivity growth falls off, it seems possible that wage-setters will aim at unduly high real wages in line with former trends. This might reflect the behaviour of unions, or even of employers wishing to motivate their workforces (see for example Grubb, Jackman and Layard, 1983; Johnson and Layard, 1986).

In Figure 5, therefore, we look at trends in the growth of the capital-labour force ratio and of technical progress (assumed labour-augmenting). As is well known, both these growth rates fell sharply in the mid-1970s.

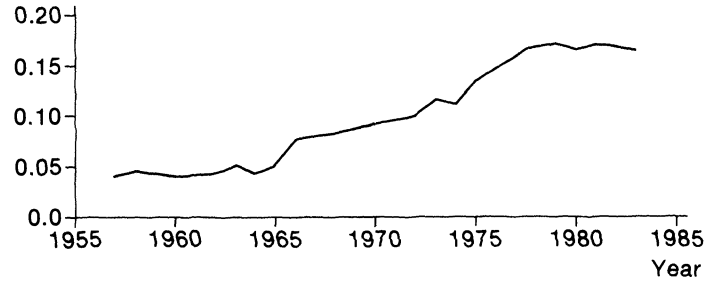
Previous unemployment

Another theory of wage pressure asserts that high rates of unemployment in the past tend to reduce the skills and work habits of the labour force, and thus to reduce effective labour supply. If lagged unemployment were important in the wage equation, this would make the short-term natural rate of unemployment a function of recent unemployment. It would also make the medium-term natural rate much more sensitive to the other push variables we have examined.[13] We therefore look hard for the effects of lagged unemployment terms in explaining wage behaviour. As it turns out, our attempt to establish this hysteresis effect is not notably successful, although there is some evidence for it in our quarterly wage equation. This brings us to two explanations of increased unemployment to which we give little credence.

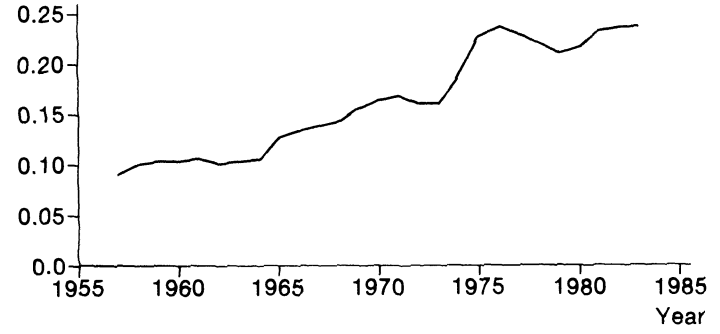
Labour force

There are those who believe that unemployment has gone up because of an increase in the labour force. This seems most unlikely. As Figure 6 shows, the

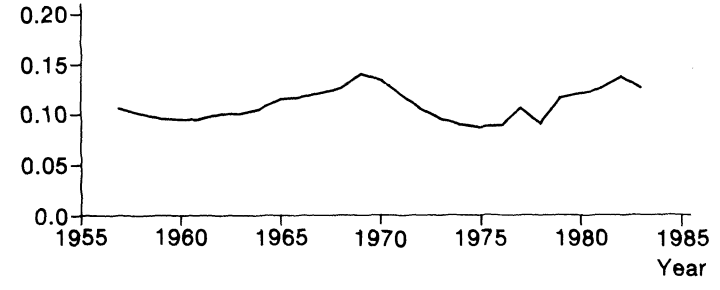
(a) Employer's tax rate (t_1)



(b) Employee's tax rate (t_2)



(c) Indirect tax rate (t_3)



(d) Log real import prices weighted by import share (1972=0)

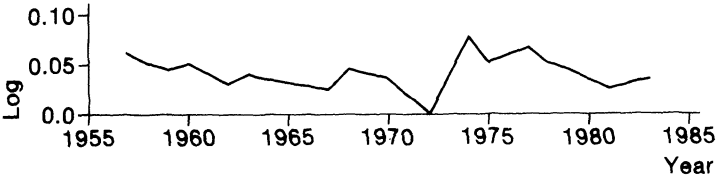


FIGURE 4. The wedge. (*Source*: Data Appendix at end of volume.)

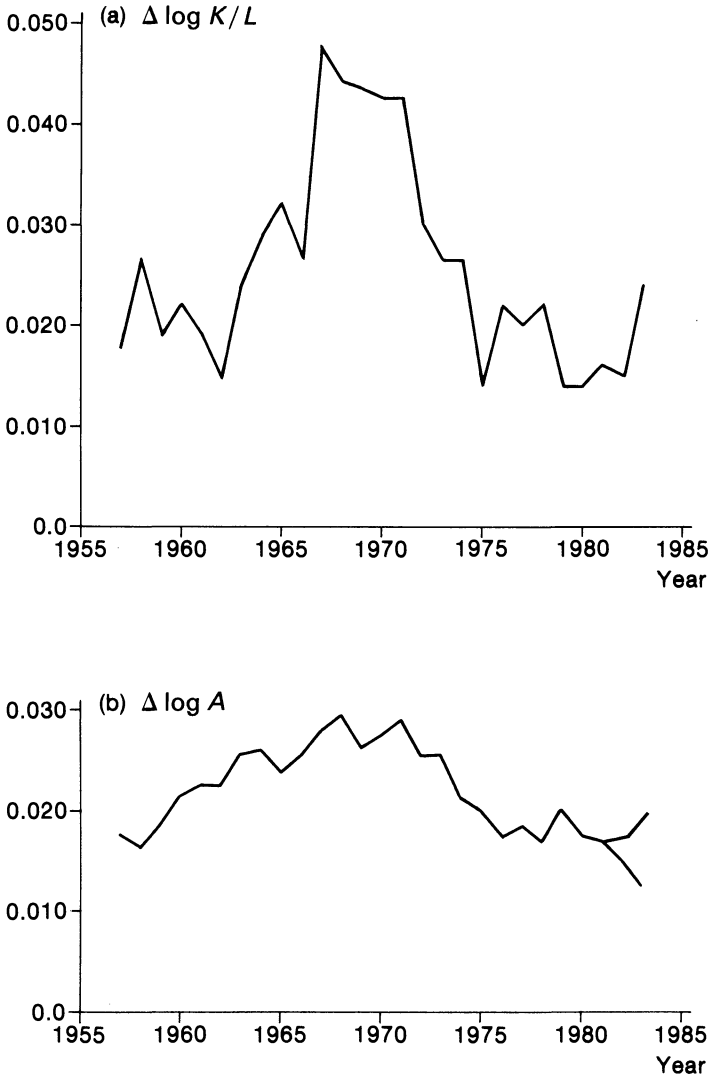


FIGURE 5. Δlog K/L and Δlog A, 1957–1983. (*Source*: Data Appendix at end of volume.)

labour force grew at least as sharply between 1950 and 1966 as between its 1971 trough and 1980. Between 1980 and 1983 it was fairly stable, and has now begun growing again. So it is difficult to suppose that the rise in unemployment is due to the increase in labour force.

Physical capacity

Others think that recent unemployment can be explained simply by a lack of physical capacity to employ the labour force. Fortunately, in Britain the Confederation of British Industries regularly asks its members, 'Is your output over the next four months likely to be limited by lack of physical capacity?' The replies are shown in Figure 7, together with the percentage of firms not

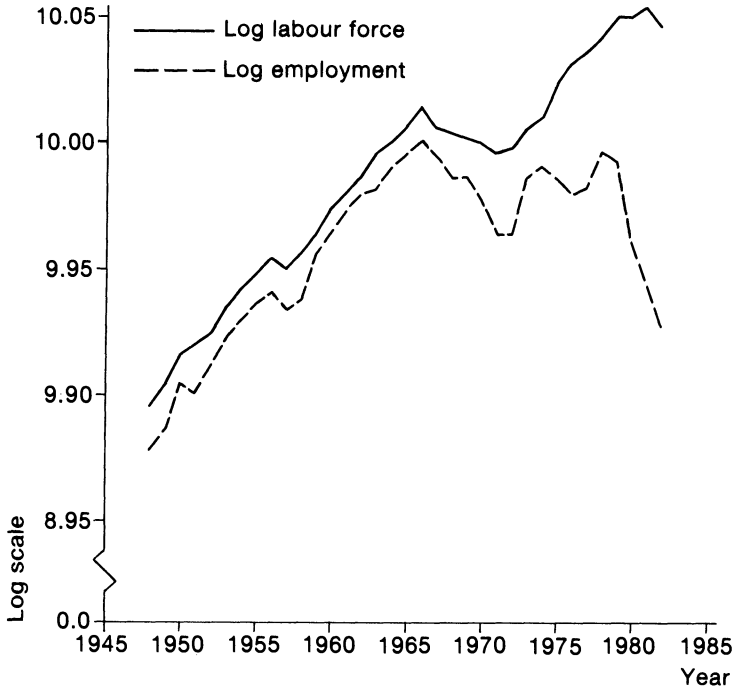


FIGURE 6. Log labour force and log employment, with the unemployment rate as the difference, 1948–1983. (*Source*: Data Appendix at end of volume.)

reporting that they were working below capacity. These figures show that until recently physical capacity has been anything but a limiting feature. In any case, there are clearly possibilities of shiftwork in factories, shops and elsewhere, which make it inherently unlikely that physical capacity could be a major limit on employment.

Real labour costs

So much for the medium-term forces affecting unemployment (the push factors). We can now turn briefly to the short-run factors affecting the level of employment (relative to capital)—i.e. to real wages and aggregate demand.

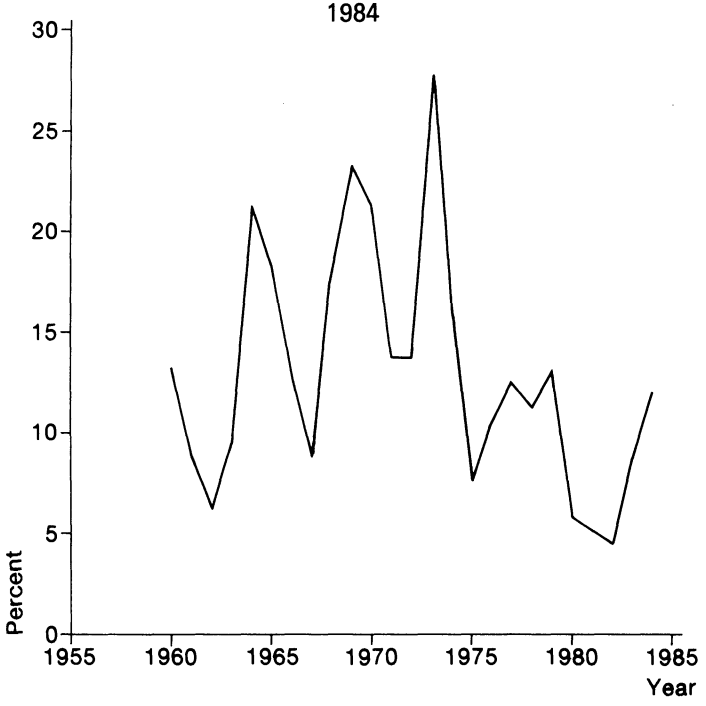
As Figure 8 shows, there is a close log-linear relation between employment (relative to capital) and real labour cost. However, there are still divergences that can be explained in part by aggregate demand factors.

Aggregate demand factors

Figure 9(a) shows the demand-weighted government deficit, adjusted for deviations of output from potential and for inflation.[14] This variable shows a severe contraction from 1979 onwards.

The other aggregate demand variables charted in Figure 9 are world trade (net of a quintic trend) and competitiveness, measured by world manufacturing export prices relative to the final expenditure deflator. This too has taken a beating in recent years.

(a) Percentage of firms reporting output to be constrained by shortage of physical capacity, 1960–1984



(b) Percentage of firms not reporting below-capacity working, 1958–1984

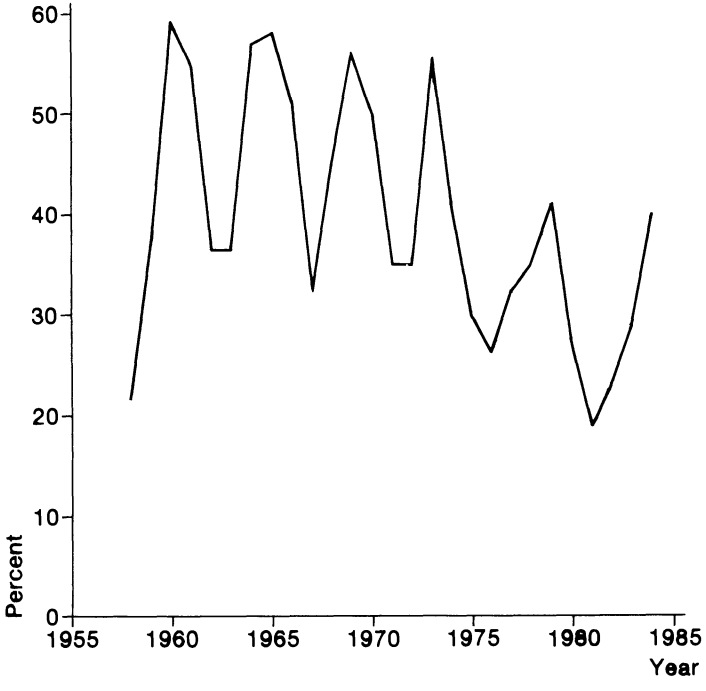


FIGURE 7. Capacity constraints on British firms. (*Source*: Confederation of British Industries, *Industrial Trends Survey.*)

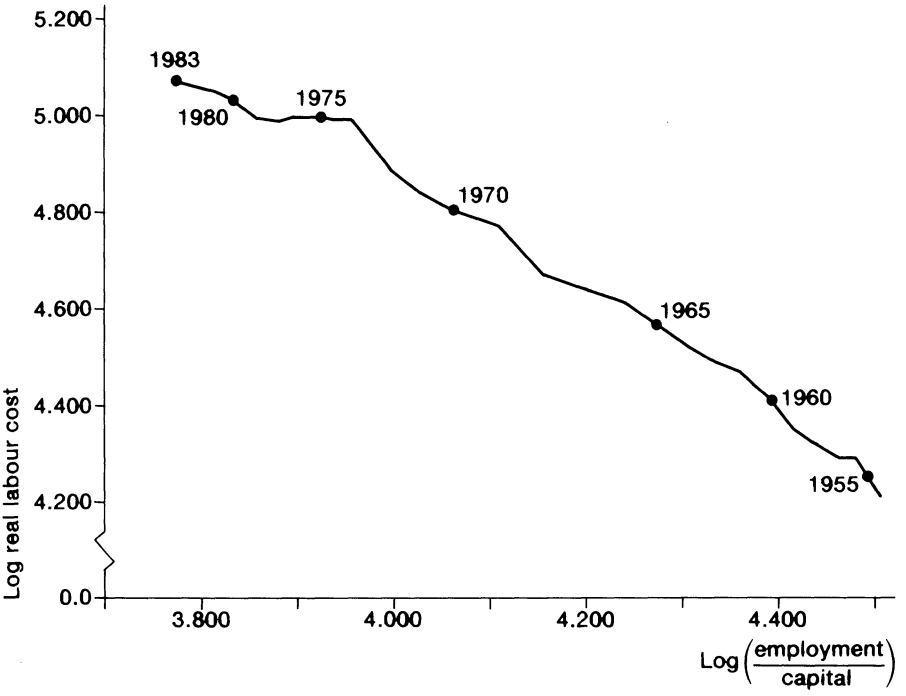


FIGURE 8. Real labour cost and the employment-capital ratio, 1954-1982. (*Source*: Data Appendix at end of volume.)

II. THE MODEL

Our model relates to an economy with price-setting firms. It comprises both the demand and supply influences affecting unemployment and inflation. But the demand side is handled by a simple reduced form, whereas the supply side is modelled in greater detail. The model comprises equations for the employment, pricing and output decisions of the firm, as well as for wage-setting behaviour in the labour market. These equations determine the level of unemployment, for given values of the real exchange rate. Since the real exchange rate has such an effect on wage pressure (p. S128) above) we can determine the long-run level of unemployment only by including a trade balance equation determining the level of competitiveness in the long run.

The overall model is set out on p. S141 below, followed by a discussion of its working. The impatient reader may wish to go straight there. But first we have to derive the rationale behind each relationship.

Employment, prices and the supply of output

Suppose the economy consists of a number (n) of identical imperfectly competitive firms. Each firm's final output is produced by a production function in which inputs (i.e. materials) are separable from capital and labour. We impose this restriction because it increases the efficiency of our estimates and does not appear to violate the data. Hence the ith firm's production of value added is determined by its capital (K_i) and its labour (N_i). In each period, the firm uses the capital stock with which it begins the period: any investment undertaken during the period only influences the capital stock for next period.

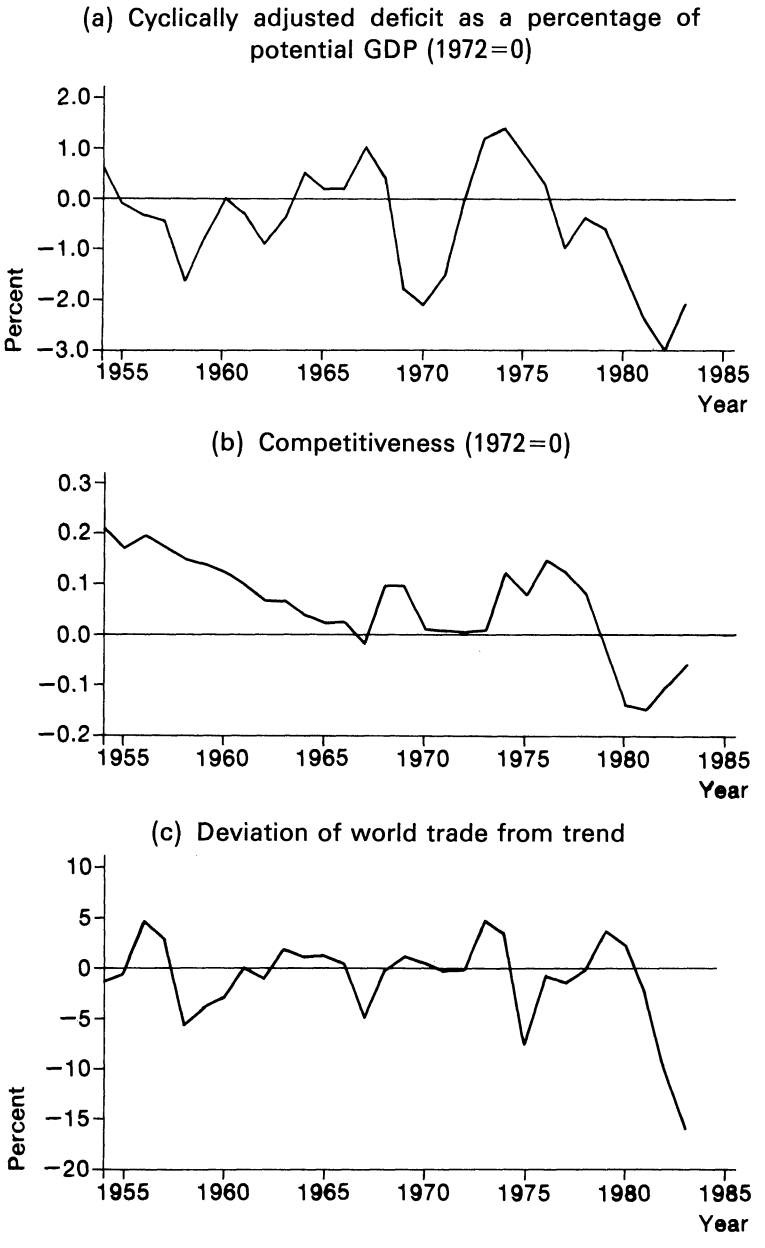


FIGURE 9. Demand variables, 1957–1983. (*Source*: Data Appendix at end of volume.)

Production involves some fixed set-up costs,[15] but thereafter the ith firm's output is produced at constant returns to scale. Technical progress (A) is assumed to be labour-augmenting (for which we later find some empirical support), with the firm's output depending on K_i and AN_i. Hence, given constant returns to scale, value-added output, Y_i, is given by

$$(1) \qquad Y_i = \psi\left(\frac{AN_i}{K_i}\right) K_i \qquad (\psi' > 0, \psi'' < 0).$$

This relation can also be inverted to give the amount of labour required to produce a given output:

$$(2) \qquad N_i = f\left(\frac{Y_i}{K_i}\right)\frac{K_i}{A} \qquad (f = \psi^{-1}, f', f'' > 0).$$

It follows, for future reference, that

$$(3) \qquad \psi'\left(\frac{AN_i}{K_i}\right) = 1 \Big/ f'\left(\frac{Y_i}{K_i}\right).$$

In other words, the marginal product of labour equals the reciprocal of the marginal cost of output measured in terms of labour. Any of the previous three equations is an equally valid description of the production process.

We come now to the behaviour of the firm. For the purposes of this exposition, we suppose that the firm sets prices, produces output, and fixes employment one period in advance, all on the basis of its expectation of the demand for its output (Y_i^e). If its demand forecast is wrong, the difference between production and sales is absorbed by inventories. In practice, of course, hours of work can also be varied almost instantaneously in order to make some adjustments to output when demand is revealed. Such a model is described in Nickell (1985) but requires a more complicated analysis; the resulting empirical model is, however, exactly the same as that given here. In our present model, then, output is equal to expected demand; that is, $Y_i = Y_i^e$.

In order to choose a price and thus determine its output and employment, the firm must forecast demand, and this is done as follows. If all the labour and capital in the economy were to be fully employed, each individual firm would produce $1/n$ of the total 'potential' output of the economy, i.e., $\psi(AL/K)K/n$, where L is the labour force and K is the aggregate capital stock. But the actual output that the firm can expect to sell (Y_i^e) will be less than that, since expected aggregate demand is only a fraction (σ^e) of total 'potential' output. The firm's expected sales will also depend on the firm's relative price (P_i/P^e) where P_i is the (value-added) output price and P^e is the expected aggregate (value-added) price level. So we can write the firm's expected demand, and thus its output, as

$$(4) \qquad Y_i = D\left(\frac{P_i}{P^e}, \sigma^e\right)\psi\left(\frac{AL}{K}\right)\frac{K}{n}.$$

The firm now has to choose its price. We can specify a completely general pricing rule in which (P_i) is a mark-up (v) on expected marginal costs. Using (2), this gives us the *pricing rule*

$$(5) \qquad P_i = vMC_i = v\frac{W}{A}f'\left(\frac{Y_i}{K_i}\right)$$

where W is the cost per worker including employment taxes.[16]

If the firm maximizes short-run profit, then the mark-up, v, is $(1-1/\eta)^{-1}$ where η is the elasticity of demand facing the firm. This, of course, includes the perfect competition case where $v=1$. If v is constant, the mark-up of prices on *wages* (as opposed to *marginal* cost) rises when output rises because marginal costs are increasing as the marginal product of labour falls.[17] There

is, however, a great deal of evidence for many industries which suggests that the mark-up of value-added prices on *wages* is very unresponsive to, or even independent of, demand fluctuations (normal cost pricing).[18] This implies that the mark-up on *marginal cost*, v, is decreasing with demand.[19] So, in general, we suppose that

$$v = v(\sigma^e) \qquad (v' \leq 0).$$

We can now move to the level of the aggregate economy by noting that $P = P_i$, $K = nK_i$, $N = nN_i$, $Y = nY_i$. So in aggregate, (3), (4) and (5) become

(6a) $\psi'\left(\frac{AN}{K}\right) = 1/f'\left(\frac{Y}{K}\right)$ Production function

(6b) $Y = D\left(\frac{P}{P^e}, \sigma^e\right)\psi\left(\frac{AL}{K}\right)K$ Expected output demand

(6c) $P = v(\sigma^e)\frac{W}{A}f'\left(\frac{Y}{K}\right)$ Pricing rule.

Note that Y is output supplied and appears on the left-hand side of (6b) because output supply is set equal to expected demand.

These equations are fairly standard blocks in most macroeconomic models. However, for the purposes of practical implementation it is convenient to have a more streamlined model in which these three equations are reduced to two, neither of which includes output. One of these equations is for prices and one for employment.

We first amalgamate equations (6b) and (6c) to obtain the equation for prices as a function of wages and expected product demand. This gives a fairly standard *price equation*

$$(7) \qquad \frac{P}{W} = g^1\underset{? \quad + \quad ? \quad -}{\left(\sigma^e, \frac{L}{K}, A, \frac{P}{P^e}\right)}.$$

Since $v' < 0$, the impact of σ is strictly indeterminate, because a rise in σ reduces the mark-up of prices over marginal cost but at the same time the real marginal labour requirement rises. However, in this context the most extreme form of behaviour that has ever been proposed is the normal cost pricing hypothesis where demand has no effect. All other hypotheses generate a positive relationship, and so we would expect $g_1^1 \geq 0$. Note also the fact that, if prices turn out to be higher than expected ($P > P^e$), this is automatically associated with a fall in the mark-up of prices on wages.

For our employment equation, the most natural relation is that obtained by using (6a) to eliminate output from (6c). This yields

$$(8) \qquad \psi'\left(\frac{AN}{K}\right) = v(\sigma^e)\frac{W}{PA}.$$

Thus, the marginal product of labour is equal to the product of the real wage

in efficiency units, W/PA, and the price mark-up on marginal cost, $v(\sigma^e)$. This is a very interesting equation in at least two senses. First, it is the natural generalization of the perfect competition result ($v = 1$). In particular, it demonstrates that the *ceteris paribus* real-wage elasticity of employment is unaffected by conditions in the product market. Second, it illustrates the crucial role of the price mark-up on marginal cost in determining employment. If, when demand increases, prices do not rise as much as marginal cost, then employment must rise (since $v' < 0$).

The marginal productivity condition, (8), thus generates an *employment equation* of the form

$$(9) \qquad \frac{N}{K} = \frac{1}{A} g^2 \underset{- \quad +}{\left(\frac{W}{PA}, \sigma^e\right)}.$$

To many people this is an unfamiliar equation. One question that arises is how (in the short run, with K, A fixed) real wages can vary while expected demand, σ^e, is unchanged. The answer is that P/P^e may vary, and this will affect real wages through equation (7).

Let us consider an example of this. Suppose that a firm strikes an unexpectedly poor wage bargain but its expectation concerning aggregate prices remains unchanged. Then it will certainly raise prices and cut production, although prices will not rise by as much as wages because it does not wish to lose out too much *vis-à-vis* its competitors. But all firms are in an identical position. All prices respond in the same way, and so actual prices turn out to be higher than expected but the price mark-up on wages has declined. Furthermore, all firms produce less and employ fewer workers as a consequence of these events although σ^e remains unchanged. So we have a rise in real wages, and employment falls exactly as predicted by equation (9).

As an alternative to the employment equation (9) derived above, we can consider two other possible employment equations, one of which excludes the real wage, W/PA, and the other of which excludes demand, σ^e. To obtain the former we simply use demand (6b) to replace output in the production function (6a). This would give

$$\frac{N}{K} = g^3\left(\sigma^e, \frac{L}{K}, A, \frac{P}{P^e}\right)$$

which is, in many ways, less appealing than (9), at least as far as empirical implementation is concerned. Its advocates (see, for example, Carlin and Soskice, 1985) are generally those who believe that the marginal product of labour is constant, so that (8) and (9) are actually invalid. But our empirical work gives such strong support for the presence of real-wage effects in (9) that we are convinced that real marginal cost does indeed rise.[20]

In the third possible employment relation, expected demand (σ^e) does not appear. To obtain this we have to combine all three equations (6a), (6b) and (6c), or (which is equivalent) to use (7) to eliminate σ^e from (9). This gives

$$\frac{N}{K} = g^4\left(\frac{W}{PA}, \frac{L}{K}, A, \frac{P}{P^e}\right).$$

Clearly, this procedure will fail in the special case where there is exactly normal cost pricing, and hence σ^e does not appear in (7). But even if there is nearly (but not exactly) normal cost pricing, an equation with only real wages is not likely to be robust. We therefore strongly prefer the simplicity and generality of equation (9) to the alternative employment relations.

The determination of demand, σ

Our demand variable, σ, represents demand relative to total potential output and can be thought of as being solved out of a standard, open-economy, *IS-LM* system. It is therefore a function of government fiscal and monetary policy instruments, x_d, an index of world economic activity, Y^*, and an index of price competitiveness, $P^*/\bar{P}$, the ratio of the world price of output in domestic currency to the price of domestic output. It is also worth noting that, when specifying the firm's demand in equation (4), we chose as the relative price the ratio of the firm's price to the aggregate domestic price level. In an open economy it is more natural to suppose that the appropriate normalizing price is some weighted average of domestic and world prices. Our formulation is, however, perfectly satisfactory, since we absorb the domestic to world price ratio into σ. To summarize, therefore, σ may be written as

$$\sigma = \sigma\left(x_d,\ Y^*,\ \frac{P^*}{\bar{P}}\right). \tag{10}$$

Wage determination

We turn next to wage formation. Initially, we suppose that prices are correctly foreseen, so there is no discrepancy between the real wage that agents intend to bring about as a result of their activities and the real wage that actually occurs.

We can imagine real wages being determined by four possible mechanisms; (1) supply and demand (i.e. by impersonal forces); (2) firms; (3) unions; (4) bargaining between firms and unions. Any of the last three can give rise to involuntary unemployment (see Johnson and Layard, 1986). It does not require unions to produce 'real-wage resistance'.

It is highly probable that all four mechanisms are used in various sectors of the economy. It is important, therefore, that our estimated model of wage determination is sufficiently general to encompass all types of model. In fact, this is not as difficult as it seems, because all the models have broadly similar implications. In order to see how this comes about, let us start with the standard model of competitive wage determination.

The demand for labour is given by (9), and we can write the supply of labour, conditional on the labour force, as

$$N = g^5\left(\frac{W}{P},\ Z^s\right)L \tag{11}$$

where g^5 is the proportion of the labour force prepared to work at the real wage W/P. Z^s is a set of variables that influence labour supply given the real wage. Remember that the real wage is defined as hourly labour costs divided by value-added prices, and so Z^s must incorporate all elements of the wedge

between this and the real consumption wage (see p. S128 above and n. 11). So Z^s includes taxes as well as relative import prices and any other variables affecting the search intensity and willingness of the unemployed to work, such as the size and availability of unemployment benefit. Equating supply and demand in the labour market generates an equilibrium real-wage function of the form

$$(12) \qquad \frac{W}{P} = h^1\left(\underset{+}{\sigma^e}, \underset{?}{A}, \underset{+}{\frac{K}{L}}, \underset{+}{Z^s}\right).$$

The real wage is influenced by the variables that affect the supply and demand for labour, with K/L being the key variable explaining the secular rise in the real wage over time. This is, of course, a reduced-form equation relative to the labour market.

Now suppose firms set wages. There are numerous models of firms' wage-setting behaviour, many of which are summarized in Johnson and Layard (1986) and Stiglitz (1986). A typical group of such models is the efficiency wage type. These have the property that, for one reason or another, an increase in the wage paid generates a benefit to the firm, which partially offsets the direct cost. For example, increasing wages relative to some externally given level[21] reduces quitting (Pencavel, 1972), or reduces vacancies (Jackman, Layard and Pissarides, 1984), or raises employees' work effort (Shapiro and Stiglitz, 1984). The firm thus sets the wage to equate the marginal benefit to the direct marginal cost. This generates a wage function which may be thought of as a pseudo-supply price relationship. The wages set depend on outside opportunities, which would include some alternative wage level as well as the outside employment rate and Z^s variables, such as the unemployment benefit levels.

One possibility is that the wage-setting equation requires the wage set to be proportional to the expected outside wage. In that case, in the absence of expectational errors, the natural rate of unemployment is determined in a very simple way. When the wage-setting equations are averaged across all firms, the average level of wages would not appear in the resulting relationship. Instead, the equation determines the employment rate as a function of the Z^s variables. This is in the spirit of the traditional augmented Phillips curve. However, it is better to allow for the possibility that the wages set are not proportional to the expected outside wage. There will then, in fully anticipated equilibrium, be a long-run relationship between the prevailing real wage, the employment rate and the Z^s variables. Eliminating the employment rate via the labour demand function would lead to a reduced-form real wage function much the same as that in (12).

Similar conclusions follow from union or bargaining models of wage determination, which are discussed fully in Layard and Nickell (1985a). There are strong grounds for believing that, even in the presence of unions, employers fix employment, taking the wage as given (see Oswald, 1986; Oswald and Turnbull, 1985). Thus, in bargaining, unions and firms compute their welfare and expected profit functions, knowing that this is how employment will be determined. The expected profit function of the ith firm will depend on all the variables entering its profit equation (especially W_i/P, σ^e, A, K/L and

K_i). The welfare function of the union will depend on W_i/P, on any other determinants of employment (as above), on any wedges between real labour costs and real take-home pay (taxes and import prices), and on the alternative opportunities open to union members who do not get work in the firm. The outside opportunities will be affected by the outside wage (W/P), the general level of employment (N/L) and the level of wellbeing of those who are unemployed.

Thus, the final level of the real wage settled for (W_i/P) will depend on σ, K, A, K/L, N/L, W/P and the whole set of supply-side variables (Z^s).[22] It will also, of course, depend on the degree of union strength (U_p). Taking the equilibrium relationship (with $W_i = W$) gives us (provided W_i is not proportional to W) a structural real-wage equation:

$$(13) \qquad \frac{W}{P} = h^2\left(\underset{?}{\sigma^e}, \underset{+}{A}, \underset{+}{\frac{K}{L}}, \underset{+}{\frac{N}{L}}, \underset{+}{Z^s}, \underset{+}{U_p}\right).$$

This differs from (11) in that it is a structural equation yet includes demand-side variables (σ, A, K/L). It differs from the reduced-form equation (12) in that it includes employment. It is thus the most general wage equation and forms the basis of our approach to estimation.

However, a number of minor adjustments must be made to this formulation. First, we expect the impact of the demand variable, σ^e, to be relatively minor since it mainly reflects short-run fluctuations and firms would be reluctant to allow short-run demand shifts to influence longer term wage agreements, especially if they are using normal cost pricing. We therefore omit σ^e from our wage model.[23] Second, as we have already noted, one of the elements of Z^s is the real price of imports $P_m/\bar{P}$ where P_m is the price of imports and $\bar{P}$ is the price of domestic output. This may be rewritten as $(P_m/P^*)(P^*/\bar{P})$ where the first term may be thought of as the exogenous world terms of trade between importables and world output and the second term represents endogenous price competitiveness. We may thus separate the wage pressure variables Z^s and U_p into all the exogenous factors, which we simply term Z, and the price competitiveness $P^*/\bar{P}$. Finally, our wage derivation in fact relates to the intended real wage W/P^e. If we wish to explain the actual real wage, W/P, then we must clearly include P/P^e as an explanatory variable taking a negative sign. If prices rise faster than expected, real wages will turn out lower than were bargained for.

The upshot of this discussion is a real-wage equation of the form

$$(14) \qquad \frac{W}{P} = h^3\left(\underset{+}{A}, \underset{+}{\frac{K}{L}}, \underset{+}{\frac{N}{L}}, \underset{+}{Z}, \underset{+}{\frac{P^*}{\bar{P}}}, \underset{-}{\frac{P}{P^e}}\right).$$

Note that an improvement in competitveness leads to an increase in the real price of imports, a consequent rise in wage pressure, and a rise in the real wage.

The long-run determination of competitiveness, $P^*/\bar{P}$

We assume that competitiveness is determined in the long run by the condition

that the balance of trade is zero. This suggests an equation of the form

$$(15) \qquad \underset{+\ -}{P^*/\bar{P} = h^4(\sigma,\ Y^*,\ Z^c)}$$

where Z^c represents exogenous factors including the value of oil production.

The model in operation

We are now in a position to discuss the workings of the model as a whole, but in order to do so it is convenient to set out our equations *en bloc*, starting with the supply side. This consists of four equations (already derived) for employment, prices, wages and output:

$$(9) \qquad \underset{-\ \geq 0}{\frac{N}{L} = g^2\left(\frac{W}{PA},\ \sigma^e\right)\frac{K}{AL}} \qquad \text{Employment}$$

$$(7) \qquad \underset{\geq 0\ -\ ?\ -}{\frac{P}{W} = g^1\left(\sigma^e,\ \frac{K}{L},\ A,\ \frac{P}{P^e}\right)} \qquad \text{Prices}$$

$$(14) \qquad \underset{+\ +\ +\ +\ +\ -}{\frac{W}{P} = h^3\left(A,\ \frac{K}{L},\ \frac{N}{L},\ Z,\ \frac{P^*}{\bar{P}},\ \frac{P}{P^e}\right)} \qquad \text{Wages}$$

$$(6b) \qquad \underset{-\ +\ \ +}{Y = D\left(\frac{P}{P^e},\ \sigma^e\right)\psi\left(\frac{AL}{K}\right)K} \qquad \text{Output}$$

We can now look at *actual product demand* and how this relates to supply. Actual aggregate sales are[24]

$$(16) \qquad Y^d = D(1,\ \sigma)\psi\left(\frac{AL}{K}\right)K \qquad \text{Aggregate sales}$$

where

$$(10) \qquad \underset{+\ \ +}{\sigma = \sigma\left(x_d,\ Y^*,\ \frac{P^*}{\bar{P}}\right)}.$$

If $P = P^e$ and $\sigma = \sigma^e$, then actual output, given by (6b), equals aggregate sales. Otherwise the difference is made up by changes in inventories by an amount equal to $(Y - Y^d)$.

Finally, there is a relation determining the long-run level of competitiveness, given by

$$(15) \qquad \underset{+\ -}{P^*/\bar{P} = h^4(\sigma,\ Y^*,\ Z^c)}.$$

The first three equations (for employment, prices and wages) are the key to understanding unemployment, both in the long run and the short run.

(i) *Long-run analysis.* Let us take the productive capacity of the economy (K, L, A), the level of competitiveness, $P^*/\bar{P}$, and the degree of wage pressure, Z, as given. Then the supply side of this model tells us the level of output (Y), employment (N), the real wage (W/P) and the price surprise (P/P^e) generated by any given level of expected demand. It therefore follows that there is a particular level of demand that will generate no price surprise ($P/P^e = 1$). Furthermore, this 'long run' feasible level of demand is determined along with employment and the real wage, simply by setting $P = P^e$ in the key supply equations (9), (7) and (14). This is a very classical result from what looks like a very non-classical model. It must, however, be emphasized that large numbers of individuals may be voluntarily unemployed, since wage determination is not based on market-clearing.

Clearly, if wage pressure (Z) increases, this will make things worse, by making it more difficult for firms to provide the real wages that wage-bargainers would like. Only higher unemployment will force wage-bargainers back into line.

By contrast, a loss of competitiveness will make it easier for firms to meet the real-wage targets of wage-bargainers. Thus it would be possible, even in the absence of price surprises, to get rising employment if this were accompanied by a loss of competitiveness (shades of the United States in the recent past). Demand (σ) would need to expand to generate the extra employment. How long such a loss of competitiveness could be sustained would, however, depend on the underlying forces determining the real exchange rate. In the very long run, (15) would come into play and pin down the real level of activity in the economy.

To understand the dynamics of the system we can now perform two experiments. First, we shall examine what happens when there is a real demand shock (which must in its nature be temporary). Second, we shall examine a supply shock, looking at both its short-run and long-run effects.

(ii) *A short-run demand shock.* What happens if demand is pushed above its natural rate? According to the price equation, real wages cannot rise unless prices are higher than expected. But according to the wage equation, real wages will have to be higher if output and employment rise, unless prices are higher than expected. Thus, the only way in which the behaviour of price-setters and wage-setters can be reconciled is by prices running ahead of expectations. This is what makes both price-setters and wage-setters happy with their mark-up even though at prevailing levels of employment both sides could not be happy if they realized what was happening.

In this situation do real wages rise or fall? This depends mainly on the slope of the pricing relationship. Here we shall make two polar assumptions. First, we shall assume normal cost pricing. So demand (σ) has no effect on pricing and a strong effect on employment. Then we shall assume perfect competition, so that σ has a strong effect on the real wage and no direct effect on employment.

The two cases are illustrated in Figure 10. Initially we are at the natural level of σ, with $P = P^e$. The economy is at A. Now σ rises.

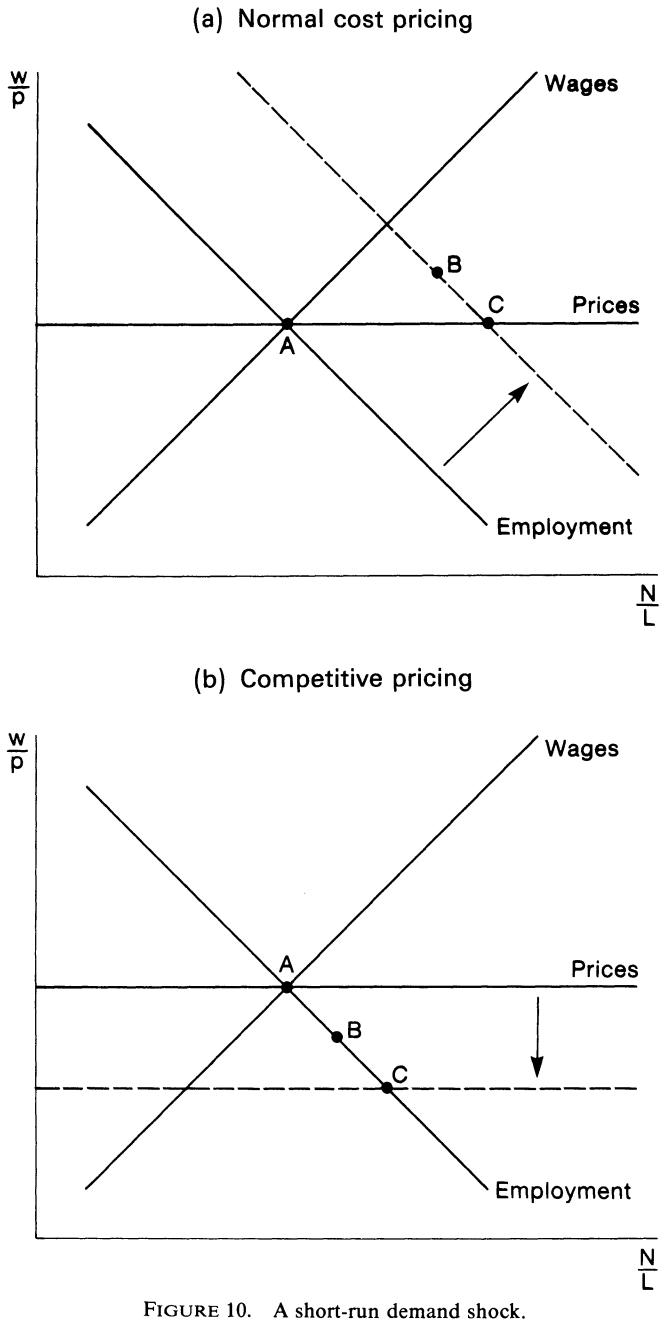


FIGURE 10. A short-run demand shock.

If we have normal cost pricing, the real wage must rise; for as prices rise above their expected levels, firms reduce the mark-up of prices on wages. It is true that this also induces wage-bargainers to reduce the mark-up of wages on prices. But this is not enough to reduce the real wage because of the tighter labour market. The new disequilibrium observation is at *B*. Thus this model is consistent with the common claim that real wages rise in demand-led booms.

By contrast, if we have competitive pricing, the real wage has to fall; for this is the only way in which employment can rise, as at *B*. Thus, one clear test of pricing models is the behaviour of real wages in relation to demand shocks.

Of course, if at the same time as demand rises there is a supply-side improvement in wage behaviour, then prices need not run ahead of expectations. In the present case we should need a fall in the wage equation till it went through point *C*. Such a shift could come from a reduction of any of the 'push factors' including, as we have said, a fall in competitiveness.

(iii) *A supply shock: short-run and long-run.* We can now look at the effect of an exogenous increase in wage pressure, brought about, for example, by a rise in relative import prices such as occurred in the 1970s. If in the short run real demand remains unchanged, then there must be positive price surprises, typically brought about by rising inflation. In terms of Figure 11, as wage pressure rises the wage function moves to the left and we move from the equilibrium point *A* up the labour demand curve to a point such as *B*. As before, the new point must be above the price function and below the wage function, because of positive price surprises. Because the demand-for-labour schedule is fixed, the rise in wage pressure produces a fall in employment, and a rise in real wages. This fall in employment is decidedly classical in the sense that the rise in wage pressure has succeeded in raising real wages and opening up a 'wage gap' (see Bruno's paper in this volume).

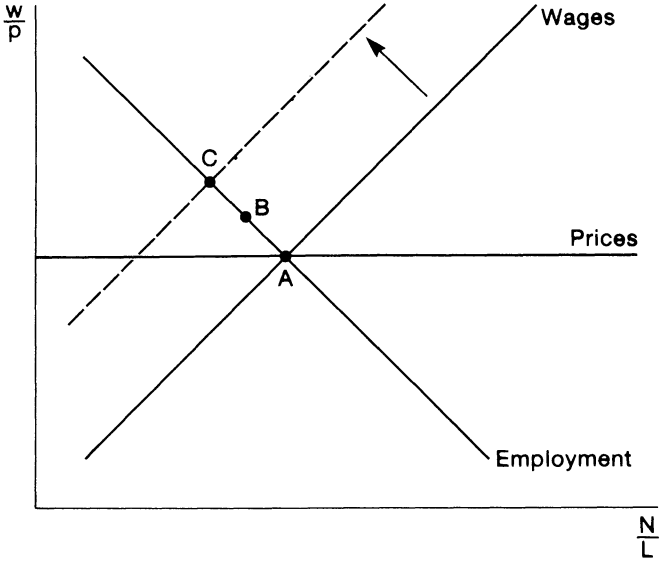
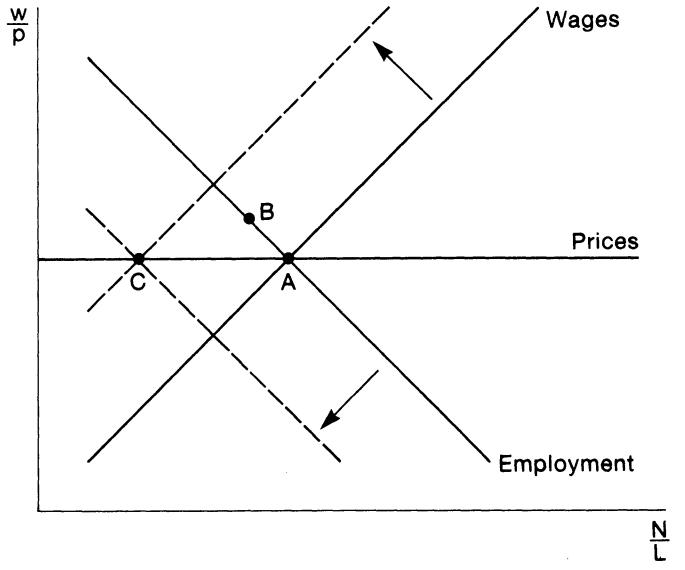


FIGURE 11. An increase in wage pressure (real demand fixed).

However, this is not the end of the story. In order to stabilize inflation at the new higher level of wage pressure, real demand must fall. This could happen endogenously or by a policy reaction. Endogenous mechanisms might include reduced consumption arising from higher inflation, higher real interest rates associated with lower real balances, losses of competitiveness (from the same source) and falls in the real value of cash-limited government expenditure.

In any event, let us suppose that, somehow or other, demand (σ) has adjusted down to the level appropriate to the new level of wage pressure. What happens to real wages? To examine this we present two diagrams corresponding to the two extremes of firm behaviour, normal cost pricing in Figure 12(a) and competitive pricing in Figure 12(b). As a consequence of the increase in wage push we have a fall in the equilibrium level of employment

(a) Normal cost pricing



(b) Competitive pricing

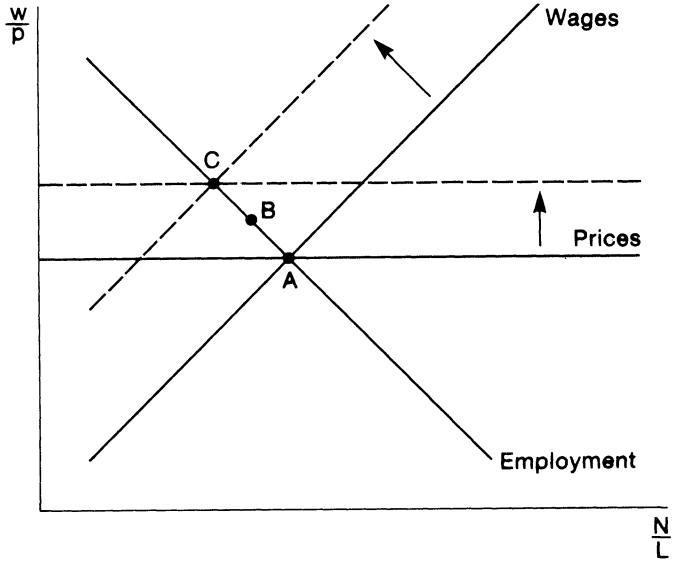


FIGURE 12. An increase in wage pressure: the new equilibrium.

and a correspondng fall in the level of real demand consistent with stable inflation. But under competitive pricing we have a rise in the real wage whereas under normal cost pricing there is no such rise. This is hardly surprising, for under normal cost pricing real wages are fixed, independently of demand, by the pricing policies of firms. Under competitive pricing, however, real wages must rise if lower employment is to be generated, and this happens naturally as lower demand leads to a lower mark-up of prices on wages since prices are rising with marginal cost. What happens in this 'second phase' thus depends crucially on firms' pricing behaviour. Under competitive pricing, unemployment remains 'classical'. The labour demand schedule is fixed, and real wages and the 'wage gap' increase further. Under normal cost pricing, however, unemployment now begins to look more 'Keynesian'. As demand is reduced, employment falls further from B to C, but the real wage falls and the 'wage gap' is closed. This provides an explanation of the continuing rise in European unemployment in the 1980s while the 'wage gap' is falling (see Bruno, this volume, and Gordon, 1985). It must, however, be emphasized that it is the rise in wage pressure that is the ultimate cause of the fall in employment, whichever form of pricing behaviour is assumed. The fall in demand has to come about in order to stabilize inflation, and the real wage outcome is entirely a secondary matter in the macroeconomic context.

To summarize, it should now be clear why we have unemployment. Very crudely, firms try to achieve a certain mark-up of prices on wages as part of their pricing strategy. On the other hand, workers try to achieve a certain mark-up of wages on prices in wage bargaining. If they are inconsistent, then in the short run they may be realigned by surprises. But in the long run these must be ruled out, and unemployment is the key mechanism that reduces the workers' aspirations, with the concomitant fall in demand possibly also reducing the aspirations of the firms. In the competitive economy the aspirations of firms do not come into it; but as soon as we move away from perfect competition in both labour and product markets there is a 'battle of the mark-ups', and, in the long run, it is unemployment that provides the resolution.

III. The Empirical Framework

As we have already noted in the previous section, in order to investigate unemployment in both the short and the long run, all we require is the employment equation (9), the price equation (7), the wage equation (14) and the competitiveness equation (15). In this section, therefore, we set out our empirical versions of these four equations and discuss how they may be utilized to analyse unemployment.

The employment equation

The dynamic version of (9) which we estimate has the form

$$\log N = \alpha_0 + \alpha_1 \log N_{-1} + \alpha_2 \log N_{-2} + \alpha_3 \log \left(\frac{W}{P}\right)_{-1} + \alpha_4 \sigma^e + \alpha_5 \log A + (1-\alpha_1-\alpha_2) \log K, \tag{17}$$

$$(\alpha_3 < 0,\ \alpha_4 > 0,\ 1-\alpha_1-\alpha_2 > 0)$$

where N = employment, W = hourly labour cost, P = value-added prices, σ^e = expected real demand relative to potential output, A = labour-augmenting technical progress and K = capital.

Three points are worth noting. First, dynamics may arise via adjustment costs and aggregation in the usual way. Second, it is clear from the form of (9) that the impact of technical progress is related to that of capital and the real wage. In fact, the restriction is

$$\alpha_5 = -\alpha_3 - (1 - \alpha_1 - \alpha_2). \tag{18}$$

So technical progress will have no impact on employment if the long-run wage elasticity of the demand for labour is unity. Third, in order to estimate our model we must specify how we measure real demand relative to potential output, σ. This is specified as a linear combination of price competitiveness, $P^*/\bar{P}$, the adjusted fiscal deficit relative to GDP, AD, and detrended world trade, WT. We tried including long-term real interest rates but with no success.

Thus we have

$$\sigma = \log \frac{P^*}{\bar{P}} + \alpha_{41} AD + \alpha_{42} WT \tag{19}$$

where we take care of the fact that we have expected demand in our equation by using actual values and instrumenting in the usual way (see Wickens, 1982, for example).

The price equation

If there is some degree of sluggishness in price adjustment, then we have a simple dynamic version of (7) of the form

$$\log P = \log W + \beta_0 + \beta_1 \log \left(\frac{P}{W}\right)_{-1} + \beta_2 \sigma^e + \beta_3 \log \frac{K}{L} + \beta_4 \log A + \bar{\beta}_5 (\log P - \log P^e). \tag{20}$$

In order to deal with the last term, note that, if we take expectations of (20) and subtract, we obtain

$$\log P - \log P^e = \log W - \log W^e + \bar{\beta}_5 (\log P - \log P^e)$$

where we assume that K/L and A are known in advance. Hence we may replace $\log P - \log P^e$ by $(\log W - \log W^e)/(1 - \bar{\beta}_5)$, which we model by a distributed lag on $\Delta^2 \log W$. Thus we estimate an equation of the form

$$\log \left(\frac{P}{W}\right) = \beta_0 + \beta_1 \log \left(\frac{P}{W}\right)_{-1} + \beta_2 \sigma^e + \beta_3 \log \frac{K}{L} + \beta_4 \log A + \beta_5 \Delta^2 \log W + \beta_6 \Delta^2 \log W_{-1}, \qquad (\beta_2 > 0;\ \beta_3, \beta_5, \beta_6 < 0). \tag{21}$$

In addition, the derivation of the price and employment equations ensures that there are some cross-equation restrictions which essentially follow from the production function constraint (6a). These are

$$\beta_3/(1 - \beta_1) = (1 - \alpha_1 - \alpha_2)/\alpha_3;\ \beta_4/(1 - \beta_1) = -(1 - \alpha_1 - \alpha_2)/\alpha_3 - 1 \tag{22}$$

and a proof may be found in Layard and Nickell (1985b).

The wage equation

The wage equation is based on equation (14) and has the form

$$\log\frac{W}{P}=\gamma_0+\log\frac{P^e}{P}+\gamma_1 U+\gamma_2\log\frac{K}{L}+\gamma_3\log A+Z+\gamma_4\nu\log\frac{P_m}{\bar{P}}, \tag{23}$$

$$(\gamma_1<0,\ \gamma_2,\ \gamma_4>0)$$

where U = unemployment rate $\simeq -\log N/L$, and ν = share of imports in GDP. We exclude the real price of imports, $P_m/\bar{P}$, from Z because it is endogeneous, so Z now includes mismatch (MM), the replacement rate (ρ), an index of union power (U_P), the labour tax rate on employers (t_1), the income tax rate (t_2), the indirect tax rate (t_3), and a dummy for incomes policy (IPD). These variables are all described in the Introduction, so we may write Z as

$$Z=\gamma_{31}MM+\gamma_{32}\rho+\gamma_{33}U_p+\gamma_{34}t_1+\gamma_{35}t_2+\gamma_{36}t_3+\gamma_{37}IPD, \tag{24}$$

$$(\gamma_{31},\ \gamma_{32},\ \gamma_{33},\ \gamma_{34},\ \gamma_{35},\ \gamma_{36}>0,\ \gamma_{37}<0)$$

Although (23) does not look much like a standard Phillips curve equation, it is, in fact, very closely related, as our discussion in Layard and Nickell (1985a) makes clear.

In our empirical work, we use a number of different variants of equation (23), as we shall see. In particular, we replace U successively by $\log U$, $\log V$ (the vacancy rate) and U_s (the short-term unemployment rate), and we also include $\nu\log(P_m/\bar{P})$. The reasons for this are discussed with the results.

The competitveness equation

In order to determine the long-run level of competitiveness given by equation (15), we estimate an equation explaining the trade balance as a proportion of potential GDP (B/Y^P). The actual equation used is

$$\frac{B}{Y^P}=\delta_0+\delta_1\nu\log\left(\frac{P^*}{\bar{P}}\right)_{-1}+\delta_2\nu\log\left(\frac{P_m}{P^*}\right)_{-1} \tag{25}$$

$$+\delta_3\sigma_{-1}+\delta_4 OIL_{-1}+\delta_5 WT, \qquad (\delta_1>0,\ \delta_3<0,\ \delta_4,\ \delta_5>0).$$

where P_m/P^* is the price of imports relative to world prices in domestic currency and OIL is the real value of oil production (nominal value divided by $\bar{P}$). Setting $B/Y^P=0$ then gives the long-run equilibrium level of competitiveness.

The analysis of unemployment

In order to use these equations to analyse the changes in unemployment, we proceed as follows. First, to account for the medium-term changes in unemployment, we combine the employment function (17) and wage function (23) to obtain an unemployment function of the form

$$(1-\alpha_1-\alpha_2+\alpha_3\gamma_1)U=-(\alpha_0+\alpha_3\gamma_0)-(1-\alpha_1-\alpha_2+\alpha_3\gamma_2)\log\frac{K}{L} \tag{26}$$

$$-(\alpha_3\gamma_3+\alpha_5)\log A-\alpha_3\log\left(\frac{P}{P^e}\right)-\alpha_3 Z-\alpha_3\gamma_4\nu\log\left(\frac{P_m}{\bar{P}}\right)-\alpha_4\sigma.$$

where we have used the long-run solutions to the two equations. This equation determines the unemployment rate conditional on the demand index σ and the level of competitiveness, $P^*/\bar{P}$. As the equation makes clear, in the long

run the unemployment rate could be affected by the capital-labour force ratio but not by the size of the labour force (for any given K/L). However, in the light of history it does not seem reasonable to think of the capital-labour force ratio as an important determinant of unemployment *in the long run.* If long-run 'neutrality' holds with respect to K/L and log A, we would have to find

(27a) $\gamma_2 = -(1-\alpha_1-\alpha_2)/\alpha_3$

(27b) $\gamma_3 = -\alpha_5/\alpha_3$.

In other words, wage behaviour would have to be such that, when K/L or A alters the demand price for labour, the actual wage changes in the same proportion.

The second use of the model is to compute the natural rate of unemployment and the effect upon it of the Z variables. For this purpose we set $P = P^e$ and $W = W^e$. In practice, we compute two versions of the natural rate, one conditional on the actual level of price competitiveness, $P^*/\bar{P}$, and an unconditional version assuming zero trade balance. The former may be obtained by noting that the employment equation and the price equation together imply

$$(28)\quad (1-\alpha_1-\alpha_2)U = -\alpha_o\left(-\frac{\alpha_3\beta_0}{1-\beta_1}\right) - \left(1-\alpha_1-\alpha_2-\frac{\alpha_3\beta_3}{1-\beta_1}\right)\log\frac{K}{L}$$
$$-\left(\alpha_4-\frac{\alpha_3\beta_2}{1-\beta_1}\right)\sigma - \left(\alpha_5-\frac{\alpha_3\beta_4}{1-\beta_1}\right)\log A.$$

Notice that the restrictions (18) and (22) imply that the coefficients on both log K/L and log A are zero. So long-run 'neutrality' in this equation is a consequence of the production function constraint. Next we eliminate σ between (26) and (28) and, given K/L and A neutrality, obtain

$$(29)\quad U = \text{constant} + \frac{\{\alpha_4(1-\beta_1)-\alpha_3\beta_2\}(Z+\gamma_4\nu\log P_m/\bar{P})}{\beta_2(1-\alpha_1-\alpha_2+\alpha_3\gamma_1)-\alpha_4\gamma_1(1-\beta_1)}$$

which emphasizes the crucial role of the wage pressure variables.

To obtain the zero-trade-balance natural rate, we note that under this condition (25) implies that

$$(30)\quad \delta_1\nu\log\left(\frac{P^*}{\bar{P}}\right) = -\delta_0 - \delta_2\nu\log\left(\frac{P_m}{P^*}\right) - \delta_3\sigma - \delta_4 OIL - \delta_5 WT.$$

If we now write

$$(31)\quad \nu\log\frac{P_m}{\bar{P}} = \nu\log\frac{P_m}{P^*} + \nu\log\frac{P^*}{\bar{P}}$$

we can use (28), (30) and (31) to eliminate ν log $P_m/\bar{P}$ from (29) to obtain

$$(32)\quad U = \frac{\Delta\{\alpha_4(1-\beta_1)-\alpha_3\beta_3\}}{\Delta-\gamma_4\delta_3(1-\alpha_1-\alpha_2)(1-\beta_1)}$$
$$\times\left\{Z-\frac{\delta_4\gamma_4}{\delta_1}OIL-\frac{\delta_5\gamma_4}{\delta_1}WT+\frac{(\delta_1-\delta_2)}{\delta_1}\gamma_4\nu\log\frac{P_m}{P^*}\right\}$$

where $\Delta = \beta_2(1-\alpha_1-\alpha_2+\alpha_3\gamma_1)-\alpha_4\gamma_1(1-\beta_1) > 0$.

Note that both oil and positive deviations in world trade from trend will tend to reduce the natural rate because they tend to improve the terms of trade (lower competitiveness).

IV. Accounting for Unemployment Growth (Using Annual Data)[25]

We now estimate the model based on equations (17), (21), (23) and (25) with appropriate lags introduced as suggested by the data. The first three equations are estimated simultaneously, with the cross-equation restrictions (22) and (27) imposed.

Labour demand

Estimates of the labour demand equation corresponding to (17) are presented in Table 4. The long-run unit capital stock elasticity is imposed and the t-statistic (0·3) is based on a Wald test of this hypothesis. To test the validity of the separability assumption which enables us to use value-added prices, we first include, as separate variables, wages relative to final output prices ($W/\bar{P}$)

TABLE 4

LABOUR DEMAND EQUATION, 1954–1983

Independent variables	Dependent variable log N
Constant	2·57 (4·9)
log N_{-1}	1·057 (8·2)
log N_{-2}	−0·361 (2·6)
log K	0·304 ($t = 0·3$)
log $(W/P)_{-1}$	−0·285 (4·9)
*log $(P^*/\bar{P})$ } σ	0·0667 (3·2)
*AD } σ	0·718 (3·6)
WT } σ	0·0686 (1·9)
s.e.	0·0077
DW	2·23
LM (autocorrelation χ^2 (2))	2·20
Parameter stability χ^2 (7)	5·12
Wage elasticity	0·94
Capital stock elasticity	1·0

Notes:

(i) Asymptotic absolute t-ratios in parentheses.

(ii) The parameter estimates are generated by nonlinear 3SLS (TSP 4·0) and refer to the labour demand equation corresponding to the wage equation, Model 1. Additional instruments include lags on the endogenous variables. Not surprisingly, the labour demand equations corresponding to Models 2 and 3 are very similar and are not reported here. The autocorrelation and parameter stability statistics refer to unrestricted instrumental variables estimates of the same equation since these are not to be found in TSP.

(iii) The demand index, σ, is given by $\sigma = \log(P^*/\bar{P}) + 10·76AD + 1·028\,WT$.

Variables:

N = aggregate employment, K = aggregate capital stock, W = labour costs, P = value-added deflator, AD = adjusted deficit-potential GDP, P^* = world price of manufacturers (pounds), $\bar{P}$ = TFE deflator at factor cost, WT = deviation of world trade from trend.

and import prices relative to final output prices ($P_m/\bar{P}$), weighted by the share of imports in value added (ν). The coefficients were almost identical ($t = 0.04$).

The long-run wage elasticity is −0·93. If technical progress is labour-augmenting, the technical progress coefficient should be around −0·07 (see equation (18)). In fact, it turns out to be very close to this, but it is so near zero that its contribution to the model is negligible. It is therefore simply omitted. The demand side variables make a significant positive contribution to labour demand, and if they are omitted the real-wage coefficient is both smaller and less well determined. Their strength also indicates that a simple competitive model, where only K and W/P would appear, is not an adequate representation of the data.

Prices

Turning now to the price equation based on (21), the results are reported in Table 5. The equation is very simple, with the price surprise terms being captured by second differences in the wage. Demand shows up as having a significant but small positive impact on prices, which is consistent with the strong showing of the same variables in the employment equation. We also investigated the consequences of including an additional variable capturing the effective tax rate on profits including investment incentives and the like (t_4). The idea here is that firms will allow some erosion of pre-tax profit margins if they are more generously treated on the tax front. The variable used is based on that described in Beath (1979).[26] As can be seen, it appears to show up quite well in the equation with the expected sign.

TABLE 5

PRICE EQUATION, 1954–1983

Independent variable	Dependent variable	
	log (P/W)	log (P/W)
Constant	−4·18 (4·2)	−4·47 (4·5)
log $(P/W)_{-1}$	0·544 (5·0)	0·514 (4·7)
$*\Delta^2$ log W	−0·336 (4·2)	−0·318 (4·1)
Δ^2 log W_{-1}	−0·242 (3·8)	−0·210 (3·3)
$*\sigma$	0·0381 (2·1)	0·0371 (2·1)
log (K/L)	−0·486 ($t = 0·1$)	−0·518 ($t = 0·4$)
t_4		0·0318 (1·1)
s.e.	0·015	0·0155
DW	2·27	1·71
LM (autocorrelation χ^2 (2))	5·37	4·83
Parameter stability χ^2 (5) (sample split 1968)	1·18	7·70 (χ^2 (6))

Notes:

(i) Asymptotic absolute t-ratios in parentheses.

(ii) See note (ii), Table 4.

Variables not recorded in Table 4:

L = labour force; σ = the demand index, given in Table 4, note (iii); $t_4 = (1-\tau)^{-1}$ where τ = effective rate of tax on profits.

Wage behaviour

Turning to wage behaviour, we consider three different models. First (Model 1) we estimate equation (23)—see Table 6, column (1). In comparison with (23), a number of differences may be observed. First, $\log P^e - \log P$ is omitted. This is not a consequence of any prior judgment concerning its place in the equation; it simply follows from the fact that, in spite of innumerable attempts, we were unable to model this term in a satisfactory manner. We tried modelling P^e explicitly, using fitted values from a subsidiary regression. We tried approximating $\log P^e - \log P$ by any number of different formulations of past wages, prices, etc.[27] We had absolutely no success, in the sense that the results were often incorrectly signed, generally of negligible significance, and made no contribution of any value to the equation. We therefore consigned the term to the equation error (see Minford, 1983, for a similar result). This, of course, has consequences for estimation, in the sense that any variable that is included in the equation which represents a current-dated shock will be correlated with this error. As a consequence, all such variables are treated as endogenous, and, with the exception of predetermined variables such as K/L, only lagged variables are used as instruments in this context.

TABLE 6

WAGE EQUATION, 1954–1983

	Dependent variable: log (W/P)		
	Equation number:		
	Model 1	Model 2	Model 3
Constant	8·41 (9.0)	9·31 (106·5)	8·50 (9·9)
*log U	−0·0621 (4·4)		
*log V		0·0357 (3·8)	
*U_s			−2·47 (4·2)
MM	0·039 (3·3)	0·0144 (1·88)	0·0350 (3·6)
*ρ	0·182 (1·5)		0·142 (1·2)
*$\nu \log P_m/\bar{P}$	0·499 (2·5)	0·268 (2·5)	0·685 (3·3)
*$\Delta(\nu \log P_m/\bar{P})$	0·419 (2·0)	0·619 (3·2)	0·196 (0·9)
*U_p	0·0853 (4·1)	0·0506 (3·8)	0·0775 (4·1)
*t_1	0·179 (0·9)		0·156 (0·9)
IPD	−0·0214 (1·7)	−0·0177 (1·5)	−0·197 (1·6)
log (K/L)	1·07 ($t = 1·03$)	1·07 ($t = 1·3$)	1·07 ($t = 0·9$)
s.e.	0·0145	0·0167	0·0147
DW	1·66	1·67	1·47
LM (autocorrelation χ^2 (2))	3·73	4·75	5·91
Parameter stability χ^2 (7) (sample split, 1968)	0·92	9·81	18·32 (χ^2 (8))

Notes:

(i) Asymptotic absolute t-ratios in parentheses.

(ii) See note (ii), Table 4.

Variables not reported in Tables 4 and 5;

U_p = log union mark-up; ρ = replacement ratio; MM = the *absolute* change in the proportion of employees in the production sector; IPD = incomes policy dummy (=1,1976+7; zero, elsewhere); U = male unemployment rate; V = vacancy rate; U_s = short-term unemployment rate, i.e. proportion of the labour force unemployed for less than 26 weeks.

These points bear emphasis. We have *not* simply omitted a relevant variable. What we have done is to estimate consistently the parameters of the equation, which *includes* $\log P^e - \log P$. The only thing we have not done is to estimate the coefficient on $\log P^e - \log P$. In any event, the variable is zero in the long-run equilibrium and will clearly make no contribution to the secular trends in unemployment in which we are particularly interested.

Turning now to the variables that are included, a key point is that, instead of U, the equation contains $\log U$. This appears because it is a more robust formulation, but it does of course, have very serious consequences. In essence, it says that, when it comes to holding down wages, it is proportional and not absolute increases in unemployment that are important. This may not look to be a very significant difference, but its ramifications are serious. In particular, the *absolute* consequences for the natural rate of any exogenous changes will tend to be bigger if we start from a higher initial level of unemployment. This is, of course, entirely consistent with the hypothesis that the short-term unemployed exert greater downward pressure on wages than the long-term unemployed. As unemployment rises, the short-term proportion falls and the unemployment effect has the concave shape characteristic of the log function. For reasons already explained, we also looked for effects from lagged unemployment terms, but could find none. (However, see the quarterly model of the next section.)

Turning to the effects of the push variables, the replacement ratio appears with the correct sign and is relatively well determined. The union mark-up variable also shows up clearly. This variable seems to us to represent a good *ex post* measure of union activity which will reflect fluctuations in the autonomous use of power. For example, it rises strongly in the period 1968–72. This contrasts with the alternative variable that is sometimes favoured, namely union density. This seems to us to have a very limited theoretical pedigree as well as appearing to be highly unrobust once the sample period is extended beyond 1979. In fact, our experiments with this variable indicate that it is empirically more or less useless as a measure of union power.

The mismatch variable is another case where a proxy is required, and here we simply use the *absolute* change in the proportion of employees in the production sector. This appears to work rather well. Looking next at the tax variables, the point to note is that the only one that is included is the labour tax rate on employers, the others being completely insignificant. The other element of the wedge between the net consumption wage and the real wage in terms of value added is the real price of imports. Here we have a positive long-run effect, reinforcing a similarly signed short-run effect.

Turning to the productivity variable (K/L), we imposed a coefficient equal to the inverse of the wage elasticity of labour demand. This was done for reasons explained earlier, but, as we can see from the t-statistic, this restriction in no sense violates the data. We had no success in our attempt to capture the wage effects of productivity slowdowns using $\Delta^2 \log K/L$ terms. In fact, we tried many variations on this theme, looking at the rate of change of productivity growth over various time horizons and testing for asymmetries (e.g. the variable has an impact only if it is negative). We also included an incomes policy dummy for the years 1976–77, although we recognize that this is an inappropriate procedure for dealing with incomes policies. (Pudney, 1983, for example,

allows systematically for the strength of the policy by comparing the norm with the wage that would have resulted in its absence.)

Finally, it is worth commenting on the dynamic structure of the equation, which is somewhat spartan. Of course, the combination of a very short time series and a rather large number of regressors precludes extensive dynamics, although it should be noted that there is no evidence that the lagged dependent variable should be included (coefficient = 0·10 (0·4)).

The problem with this equation is that it may not fully capture the effects of changes in the availability of social security. The value of benefits is by no means the only relevant variable here, since ease of access to benefits is also very important. Employment protection may also affect the perceived shortage of labour and thus affect wage pressure. To capture the effect of all these influences, we can use as a variable the shift of the U/V curves as measured by the 'search intensity' variable(s) described on p. S125 above.

One approach would be simply to incorporate this in equation (23) as one of the push variables (Z). However, given the trended nature of the variable, this is not very satisfactory. A preferable approach is to estimate equation (23) with vacancies (V), rather than unemployment (U), as the pressure-of-demand variable. One can then eliminate vacancies (V) from the equation, replacing it by unemployment (U), search intensity (s) and mismatch (MM), using the long-run relation

$$\log U = -2{\cdot}79 - 0{\cdot}896 \log V + 0{\cdot}098 MM - s \tag{33}$$

derived on p. S125.

The wage equation including vacancies (V) is shown in column (2) of Table 6. As we might expect, the replacement ratio effect drops out since the inclusion of vacancies in place of unemployment takes account of this effect already. But the equation is generally somewhat less satisfactory than the unemployment version, providing a considerably weaker explanation of the data. The employers' tax rate also disappears.

Our third approach to wage behaviour is motivated by an attempt to understand why wage pressure has not fallen in recent years as much as one might expect, given our high levels of unemployment. One obvious fact is that since 1981 the whole increase in unemployment has been of people unemployed for over six months. Could it be that such people exert very little downward pressure on wages? There is evidence from the Department of Health and Social Security Cohort Study of the Unemployed that long-term unemployed people spend less time and money searching for work than the short-term unemployed. They also make fewer job applications. It therefore seems quite likely that they exert less downward pressure on wages than the short-term unemployed. This would be reinforced if there was any tendency for downward pressure on wages to be exerted especially by increasing inflows into unemployment. We therefore estimate equations in which we include both the long-term unemployed (over six months) as a proportion of the labour force (U_L) and the total unemployment rate (U). These turn out to have almost exactly equal and opposite signs ($t = 0{\cdot}5$), indicating that we can simply use the short-term unemployment rate. This we do in column (3) of Table 6. Otherwise the equation is fairly similar to the equation in the first column, although it explains the data less well.

To close this third model, we have an equation for the long-term unemployment proportion (U_L/U), of the form

$$(34) \quad \frac{U_L}{U} = \underset{(2\cdot5)}{0\cdot159} + \underset{(1\cdot0)}{0\cdot466}\left(\frac{U_L}{U}\right)_{-1} \underset{(3\cdot9)}{0\cdot689}U + \underset{(2\cdot1)}{3\cdot89}U_{-1} - 2\cdot15U_{-2}$$

(OLS, 1955–83).

This yields a long-run relation between the short-term unemployment rate (U_S) and the total rate, of the form

$$(35) \quad U_S = 0\cdot702U - 1\cdot968U^2$$

which has the concave structure picked up by the log transformation of U in the first equation.

Trade balance

In order to compute our long-run natural rate estimates, we require a trade balance equation, and one based on (25) is reported in Table 7. It differs from (25) in so far as world trade deviations are omitted because we obtained no significant estimate of their contribution. Otherwise the variables are sensibly signed, but the explanatory power of the equation is not strong.

TABLE 7

TRADE BALANCE EQUATION, 1954–1983

	Dependent variable B/Y^P
Constant	41·68 (2·6)
$\nu \log (P^*/\bar{P})_{-1}$	361·03 (2·7)
$\nu \log (P_m/P^*)_{-1}$	135·84 (1·4)
σ_{-1}	−39·82 (2·3)
OIL_{-1}	24·67 (1·4)
s.e.	10·46
DW	1·56
LM (autocorrelation χ^2 (2))	4·12
Parameter stability χ^2 (4) (sample split, 1968)	4·41

Note:
Asymptotic t-ratios in parentheses.
Variables not reported in Tables 4, 5 *and* 6:
B/Y^P = (value of exports—value of imports)/nominal potential; GDP, OIL = real value of North Sea Oil production in terms of output prices.

Accounting for postwar unemployment growth

We can now use these estimates to account for postwar unemployment growth. Using Model 1, the empirical equivalent to equation (26) is

$$(36) \quad U + 0\cdot0579 \log U = \text{constant} - 0\cdot22\sigma + 0\cdot029MM + 0\cdot17\rho + 0\cdot47(\nu \log P_m/\bar{P}) + 0\cdot39\Delta(\nu \log P_m/\bar{P}) + 0\cdot080U_P + 0\cdot17t_1 - 0\cdot096IPD.$$

Note that we have retained $\Delta(\nu \log P_m/\bar{P})$ even in the 'long run' because it exhibits such strong long-period trends.

Our first step is to analyse the changes in unemployment conditional on the actual values of the demand variable σ. In order to do this while coping with the nonlinearity inherent in the log U term, we divide up the sample into four periods: 1956–66, 1967–74, 1975–79, 1980–83. We then consider average values of the variables over these periods and look at changes from one period to the next. This gives us, from (36),

$$\left(1+\frac{0{\cdot}0579}{\bar{U}}\right)\Delta U = \Delta \text{ (right-hand side)}$$

where $\bar{U}$ is set at the average level of U *across the two periods being considered.* The next question concerns the dating of the changes on the right-hand side. Here we take the demand variables at the current date (e.g. we consider $\sigma(67\text{–}74)-\sigma(56\text{–}66)$); but for all the other variables we have taken a two-year lag (e.g. we have $t_1(65\text{–}72)-t_1(54\text{–}64)$). Because the real wage has a one-year lag in the labour demand equation, this generates a natural one-year delay; and, given the compression of the lags in the employment equation inherent in the long-run solution, we felt that two years was appropriate for these more structural changes, particularly as their impact on wages has probably been artificially compressed in our estimation of the wage model. It is also worth noting that the first long period, 1956–66, was selected because it exhibits practically no change in inflation. We can, therefore, consider its average unemployment rate as being close to its long-run natural level. This serves as a baseline for our natural rate investigations.

For reference purposes it is useful to set down the actual changes in the relevant variables over these periods, and this we do in Table 8. Noteworthy

TABLE 8

CHANGES IN THE AVERAGE VALUES OF SELECTED VARIABLES, 1954–1981

	1954–64 to 1965–72	1965–72 to 1973–77	1973–77 to 1978–81
Employers' labour taxes (t_1)	0·045	0·049	0·042
Benefit replacement ratio (ρ)	0·097	−0·011	−0·0088
Log union mark-up (U_p)	0·45	0·32	0·16
$\nu \log (P_m/\bar{P})$	−0·040	0·052	−0·012
$\Delta\{\nu \log (P_m/\bar{P})\}$	0·0024	0·020	−0·024
MM	0·17	0·15	0·27
UV shift factor (s)	−0·48	−0·36	−0·27
Log (K/L)	0·28	0·21	0·085
Technical progress (log A)	0·26	0·18	0·077
Oil production (*OIL*)	—	0·10	0·55
	1956–66 to 1967–74	1967–74 to 1975–79	1975–79 to 1980–83
Model 1	−0·017	−0·054	−0·477

are the powerful increases in labour taxes, the large changes in the union mark-up over the earlier periods, the considerable fluctuations in real import prices, and the close correlation between technical progress and the capital-labour force ratio.

Once we have considered the contributions of various factors to the actual change in unemployment, we can then set $\Delta^2 \log W = 0$ in the first price equation in Table 5 and use this in conjunction with the employment equation and (36) to eliminate σ and obtain the equation for the natural rate conditional on real import prices (equation (29)). This gives

$$(37) \quad 0{\cdot}26U^* + 0{\cdot}0579 \log U^* = \text{constant} + 0{\cdot}029MM + 0{\cdot}17\rho + 0{\cdot}47\nu \log P_m/\bar{P} + 0{\cdot}39\Delta(\nu \log P_m/\bar{P}) + 0{\cdot}08U_P + 0{\cdot}17t_1 - 0{\cdot}196IPD.$$

Perhaps more interesting is the equation for the natural rate conditional on balanced trade (equation (32)), which may be obtained by setting $B = 0$ in the trade balance equation of Table 7 and then using it and the other equations to eliminate competitiveness, $(P^*/\bar{P})$, from (37). The final equation thus has the form

$$(38) \quad 0{\cdot}44U^* + 0{\cdot}0579 \log U^* = \text{constant} + 0{\cdot}029MM + 0{\cdot}17\rho + 0{\cdot}08U_P + 0{\cdot}17t_1 - 0{\cdot}196IPD + 0{\cdot}29\nu \log P_m/P^* + 0{\cdot}24\Delta\ \nu \log P_m/P^* - 0{\cdot}032OIL - 0{\cdot}027\Delta OIL.$$

Two points are worth noting. First, a rise in both the level and rate of growth of the world price ratio between UK imports and world manufacturers raises the natural rate, because it increases wage pressure. On the other hand, increasing oil production lowers the natural rate, because it reduces wage pressure via the real exchange rate. Demand can thereby be increased without adverse inflationary consequences.

We shall use both equations (37) and (38) to generate natural rate series by estimating changes between the four periods mentioned above and assuming that, on average, unemployment was at the natural rate during the first period. First, however, we present, in Table 9, a breakdown of the changes in unemployment over the postwar period as generated by equation (36) (Model 1). The overall degree of explanation seems quite satisfactory, so let us turn to the actual numbers. The changes between the first two periods are dominated by the rise in employers' labour taxes, the rise in the benefit replacement ratio and the rise in union power or militancy. 'Demand' factors play an insignificant role but there are some gains arising from the continuing improvement in the terms of trade.

Employers' labour taxes and unions again figure strongly in the second- to third-period unemployment change, but here there is a very powerful effect owing to the dramatic rise in real import prices in 1973–74. The final and largest increase is completely dominated by 'demand' factors although some other factors are by no means insignificant, in particular the beneficial effect of the fall in the real price of imports brought about in the main by the appreciation of the pound.

TABLE 9

BREAKDOWN OF THE CHANGE IN UNEMPLOMENT RATE (MALE), 1956-1983
(Basis, Table 6, Model 1)
(percentage points)

	1956-66 to 1967-74	1967-74 to 1975-79	1975-79 to 1980-83
Employers' labour taxes (t_1)	0·25	0·38	0·44
Benefit replacement ratio (ρ)	0·54	−0·09	−0·10
Union (U_p)	1·18	1·17	0·80
Real import prices ($P_m/\bar{P}$)	−0·58	1·47	−0·93
divided into			
(P_m/P^*) and ($P^*/\bar{P}$)	(−0·35 −0·23)	(2·40 −0·93)	(−0·15 −0·77)
Mismatch (MM)	0·16	0·20	0·49
Demand factors (σ)	0·12	0·54	6·56
Incomes policy (IPD)	—	−0·36	0·49
Total	1·67	3·31	7·75
Actual change	1·82	3·01	7·00

Note:
P_m/P^* is the international 'terms of trade' between UK imports and world manufacturers, both priced in dollars, and $P^*/\bar{P}$ is output price competitiveness.

Let us now consider the natural rate sequences reported in Table 10. The sequence based on given real import prices was, on average, above the actual rate throughout the period 1967-79 but moved to around 3 percentage points below it by 1980-83. The 'longer-term' natural rate based on trade balance reveals a similar story, although by 1980-83 it was around 4 percentage points below the actual rate. In two cases out of three, this pattern is consistent with the changes in inflation, the exception being the period from 1975-79, when wage inflation came down and yet the natural rate was considerably above the actual rate.

This is an interesting result, suggesting that there were other forces at work during this period. The obvious one is the incomes policy, and, although we have tried to capture its effect by using dummies, it seems likely that its impact was, in fact, rather greater than the coefficients on these dummies would

TABLE 10

ESTIMATED 'NATURAL' RATE OF UNEMPLOYMENT, MALES, 1956-1983
(Basis, Table 6, Model 1) (percentages)

	1956-66	1967-74	1975-79	1980-83
'Natural' unemployment rate (a) (conditional on given real import prices)	1·96	4·02	8·20	10·47
'Natural' unemployment rate (b) (conditional on trade balance)	1·96	4·19	7·63	9·07
Actual unemployment rate	1·96	3·78	6·79	13·79

suggest. In any event, some forces were at work during this period which enabled inflation to come down without unemployment having to rise above its equilibrium level, at least as generated by the structural factors that we have considered. However, it is worth noting that, if we exclude 1976 and 1977, when the incomes policy was dramatically successful, then wage inflation rose somewhat over the remainder of the period.

In order to see the full contributions to the natural rate increase of the push factors set out in Table 9, we must remember that their impact is larger than shown in that table. This follows from the fact that, when a push factor, such as the benefit replacement ratio, moves adversely, it not only has a direct impact on unemployment but also serves to reduce the level of demand (σ) consistent with unchanging inflation. In order to see these effects, we have set out a breakdown of changes in the natural rate (given balanced trade) in Table 11. Notice the importance of the surge in raw material prices in the 1973–74 period and the important role of oil in *reducing* the natural rate in the last period. The union effect is quite large in all three periods, and this reflects two factors; the continuing increase in wage pressure delivered by the wage-bargaining institutions in Britain, and the fact that the absolute employment effects of any given increase in wage pressure are themselves tending to rise because of the concave shape of the unemployment effect on wages.

TABLE 11

BREAKDOWN OF CHANGES IN THE NATURAL RATE (b) GIVEN IN TABLE 10

	1956–66 to 1967–74	1967–74 to 1975–79	1975–79 to 1980–83
Employers' labour taxes (t_1)	0·29	0·51	0·69
Benefit replacement rate (1)	0·64	−0·12	−0·15
Unions (U_p)	1·40	1·58	1·25
Oil production (*OIL*)	—	−0·32	−1·73
UK import/world manufactures, price ratio (P_m/P^*)	−0·29	2·02	−0·17
Mismatch (*MM*)	0·19	0·27	0·77
Incomes policy (*IPD*)	—	−0·50	0·78
Total	2·23	3·44	1·44

In addition to analysing natural rates, we can also look at the amounts by which demand would have had to change in order to remain consistent with unchanging inflation. The numbers here for the three successive shifts are −0·071, −0·140 and −0·076, and these may be compared with the actual demand changes reported in the last row of Table 8, namely −0·017, −0·054 and −0·477. So we see that for the first two changes (1956–66 to 1967–74, and 1967–74 to 1975–79), the actual 'demand' reductions were lower than those required for unchanging inflation. As a consequence, of course, inflation rose on average over the whole period and actual unemployment was, on average, below the natural rate. But when we go from 1975–79 to 1980–83, we see that 'demand' actually fell by more than five times what was required for unchanging inflation, with the obvious consequences. Of this remarkable fall in demand,

about 46 per cent was due to fiscal policy, 42 per cent to competitiveness and 12 per cent to world trade.

Turning now to Model 2, we find that the *UV* shift factor (search intensity, *s*), not surprisingly, plays an important role contributing some 2 percentage points to the rise in unemployment, given demand. In this model, neither employment taxes nor the replacement ratio show up at all, and the role of the union variable is strongly attenuated. Aside from this, the structure of the results is not altered a great deal and the same is true of the natural rate estimates (for further details see Layard and Nickell, 1985a). In some respects, of course, this model is less satisfactory than the previous one, since we are picking up the impact of unobservable variables (workers' search intensity and employment protection legislation) by simple trends. The corresponding wage equation is also a good deal less satisfactory in terms of data explanation.

Finally, the Model 3 results, containing the short-term unemployment rate, are very similar to those of Model 1, although the general fit is less good. The implications of the wage equation in this model are, however, rather profound. In essence, it tells us that, if we reduce unemployment using a policy targeted at the long-run unemployed, its impact on wages will be negligible.

To sum up this section, we have presented our estimates of the causes of the secular rise in unemployment in the postwar period. One point must be remembered. All the numbers in these tables are based on estimated equations, where many of the coefficients are not determined with any degree of precision; the same therefore applies to the numbers in the tables. Nevertheless, we feel that this approach is a valuable one and indicates the direction in which to proceed.

V. Dynamics of Unemployment and Real Wages (Using Quarterly Data)

We now present a quarterly version of our model and use it to investigate the dynamics of wages, prices and unemployment. Aside from the dynamic structure, the model we estimate is more or less identical to Model 1 of the previous section. The equations are independently estimated, with the parameter restrictions being carried over from the labour demand equation.

Table 12 presents the labour demand equation. As with the other quarterly equations that follow, we present the equation in differences and levels. This enables one to read off the long-run effects simply by dividing through by the coefficient on the level of the lagged dependent variable (e.g. 0·0324 in this case). Not surprisingly, the long-run effects are similar to those generated by the annual model, although the wage elasticity is slightly larger at 1·19. The only essential long-run difference is our inability to find a level world trade effect in the present model.

The short-run dynamics, on the other hand, are completely different, and in this case are not really satisfactory because the speed of adjustment is very slow. The level employment coefficient is 0·0324, which is tantamount to a lagged dependent variable coefficient of 0·968. This suggests that we are having trouble in actually explaining the level of employment, with the equation being dominated by its dynamic properties. The estimates imply that any shock that hits labour demand will take an excessively long time to filter through the

TABLE 12
LABOUR DEMAND EQUATION, QUARTERLY, 1957(I)-1983(IV)

Independent variables	Dependent variable $\Delta \log N$
Constant	0·261 (2·5)
$\Delta \log N_{-4}$	0·142 (1·5)
$\log N_{-1}$	−0·0324 (2·4)
$\log K$	0·0324
$\log (W/P)_{-1}$	−0·0385 (2·7)
$\Delta_4 \log (W/P)_{-1}$	0·0284 (1·6)
AD_{-1}	0·126 (2·1)
$\log (P^*/\bar{P})_{-1}$	0·0136 (1·8)
$\Delta_4 WT$	0·0374 (3·4)
s.e.	0·00500
$\bar{R}^2$	0·496
DW	1·85
LM (autocorrelation χ^2 (4))	6·46 (5% = 9·48)
Parameter stability $F(16, 97)$ (sample split, 1979(IV))	1·64 (5% = 1·8)
Wage elasticity (long-run)	−1·19
Capital stock elasticity	1·0

Notes:
(i) Asymptotic absolute t-ratios in parentheses; seasonal dummies were also included.
(ii) There are no current endogenous variables on the right, so estimation is by OLS.
(iii) On the basis of this equation, the demand index, σ, is defined as $\sigma = \log (P^*/\bar{P}) + 9{\cdot}26AD$. $\Delta_4 WT$ is not part of the index because it only represents a transient effect.

system, given that it takes about five years to complete half of its long-run impact on employment.

Why we obtain this result is not clear. However, given the much faster adjustment that emerges in the UK manufacturing sector for a similar kind of equation (see Symons, 1985, for example), we suspect that it arises because of the problems of trying to aggregate over different sectors, including the public sector, with very different employment adjustment paths.

Turning now to the price equation in Table 13, we come up against a similar kind of problem, with the equation being unable to explain adequately the level of the price/wage mark-up on a quarterly basis. There is, however, a strong wage-surprise effect, confirming the annual result, and we seem to have pinned down some quite precise dynamics, even if the long-run effects are rather weak.

The wage equation is far more satisfactory, in the sense that we are clearly able to explain the level of the real wage as it emerges from wage bargaining. The equation compares quite well with its annual counterpart, although there are a number of important differences. In particular, there is now a large price-surprise effect (which we have constrained to be unity—see note v to Table 14) and a strong negative effect of the current change in unemployment.

Many of the long-run effects on real wages seem to be rather bigger than in the annual model, including both the Z effect and the unemployment effect.

TABLE 13

PRICE EQUATION, QUARTERLY, 1957(I)–1983(IV)

Independent variables	*Dependent variable* $\Delta \log (P/W)$
Constant	−0·883 (1·9)
$\Delta \log (P/W)_{-2}$	0·224 (3·1)
$\Delta \log (P/W)_{-4}$	0·131 (1·9)
$\log (P/W)_{-1}$	−0·110 (1·8)
*log W^e − log W)	0·685 (5·0)
log (K/L)	−0·0925
σ_{-1}	0·0202 (1·6)
t_4	0·0583 (1·5)
s.e.	0·020
$\bar{R}^2$	0·572
DW	2·19
LM (autocorrelation χ^2 (4))	9·10 (5% = 9·48)
Parameter stability $F(16, 99)$ (sample split, 1979(IV))	1·11 (5% = 1·8)

Notes:

(i) Asymptotic t-ratios in parentheses; seasonal dummies were also included.

(ii) Starred variables are treated as endogenous. Estimation is by instrumental variables. Instruments comprise ΔP^*_m, ΔP^*_{m-1}, log G, log G_{-1}, log T, log T_{-1}; P^*_m = world price of manufacturing exports in dollars, G = real government expenditure, $T = t_1 + t_2 + t_3$.

(iii) The coefficient on log (K/L) is restricted so that its long-run value is 8·406, the inverse of the long-run wage elasticity of labour demand.

(iv) Log W^e is based on the fitted value from the time series regression

$$\Delta \log W = \underset{(0\cdot52)}{-0\cdot0406}\,\Delta \log W_{-1} + \underset{(3\cdot2)}{0\cdot2436}\,\Delta \log W_{-2} + \underset{(2\cdot8)}{0\cdot2091}\,\Delta \log W_{-3} + \underset{(7\cdot8)}{0\cdot5879}\,\Delta \log W_{t-4}.$$

Note that there is no constant and the sum of the coefficient is unity. Thus we have imposed long-run neutrality with respect to inflation. This does not significantly violate the data.

However, this makes little difference to the breakdown of the causes of unemployment (owing to offsetting effects) as we can see by looking at the annual version of equation (36). This has the form

$$U + 0\cdot111 \log U = \text{constant} - 0\cdot42\sigma + 1\cdot18\rho + 0\cdot72\Delta \log P_m/P + 0\cdot195 U_P + 3\cdot16\Delta t_1$$

where note that the very much larger coefficients on the right-hand side are offset by the bigger coefficient on log U. The resulting breakdown of unemployment changes, therefore, exhibits much the same broad pattern as in Table 9.

Our main purpose, however, in estimating a quarterly model is to see if we can capture the short-run wage-price dynamics. We illustrate these by looking at the separate consequences of a demand shock and a wage shock. A wage shock is induced by anything that causes wages to rise relative to GDP prices, and therefore includes those shifts that are commonly termed 'supply shocks', such as a rise in oil prices.

TABLE 14
WAGE EQUATION, QUARTERLY, 1957(I)-1983(IV)

Independent variables	Dependent variable $\Delta \log (W/P)$
Constant	2·764 (3·8)
$\Delta \log (W/P)_{-1}$	−0·235 (1·9)
$\Delta \log (W/P)_{-2}$	−0·132 (1·2)
$\Delta \log (W/P)_{-3}$	−0·103 (1·2)
$\log (W/P)_{-1}$	−0·387 (3·7)
*$(\log P^e - \log P)$	1·0 ($t = 1·08$)
$\log (K/L)$	0·325
$\log U_{-1}$	−0·0312 (3·3)
*$(\Delta \log U)$	−0·0743 (1·7)
$\Delta \log (P_m/\bar{P})_{-2}$	0·181 (1·8)
Δt_1	0·973 (4·0)
U_{p-1}	0·0574 (3·1)
ρ_{-1}	0·369 (3·7)
s.e.	0·0207
$\bar{R}^2$	0·48
DW	2·03
LM (autocorrelation χ^2 (4))	6·32 (5% = 9·5)
Parameter stability $F(16, 94)$ (sample split, 1979(IV))	1·12 (5% = 1·8)

Notes:

(i) Asymptotic t-ratios in parentheses; seasonal dummies were also included.

(ii) Starred variables are treated as endogenous. Estimation is by instrumental variables. Instruments are as in the price equation except that log T, log T_{-1} are not included.

(iii) The coefficient on log (K/L) is restricted so that its long-run value is 0·8406, the inverse of the long-run wage elasticity of labour demand.

(iv) log P^e is based on the fitted value from the time series regression

$$\Delta \log P = \underset{(0·29)}{0·0283}\ \Delta \log P_{-1} + \underset{(7·5)}{0·6785}\ \Delta \log P_{-2} + \underset{(3·5)}{0·3156}\ \Delta \log P_{-3} - \underset{(0·24)}{0·0224}\ \Delta \log P_{-4}.$$

As with the wage regression, we have imposed long-run inflation neutrality.

(v) The coefficient on log P^e/P is set at unity. In unrestricted form it is greater than unity, and the t-ratio represents a test of this restriction.

In Table 15 we show the consequences of a one-period (one-quarter) demand shock which is roughly equivalent to a shift in the budget deficit equivalent to 1 per cent of GDP. The unemployment effect is very long and drawn-out for reasons we have already mentioned, and it seems to be leading to a permanent rise in inflation of just over $\frac{1}{2}$ per cent. The real-wage dynamics are most interesting. The first-period reduction arises because the immediate acceleration in prices leads wage-setters to underestimate price rises. This effect wears off immediately, however, and the real wage rises quite strongly after the first quarter as the labour market becomes more buoyant. The persistently higher employment is consistent with the long period of higher real wages only because of the imperfect competition nature of the model. The first and third columns taken together are, of course, inconsistent with a perfectly competitive labour demand curve, although they are consistent with

TABLE 15
CONSEQUENCES OF DEMAND AND WAGE SHOCK

Quarter	Percentage point difference in U	Percentage point difference in the annual rate of price inflation	Percentage difference in real wages
(a) Temporary demand shock			
1	−0·13	0·25	−0·06
2	−0·12	0·27	0·03
3	−0·12	0·38	0·13
4	−0·11	0·44	0·16
8	−0·11	0·53	0·12
12	−0·08	0·61	0·07
16	−0·05	0·60	0·07
(b) Temporary increase in wage pressure			
1	0·0	3·1	6·9
2	0·07	2·3	3·5
3	0·10	3·1	3·2
4	0·13	4·6	0·6
8	0·49	5·6	1·3
12	0·48	5·1	−0·16
16	0·39	3·7	−0·78

Note: All differences are measured by comparison with the no-shock case.

the known consequences of demand shocks as they emerge in simulation of all the UK macro-models (see Andrews *et al.*, 1985, Table 3).

In Table 15 we also show the consequences of a temporary increase in wage pressure (10 per cent for one quarter) such as could have been caused by a supply shock. The upshot is a period of stagflation as the pressure on wages generates inflation and raises the real wage, thus raising unemployment. The slackness in the labour market eventually starts to lower the real wage, but it is clear that it takes a long time for the inflationary pressure to disappear from the system, and the overall rise in inflation is going to be around $3\frac{1}{2}$ per cent.

VI. CONCLUSIONS

Causes of increased unemployment

To summarize, we can begin with our conclusions about increased unemployment (based on Section IV). Clearly, there are a number of levels at which this question can be answered. At one level we can take the employment function and combine it with the wage equation to get employment as a function of demand factors and 'push' factors. This exercise yields the important information that most of the rise in unemployment since 1979 is due to falls in demand.[28] Turning to the various push factors, we can divide them into factors tending to push up product wages and factors that would tend to reduce net take-home pay at given product wages. We begin with the former.

(i) *Benefits.* Our model finds a direct impact of benefit changes of about 0·4 percentage points of unemployment since the late 1950s, corresponding to a

benefit elasticity at the sample mean of around 0·7. This contrasts with the results reported in Minford (1983), who finds a benefit elasticity of about 4. This is hardly surprising, given that real benefits and union density are the only trended variables in his wage equation.[29] Our results here are of the same order of magnitude as the cross-section estimates reported in Nickell (1979a) and Lancaster (1979), although they are fractionally higher than those estimated by Narendranathan, Nickell and Stern (1985).[30] This last study, however, uses data from 1978, when unemployment was particularly high relative to the sample average. Under these circumstances one might expect to find that measured benefit effects are somewhat smaller.

In addition to the direct effect of benefits, unemployment may have risen somewhat because unemployment benefit has become less harshly administered, and people are more willing to live off the state. Some evidence in support of decreased intensity of search comes from the massive rise in unemployment at given vacancies.

(ii) *Employment protection.* However, the shift of the U/V curve may also be due in part to the growth of employment protection, making employers less willing to fill vacancies except with superior candidates. When we take the shift of the U/V curve as an index of the combined effect of social security and employment protection, we attribute around 3 per cent of the extra unemployment to these two sources.

(iii) *Mismatch of unemployment and vacancies, and structural unemployment.* The increase of unemployment is not importantly due to an increased mismatch between unemployment and vacancies, our estimate being around 1 percentage point. There has been no major increase in the rate at which jobs shift from one industry to another, leaving pockets of unemployment in declining industries or regions. Nor has there been any obvious increase in the mismatch between the pattern of unemployment and vacancies, by industry, region or occupation.

(iv) *Lagged unemployment.* We have some evidence that past unemployment tends to raise unemployment today, but only in our quarterly model.

(v) *Union militancy.* We use as an indicator of union militancy the mark-up of union over non-union wages. This has risen, and the corresponding increase in unemployment is of the order of 3 percentage points, given demand, with the effect on the natural rate being somewhat higher. However, unions may also play a role in preventing the full adjustment of real wages to external changes, discussed later.

We now turn to factors that (for given real labour costs to employers) would tend to reduce real take-home pay.

(vi) *Income taxes and indirect taxes.* We found little evidence that these had any impact on unemployment.

(vii) *Employers' taxes on labour.* Employers' 'taxes' on labour have risen by 13 points, and this may have increased unemployment by around 1·4 percentage points.

(viii) *Relative import prices.* These raised unemployment by around 1·5 percentage points in the mid-1970s, but are not now causing problems. The main

reason for the latter fact is that the onset of UK oil production raised the balanced trade real exchange rate, reducing wage pressure.

(ix) *The productivity slowdown.* Slower capital accumulation in the 1970s and 1980s reduced the warranted real wage, but we found no evidence that the actual wage failed to respond.

(x) *Technical progress.* Technical progress slowed down in the 1970s, but we find no important role for this variable.

(xi) *Technological unemployment and capital shortage.* There is no evidence that the technology embodied in the capital stock is limiting employment. Technical progress and capital accumulation have always caused dislocation, but there is no evidence that this is greater now than in the past.

(xii) *Public employment.* This is an important area which we have not fully examined.

(xiii) *Incomes policy.* We have not studied incomes policy closely. But our analysis makes clear that this should be seen as a microeconomic policy, aimed at reducing the NAIRU.

Most of our conclusions on the decomposition of the growth in unemployment are necessarily tentative. This is less true of our conclusions about real-wage/unemployment dynamics in Section V. These are that a positive demand shock will, except in the very first quarter, raise the real wage and reduce unemployment. A positive supply shock (meaning a temporary increase in wage pressure) will also raise real wages but will increase unemployment. These two basic patterns are possible because of our assumption of imperfect competition. They cannot coexist under perfect competition. The obvious fact of their coexistence is strong evidence in support of our approach.

ACKNOWLEDGMENTS

We are most grateful to Paul Kong and Andy Murfin for help on the project. We are also grateful to the Economic and Social Research Council and the Esmee Fairbairn Charitable Trust for financial assistance.

NOTES

1. The series relates to men without work registered as seeking work at public employment offices. Until the last three years such registration was a condition for receiving any form of unemployment benefit, but this condition has now been dropped and numbers unemployed now refer to those seeking benefit. These numbers in the last three years have been adjusted on to the earlier basis. Women's entitlement to benefits has grown substantially over the last 20 years and the series of women registered for work does not therefore give a good measure of trends in female job-seeking. Even now, many unemployed women are not entitled to benefit. As regards the *level* of female joblessness, the following US-style survey results hold for 1981. Census: Men 11·4, Women 7·4; General Household Survey: Men 11·1, Women 9·4; Labour Force Survey: Men 9·9, Women 8·8.
2. This draws heavily on the presentation in Layard and Nickell (1985b). The model is similar to that in Blanchard (1985), and we are very grateful to him for encouraging us to think along these lines.
3. These are an update of the results in Layard and Nickell (1985a).
4. The original scheme was known as the Youth Opportunities Programme (YOP). In 1979 a six-month place was guaranteed from Easter onwards for those leaving school the previous summer. For those leaving school in 1979 onwards, a place was guaranteed from Christmas. Followng on the youth riots (summer 1981), this was succeeded in summer 1983 by the Youth

Training Scheme. A one-year place on this is guaranteed from six weeks after leaving school and includes 13 weeks of off-the-job training. The guarantee is not a legal right but a statement of intent. In practice, sufficient places have been forthcoming.

5. General Household Survey. Data kindly supplied by Office of Population Censuses and Surveys.
6. Instead of looking at vacancies, we can also look at the percentage of manufacturing firms replying to the Confederation of British Industries that their output is likely to be limited by shortages of (a) skilled labour and (b) other labour. The picture is very similar to that in Figure 2.
7. 1954–83, *IV* estimation with log V_{-1} as instrument for log V. We also experimented with the more flexible functional form where V is replaced by $(V-\beta)$. β was not well determined, but (more relevant here) the trend in the equation was more or less invariant with respect to β.
8. There have been three main changes. The Redundancy Payments Act 1965 introduced statutory payments when a worker is made redundant, a part of which is a direct cost to the employer. The Industrial Relations Act 1971 established legal rights against unfair dismissal. The Employment Protection Act 1975 extended the periods of notice required before a termination. Employment protection has been studied in some detail in both Nickell (1979b) and Nickell (1982), with mixed results. The impact on unemployment is not clear-cut. If it becomes more difficult or expensive for firms to reduce employment, this will reduce flows into unemployment; but, by making employers more choosy, it will also increase unemployment duration. Both these effects were detected in Nickell (1982), but the net impact was in the direction of unemployment reduction. This result is, however, very tentative, since the variable used to capture the legislation (numbers of Industrial Tribunal cases) is clearly rather weak. Survey evidence is also ambiguous (see Jackman, Layard and Pissarides, 1984).
9. Our model assumes that employment always occurs on the labour demand curve.
10. See Layard, Metcalf and Nickell (1978, Table 5). The index estimated there has for purposes of Figure 3 been scaled down proportionately in all years so that the estimated mark-up in 1976 is equal to the best available estimate of the level of mark-up in that year (in Stewart, 1983). In regressions the log of the untransformed variable has been used.
11. As a matter of accounting, the following relationship approximately holds where $\bar{p}=\log$ producer prices, $p=\log$ value added prices, $\bar{w}=\log$ wages, $p_m=\log$ import prices, $t_1=$ employers' taxes, $t_2=$ employees' taxes, $t_3=$ indirect taxes, $\nu=$ share of imports in GDP.

    $$(1+\nu)\bar{p}=p+\nu p_m+\text{constant}.$$

    Hence

    $$\bar{p}-p=\nu(p_m-\bar{p})+\text{constant}$$

    and

    $$(\bar{w}+t_1-p)-(\bar{w}-t_2-\bar{p}-t_3)=\bar{p}-p+t_1+t_2+t_3=\nu(p_m-\bar{p})+t_1+t_2+t_3+\text{constant}.$$

12. We assume separability of raw materials from capital and labour, so that the GDP deflator is a mark-up on wages determined by K/L and A.
13. Suppose that real wages are fixed by firms' pricing behaviour at $(W/P)^*$, and that the wage equation is

    $$\frac{W}{P}=a_0-a_1U+a_2U_{-1}+a_3Z, \qquad (a_1, a_2>0)$$

    where Z is a push factor. Then the short-run natural rate is

    $$\bar{U}=\frac{1}{a_1}\left\{a_0-\left(\frac{W}{P}\right)^*+a_2U_{-1}+a_3Z\right\}.$$

    The medium-term natural rate is

    $$U^*=\frac{1}{a_1-a_2}\left\{a_0\left(\frac{W}{P}\right)^*+a_3Z\right\}.$$

14. Its construction is described in the Data Appendix at the end of this book.
15. In the *very* long run the set-up cost and the zero profit condition determine the number of firms. Our measures of K_i and N_i should strictly exclude the set-up cost, but we have ignored this point.
16. Our measure of cost is hourly cost. This is because we assume that, for the economy as a whole, a fall in hours per worker also involves an equiproportional fall in hours per unit of capital. Hence the marginal product of a man-hour depends on the capital-labour ratio—or, equivalently, on the output-capital ratio—as in equation (5).

17. Good evidence in favour of short-run diminishing returns to labour comes from inventory behaviour. If marginal cost were constant, there is no reason why firms should wish to smooth their production over time.
18. See, for example, Sawyer (1983).
19. This is perfectly consistent with short-run profit maximization if the elasticity of demand is increasing with demand itself. Otherwise, normal cost pricing can be viewed as average profit maximization over the cycle where, for a variety of possible reasons, firms find it difficult or costly to adjust prices every time demand shifts (see Domberger, 1979, for example). Finally, of course, normal cost pricing is optimal if marginal costs are constant. Given the compelling evidence against this proposition, we do not find this a persuasive argument.
20. See also earlier n. 17 about inventory behaviour.
21. This externally given level may simply be the employees' estimate of the alternative wage, adjusted for the probability of finding alternative employment, or it may include some element of what is deemed to be a 'fair' wage.
22. For a more formal exposition, see Nickell (1985).
23. This is quite consistent with the data; see Layard and Nickell (1985a).
24. This is because the actual demand facing each firm is

$$Y_i^d = D\left(\frac{P_i}{P}, \sigma\right) \psi\left(\frac{AL}{K}\right) \frac{K}{n}.$$

25. The results in this section differ from those in Layard and Nickell (1985a) because we have improved the data in a number of respects (see Data Appendix at the end of this book).
26. In fact, $t_4 = (1-\tau)^{-1}$ where τ is the effective tax rate. The idea here is that firms set prices in order to maintain post-tax profits as a constant share (β) of value added. So if π represents profits, we have

$$(1-\tau)\pi = \beta PY$$

or

$$(1-\tau)(PY - WN) = \beta PY$$

or

$$P = \frac{WN}{Y}\left(1 - \frac{\beta}{1-\tau}\right)^{-1}$$

or

$$\log \frac{P}{W} \simeq \beta\left(\frac{1}{1-\tau}\right) + \text{productivity}.$$

So β is the coefficient on t_4.
27. We also tried using the National Institute Economic Review's forecasts of inflation.
28. Less than a quarter of this demand effect was 'needed' if inflation was to be held stable given the increase in the push factors.
29. See also Nickell's review of Minford in the *Economic Journal* (Nickell, 1984).
30. Note that cross-section results measure the 'supply' shift. The total effect (after the interaction of supply and demand) should be less.

REFERENCES

ANDREWS, M. J., BELL, D. N. F., FISHER, P. G., WALLIS, K. F. and WHITELY, J. D. (1985). Models of the UK Economy and the Real Wage-Employment Debate. *National Institute Economic Review*, **112**, 41-52.

BEATH, J. (1979). Target profits, cost expectations and the incidence of the corporate income tax. *Review of Economic Studies*, **46**, 513-26.

BLANCHARD, O. (1985). Monopolistic competition, small menu costs and real effects of nominal money. Unpublished paper, Massachusetts Institute of Technology (mimeo).

CARLIN, W., and SOSKICE, D. (1985). Real wages, unemployment, international competitiveness and inflation; a framework for analysing closed and open economies. Unpublished paper, University College, Oxford (mimeo).

DOMBERGER, S. (1979). Price adjustment and market structure. *Economic Journal*, **89**, 96-108.

GORDON, R. J. (1985). Wage-price dynamics and the manufacturing output gap in Europe, Japan and North America. Paper presented at a conference on The Causes of Unemployment, sponsered by the Swedish Employers' Organization, September, Northwestern University (mimeo).

GRUBB, D., JACKMAN, R. A. and LAYARD, P. R. G. (1983). Wage rigidity and unemployment in OECD countries. *European Economic Review*, **21**, 11-41.

HENRY, B. and WREN-LEWIS, S. (1984). The aggregate labour market in the UK: some experiments with rational expectations models. In P. Malgrange and P. Muet (eds), *Contemporary Macroeconomic Modelling*. Oxford: Basil Blackwell.

JACKMAN, R., LAYARD, P. R. G. and PISSARIDES, C. (1984). On vacancies. London School of Economics, Centre for Labour Economics, Discussion Paper no. 165 (revised).

JOHNSON, G. and LAYARD, R. (1986). The natural rate of unemployment: explanation and policy. In O. Ashenfelter and R. Layard (eds), *Handbook of Labor Economics*. Amsterdam: North-Holland.

KING, M. (1975). The United Kingdom profits crisis: myth or reality. *Economic Journal*, **85**, 33-54.

LANCASTER, T. (1979). Econometric methods for the duration of unemployment. *Econometrica*, **47**, 939-56.

LAYARD, R. (1982). *More Jobs Less Inflation*. London: Grant McIntyre.

——, METCALF, D. and NICKELL, S. (1978). The effects of collective bargaining on relative wages. In A. Shorrocks and W. Krelle (eds.), *The Economics of Income Distribution* (1978) and *British Journal of Industrial Relations*, **56**, 287-303.

—— and NICKELL, S. (1985a). The causes of British unemployment. *National Institute Economic Review*, **111**, 62-85.

—— (1985b). Unemployment, real wages and aggregate demand in Europe, Japan and the US. *Journal of Monetary Economics*, Supplement: Carnegie-Rochester Public Policy Conference, no. 23.

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

NARENDRANATHAN, W., NICKELL, S. and STERN, J. (1985). Unemployment benefits revisited. *Economic Journal*, **95**, 307-29.

NICKELL, S. J. (1979a). The effect of unemployment and related benefits on the duration of unemployment. *Economic Journal*, **89**, 34-49.

—— (1979b). 'Unemployment and the structure of labour costs. *Journal of Monetary Economics*, Supplement: Carnegie-Rochester Public Policy Conference, no. 11.

—— (1982). The determinants of equilibrium unemployment in Britain. *Economic Journal*, **92**, 555-75.

—— (1984). Review of *Unemployment: Cause and Cure*, by P. Minford with D. Davies, M. Peel and A. Sprague. *Economic Journal*, **94**, 946-53.

—— (1985). Unemployment and the real wage. Paper presented at a conference on The Causes of Unemployment, sponsored by the Swedish Employers Organization, September, Institute of Economics and Statistics, University of Oxford (mimeo).

OSWALD, A. (1986). Unemployment insurance and labour contracts under asymmetric information: theory and facts. *American Economic Review*, forthcoming.

—— and TURNBULL, P. (1985). Pay and employment determination in Britain: what are labour contracts really like? London School of Economics, Centre for Labour Economics, Discussion paper no. 212.

PENCAVEL, J. H. (1972). Wages, specific training, and labour turnover in US manufacturing industries. *International Economic Review*, **13**, 53-64.

PUDNEY, S. (1983). Earnings equations and incomes policy. Unpublished paper, London School of Economics (mimeo).

SARGAN, J. D. (1964). Wages and prices in the UK. In P. E. Hart, G. Mills and J. K. Whittaker (eds), *Econometric Analysis for National Economic Planning*. New York: Macmillan.

SAWYER, M. (1983). Business pricing and inflation. London: Macmillan Press.

SHAPIRO, C. and STIGLITZ, J. (1984). Equilibrium unemployment as a worker discipline device. *American Economic Review*, **74**, 433-44.

STEWART, M. (1983). Relative earnings and individual union membership in the UK. *Economica*, **50**, 111-26.

STIGLITZ, J. E. (1986). Theories of wage rigidity. In J. L. Butkiewicz, K. J. Koford and J. B. Miller, *Keynes' Economic Legacy*, New York, Praeger.

SYMONS, J. (1985). Relative prices and the demand for labour in British manufacturing. *Economica*, **52**, 37-50.

WICKENS, M. (1982). The efficient estimation of econometric models with rational expectations. *Review of Economic Studies*, **49**, 55-67.

Economica, **53**, S197–S217

The Rise of Unemployment in France

By E. MALINVAUD

Institut National de la Statistique et des Études Économiques

Whereas the French unemployment rate had remained less than 2 per cent throughout the postwar years up to 1967, it has since increased, having been pushed by an irresistible trend, to 2·7 per cent in 1972, 4·1 per cent in 1975, 5·2 per cent in 1978, 7·3 per cent in 1981 and 9·7 per cent in 1984 (annual averages, ILO definitions). The size of the labour force had hardly increased before 1962; during the past 20 years its growth has been slowly accelerating but has remained moderate (0·8 per cent per annum between 1975 and 1982). On the other hand, employment increased steadily from 1962 up to the first oil shock, but has been roughly constant since then (see Figure 1).

My survey of the analysis of these features and of their explanation will follow traditional lines. It will first consider the evolution of the labour force, as well as changes in the volume, structure and nature of the supply of labour. The second section, dealing with the demand for labour, will pay particular attention to changes in the economic and institutional environment of firms. Section III will examine what can be said about a possible increase in frictional

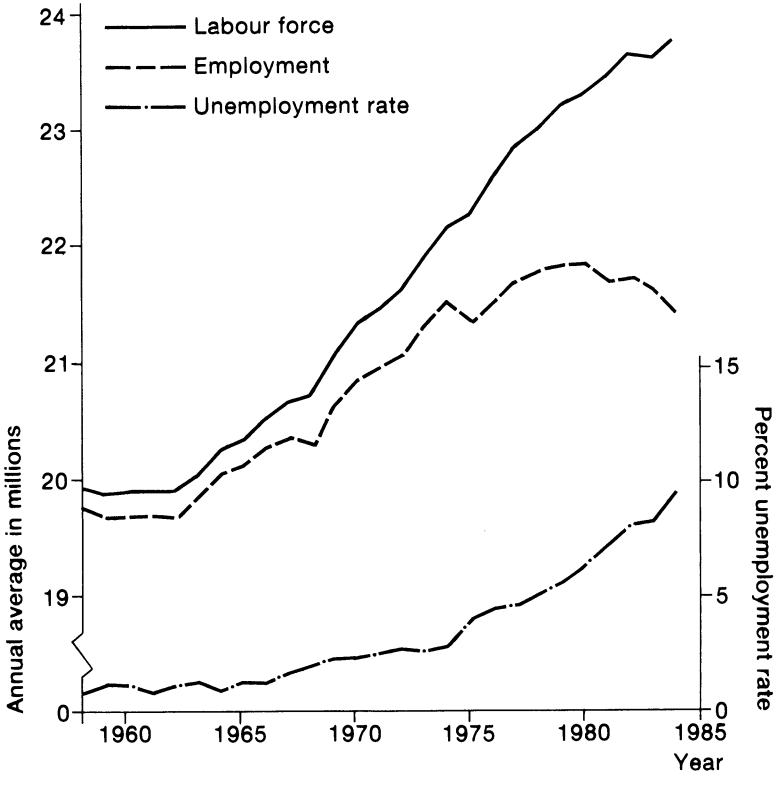


FIGURE 1. Labour force, France, 1958–1984: employment and the unemployment rate.

unemployment and a possible increasing mismatch between the respective structures of the labour supply and the demand for labour. Section IV will try to identify the origins of the malfunctioning and to allocate responsibilities.

This paper will remain mainly descriptive, empirical and qualitative rather than econometric. Such an approach is proper at the exploratory stage of the analysis of a complex phenomenon, when the main concern is not to overlook any of the factors that may have been important. Accepting a particular specification from the beginning would probably imply neglect of quite relevant features.

Moreover, my preferred specification is unfamiliar enough for its presentation to require a good deal of explanation that would divert attention from the study of the phenomenon itself. This specification has much in common with the one presented in this volume by H. Sneessens and J. Drèze; but it must go more deeply into the analysis of some medium-term determinants, particularly those of the evolution of productive capacity, capital intensity and labour productivity. Actually, the proper specification for the analysis of the medium-term rise in unemployment is not yet quite precise in my mind and still requires preliminary econometric work on particular blocks of the full model.

This methodological choice does not mean that conclusions will be postponed to subsequent work. Indeed, I shall behave like a devoted Bayesian and have no shame in giving my subjective probabilities. For substantiating them, I shall draw in particular from the econometric work done by others, and shall even present a few econometric equations.

I. The Labour Force

Two main factors explain the acceleration of the increase of the French labour force since 1962: the evolution of the population of working age, and the increasing participation of adult women in the labour force (see Table 1). On the other hand, net immigration, which had been particularly important in the 1960s, became negligible during the mid-1970s. The impact of decreased

Table 1

Growth of Labour Productivity, France, 1963-1984
(thousands of people)

Source of changes	Annual average change between censuses				
	1954-62	1962-68	1968-75	1975-82	1982-84[b]
Pure demographic factor[a]	20	132	170	201	208
Immigration	66	136	58	10	—
Changes in participation:					
People aged less than 25	−20	−64	−61	−40	−90
Adult men	−3	−5	−2	−14	−11
Adult women	−3	−25	113	156	95
People aged 55 and more	−32	−84	−79	−71	−179
Total	28	140	203	242	23

[a] Change of labour force that would have been observed if net immigration had been nill and if detailed participation rates by sex and age had not changed.
[b] Estimates from the labour force survey.

participation by young people, who are remaining in the education system longer, and older ones, who are retiring earlier, has been significant throughout the postwar period.

In comparison with its long-term trend, the population of working age has increased particularly rapidly in the 1970s and 1980s, both because of the influx of people born during the postwar baby boom, which was sustained in France up to the middle of the 1960s, and because of an exceptionally low number of old people leaving the working age group—those reaching age 65 in 1980 belonged to the small cohort born in 1915 during the First World War.

Female labour supply deserves particular attention. Its increase became rapid only after 1967, precisely when labour market conditions began to deteriorate and when the fertility rate declined. This coincidence has of course no causal meaning. In particular, women participated more and more frequently in the labour force, however many children they had; the participation rate of married women aged 25–44 with two children increased from 30 per cent in 1968 to 60 per cent in 1982. At present, the working behaviour of French women is analogous to that of American women, except that on average they work longer hours. In Western Europe, only Scandinavia has higher female activity.

The main explanation of this dramatic change of behaviour is of course cultural, and is linked with the diffusion of education. The events of spring 1968 revealed and promoted new values and attitudes which downgraded the attachment of women to their homes. But economists must wonder whether some economic factors did not also play a role.

It was a shift in the composition of the demand for labour, by industry and by profession, that permitted this huge entry of female labour (see Section III below). As a result, the prospects for women finding jobs did not deteriorate much more than the prospects for men. The female unemployment rate increased from 4·5 to 13·7 per cent between 1968 and 1984, whereas the male unemployment rate increased from 1·7 to 8·7 per cent.

During the years 1968–84, a number of changes in the economic environment shifted the terms of the choice between home work and paid work. The shortening of the work week made life less difficult for employed women with a family; the increase of real wages made wage-earning more attractive, while the husbands' increasing exposure to the risk of unemployment made it more necessary; changes in family allowances shifted the trade-off in favour of employment; even the improvement in unemployment insurance may explain why some women entered into or remained in the labour force whereas they would not have done so otherwise.

I shall not attempt to evaluate the impact of all these changes on the evolution of the female labour force. Even in the United States, where a large amount of econometric work has been devoted to this issue, the evaluation of their impact is notoriously imprecise. In France the econometrics of the labour market is much less advanced.[1] I shall just broadly describe these various changes and note that they all acted against a preference to stay at home.

The average work week for full-time wage-earners had remained between 45·5 and 46 hours from 1956 to 1967. Since then it has decreased, to 42·1 hours in 1975 and 39·1 hours in 1984. Simultaneously, part-time work, which was quite limited in the 1960s, slowly spread in the 1970s. According to the

Labour Force Survey, the proportion of women that were employed part-time (among those employed) is estimated at 13 per cent in 1971, 15 per cent in 1975, 19 per cent in 1982 and 21 per cent in 1984. (Approximately 2 per cent of this increase from 1971 seems to be due to changes in definitions.)

Between 1962 and 1967 the average hourly real wage (for men and women) had increased at an annual rate of 3·2 per cent; the rate jumped to 5·4 per cent over 1968–74, then declined, to 3·3 per cent in 1977–78 and 2·1 per cent over 1979–83. If anything, this increase benefited women slightly more than men; the average annual earnings of full-time female 'employés' was 24 per cent less than for men in the 1960s, but only 21 per cent less in 1978.

In the immediate postwar period family allowances were notoriously important in France; a significant role was played by the single-earner allowance given to families in which the mother was not in paid work. Progressively, the family allowances, and particularly the single-earner allowance, became relatively less significant; this trend was reinforced after 1967, ceasing only in the late 1970s.

In 1968 unemployment insurance coverage was still rather low in France by comparison with some other developed countries. It has improved progressively since then, and has been particularly high by international standards since 1978, notwithstanding a small reduction in the last few years. A suitable indicator is the ratio of the average compensation received by unemployed people to the average wage of employed wage and salary-earners: this amounted to about 12 per cent in the late 1960s, 23 per cent in 1975, and 34 per cent in 1982. It declined to 25 per cent in 1984.

Some of the preceding changes may also have acted on the working behaviour of groups other than adult women. But the overall impact is likely to have been small. Almost all adult men were already in the labour force and a large majority of school-leavers were entering it. On the other hand, the decrease in the rate of participation of old people in the labour force has been so rapid that one can hardly imagine it any faster; for instance, for men aged 60–64 the rate was 66 per cent in 1968, 54 per cent in 1975, 39 per cent in 1982 and 32 per cent in 1984.

One must also be aware that some government policies had the direct result of slowing down the increase of the labour force. These concerned extended schooling for young people without a job (in particular the so-called 'stagiaires' and various inducements to early retirement, from the age of 55 in some cases. Partly as a result of these policies, the decline in the activity rates of young and old people since 1975 has been much stronger than had been anticipated by the extrapolation of previous trends in behaviour. From 1975 to 1982 the difference amounts to an annual net flow of 44,000 people more leaving the labour force.[2] the 'traitement social du chômage' in 1982–83 also acted in this direction.

II. The Demand for Labour

During 1973–84, whereas the labour force was steadily increasing, employment remained almost stagnant, slowly increasing at first, then slowly decreasing. Table 2 shows that this global stability was the result of contrasting movements. Between 1973 and 1984 employment increased by 2·1 million people in services,

TABLE 2
EMPLOYMENT IN FRANCE, BY SECTOR, 1963-1984[a]
(thousands)

	1963	1969	1973	1979	1984
Agriculture	3,760	2,910	2,330	1,930	1,680
Industry	5,640	5,710	6,070	5,730	5,180
Building	1,670	1,970	1,980	1,820	1,580
Transport, trades and services	5,380	6,270	6,810	7,860	8,140
Financial institutions and government	3,410	3,730	4,110	4,490	4,850
Total	19,860	20,590	21,300	21,830	21,430

[a] The selected years (except for 1984) may be considered as peak years of the business cycle.

broadly defined, but decreased by almost as much in agriculture, industry and building (at rates of, respectively, 3·0, 1·4 and 2·1 per cent per annum).

This stability of employment is of course due mainly to the slow rate of growth of output. Indeed, whereas the French economy experienced some decline in the rate of growth of labour productivity, this decline appears moderate in comparison to what happened in some other industrial countries. Table 3 gives a few relevant figures in this respect. These concern production per man-hour, but the picture would be roughly the same for production per man-year since the reduction of the length of work has been about steady since 1967.

Some analysts of French economic trends have argued that the decline in labour productivity could be fully explained in manufacturing, and largely explained for the whole economy, by two factors only; (1) the business cycle, which was responsible for a less intensive use of labour within firms in 1979 and 1984 than in the peak years 1963, 1969 and 1973, and (2) a less favourable evolution of productive capital; whereas investment had been previously accelerating, inducing a continuous shift in the composition of capital towards recent and more modern equipment, it slowed down after 1973 so that the average age of capital increased; moreover, the average length of use of equipment during the year was significantly reduced during the last decade. On these points, see Cette and Joly (1984), Dubois (1985) and Raoul and Rouchet (1980).

TABLE 3
GROWTH OF LABOUR PRODUCTIVITY, FRANCE, 1963-1984
(value added, in constant prices, per man-hour)

	Annual rates (%)			
	1963-69	1969-73	1973-79	1979-84
Industry	6·1	6·2	5·2	4·2
Global (except financial institutions and government)	5·7	6·2	4·1	3·5

Source: Dubois (1985).

Clearly, the stagnation of employment since 1973 is, above all, the result of the depression of the demand facing French firms. This assertion is commonly accepted by analysts of economic trends but is disputed by some theoreticians. I shall discuss later the econometrics of the demand for labour, but at this stage I note two facts that agree with the predominance of demand factors. First, the rise of unemployment is a general phenomenon in the world economy, along with a sluggishness of aggregate demand, while for other factors contributing to the explanation of unemployment national specificities seem to be important. Second, the rise of French unemployment was forecast with econometric models that are quite imprecise for anything but the formation of aggregate demand (Malinvaud, 1984, p. 111).

Depressed demand was of course a reflection of a world-wide phenomenon. Confronted with it, however, the French economy could have fared a little better from the viewpoint of employment (or again, still worse). Hence, we must consider in turn the two following questions: (1) Why wasn't the level of demand facing French firms somewhat higher? (2) This demand being what it was, why didn't French firms employ more labour in order to meet it?

The demand for goods

The first question raises two further sub-questions concerning, respectively, French domestic demand policy and French competitiveness.

During the first phase of the depression, from 1974 to 1978, economic policy underwent several phases of stop–go but was on the whole mildly stimulatory. Real interest rates were very low, credit rationing moderate, and budgetary policy about neutral. (Public administrations had a surplus of 0·9 per cent of GDP in 1973 and a deficit of 1·9 per cent GDP in 1978, but Chouraqui and Price (1983) show that this change is fully explained by automatic stabilizers.) Investments in public utilities (nuclear electricity generation and telecommunications), moreover, were strongly stimulated by public policy.

During the 1980s, on the contrary, economic policy became rather restrictive. Real interest rates jumped up and the autonomous stimulation given by the 1981 budget did not compensate for the restrictive effects of budgets in other years, 1979–80 and 1984 in particular. (The deficit of public administrations went up, however, to 2·8 per cent of GDP.)

Could demand policy have been a bit less restrictive in recent years? I shall leave the question unanswered here, but I must note that policy-makers definitely felt constrained by the international environment and by public perception of what sound public finances ought to be. Although real interest rates were substantial in France (around 5 per cent for bonds), they did not go as high as in other countries. Public opinion was sensitive to the existence of a public deficit and apparently was unimpressed by the situation elsewhere in the world, where public deficits are usually larger and public debts much heavier. Finally, an unsustainable balance of payments deficit was experienced in the years 1980–83.

As far as competitiveness goes, the various indicators do not all tell the same story. Indeed, it is basically difficult to evaluate changes of competitiveness for an economy that opened so quickly to foreign trade (the ratio of imports of manufactured goods to the home demand for these goods increased

from 10 per cent at the beginning of 1963 to 26 per cent in 1974 and 47 per cent in 1984).

The broad facts can, however, be described by comparing the evolution of labour costs and prices in international currency to those of competitors. One then sees an unfavourable evolution during the 1970s, preceded and followed by favourable periods. Between 1967 and 1970, as a consequence in particular of the devaluation of the franc in 1969, relative labour costs adjusted for exchange rate movements declined by about 10 per cent; prices of exports of competitors relative to French export prices increased by about as much. But during the 1970s French relative labour costs increased by 15 per cent, and, whereas relative export prices seem to have declined by another 10 per cent (according to unit values derived from international trade statistics), import prices decreased much more with respect to domestic production prices (by more than 20 per cent between 1970 and 1980). On the other hand, by 1983 relative labour costs had come back to their 1970 level, relative export prices had declined by another 15 per cent, and relative import prices had stopped decreasing.

These facts about competitiveness indicators agree with the evolution of import penetration, as measured by the ratio of imports of manufactured goods to the domestic absorption of these goods. Import penetration indeed slowed down after a lag as a consequence of the favourable change that occurred before 1970 and after 1980. But the evolution of the share of the French export market in OECD exports raises an important question. Whereas this share increased from 1968 to 1973, it has been progressively declining since 1979 in value terms and has remained roughly constant in volume. Of course, the lag on the export side should be longer than for import penetration; it may, moreover, be noted that France exports mainly to Europe, where demand has recently been more sluggish than in the world as a whole. But the inability of French firms to benefit much up to now from the recent favourable shift of labour costs and production prices in international currency is worth noting; in 1982–83 it could be attributed to the fact that demand was more depressed abroad than in France, but that explanation can no longer hold in 1984. The present mediocre performance of the French market share may be related to the pronounced decline in profitability in the early 1980s, about which more will be said later.

An inappropriate response

We must now analyse why, confronted with a depressed demand for their goods and with an excess supply of labour during the last ten years, French firms did not shift their input combination more in favour of labour and did not seize more opportunities to sell and produce. But before doing so, it may be enlightening to speculate on what an appropriate response of the French economy could have been.

Let us then assume that the new configuration of disequilibria faced in the late 1970s and the 1980s had been perfectly forecast. Let us take as given world demand, exchange rates and autonomous domestic demand. Let us, moreover, assume that priority has been given to minimizing unemployment over this decade and a half. What, then, should have been done?

The answer of course depends on one's views about what generates the medium-term development of an economy in disequilibrium. It is not the place for me to display my own views, which are somewhat electric but roughly similar to those entertained by most analysts of current economic trends. I hope, then, that the following answer will be accepted by most readers, and later I shall try to discuss the econometric evidence that could substantiate at least part of it.

The appropriate fictitious programme can be described by three main actions. First, one should have stopped the substitution of capital for labour, more precisely the part of it that did not result from the introduction of new and more productive techniques. Second, one should have favoured flexibility in labour management and labour remuneration, although at the cost of valuable social objectives other than employment. Such improved flexibility would have induced firms both to seize market opportunities, even when they were suspected to be temporary, and to use unqualified labour more often for equipment upkeep, improved service to customers and the like. Third, one should have maintained profitability because it would have appeared both directly and indirectly necessary: directly, because firms will pay little attention to currently occurring opportunities if profitability is low; indirectly, because, faced with an uncertain future, they will not install new capacity or replace old unless this is likely to be rewarding. Later, when capacity margins are not available, market opportunities will again be missed.

Against the background of this fictitious programme, let us consider the evolution of the past ten years. We shall then realize that the French economy was quite slow to adapt to the new conditions within which it had to operate. Indeed, it is only quite recently that the need for adaptation was understood. Previous trends were maintained for too long, and this conflicted with the objective of minimizing unemployment.

Let us start with profitability, although its development is the consequence of other factors to be discussed later on. In Malinvaud (1983) I evaluated the net profit rate of non-financial corporations as having been equal to 6·8 per cent on average between 1962 and 1972. It then went down to 4·4 per cent in 1976–77, up to 5·3 per cent in 1978–79, down to a minimum of 1·9 per cent in 1981 (revised figure), and up again to 2·7 per cent in 1983 and 1984. But this should be compared with the real interest rate, which was 3·1 per cent on average during 1962–72, went down to quite low levels during the following years (1·3 per cent in 1979), and up again in the 1980s (4·2 and 5·1 per cent, respectively, in 1981 and 1984). So before 1980 rising inflation protected the pure profit rate (excess of the profit rate over the real interest rate) and prevented it from declining. The situation has completely changed since 1980.

Confronted with these profitability conditions, with increased business uncertainty and with progressively more pessimistic prospects for the future expansion of demand, firms slowed down the building of new capacity, first in manufacturing, more recently in trades and services. The average rate of capacity utilization in manufacturing declined somewhat from the high level reached in the early 1970s but was never really depressed; the average of 83·1 per cent for the years 1974–79 was almost exactly on the same level as that for 1965–68 (83·0 per cent) and the average for 1980–83 was hardly lower (82·3 per cent). This means that the increasing under-utilization of human

resources was not accompanied by a similar under-utilization of productive capacities. There is an increasing mismatch between the two. This may also mean that firms were not very strongly pushed to increase their market share abroad or to maintain their market share at home, since a good proportion of them did not really experience idle capacity. We shall come back to this point.

The substitution of capital for labour had been a necessity in the early 1960s, when the labour market was very tight; it was still to be recommended during the fast expansion of the early 1970s. But it seems to have gone on since then, notwithstanding the mounting labour surplus. The explanation is probably to be found not only in the evolution of relative prices, as ordinarily measured, but also in the fact that labour has become more like a fixed factor of production, with recruitment often considered to be an irreversible decision.

The relative cost of labour with respect to capital increased markedly up to the middle 1970s, then remained roughly constant up to 1982; with the present high real interest rates and the recent stagnation of real labour costs, the relative cost of labour with respect to capital is now tending to fall. (The series shows rather large fluctuations, but the trend annual rate of increase may be estimated at roughly 10 per cent from 1963 to 1975.) It is clear that price stimuli strongly favoured labour-saving after labour had ceased to be a scarce production factor. The reversal of the previous trend is still too recent to have had a significant impact on labour requirements.

Even for a Frenchman, it is difficult to form a firm evaluation about the role of non-price obstacles to recruitment. These obstacles arise not only as a result of the laws and regulations themselves, but also from their method of application and more generally from public attitudes concerning labour management. They are mainly the difficulties and high costs involved in dismissing a newly recruited labour force. (The view that dismissal is practically infeasible in France is, however, very far from the truth.) In fact, managers have more and more expressed the view that good businessmen should carefully control the size of their labour force, keeping it as close as possible to the medium-term minimum requirement, even if this implies that one will occasionally miss some opportunities for extra sales. Of course, new forms of labour use developed as a consequence: firms hiring temporary workers extended their activities, and short-duration labour contracts became more and more common, notwithstanding the rather meticulous legislation concerning these forms of employment.

Since in most cases this trend towards making labour a fixed factor of production is tantamount to an increase in the user cost of labour, it could have been compensated by a decrease in the usual measure of the 'product wage', more precisely in the labour cost per unit of output divided by the GDP price. But the evolution of the latter was rather different, with in particular a rapid increase between 1973 and 1979; taking 1973 as the base year, the index was 94 in 1963, 96 in 1969, 100 in 1973, 111 in 1979, 112 in 1983 and 110 in 1984.

Another form of the reduced flexibility came from the minimum wage legislation. The minimum wage had been progressively less binding during most of the 1960s but was greatly raised in 1968 and thereafter. As an indicator, one may consider the ratio between the earnings of an adult worker paid at the minimum wage and the average wage of a manual worker; it was 0·53 in

1959, 0·46 in 1967, 0·57 in 1973, 0·60 in 1979 and 0·63 in 1983. As Martin (1983) has shown, the impact of this evolution should not be overestimated (see also OECD, 1984, Chapter V). However, it certainly played some negative role, in particular against youth employment.

An econometric assessment

In order to gauge the respective influence on the demand for labour of the various factors that have been discussed, a quantitative assessment would be required. One does not expect it to be easy, considering the complexity of the relationship to be tackled, the fact that our interest here is mainly in medium-term phenomena, and the fact that the econometrics of the demand for labour in other countries has few really conclusive results to offer, beyond the dominant importance of the demand for goods. Attention will therefore concentrate on the main question, to what extent is the stagnation of employment since 1973 due to an inappropriate structure of prices and wages?

Let us first note that the model now used for the discussion of medium-term economic policy at the Commissariat du Plan still stresses the income effect of wage changes. The results presented by Catinat and Maurice (1984) show in particular that, starting in 1983, a higher rate of increase of labour remuneration rates would lead to higher employment during the five following years, although it would induce lower investment and a larger trade deficit. Negative effects of excessive wages at a five-year horizon could then come only from a deterioration of competitiveness, which would force the government to adopt more restrictive demand management.

This model is no proof, of course, if it is biased towards Keynesianism. But one should note that other macroeconometric models of the French economy give less weight to profitability considerations and are typically still more Keynesian. More importantly, one must note that direct econometric attempts at evaluating the effect of labour costs on employment find it to be small.

Working on annual data for the period 1957–74 and fitting a simultaneous model of demand for the two main factors, labour and capital, Villa *et al.* (1980) have identified a small negative effect of labour cost on employment (elasticity 0·05). But this case seems to be unique. For instance, a number of regressions and statistical tests have been tried in Artus (1985), working with quarterly data for the years 1963–83; causality tests on the role of real wage on employment find it to be non-significant.

The specifications to be used in the present work must of course be strictly defined with respect to the phenomenon to be measured. As Figure 2 suggests, one may consider determinants that are located more or less upstream in the chain of causation. Two specifications have been tried here on annual data for the years 1963–84: one concerning the most proximate causes (arrows at the bottom of Figure 2), the other aiming at a fuller grasp of the medium-term role of prices and remuneration rates on the demand for labour.[3] The results are on the whole disappointing.

The first regression aims at detecting whether, given output and capital, flexible wages or high profitability leads to high employment. The results are negative for both factors, in so far as the coefficients of the two corresponding variables have the wrong signs with respect to the hypothesis to be tested.

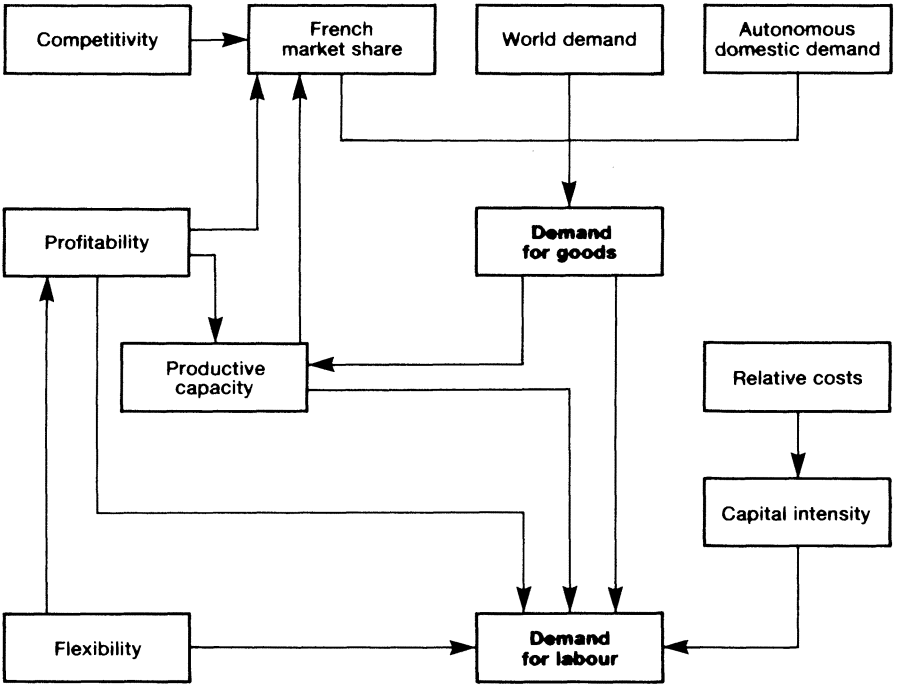


FIGURE 2. Demand for goods and demand for labour; a few determinants.

Flexibility is represented by a proxy whose effect should be in the opposite direction, the ratio φ_t of the minimum wage to the average wage rate; its coefficient is found to be positive (and just significant). The profitability measure π_t, taken from Malinvaud (1983) updated, is, on the contrary, found to have a negative and significant coefficient. I obtain the following, where n_t is the logarithm of employment;

$$(1) \qquad \begin{aligned} n_t = {} & 0{\cdot}73 n_{t-1} + 0{\cdot}39 y_t - 0{\cdot}12 k_t - 0{\cdot}27 h_t + 0{\cdot}05 z_{1t} \\ & (7{\cdot}1) \quad (-) \quad (-) \quad (-) \quad (1{\cdot}0) \\ & + 0{\cdot}07 z_{2t} + 0{\cdot}04 \varphi_t - 0{\cdot}13 \pi_t + f_t. \\ & (2{\cdot}4) \quad (2{\cdot}0) \quad (3{\cdot}1) \end{aligned}$$

In this regression the coefficients of the logarithms of output (y_t), capital (k_t) and hours (h_t) have been constrained to agree with a constant-returns-to-scale Cobb–Douglas production function with a 0·3 coefficient for capital in order to improve the fit. An unconstrained regression is no more favourable to the hypothesis to be tested. The exogenous variables z_{1t} and z_{2t}, which denote, respectively, the rate of capacity utilization in industry and the proportion of industrial firms constrained by labour shortages, have been introduced to capture short-term business conditions. The variable f_t is a split-time trend with a break at 1973. It corresponds to an annual rate of technical progress of 4·1 and 2·4 per cent over 1963–73 and 1973–84, respectively. The t-statistics are given in brackets. The Durbin–Watson statistic is 2·24.

The second regression aims at fitting a kind of reduced form, in which employment would be directly related to its fundamental determinants appear-

ing at the extreme origins of the arrows of Figure 2: autonomous demand, competitiveness, profitability, flexibility and relative costs. Neither production nor capital, which are endogeneous like employment, appear any longer. Ideally, such a reduced form should catch both short-term and medium-term effects; hence, its lag structure should be left flexible.

But this is clearly too much to expect from a regression fitted on 22 years of observation on the aggregate French productive sector: attempts at fitting elaborate lag structures did not give any result worth reporting. This means that the equation reported below is ambiguous in meaning, in the same way as are similar regressions of other authors. Whereas its full justification implies medium-term considerations, it cannot claim to catch much more than short-term effects. The result is as follows:

$$(2) \qquad \begin{array}{l} n_t = \underset{(0\cdot1)}{-0\cdot03}\, n_{t-1} + \underset{(2\cdot5)}{0\cdot20}\, dd_t - \underset{(2\cdot5)}{0\cdot13}\, dd_{t-1} + \underset{(6\cdot3)}{0\cdot17}\, wd_t \\ \qquad\quad + \underset{(2\cdot5)}{0\cdot05}\, \gamma_t + \underset{(0\cdot7)}{0\cdot01}\, \omega_t - \underset{(1\cdot7)}{0\cdot09}\, \varphi_t - \underset{(2\cdot1)}{0\cdot16}\, \pi_t + f_t^*. \end{array}$$

The two autonomous demand variables are significant and appear with the correct sign. The index of the trade-weighted volume of world demand (wd_t) plays an important part. Domestic autonomous demand is also significant, but more in the short run than in the medium run. (The variable dd_t is the logarithm of the sum of government demand, social transfers to households, investment of the main large public enterprises, and investment in housing by households.) The long-run elasticity of employment to autonomous demand appears to be roughly one-quarter, which must be considered too small. Another variable, the overall rate of taxes and social security contributions, was added in some regression runs, but turned out to have a very small t-value and the wrong sign. Finally, the linear trend f_t^* imparts a reduction of 1·4 per cent per annum, which cannot account fully for technical progress and the reduction of the work week. All this reinforces the view that medium-term effects are reflected only partially in equation (2). The Durbin–Watson statistic is 2·52.

The main point of interest here concerns the price variables. Competitiveness γ_t, as measured by relative unit labour costs, is found to be significant and to play the expected role, but with a small elasticity. Flexibility of wages, measured by the same inverse proxy φ_t as in regression (1), here has a coefficient of the expected sign and an almost satisfactory t-statistic. On the contrary, the profitability variable π_t has the same wrong sign and apparent statistical significance as in regression (1). Finally, the logarithm of the relative cost of labour with respect to capital ω_t appears with a very small coefficient (of the wrong sign) and is not significant.

These rather disappointing results reinforce my personal prior belief, which is shared by many others and gives a dominant role in Figure 2 to the causal chain running from world demand and autonomous domestic demand to the demand for goods, then to the demand for labour. Each one of the other factors appears by comparison to be marginal.

This, however, cannot mean that the structure of prices and wage rates has no effect. The role of competitiveness has been identified above. Profitability and the relative cost of labour with respect to capital are certainly also

important, but their effects are probably too slow to be easily detectable by regressions of the type reported here. More detailed econometric work is required; recent studies in investment behaviour have indeed tended to identify, much more often than earlier ones, the impact of profits on investment.

This is why I maintain that an inappropriate evolution of relative prices and real costs since 1973 is a subsidiary factor explaining why the French demand for labour has grown so slowly. Unfortunately, we cannot be more precise and give a reliable measure of its impact.

III. The Labour Market

The rise of unemployment has been the main factor behind the changes that occurred in the functioning of the labour market. All changes will not be described here. Attention will focus on those that might reveal special forces reacting on unemployment, accelerating or retarding it.

The question of whether, and by how much, frictional unemployment increased is particularly relevant, both for the explanation of the unemployment and for its welfare implications. The definition of frictional unemployment is admittedly conventional; it will not be made precise here. Various aspects of frictional unemployment will be considered in turn.

First comes the question of how the mismatch between the supply of and demand for labour evolved. This may be considered by region, by industry, by age-sex, by qualifications. A full discussion of labour market mismatch would be quite lengthy and drawing firm conclusions would be difficult, but it does not seem to be a major factor in explaining the rise of unemployment.

When the mismatch is measured by disparities between specific unemployment rates, a typical pattern emerges: relative disparities decreased, absolute differences increased. This is apparent for instance in the figures given above for female and male unemployment rates; the ratio between the two decreased from 2·7 in 1968 to 1·6 in 1984, but the difference increased from 2·8 to 5·0 percentage points. The same pattern appears for youth *v.* adult unemployment and for regional disparities: the inter-decile ratio of the unemployment rates in the 'départements' decreased from 2·6 to 1·7 between the two population censuses of 1968 and 1982, but the corresponding difference increased from 1·6 to 4·2 percentage points (the first and ninth deciles being, respectively, 1·0 and 2·6 in 1968, 6·5 and 10·7 in 1982). Similarly, between 1968 and 1975 the ratio between the rates applying to male manual workers and higher staff ('cadres supérieurs') decreased from 3 to 2, whereas the difference increased from 1·3 to 1·8 percentage points. (The evolution of disparities between qualifications was, however, different after 1975, as we shall see later.)

What should be concluded from such a pattern with respect to the trend of frictional unemployment is difficult to say. I tend to see the pattern essentially as being induced by the shift towards a general situation of excess supply of labour. This excess appears in all sectors, however defined, of the labour market, so that all unemployment rates increase. But a general situation of excess supply reduces the incentive to geographical mobility and leads employers to be more selective in their recruitment, so that the increase in unemployment is more important for those groups that are traditionally less in demand.

Another way of testing for an increasing mismatch consists in looking at the data on registered unemployment u_{it} and registered vacancies v_{it} for various groups i and dates t. If u_t and v_t are the corresponding totals for all groups, the index

$$(3) \qquad d_t = \sum_i \left| \frac{u_{it}}{u_t} - \frac{v_{it}}{v_t} \right|$$

may be taken as an indicator of the degree of mismatch. For the 22 French administrative regions, the indicator oscillates around 0·30 with no trend. Particularly high values are observed in March 1974 (0·37) and March 1983 (0·39), and particularly low values in March 1975, 1976 and 1977 (0·24 or 0·25); for March 1984 and 1985 the figures are 0·32 and 0·31. A similar calculation for the 42 main profession groups can be made only for recent years; the March figures for 1979–84 read as follows: 0·55, 0·65, 0·59, 0·50, 0·48 and 0·55.

Looking at productive operations, one does not find special reasons to believe in an increase in structural reorientation, and therefore in an increasing mismatch between a quickly changing demand for labour and a more slowly evolving supply of labour. Discrepancies between the growth rates of various industries roughly kept the same importance. The variance between the rates of capacity utilization in various industries was even significantly higher in the late 1960s than in the early 1980s. The average yearly rates of change of employment in 54 detailed manufacturing industries were considered for the three periods 1970–73, 1973–79 and 1979–84. The standard deviation between these industrial rates was quite stable: 2·38, 2·43 and 2·35 per cent in the three periods.

All things considered, the idea of an increasing structural mismatch cannot be sustained, except perhaps as a consequence of the lack of flexibility of relative wages (of young or unqualified workers), about which more will be said later.

The second question is whether the individual behaviour of workers is responsible for part of the increase in search time before an unemployed worker accepts a new job or exits the labour force. With this question in mind, one can look at data about labour mobility and wonder about the role of unemployment compensation.

Labour mobility had been definitely increasing in the 1960s; but it seems to have decreased somewhat recently. Among employed men who were employed five years before, the proportion of those no longer working in the same establishment was evaluated at 21 per cent in 1964, 34 per cent in 1970 and 33 per cent in 1977. The same statistics, but referring to 12 months before, give 11 per cent in 1977 and only 8 per cent in 1984. Similarly, 6·4 per cent of the labour force of 1968 was not living in the same region six years earlier. The corresponding proportion (but referring to the residence seven years earlier) was 8·9 per cent in 1975 and 8·3 per cent in 1982.

The interpretation of this trend, however, is not clear with respect to the question at issue. I tend to see it mainly as evidence of a deterioration of employment prospects: employed workers move little nowadays because they can not find better jobs; indeed, the proportion of employed workers looking for another job increased from 2·1 per cent in 1963 to 2·9 per cent in 1973

and 4·3 per cent in 1983 (4·7 in 1984); also, the number of people who entered registered unemployment by voluntarily quitting their job decreased from 438,000 in 1976 to 284,000 in 1984. One should not forget that mobility has always been low in France (a sociological feature that the imperfections of the housing market reinforce); but its recent evolution can hardly be taken as evidence of an exogenous change in workers' behaviour.

To assess whether greater unemployment compensation is responsible for a significant part of the increase in search time remains difficult. Econometric studies concerning the consequences of unemployment insurance in other countries have not yet resulted in firm conclusions, even for the partial equilibrium question that concerns us here. Perhaps the most relevant study in this respect was provided by Clark and Summers (1982), working on a sample of Americans. They show that better unemployment insurance indeed inflates the number of unemployed people because of both an increase in search time and increased labour force participation, a consequence that was mentioned in the first section of this paper. However, these effects appeared to be fairly small. The results of Narendranathan *et al.* (1985), working on a sample of Englishmen, seems to lead to the same qualitative conclusion.

What about France, where unemployment compensation has quite significantly improved in the 1970s (as shown by the figures given in Section I), and where it seems to be now particularly high in comparison with other countries? (According to UNO (1982), such a level of compensation as the present one in France is much higher than the one provided in the United States.)

One is tempted to relate this high compensation to the fact that long unemployment spells are particularly important in France. (In 1983, 43 per cent of unemployed French people were in this situation for more that a year; the corresponding proportion was 36 per cent in the UK and 13 per cent in the United States.) Unfortunately for the analyst, long-unemployment duration seems to be a tradition in France, and is certainly related to low labour mobility. Whereas the average length of uncompleted unemployment spells was 14·5 months in March 1984, it was already about 8·5 months from 1970 to 1972 when the labour market was still fairly tight and unemployment compensation much lower.

The third question is whether the increased 'dualism' prevailing in the French labour market induced a rise of frictional unemployment and generated a phenomenon that is well known in developing countries and is formalized by the Harris–Todaro theory.

Dualism has always existed in the French economy, as in all others; but since the middle 1970s it seems to be definitely increasing in the labour market. Two features of this evolution appear in the statistics.

In the first place, unemployment now increases much more slowly for highly qualified labour than for ordinary wage-earners. For instance, the rate of unemployment of male manual workers increased by 80 per cent between 1975 and 1982 and by another 40 per cent between 1982 and 1984, whereas the rate for male 'cadres supérieurs et professions libérales', although only half the size in 1975, increased by only 30 per cent between 1975 and 1982 and seems to have slightly decreased since then.[4] This evolution may be related to the substitution of capital for labour, which was discussed in Section II,

and to changes in the structures of wages. Not only did the increase in minimum wage make poorly qualified workers more costly, but salaries to higher staff and technicians increased significantly less than average wages; between 1975 and 1982 the average real annual salary of a 'cadre supérieur' is estimated to have decreased by 8 per cent, whereas the average real annual wage of a manual worker has increased by 10 per cent. In other words, the labour market seems to have been less constrained for qualified than for unqualified labour.

In the second place, faced with the rigidity of normal labour contracts, employers often hired workers only temporarily and tended to offer contracts for a limited and preagreed duration. These two types of employment concern only a small minority of the employed labour force (about 3 per cent, but 10 per cent for workers under 25), but they reinforce the dualism of the labour market since a number of workers find only jobs of this kind and are recurrently unemployed. Indeed, among the 2·67 million workers who shifted from employment to registered unemployment at some date during 1984, 56 per cent held (up to this date) an interim or limited-duration contract; the corresponding proportion was 31 per cent in 1976. Knowing this situation, most unemployed people quite understandably take such contracts only for lack of a better alternative and after having prolonged their search for a permanent contract.

Another consequence of the dualism and lack of flexibility of the French labour market is the particular importance of youth unemployment. According to the recent OECD (1984) study, the ratio between the rates of unemployment of young and adult workers was higher in France in 1983 than in any other of the countries under examination; it had increased from 2·3 to 3·6 between 1970 and 1980.

It is worth noting that this evolution of youth unemployment had very little impact on the relative wage of young workers, contrary to what was observed in other countries. One cannot help thinking that this feature, as well as the stickiness of real wages in the lower half of the qualification scale, has something to do with the high minimum wage that was maintained during this period of unemployment.

The conclusion of this discussion is that frictional unemployment has quite probably increased in the French economy, but only because of the increase in unemployment compensation and the increased dualism of the labour market, *not* because of an increasing mismatch between the geographical and industrial structures of labour demand and supply. Hence, the increase in frictional unemployment can be only moderate.

One should like to be able to quantify this increase. The idea naturally comes to mind of looking at the 'Beveridge curve', relating the vacancy rate to the unemployment rate. An outward shift of this curve might be taken as evidence of increased frictions on the labour market and could provide a basis for a measure of a corresponding component of unemployment growth. Unfortunately, in the French case this examination of the Beveridge curve is disappointing.

It should first be said that French statistics on vacancies are poor. They concern only those vacancies that were reported at labour exchange offices; and the number of these offices greatly increased, particularly between 1967 and 1974, so that the evolution of reported vacancies is misleading. French

statisticians have therefore taken to looking at the ratio of reported vacancies to the number of job applicants at the same labour exchange office.

Figure 3 plots the logarithm of the ratio v/u so defined against the logarithm of unemployment rate u (independently measured) for the years 1960–84. Clearly, the curve shifted rightwards (by about 2·5 percentage points of unemployment) between 1967 to 1972. But such a large shift, occurring early in the period of rising unemployment, simply suggests better prospecting of vacancies by labour exchange offices, which were indeed explicitly given this mission. This being the case, I consider that Figure 3 tells us nothing useful.

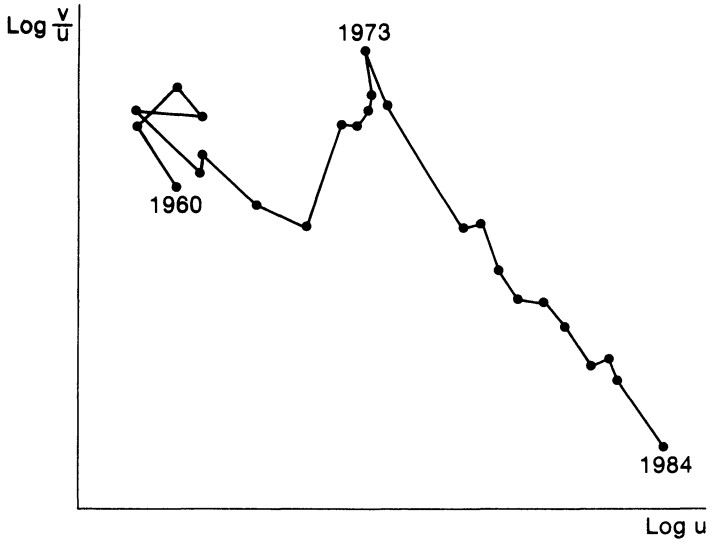


FIGURE 3. Unemployment-vacancy relationship.

IV. THE MACROECONOMIC PHENOMENON

The three preceding sections took a partial equilibrium viewpoint (some would prefer to say 'partial disequilibrium'). The discussion did not consider only proximate causes, but it never claimed to cover all the macroeconomic interdependencies. This must now be rectified.

Clearly, however, some of the preceding conclusions stand and they will not be re-examined. Two of them will simply be stated. The rise of unemployment is first and foremost due to international conditions: a long period of stagflation, disorder and depression at the world level, and an inability of Western Europe to maintain its competitiveness and to organize the coordination of economic policies of its various members. But it is also due to an inadequate policy response in France. Faced with the prospect of mounting unemployment, public opinion and governments did not want to sacrifice other objectives in order to contain it; or perhaps they did not want to recognize this unpleasant prospect and did not understand what the real trade-offs were.

But a theme has been occurring repeatedly in the previous discussion and deserves more attention, namely that the system of relative prices and wages performed poorly and did not induce the necessary substitution and adaptation.

Since prices and wages were not fully controlled, we must ask why their development was not better suited to the prevailing situation.

Before considering this aspect of the macroeconomic phenomenon, however, I should like to express some reservation about the attitude of many economists who see in it the alpha and omega of any explanation of disequilibrium unemployment. Fitting Phillips curves tells nothing in itself about the causes or even the measure of this unemployment. Indeed, there is no compelling reason for accepting the identification, proposed by M. Friedman, of the frictional unemployment rate with the NAIRU (non-accelerating inflation unemployment rate). Acknowledging the frequent conflict between the two objectives of employment and disinflation does not require an acceptance of this identification. The dynamics of prices and wages is much more complex than is assumed when the identification is accepted; moreover, these dynamics are often perturbed by forces that the economist can only regard as exogenous but nevertheless must recognize.

With this reservation in mind, however, we must seriously consider the main feature that made the price vector inappropriate, namely a too-rapidly increasing average real wage rate during the 1970s. This increase in real wages resulted in a significant increase in the real average labour cost per unit of output. The increase occurred mainly between 1972 and 1976 and amounted to 8 per cent in four years; but the movement was reversed only in 1983, when real-unit labour costs at last began to fall. (A small decrease had taken place in 1978 and 1979, but was nullified by the second oil shock; the 1981–82 level exceed the 1976 level by 1 per cent.) This increase was almost equal to the deterioration of the terms of trade (8 per cent between 1972 and 1976, 11 per cent between 1972 and 1981).

It is surprising that it was so long before the rise in unemployment produced a visible impact on the evolution of real wages. We may seek an explanation in the results of econometric studies on wage and price formation. Such studies are now quite numerous for France; moreover, they have recently been the object of a very serious scrutiny into their robustness with respect to details of the specification or sample period.

The four-equation model fitted by Feroldi and Meunier (1984) serves the present purpose well. The four endogenous variables are the rates of increase of the hourly wage rate ($\dot{w}$), the manufacturing industry production price ($\dot{p}_i$), the services production price, and the consumer price ($\dot{p}_c$). The model was fitted by instrumental variables on quarterly data for the years 1966–81, with dummy variables for the second and third quarters of both 1968 and 1974. The wage equation and the industrial price equation are reported below;

$$(4) \qquad \dot{w}_t = 0{\cdot}4 + \sum_{\tau=0}^{4} b_\tau \dot{p}_{c,t-\tau} - 0{\cdot}5\hat{u}_t + \sum_{\tau=0} d_\tau \dot{a}_{t-\tau}$$

$$(5) \qquad \dot{p}_{it} = 0{\cdot}3\dot{p}_{i,t-1} + 0{\cdot}3(\dot{w}_t - \dot{z}_t) + 0{\cdot}1\dot{p}_{et} + 0{\cdot}1\dot{p}_{a,t-2} + 0{\cdot}08\dot{p}_{mt} - 0{\cdot}2\ c\dot{m}_t.$$

The following exogenous variables appear:

$\hat{u}$ logarithm of the ratio between the number of men aged 25–49 registered as unemployed, and the number of job vacancies

$\dot{a}$ rate of increase of hourly labour productivity

$\dot{z}$ rate of change of employers' social security contributions minus trend rate of growth of labour productivity in industry
$\dot{p}_e$ rate of increase of energy prices
$\dot{p}_a$ rate of increase of agricultural prices
$\dot{p}_m$ rate of increase of prices of industrial imports
$c\dot{m}$ change in unused capacity margins

All coefficients are statistically significant at conventional levels, except the constant of the wage equation. The sum of the coefficients b_τ is equal to 1·2 and that of d_τ to 0·5.

The general form of these equations is fairly robust. In particular, the Phillips phenomenon, here represented by the variable $\hat{u}$, appears in all specifications and is not weaker in France than in other countries. However, the productivity variable is not always found to be significant in the wage equation; neither is the capacity margin variable in the industrial price equation. Conversely, some regressors not present in equation (5) are sometimes significant in other formulations of the industrial price equation: the cost-to-price ratio, the rate of investment in industry, a competitiveness variable (price of industrial imports divided by industrial unit cost).

Equation (4) would imply even more than a full indexation of wages to consumer prices. Other econometric estimates of the wage equation over the same period generally give somewhat lower coefficients to consumer prices, but in no case is the hypothesis of full indexation rejected by statistical tests.

If, as is the case for equation (4), no regressor represents government wage decisions, in particular concerning the legal minimum wage or the wage rate in large public corporations, large positive residuals, often hidden by *ad hoc* dummy variables, appear in 1968, again in 1974–75, and in 1981–82. *Per contra*, extrapolation of the equation to 1983–84 gives higher wage increases than were observed.

These results suggest that two factors were responsible for the apparent sluggishness of the French real wage rate in the period from the late 1960s to the early 1980s. The first one was a high and quick *de facto* indexation of wages to the cost of living. If the dynamic of the wage-price system was not unstable it is because of the price equations; a wage push, for instance, induced some reduction of profit margins. This indexation of wages was probably related to the prevailing public attitude that placed unique emphasis on equity when considering wage questions.

Second, special events in recent French history played a role in this apparent lack of responsiveness of real wages to the rise of unemployment. We saw that large positive residuals appear in the wage equation in 1968, again in 1974–75, and in 1981–82. I need not insist on the fact that 1968 was the time of the May students' and workers' uprising that shook the whole French society and ended with large wage concessions. The period 1974–75 was the beginning of the Giscard d'Estaing presidency, when the new President attempted to install social peace. Similarly, 1981–82 followed the change to a socialist government which raised the minimum wage and decided full wage compensation for the reduction of the legal duration of the working week.

Wage indexation, and the former bias of public policies towards wage increases, have somewhat similar roots in the French common ideological

core. If excessive real wages are taken to have some responsibility for the present size of unemployment, as I think it does, we can say that some of the unemployed are now paying the price for what had to be done in order to maintain the cohesion of French society, and to teach an unwilling public economics.

The same kind of socio-political explanation applies to the two other major features that characterized the French system of prices and remuneration rates: a lack of flexibility of relative wages in the lower half of the scale, and, until recently, a bias of economic policy towards inflation. Nothing more will be said about the first feature, since it was discussed above and is related directly to some of the decisions that explain excessive real wages. But the second feature deserves a few additional comments before I finish.

The acceleration of inflation, which occurred before and after the first oil shock and again after the second one, helped to alleviate for a time the burden of classical unemployment. The deterioration of real profit margins did not mean (until recently) an equivalent deterioration of profitability, because of the capital gains realized by indebted firms and because of low real interest rates. According to the estimates I made in Malinvaud (1983), the net profit rate, computed without taking these capital gains into account, was about 5 per cent from 1962 to 1972, then stayed around 2 per cent from 1974 to 1979. When capital gains resulting from the decrease in the real value of debts are accounted for, the corrected net profit rate amounts on average to 6·8 per cent from 1962 to 1972 and to 5·3 per cent from 1974 to 1979. Simultaneously, the average real interest rate declined from 3·1 per cent during the first period to 1·1 per cent during the second. Thanks to the acceleration of inflation, a margin of more than 4 per cent of the (corrected) profit rate over the interest rate was thus realized between the two oil shocks.

If we accept the argument presented in Bruno and Sachs (1985), a low profitability has some responsibility for poor productivity performance and thus feeds upon itself. *Per contra*, the fact that profitability was maintained in France longer than elsewhere by the acceleration of inflation may explain why the decline in productivity growth rates there was quite moderate.

As is well known, profitability radically deteriorated from 1980 to 1982 and real interest rates leapt. Now that inflation is receding, the risk of a strong push in the classical component of unemployment is quite real. It was, however, obvious enough to cause the 'politique de rigueur' with its strict controls and guidelines on wage rates. Feroldi and Meunier (1984) show that, indeed, significant negative residuals appear in the French wage equation since the second half of 1982; the national accounts also show a substantial improvement of industrial profit margins in 1983 and 1984.

The socio-political background of French macroeconomic policy is thus in full revision. But depressing factors acting on both demand and profitability are still so strong that employment prospects have not yet improved significantly.

ACKNOWLEDGMENTS

This article benefited from useful comments or contributions by P. Dubois, P. Mazodier, J.-P. Puig, C. Thelot and from the discussions at the Chelwood Gate Conference.

NOTES

1. See however Lollivier (1984), Bourguignon (1985) and Riboud (1986).
2. See Marc and Marchand (1984).
3. Assistance was provided by J.-P. Caffet and J.-P. Puig. Regressions (1) and (2) concern employment in non-financial non-governmental activities ("branches marchandes").
4. The phenomenon was noted in Méraud (1984), who gives other data about it. It also appears in unemployment rates by educational level.

REFERENCES

ARTUS, P. (1985). Salaire réel et emploi. Unpublished paper, INSEE (mimeo).

BOURGUIGNON, F. (1985). Women's participation and taxation in France, in Blundell, R. ed. *Applied Labor Economics*, Oxford University Press.

BRUNO, M. and SACHS, J. (1985). *Economics of Worldwide Stagflation.* Oxford: Basil Blackwell.

CATINAT, M. and MAURICE, J. (1984). Analyse quantitative d'une stratégie pour l'emploi. *Revue économique*, **35**, 1007-90.

CETTE, G. and JOLY, P. (1984). La productivité industrielle en crise, une interprétation. *Economie et Statistique*, no. 166, 3-24.

CHOURAQUI, J.-C. and PRICE, R. W. R. (1983). Public sector deficits: problems and economic policy implications. *OECD Occasional Studies*, June.

CLARK, K. B. and SUMMERS, L. H. (1982). Unemployment insurance and labor market transitions. In M. N. Baily (ed.), *Workers, Jobs and Inflation.* Washington: Brookings Institution.

DUBOIS, P. (1985). Ruptures de croissance et progrès technique. *Economie et Statistique*, no. 181, 3-31.

FEROLDI, M. and MEUNIER, F. (1984). Une maquette d'étude de la boucle prix-salaires, and La boucle prix-salaire et l'inflation depuis 1970. *Economie et statistique*, no. 169, 45-59.

LOLLIVIER, S. (1984). Revenu offert, prétentions salariales et activité des femmes mariées: un modèle d'analyse. *Economie et Statistique*, no. 167, 3-15.

MALINVAUD, E. (1983). Analyse macroéconomique des déséquilibres: la France des vingt dernières années. In E. Malinvaud, *Essais sur la théorie du chômage.* Paris: Calmann-Lévy.

—— (1984). *Mass Unemployment.* Oxford; Basil Blackwell.

MARC, N. and MARCHAND, O. (1984). La population active de 1975 à 1982: les facteurs d'une forte croissance. *Economie et Statistique*, no. 171-2, 5-23.

MARTIN, J. P. (1983). Effets du salaire minimum sur le marché du travail des jeunes en Amérique et en France. OCDE, *Etudes spéciales*, June, 51-73.

MÉRAUD J. (1984). Productivité, croissance, emploi. Report to the Conseil Economique et Social, Paris.

NARENDRANATHAN, W., NICKELL, S. and STERN, J. (1985). Unemployment benefits revisited. *Economic Journal*, **95**, 307-329.

OECD (1984). *Employment Outlook*, September. Paris; OECD.

RAOUL, E. and ROUCHET, J. (1980). Utilisation des équipements et fléchissement de la productivité depuis 1974. *Economie et Statistique*, no. 127, 39-53.

RIBOUD, M. (1986). Women in the labour force in France. *Journal of Labor Economics*, forthcoming.

UNO (1982). *The Economic Situation in Europe in 1981*, Section 1, (iii), (c). Economic Commission for Europe.

VILLA, P., MUET, P.-A. and BOUTILLIER, M. (1980). Une estimation simultanée des demandes d'investissement et de travail. *Annales de l'INSEE*, **38-9**, 237-258.