REGIONAL LABOUR MARKETS

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ABSTRACT

In the present study we wish to address four related questions. Firstly we ask what effect sectoral imbalance has had on aggregate unemployment. We examine this question in Chapter 2 using the framework of regional wage determination and evidence from Great Britain over the period 1975-1989. Secondly we ask why such an imbalance should persist over time and why labour does not move to equilibriate its compensating differentials across regions. We attempt to answer this question in Chapters 3 and 4 using a model of migration flows based on the theory of the 'hiring function' and use evidence on bilateral migration flows across the standard regions of Great Britain over 1975-1989. Thirdly we wish to examine whether long-term unemployment distorts the working of the labour market by examining its effects on regional wage determination in Chapter 2 and on migration Chapters 3 and 4. Finally we examine whether certain developed economies have been more successful than others in curbing both excessive unemployment growth and unemployment persistence. In Chapter 5 we attempt to explain such contrasting performance by comparing differences in institutional features and the more pragmatic active labour market intervention in the form of training and other employment related measures initiated by different countries following each of the two oil price shocks. In comparing national labour market performance we use comparable data of the 14 main OECD member countries covering the period from the mid 1970s to the late 1980s.

For my grandparents and parents

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CHAPTER 1

INTRODUCTION

1.1 Overview

High and persistent unemployment was the experience of most developed economies following the two oil price shocks of 1973 and 1979, with the effects being especially protracted and pronounced during the 1980s. Further, the economic recovery of the late 1980s led to inflationary pressures at rates of unemployment far higher than those experienced in the 1960s and 1970s. This latter point would suggest that there had been an increase in the natural rate of unemployment, defined as that rate of unemployment which is consistent with no wage and price inflation spiral. Another alarming feature was that as unemployment increased, long-term unemployment increased proportionately more. In France by 1988, as in Belgium, Germany, Italy, the Netherlands, Spain and the United Kingdom, more than 40 per cent of the unemployed have been out of work for more than a year with these figures extending to over 60 per cent in certain cases. The effects of long spell unemployment range from their social effects, resulting from disillusionment and despair at one extreme, through the financial costs in the form of dependence of welfare payments to the inherent economic effects whereby long-term unemployment may of itself hinder the efficient working of the labour market. It is well known that the experience of long-term unemployment leads to a loss of morale and motivation and that people who have been unemployed for a long time become increasingly unattractive to employers seeking to fill vacant jobs. It is these latter effects of long-term unemployment which we will examine in this study with particular reference to the effects on wage behaviour and migration.

Furthermore, throughout the 1980's many industrialised economies experienced quite pronounced differentials in regional unemployment rates. For example, evidence for Great Britain reveals that the correlation coefficient of regional unemployment rates between the mid 1970s and the mid 1980s was 0.92, with comparable figures of 0.91 for Japan, 0.84 for Italy, 0.83 for Germany and 0.69 for Sweden. The persistence of relative unemployment rate differentials lead to increases in absolute differences in unemployment across regions with the associated social problems that such a dichotomy in economic experiences within countries produced. In fact the issues related to the "North-South" divide were as relevant to Britain as they were to Italy, with similar geographical divisions existing in many other developed economies.

In the present study we wish to address four related questions. Firstly we ask what effect sectoral imbalance has had on aggregate unemployment. We examine this question in Chapter 2 using the framework of regional wage determination and evidence from Great Britain over the period 1975-1989. Secondly we ask why such an imbalance should persist over time and why labour does not move to equilibrate its compensating differentials across regions. We attempt to answer this question in Chapters 3 and 4 using a model of migration flows based on the theory of the "hiring function" and use evidence on bilateral migration flows across the standard regions of Great Britain over 1975-1989. Thirdly we wish to examine whether long-term unemployment distorts the working of the labour market by examining its effects on regional wage determination in Chapter 2 and on migration Chapters 3 and 4. Finally we examine whether certain developed economies have been more successful than others in curbing both excessive unemployment growth and unemployment persistence. In Chapter 5 we attempt to explain such contrasting performance by comparing differences in

institutional features and the more pragmatic active labour market intervention in the form of training and other employment related measures initiated by different countries following each of the two oil price shocks. In comparing national labour market performance we use comparable data of the 14 main OECD member countries covering the period from the mid 1970s to the late 1980s.

1.2 Regional wage determination

One idea which we pursue in this study is that the distribution in unemployment either through the geographical concentration in economically depressed regions or into low skill occupation groups has of itself added to wage pressure at given aggregate unemployment. This would explain the emergence of wage pressure at lower aggregate unemployment rates if the mechanism of wage determination was local in character. According to this idea if a reduction in the dispersion of unemployment rates across regions can reduce inflationary pressure for given aggregate unemployment, then a reduction in unemployment dispersion can allow a reduction in aggregate unemployment consistent with a given inflationary pressure. This issue is pursued in Chapter 2 where we ask how the inter-sectoral dispersion of unemployment is related to the overall aggregate unemployment rate. We conclude that average unemployment increases with the variance of relative unemployment rates across regions. We examine the determinants of regional wage behaviour using time series data for the standard regions of Great Britain over the period 1974 to 1989 drawn from the Department of Employment New Earnings Survey. We carry out a detailed analysis disaggregating earnings firstly by sex, secondly by sex and occupation and thirdly by sex, occupation and industry. We examine which regional variables determine earnings for each of our separate groups and we propose possible explanations for our findings.

1.3 Regional Migration

Many researchers have attempted to explain the labour market developments of the 1980s by arguing that those economies which have suffered most through unemployment growth and its subsequent persistence have been those which have been least flexible in matching their unemployed with available employment opportunities. Such mismatch may have occurred either through inadequate education and training of job seekers, notably the recently unemployed and the young, or insufficient geographical labour mobility amongst those groups. The failure of migration to help eliminate unemployment dispersion, has lead economists into an examination of possible barriers to movement. This has largely concentrated on an analysis of the housing market, with particular reference to the local authority housing sector within Britain. While justifiably important in understanding migration, housing alone fails to explain why migration flows follow a cyclical pattern. Moreover, since unemployment dispersion generally grows in downturns, migration is least effective when it is most needed. This study rigorously examines, in Chapters 3 and 4, the issue of geographical mobility using evidence for Great Britain from the National Health Service Central Register which records the transfer of patients between GPs across regions. We find that migration can be viewed as one component of job hiring and as such will fall when overall engagements fall. We examine migration using the mechanism of the "hiring function", which assumes that the job filling is based on the interaction of unemployment and vacancies.

1.4 International comparison of hiring functions

We continue with the idea of the "hiring function" in Chapter 5 where we examine national hiring functions across the economies of the OECD through their observed reduced forms; the U-V curves. We examine whether

active intervention in the labour market through training and other forms of labour market spending improved the matching efficiency of national labour markets and whether institutional features help aid hiring, either through the mechanism of wage bargaining or through differences in unemployment benefit entitlement.

1.5 Data

While each chapter attempts to be self-contained in its specification of data sources we will give a brief summary of the data with the respective sources below.

The data we will use in this study derives almost completely from published sources. The time span covers the period from the mid 1970s through to the late 1980s.

In Chapter 2 where we examine evidence on wage determination within Great Britain we use figures published by the Department of Employment and published in Regional Trends and the Employment Gazette. In Chapters 3 and 4 where we examine the determinants of migration flows across the regions of Great Britain we again use data drawn from Regional Trends and the Gazette supplemented by migration data kindly supplied by the Office of Population Censuses and Surveys (OPCS).

In Chapter 5 where we make an international comparison of U-V curves across developed labour markets we use published figures taken from the two OECD publications Economic Trends and Employment Trends.

CHAPTER 2

REGIONAL WAGE DETERMINATION IN GREAT BRITAIN

2.1 Introduction

The labour market in Britain continues to be characterised by substantial differences in unemployment rates across regions. In 1990, average unemployment rates over the year ranged from 3.7 per cent in East Anglia and 4.0 per cent in the South East up to 8.2 per cent in Scotland and 8.7 per cent in the North of England. These differences are commonly attributed to a shift in the composition of employment from traditional manufacturing industries to services - the former concentrated in the North, the latter in the South - so that jobs have been migrating from North to South but workers, or at least some types of workers, have been slow to follow them.

Regional policy takes as its basis the idea that, given the barriers to migration, it is economically wasteful and socially unproductive to allow high unemployment to persist in areas where the demand for labour is falling. The immediate, and superficially attractive, answer is policy intervention to revive the demand for labour in the depressed regions, for example, by means of incentives to encourage firms to relocate or take on more workers in areas of high unemployment (see, for example, the 1983 White Paper Regional Industrial Development, Cmnd 9111).

A question often asked about such policies is whether, if they are effective in raising employment in the depressed region, they do so simply by shifting jobs from one region to another, or whether a reduction in regional inequalities can lead to less unemployment in total in the economy as a whole. This chapter attempts to address this issue. We should stress that an economic case for regional policy can be made on the grounds of

reducing external social costs resulting from migration. But if aggregate unemployment can be reduced there are also gains in the form of additional output, and additional revenue to the exchequer (from higher taxes and lower unemployment benefit outlays) which can be set against any public expenditure costs of regional policy.

The key issue is the relationship between unemployment and inflation. It is often argued that shifting jobs from low unemployment regions to high unemployment regions will reduce inflationary pressure in the economy as a whole. Recognising, however, that the rate of inflation is ultimately determined by macroeconomic commitments, such as membership of the Exchange Rate Mechanism (ERM) of the European Monetary System (EMS), a reduction in inflationary pressure at any given level of economic activity can be seen as permitting a higher overall level of economic activity consistent with achieving a given inflation objective. Hence, if a reduction in the dispersion of unemployment rates across regions can reduce inflationary pressure for given aggregate unemployment, this is equivalent to arguing that a reduction in dispersion can allow a reduction in overall unemployment consistent with a given inflationary pressure.

There are two arguments as to why a reduction in the dispersion of unemployment rates may lead to less wage pressure. The first, originally due to Lipsey (1960), rests on the curvature of the wage-unemployment relationship. Suppose wages in each region depend on the unemployment rate in that region but the wage-unemployment relationship is convex to the origin, such that a given small change in unemployment has a bigger impact on wages in regions where unemployment is low than in regions where it is high. Then reducing the dispersion of unemployment rates while maintaining the average unemployment rate unchanged will reduce aggregate wage pressure in the economy.

A second idea is that there is a "leading sector", say the South-East, and that wage increases in the South-East depend on the pressure of demand in the labour market in the South-East, and wage increases in other regions simply follow the levels set in the South-East. Again a reduction in the dispersion of unemployment rates, so long as it was associated with an increase in unemployment in the leading sector, would lead to lower wage pressure in the economy as a whole.

One of the major counter-arguments to the case for regional policy is the view that Britain is essentially a national labour market, and wages are determined with regard to national rather than local conditions (including the unemployment rate in the country as a whole rather than in any particular region). In this case, of course, a reduction in the dispersion of unemployment rates with the average unemployment rate unchanged would have no effect on wage pressure. The first question to investigate in our empirical work is therefore whether wages in a particular region influenced more by the unemployment rate in that region, the unemployment rate in the leading sector region (the South-East), or the unemployment rate in the nation as a whole. While this question might appear relatively straightforward, it is in fact not easy to distinguish these hypotheses because there is a strong tendency for the unemployment rates in the different regions to move in tandem. Nonetheless we do believe that the evidence lends strong support to the idea that wages of some groups of workers, and in particular of manual men, within a region are most strongly influenced by the unemployment rate in that region.

If this is accepted, the impact of regional inequalities on aggregate unemployment depends on the curvature of the wage-unemployment relationship. To establish the degree of curvature of an economic relationship requires careful modelling and we have insufficient data to do

this unless we make the assumption that the form of the relationship is the same across regions. We investigate this issue and we are satisfied that it is reasonable to assume a common form. Our results suggest that the data are best fitted by a double logarithmic form of the wage - unemployment relationship, embodying a significant degree of curvature.

In less technical terms, we believe that there are social and institutional forces within Britain pushing towards a greater degree of wage equality across regions than is justified on the basis of (full employment) productivity levels. In the low productivity regions wages are as a result too high and in consequence unemployment emerges. This serves to push wages down, thus creating the observed wage differentials. The forces pushing towards equality may be pay comparability, the wage policies of big firms which operate in many parts of the country (or of the public sector), and social security policies in particular uniform, flat rate unemployment benefits.

The argument is illustrated in Figure 2.1. In the Figure, there are two regions, a high productivity region 1 and a low productivity region 2. The total labour force in each region (L) is set equal to unity. The demand for labour in the two regions is given by the curves D_1D_1 and D_2D_2 respectively. If wages in each region were very flexible, the employment rate in each region would settle down at, say, L*, with 1-L* the equilibrium unemployment rate (due to frictional and voluntary unemployment). Wages in region 1 would be W_1*, and in region 2, W_2*.

By contrast, if wages are set nationally at a common level, say $\bar{W}$, then the wage in two regions would obviously be the same, but the unemployment rate in region 1, $(1-\bar{L}_1)$, would be lower than that in region 2, $(1-\bar{L}_2)$.

Our approach lies between these two extremes. We assume a wage-setting relationship common to the two regions, marked WW on the Figure, but that

the level of wages actually set depends on the unemployment rate within the region. Thus region 1 ends up with higher wages and lower unemployment, and region 2 with lower wages and higher unemployment.

The question then is whether the overall level of unemployment in the economy as a whole, for given average wages, is affected by the dispersion of unemployment between the two regions. This depends on the curvature of the wage function WW. If the wage function is a straight line, the average wage in the economy depends only on the average level of unemployment but if the wage function is curved, as shown in the Figure, the more dispersed the regional unemployment rates the higher the average wage for any given overall level of unemployment. For any given feasible level of wages in the economy, total unemployment will be lower the smaller are regional inequalities, as shown in Figure 2.2. (For a fuller discussion of these issues, see Jackman et al, 1991.)

The unemployment differentials that are created are, thus, asymmetric in their effects. Higher unemployment rates in the depressed regions do relatively little to reduce wage pressure in such areas, but lower unemployment rates in more prosperous areas add significantly to wage pressures in those regions.

Clearly the coexistence of depressed regions with lower than average wages and higher than average unemployment, and prosperous regions with higher wages and lower unemployment suggests at a minimum that there are significant barriers to migration from one region to another. For the purposes of this study we take such constraints on migration as given, and we do not consider whether it would be desirable or practicable to alleviate regional inequalities by breaking down the barriers to migration.

Our main conclusion is that there is clear evidence of a regional problem, but it is confined to the labour market for manual men. This is

consistent with the view that barriers to migration are important primarily for manual men for reasons which may have as much to do with tradition and culture as with current housing policies. Unemployment rates of manual workers vary more across regions than is the case with non-manuals (Minford and Stoney, 1991) which suggests that when local economic conditions are depressed the tendency is for manual workers to stay put and to become unemployed, whereas non-manual workers are more likely to get up and go elsewhere, where job prospects are better.

Unemployment rates of manual men are high and, we think, could be reduced by a reduction in regional disparities. To get an idea of the magnitudes involved, if the wage equation takes a double logarithmic form, the equilibrium unemployment rate for a group of workers increases with the variance of the relative unemployment rates across regions such that, at a given wage level, a 10 per cent reduction in this variance would be associated with a 5 per cent reduction in the overall unemployment rate of the group (ie for example from 10 per cent to 9.5 per cent).

The remaining sections of this chapter are as follows:

Section 2: outlines the basic theoretical approach, which differs from the traditional mainly in its focus on unemployment as influencing the level of real wages rather than the rate of wage inflation.

Section 3: provides an empirical overview of the behaviour of regional wages and unemployment over the past 16 years.

Section 4: is on empirical methodology and is concerned primarily with the question whether one should require a common structural form for the wage equations in the different regions.

Section 5: presents tests concerning the assumption of a common form for the wage equations, and assesses the relative importance of regional, leading sector and nationwide unemployment rates in wage equations.

Section 6: makes use of estimates of relative wage equations to obtain as precise estimates as possible of the impact of labour market variables.

Section 7: discusses the issue of curvature in relation to our estimated wage equations.

Section 8: summarises the findings of the study.

2.2. Theoretical Approach: Real Wage Equations

While in inflation prone economies, such as Britain, the most publicised aspect of wage determination is the annual increase in the money wage received by each group of workers, it is clear that in general money wages and prices tend to move quite closely together. In the short-term it may be important for workers to attempt to anticipate changes in the inflation rate, or in the wage increases of other groups of workers, but over the longer haul any such errors can be corrected. What is important in wage determination is not the accuracy with which a given group of workers' money wage tracks the price level in the short run, but rather the level of real wages underlying any claim. Any money wage settlement can be regarded as the product of a desired real wage and of the average price level expected to prevail over the period of the settlement. Similarly any increase in money wages can be regarded as the sum of any increase in the desired real wage and of the expected rate of price inflation. Since inflation expectation errors are unlikely to persist, the driving force behind wage settlements is the desired level of real wages which they are intended to secure.

Most[1] recent empirical work on wage determination therefore focusses on the determinants of the real wage, and these typically include the level of unemployment or some other indicator of labour market conditions. The idea that there is a relationship between the level of unemployment and the level of the real wage is consistent with models of wage determination

based on bargaining theory and with "efficiency wage" models. In the first case, unemployment weakens the union's bargaining power, because workers are more worried about the risk of job loss and thus less willing to bargain for a high wage. In the second case, unemployment itself assists firms in recruitment and in retaining and motivating their workforces thus reducing the incentive for firms to offer high wages for these reasons.

These theoretical considerations parallel econometric arguments to the effect that looking only at the rate of change of wages can lead to a neglect of factors fundamental in determining the level of wages in the long run but whose effects may be difficult to quantify on a year-to-year basis. This line of argument, first put forward by Sargan (1964), has been immensely influential in improving the econometric modelling of wages and many other economic time series.

While we adopt the real wage specification, in our empirical work we generally include the lagged value of the real wage as one of the explanatory variables. This, in a sense, allows the data to determine the correct specification. If the estimated coefficient on the lagged real wage is unity, the equation is identical to the Phillips Curve specification with unit coefficient on price inflation[2]. If the estimated coefficient is zero, we have a pure real wage equation with no dynamics. In general we find an estimated coefficient on lagged real wages lying between zero and one-half.

While the various theories of wage behaviour examine the determinants of the desired real wage, the real wage that can actually be paid is determined by labour productivity. In general unemployment serves the role of constraining real wage demands to be consistent with what can feasibly be paid (Layard and Nickell, 1986). For example, if unions become more powerful and demand higher real wages, the initial outcome may be a rise in

inflation which may temporarily lead to the belief that real wages are rising when in fact they are not, but the ultimate effect will be to raise unemployment sufficiently to restrain real wage demands so that they are again in line with what can feasibly be paid.

2.3. Wage Dispersion in Britain 1974-89

We start with some basic facts. Despite frequent claims that wages in Britain are determined nationally and therefore uniform across regions there are in fact quite significant variations. In particular, there has been a sharply increasing wage dispersion across regions in the average hourly money earnings of manual men since the early 1980s.

Figure 2.3 sets out the dispersion[3] of hourly earnings of men and, for comparison, the dispersion of male unemployment rates, house prices and the cost-of-living across regions over the period 1974-89. All these measures show a sharp increase over the past ten years, although in the case of wages there is an extraordinary disparity of experience, with the South East growing further apart and all the other regions converging closer together.

Our particular concern is with the relationship between earnings and local labour market conditions, and in Figure 2.4 we set out for each of the ten regions of Britain the time series of earnings and unemployment relative to the national average. These graphs show a systematic tendency for earnings and unemployment to be inversely related. In the South East, East Anglia and the South West, relative unemployment has been falling since the late 1970s and relative wages have been rising. In the West Midlands the relative unemployment rate has been much higher in the 1980s, than in the 1970s, and relative wages have been much lower. In the East Midlands, the relative unemployment rate rose to a peak in the mid 1980s, and has since fallen back a little, whereas relative wages fell to the mid

1980s, and have since risen quite sharply. In the North West, relative unemployment fell and wages increased up until the early 1980s, but since then unemployment has risen but wages have remained relatively high. In the North, and in Wales, there is a marked inverse relationship in the 1970s but no clear pattern in the 1980s. Finally, Scotland shows a very clear inverse relationship, with low levels of relative unemployment in the mid 1970s and early 1980s, corresponding to relative wage peaks, and the worsening in the Scottish relative unemployment position since 1982 being associated with a steady fall in relative wages.

To examine the statistical signficance of this relationship we examine a simple equation of the form

$$(\log w_i - \log w)_t = \alpha_{oi} + \alpha_1(\log w_i - \log w)_{t-1} + \alpha_2(\log u_i - \log u)_t + \varepsilon_t \qquad (2.1)$$

where w_i is average hourly earnings of employees in full-time employment in region i, u_i is the unemployment rate in region i and the subscript t refers to time. The equation is estimated on 15 annual observations (1975-89) and the data sources are described in the Data Appendix.

For manual men the estimate of α_1 is 0.57 (t-statistic 9.3) and of α_2 -0.054 (t-statistic 3.4). The implied long-run elasticity of unemployment on wages is therefore about -0.13. This implies that an increase in a region's unemployment rate of 10 per cent of the national unemployment rate (that is, in present circumstances, by about 0.7 percentage points) would be associated with a fall in its wage relative to the national average of 1.3 per cent. We have tested whether in the context of equation (2.1) the unemployment coefficient (α_2) is the same for all regions, and the Gallant-Jorgensen test statistic indicates that this restriction is satisfied. (The test statistic takes the value 8.4 as against a critical

value at the 10 per cent level of significance of 14.7 (χ^2_9).)

This exercise demonstrates that, at least as far as manual men are concerned, average wages paid in a region are systematically related to labour market conditions as measured by the regional unemployment rate. There are of course other categories of workers, and following the basic classification of the New Earnings Survey we distinguish workers by sex, occupation (manual or non-manual) and industry (manufacturing or non-manufacturing). In fact, in the empirical work that follows we make use of 14 categories of workers involving a breakdown of the NES sample first by sex, second by sex and occupation and third by sex, occupation and industry. These categories are set out schematically in Table 2.1, and the data is described in the Data Appendix.

Rather than plot out the time series for each region for each of these 14 groups, we focus on the statistical summary provided by the regression equation. Starting with men, in Table 2.2 we set out the estimates of equation (1) for each of the seven groups of male workers. For each of the four occupation-specific subgroups, the unemployment effect is significant ($t>1.6$), and the estimated long-run elasticity is close to -0.1. The equation for all manuals is also well-defined, but in the other two aggregate equations the unemployment term is not statistically significant. A possible reason has to do with the composition of employment: if a rise in unemployment affects relative employment rates in different proportions, the average wage would change even if individual earnings were unaffected. For example, if in a downturn firms lay off unskilled and low paid workers, average wages may rise even though no individual wage rises. Testing for the equality of unemployment elasticities across regions using the Gallant-Jorgensen test statistic we observe that we can accept the hypotheses of common coefficients for all our occupational groups.

Table 2.3 presents the equivalent results for women workers. The effect of unemployment on the wages of women workers is not significant for any group and in most cases is wrongly signed. This conclusion holds whether unemployment is measured (as in the table) by the female unemployment rate or by the male unemployment rate or by the overall unemployment rate[4]. Our explanation for this finding is that it is caused by differences in participation, or activity, rates of women across regions (see section 6 below).

The broad overview of the data in this section suggests the existence of a significant impact of regional labour market conditions on wages in the region. Further, the estimated unemployment effect on wages, an elasticity of 0.1, is of the same order of magnitude as the results found for national wage equations, e.g. by Nickell (1987). However, these graphs and regressions can be no more than suggestive since other possible explanatory variables have not been taken into account and the particular relationship discussed - that between relative wages and relative unemployment rates - has not been justified. We proceed to this issue in the next section.

2.4. Empirical Methodology

The wage level in a particular region is a purely statistical concept: it is the weighted average of the level of wages paid in each firm or enterprise located within the region. In exactly the same way, the aggregate national wage level is no more than the weighted average of wages paid in each firm or enterprise in the country.

We start from the assumption that wage determination can be represented by a linear relationship common to all firms. This assumption does not preclude variables entering in an interactive way or in more complex functional forms, i.e. we do not rule out a relationship of the form

$w = a_0 + a_1x + c_2y + a_3xy + a_4y^3 + \epsilon$. The objective is to model differences between firms by differences in explanatory variables, or in interactions between them, rather than in having different models (i.e. different regression coefficients). There might, in principle, be three types of variable:

(i) firm specific variables, denoted x_{fj} (e.g. firm profits) where subscript f indicates the firm and j the variable

(ii) region specific variables, denoted y_{ij} (e.g. local economic conditions), where subscript i indicates region

(iii) national variables, denoted z_j (e.g. interest rates, tax rates).

Interaction between variables are represented by composite variables at the level of the most disaggregate of the variables interacted.

It then follows:

at the firm level $$w_f = \alpha_0 + \sum_j \alpha_j x_{fj} + \sum_j \beta_j y_{ij} + \sum_j \gamma_j z_j + \epsilon \qquad (2.2)$$

at the regional level $$w_i = \alpha_0 + \sum_j \alpha_j x_{ij} + \sum_j \beta_j y_{ij} + \sum_j \gamma_j z_j + u \qquad (2.3)$$

where $x_{ij} = \sum_f x_{fj}$, where the summation here and subsequently is understood to be appropriately weighted, but the weights are not represented in the equations.

at the national level $$\bar{w} = \alpha_0 + \sum_j \alpha_j \bar{x}_j + \sum_j \beta_j \bar{y}_j + \sum_j \gamma_j z_j + v \qquad (2.4)$$

where $\bar{x}_j = \sum_i x_{ij}$ and $\bar{y}_j = \sum_i y_{ij}$

and the relative regional wage $$(w_i - \bar{w}) = \sum_j \alpha_j (x_{ij} - \bar{x}_j) + \sum_j \beta_j (y_{ij} - \bar{y}_j) + (u - v) \qquad (2.5)$$

While we are interested in equation (2.3), we will also estimate equations of the type (2.5) since we believe these enable better estimates of the α_j

and β_j terms to be obtained. Indeed it is our view that estimating equations of the form of (2.3) directly can lead to inefficient estimates due to collinearity between unobserved z_j variables and x_{ij} and y_{ij} variables. The possibility that the extent of this collinearity may differ between regions may explain why some studies have found that wage behaviour in the different regions appears to be determined by different factors.

However, relative wage equations such as (2.5) can only be derived if one can assume that the absolute regional wage equations (such as (2.3)) have coefficients that are common across regions. We address this issue in two ways. First, we examine some recent empirical studies on wage determination at the level of the firm. The evidence here, which is briefly discussed in Note 1, is that firms in different regions set wages in much the same way. It follows that regional wage equations, being simply aggregates of firm level wage decisions should also look much the same. Second, we make use of statistical procedures (the Gallant Jorgensen test) to establish whether differences in estimated coefficients across regions are or are not statistically significant. On balance, our conclusion is that is is valid to assume a common specification, and hence legitimate to estimate relative wage equations.

There are two types of advantage of estimating relative equations, such as (2.5) rather than absolute equations, such as (2.3). First, with respect to variables that affect wages at a national level (z_j), these variables appear in (2.3) but not in (2.5). Since they have proved hard to identify, and may be correlated with region specific (y_{ij}) variables, their omission will bias the estimates of (2.3) while (2.5) is free of such problems.

A case in point is productivity. The reason is that it is difficult to measure variations in the underlying rate of productivity growth, which

tend to be small in the short run, given that changes in economic activity are associated with sharp short-run changes in measured labour productivity. To the extent that national rather than region-specific productivity affects wages, and unfortunately we do not have data to investigate this issue, the relative wage formulation allows us to omit the productivity variable altogether.

Second, with respect to the region specific variables (y_{ij}), these appear both in (2.3) and in (2.5) but insofar as the variation in them is primarily a variation over time with a similar pattern across regions rather than a differential movement across regions there will be bias in equation (2.3) but not in (2.5). For example, the proportion of workers unionised has varied substantially over the last fifteen years, but the proportion unionised in one region relative to the nation as a whole has not varied to anything like the same extent (see Minford and Stoney, 1991, p.134, for evidence covering the period 1963-79). A similar argument would apply to productivity, if it is regional specific rather than national productivity which affects regional wages.

A further problem is that the omission of key variables may generate spurious effects of aggregate unemployment on region-specific wage equations.[5] Imagine, for example, a highly simplified form of equation (2.3) in which regional wages depend only on unemployment in the region and some aggregate, but unobserved, national variable z. Then the true equation is

$$w_{it} = \alpha_o - \alpha_1 u_{it} + \gamma_1 z_t \qquad (2.6)$$

Aggregation of (6) across regions gives

$$\bar{w} = \alpha_o - \alpha_1 \bar{u}_t + \gamma_1 z_t \qquad (2.7)$$

If we were to estimate

$$w_{it} = \alpha_o - \alpha_1 u_{it} - \gamma_2 \bar{u}_t + \varepsilon_t \qquad (2.8)$$

the value of $\hat{\gamma}_2$ would tend towards $-\alpha_1$ depending on the correlation between $\bar{w}_t$ and $\bar{u}_t$ in the aggregate data. To see this we need only note that, from (2.6) and (2.7), the true model can be written

$$w_{it} = -\alpha_1 u_{it} + \alpha_1 \bar{u}_t + \bar{w}_t \qquad (2.9)$$

and hence estimating (2.9) would yield a coefficient on $\bar{u}_t$ equal and opposite to that on u_{it}, and a coefficient on $\bar{w}_t$ of unity. Equation (2.8) is the same as (2.9) but with $\bar{w}_t$ omitted: the omission of $\bar{w}_t$ will bias the estimates on the other explanatory variables to the extent that it is correlated with them.

It follows further that it may be very difficult to detect any effect of aggregate (nationwide) unemployment on regional wages. If, now, the true model is

$$w_{it} = \alpha_o - \alpha_1 u_{it} - \beta_1 \bar{u}_t + \gamma_1 z_t \qquad (2.6')$$

then aggregation across regions gives

$$\bar{w}_t = \alpha_o - (\alpha_1+\beta_1)\bar{u}_t + \gamma_1 z_t \qquad (2.7')$$

The relative wage equation (2.9) is the same as before, and hence if we estimate (2.8)

$$w_{it} = \alpha_o - \alpha_1 u_{it} - \gamma_2 \bar{u}_t + \varepsilon_t \qquad (2.8)$$

we will again find the estimate of the coefficient $\hat{\gamma}_2$ tending to $-\alpha_1$.

2.5. Regional Wage Equations

Our first task is to establish to what extent wages at the regional level are sensitive to regional as against national labour market

conditions. For this purpose, we need to investigate absolute wage equations (such as (2.3) above), since national labour market conditions do not appear in a relative wage equation. We therefore investigate equations of the following form:

$$\log w_{it} = a_{oi} + a_{1i} \log u_{it} + a_{2i} \log u_{Lt} + a_{3i} \log \bar{u}_t + a_{4i}t + a_{5i} \log w_{it-1} + a_{6i}z_{it} \qquad (2.10)$$

where w_{it} is the real wage, measured as the average hourly earnings of full-time adult workers, deflated by the GDP deflator, of a category of workers in region i at time t, u_{it} the unemployment rate in the region u_{Lt} the leading-sector (South East) unemployment rate[6], $\bar{u}_t$ the average nationwide unemployment rate (excluding region i and the South East), w_{it-1} the real wage in the previous period and z_{it} all other factors affecting the real wage.

Two comments are required about estimation of equation (2.10). First, after some experimentation with various combinations of price indices it became clear that the best measure to use for the purpose of deflating the money wage was the GDP deflator. Thus, real wages henceforth are defined as average hourly earnings deflated by the GDP deflator. Cost-of-living effects on wages thus have to be introduced by means of additional explanatory variables on the right hand side of the equation, rather than into the definition of the real wage.

Second, rather than attempt to estimate some underlying productivity growth, which can raise problems of interpretation, we have simply included a time trend in the equation to capture the trend increase in real wages over time. This then also captures the effects on average hourly earnings of other gradual changes, such as in working hours or in the proportion of part-time workers, to the extent that changes in the composition of labour

time between part-time and full-time work affect the hourly productivity of full-time workers.

Third, here and throughout we estimate 14 separate wage equations for each of the groups of workers set out in Table 1. In the most aggregate of the equations (ie those for all male workers and for all female workers) we allow for compositional effects by including share of manual workers (ie male manual workers, as a proportion of all manual workers, and likewise for females) for each region in each year. Similarly in looking at the equations for male manual, male non-manual, female manual and female non-manual workers, we allow for the proportion employed in manufacturing within each category for each region and each year. These proportions are incorporated as additional explanatory variables in the equations but not reported. The most disaggregated of our equations are not adjusted for compositional effects. The wage variable in these equations also suffers from being inclusive of overtime payments. We examine the effects of overtime payments below.

We might in principle estimate equation (2.10) for each of our categories of workers for each region independently. However, it turns out that equations estimated in this way are poorly defined. The reason is that the number of observations for each equation is only 15, and this gives insufficient degrees of freedom for any reliable estimates to be obtained. We therefore need to cut back the number of explanatory variables by removing all the independent variables other than the unemployment variables and the national average wage.

The results of this exercise for the various groups of male workers are set out in Table 2.4. The striking feature of Table 2.4 is that the national unemployment rate, ($\bar{u}_t$), takes a coefficient approximately equal and opposite to that on the region specific unemployment rate, as suggested

by our analysis of the previous section concerning the consequences of omitted variables, while the unemployment rate in the leading sector region, the South East, ($u_{SE,t}$), is also positive. To check the nature of the mis-specification we experimented with adding the national average wage $\bar{w}_t$ in place of the time trend. The results, set out in Table 2.5a, confirm those of Table 2.4, and suggest the positive coefficient in nationwide unemployment is simply the result of omitted variable bias.

In Table 2.5a the leading sector unemployment rate is always insignificant, and we therefore examined the consequences of aggregating these two variables into a single nationwide unemployment rate (Table 2.5b). In Table 2.5b it is remarkable that the coefficients on u_i and $\bar{u}$ are almost exactly equal in magnitude and opposite in sign in nearly all the equations.

In Tables 2.4 and 2.5 we have also recorded the Sargan statistic which tests for mis-specification. This indicates that the national average wage successfully represents the effects of common omitted exogenous variables, as suggested by the analysis of the previous section.

In addition to the equal and opposite coefficients on region specific and national unemployment rates, the coefficient on the national wage rate is approximately equal to one. This is consistent with the idea of a common regional specification such that the data can be fitted by a relative wage equation of the form $(\log w_{it} - \log \bar{w}_t) = a_o - a_1(\log u_{it} - \log \bar{u}_t) + \ldots$. To investigate this issue further we examine the wage equation allowing the impact of unemployment in the ten regions to be estimated separately. That is, we test an equation of the form

$$\log w_{it} = a_o - a_{1i} \log u_{it} + a_2 \log \bar{u}_t + a_3 \log \bar{w}_t + \varepsilon_t \qquad (2.10')$$

Table 2.6 presents the estimates of a_{1i} for manuals and for manuals in manufacturing. Clearly the independently estimated coefficients lie very

close to one another[7]. In Table 2.7 we summarise the range of estimates for each of the groups of workers. The South East shows generally the smallest effect, and Wales the biggest. The range is about the same for all the groups of workers. Table 2.7 also sets out the Sargan statistic, which shows that these equations suffer from mis-specification. Our explanation is that the relative form of the wage equation eliminates the bias from omitted variables, but the freely estimated form does not[8]. Again this is consistent with the discussion of the previous section.

The key conclusion is that, for the reasons suggested in the previous section, an analysis based on absolute wage equations does not lead to satisfactory results. Essentially there are too many variables relative to the number of observations and some of the variables are difficult to measure and their effects may change over time. The results suggest we should adopt a relative wage form, which overcomes many of these problems.

We have repeated all the empirical work in this section for each of the groups of women workers. However, as might be expected from the preliminary results of Table 2.3, all the equations are very poorly defined. (These results are available on request.) When, in the next section, we turn to the estimation of relative wage equations, we are able to introduce more variables and thus offer some hypotheses about the influences on women's wages. At this stage we have only the negative finding that there is no relationship between wages of women workers and unemployment at the regional level.

2.6. Relative Regional Wage Equations

The results in Table 2.7 provide a basis for accepting a common coefficient specification for the wage equations in the different regions but they do not provide very precise estimates of the impact of regional unemployment on regional wages. This is because, in order to carry out the

common coefficient test, given the small number of observations, it was necessary to omit a number of relevant variables. In this section we take advantage of the assumption of common coefficients to estimate the determinants of relative regional wages.

Starting from equation (2.10) or (2.10') and imposing common coefficients allows us to rewrite each equation relative to the national average:

$$\log w_{it} - \log \bar{w}_t = (a_{oi} - \bar{a}_o) + a_1(\log u_{it} - \log \bar{u}_t) + a_5(\log w_{it-1} - \log_{-1}) + a_6(z_{it} - \bar{z}_t) \qquad (2.11)$$

Because this equation has many degrees of freedom, this formulation permits us to investigate the impact on wages of other possible explanatory variables.

The new variables we introduce are:

(i) the proportion of male long-term unemployment (R_i)

(ii) relative regional cost-of-living excluding housing costs ($P_{\bar{H}i}/P_{\bar{H}}$)

(iii) relative regional house prices (P_{Hi}/P_H)

(iv) relative regional house prices multiplied by the owner occupancy rate ($\Pi_i^H P_{Hi}/P_H$)

(v) the proportion of householders in the local authority rental sector ($\bar{\Pi}_i^H$).

While we were keen to include other variables, such as value added per head, unionisation rates or skill composition, we were unable to track down any for which consistent annual data were available on a regional basis. Insofar as these variables evolve slowly over time, their effects will be captured by the term in the lagged dependent variable.

The estimated relative wage equations for each of the groups of workers

are set out in Table 2.8. For men (Table 2.8a), the new equations are in line with the results of Table 2.5, but the effects are now more clearly specified and the Sargan test confirms that there is no misspecification. The results quoted do not allow for region specific time trends. Equations including such trends exhibit very similar effects of unemployment on wages, but the effects of the other economic variables are much less well-defined.

The main results are now clear. Unemployment matters but primarily because it matters for manual men in manufacturing. (We examine in more detail the results for non-manufacturing manual men below.) As far as non-manual men are concerned, regional cost-of-living and house price effects are much more important. The only consistently significant variable influencing women's wages is house prices (Table 2.8b). The long run house price coefficient for non-manual men not in manufacturing is found to be 0.19 while for all employed women it is 0.22. This is in line with the elasticity of approximately 0.2 found by Carruth and Oswald (1989) and Bover et al (1989).

Before drawing any general conclusions from this result we investigate its resilience in the face of changes in specification. First, we introduce economic activity rates as an additional labour market variable. The reason for doing this is that the difference between being classified as unemployed and out of the labour force is in some cases rather arbitrary (particularly with regard to married women). People can become discouraged from entering the labour force if there is little hope of getting a job. A high level of economic activity, on the other hand, will encourage people to enter the labour market and look for work. It is also sometimes said that people in areas such as London and on the South coast where informal work is relatively easy to get, can claim benefits while in informal work

and that hence registered unemployment in such areas overstates the number of people looking for work.

The economic activity rate appears with a significant and positive effect (consistently with the argument set out above) in five of the seven equations for men (Table 2.9a). Rather unexpectedly the addition of this extra labour market variable serves to increase the magnitude (and the significance) of the unemployment effects in the case of manual workers, but at the same time to further weaken these effects in the case of non-manuals. This seems to strengthen the conclusion that local labour market conditions matter for manual but not for non-manual men, although the nature of the interaction between unemployment and activity rates is not clear.

Turning to women, the activity rate has a consistently, and in the case of non-manuals, significantly negative effect (Table 2.9b). A possible explanation of this finding is that there is a supply side effect whereby more women wishing to work pushes down the average female wage. To investigate this we examined the determinants of the female economic activity rate. Interestingly the estimated reduced form equation for the female activity rate suggests that female activity rates are higher when house prices are high and council tenancy rates are low (Table 2.10). This could be interpreted as a mortgage effect on labour supply: women may be more likely to go out to work if there is a mortgage to pay off.

Of more immediate concern, the introduction of the activity rate does nothing to improve the significance of the unemployment variables in the equations in women's wages. Therefore in Table 2.11 we leave out the unemployment terms altogether. The equations for non-manual female wages seem quite well determined in terms of house prices and activity rates, but those for manual women remain very poor with virtually no significant

explanatory variables.

We experimented with a range of specifications, including those adding lagged house prices and lagged employment. None of those yielded any results of particular interest. We also examined the possibility of wage emulation effects. However, it turned out that the manual wage had at least as big an effect on non-manual wages as vice versa (Table 2.12). In Table 2.13 we carry out a sensitivity analysis where we examine the robustness of our results to the inclusion or omission of overtime payments. As overtime payments are counter-cyclical it might be argued that the observed unemployment effects might be somewhat spurious. We find that the effect of unemployment on manual male earnings is in fact improved by excluding overtime payments.

A puzzling feature of our results is that local unemployment rates appear to influence the earnings of manual men in manufacturing but not of those employed outside manufacturing. To understand why this might be we note first that "non-manufacturing" covers a diverse range of activities from mining at one extreme to services at the other. Some of these activities may have been covered by national bargaining over some or all of the period and others not.

We consider a number of hypotheses that have been suggested:

i) that changes in relative regional wages reflect primarily compositional changes in the structure of non-manufacturing employment by industry. In Table 2.14 we set out the proportion of non-manufacturing manual men in three very different sectors: agriculture, construction and mining. The figures show significant variation both across regions and over time.

ii) that the sensitivity of wages to unemployment may be different in different sectors: for example, construction workers may be more willing to

move between localities and hence their wages will be less sensitive to local labour market conditions.

iii) that the sensitivity of wages to unemployment in particular sectors may have changed over time, in particular as a result of the breakdown of national bargaining.

The results of these investigations are set out in Table 2.15. The main results are:

a) that compositional effects are significant, in particular wages in mining are significantly higher than in other sectors.

b) that wages in mining are more sensitive to local unemployment rates, and wages in construction less sensitive to local unemployment rates than for the sector as a whole.

c) that wages have been more sensitive to unemployed since 1985 than previously.

Overall the results in Table 2.15 show that wages of manual men outside manufacturing have been responsive to unemployment at least since 1985.

Interpreting the significance of the 1985 dummy as indicating the breaking down of national pay bargaining (perhaps associated with a decline in union power) leads to the thought that this effect might be found for other groups of workers also. However we were unable to establish any such effect on wage determination of any other groups.

With regard to women's wages, our feeling is that the poor quality of the equations reflects compositional effects which we have had no success in measuring. Indeed even our basic disaggregation between manual and non-manual, and between manufacturing and non-manufacturing is not very helpful for women since about 70 per cent of women are in the non-manufacturing, non-manual category, and only 57 per cent of female workers (as against 94 per cent of male workers) are in full-time employment.

2.7. Curvature

Structural imbalances can be seen as a force raising wage pressure if the wage-unemployment relationship is non-linear. If, as we have so far assumed, the functional form is double logarithmic, then in each sector

$$\log w_i = \log w_{oi} - a \log u_i \qquad (2.12)$$

Then, summing over regions, where α_i is the proportion of workers in region i,

$$\begin{aligned} \Sigma \alpha_i \log w_i &= \log w_o - a \Sigma \alpha_i \log u_i \quad (\text{where } \log w_o = \Sigma \alpha_i \log w_{oi}) \\ &= \log w_o - a \log \bar{u} - a \Sigma \alpha_i \log (u_i/\bar{u}) \\ &\simeq \log w_o - a \log \bar{u} + \tfrac{1}{2} a \text{ var } (u_i/u) \qquad (2.13) \end{aligned}$$

where $\bar{u} = \Sigma \alpha_i u_i$ is the aggregate unemployment rate. Equation (2.13) uses the approximation $\log u_i/\bar{u} \simeq (u_i/\bar{u} - 1) - \frac{1}{2}(u_i/\bar{u} - 1)^2 + \ldots$

and hence $\Sigma \alpha_i \log u_i/\bar{u} \simeq -\frac{1}{2} \text{ var } u_i/\bar{u}$

For a given aggregate unemployment rate, the aggregate real wage will be higher the higher is the variance of unemployment across sectors. Thus for given levels of productivity (and hence for a given feasible real wage) aggregate unemployment will have to be higher if the variance is higher in order to secure the given real wage (see Note 2).

With $\sum \alpha_i \log w_i$ taken as constant, total differentiation of (2.13) gives

$$0 = - a \, d \log \bar{u} + \frac{1}{2} a \, d \text{ var } (u_i/\bar{u})$$

$$d \log \bar{u} = \frac{1}{2} d \text{ var } (u_i/\bar{u})$$

According to the Labour Force Survey, in 1987 unemployment rates of manual workers were around 13 per cent in the South East, South West and East Anglia, and around 20 per cent in the North, the North West, in

Scotland and in Wales (see Minford and Stoney, 1991, p.117). If we take these two composite regions as of approximately equal size, the reduction in their average unemployment rate if unemployment could be equalised would be 2.25 per cent, that is from an average of 16.5 per cent to just over 16.1 per cent. This would correspond to a net fall in unemployment of just over 20,000 men implying an increase in output of around £270m (assuming unemployed men are paid 83 per cent of average manual wages which were £12,300 p.a. in 1990) and savings to the exchequer[9] of the order of £140m. These numbers are clearly significant, if not overwhelming. Clearly the effects of smaller reductions in the disparities would be less. A reduction in the unemployment rate differential of one percentage point (i.e. from 7 to 6) would imply a fall in aggregate male manual unemployment of 0.6 per cent, from 16.5 to 16.4 per cent, implying a net fall in aggregate unemployment of 5,000 men and exchequer savings of the order of £35m.

The double logarithmic form has however up to now been assumed rather than justified. In Table 2.16 we investigate two alternative assumptions. First, we ask whether wages might be responsive to the level, rather than the logarithm, of the unemployment rate. A comparison between these two formulations is shown in rows 1 and 2 of Table 2.16 which show the logarithmic form to be better specified. In row 3 the level and logarithm are both included, and while the logarithmic term remains highly significant, the level term is on the margin of significance, with a t-statistic of 1.6, though positively signed.

If one were to regard the level term as also significant, we may compute the effect of this change on the impact of disparities in unemployment on its average level as follows. Equations (2.12) and (2.13) become

$$\log w_i = \log w_{oi} - a_1 \log u_i + a_2 u_i \qquad (2.12')$$

$$\Sigma\alpha_i \log w_i = \log w_o - a_1 \log \bar{u} + 1/2 a_1 \text{var}(u_i/\bar{u}) + a_2 \bar{u} \qquad (2.13')$$

Then, totally differentiating (2.13') with $\Sigma\alpha_i \log w_i$ taken as constant, we have

$$0 = -\frac{a_1}{\bar{u}} d\bar{u} + \frac{1}{2} a_1 d \text{ var } (u_i/\bar{u}) + a_2 \, d\bar{u}$$

$$\frac{d\bar{u}}{d \text{ var}(u_i/\bar{u})} = \frac{1}{2} \frac{a_1 \bar{u}}{a_1 - a_2 \bar{u}}$$

A reduction in the variance thus leads to a smaller fall in unemployment than before. Using the estimated parameter values, a_1=-0.057, a_2=0.0041, and an average value of $\bar{u}$ over the period of say 10 per cent (so $\bar{u}$=10), the inclusion of the level term approximately doubles the size of the denominator of the above expression. This suggests a lower degree of curvature with correspondingly diminished effects of reducing the variance of unemployment on its sustainable average level.

We finally investigated the possibility that terms in the square or cube of the logarithm of unemployment might be relevant, as suggested by Blanchflower and Oswald (1990). The results, in row 4 of Table 2.16, show no such effects on relative regional wages.

2.8. Conclusion

The main conclusion from the econometric work on wages of men is that there is a very marked difference between the determinants of manual as against non-manual wages at the regional level. Manual wages for men are sensitive to regional labour market conditions. Differences in non-manual wages across regions appear attributable largely to differences in the cost-of-living and house prices.

A possible explanation for this difference is that we have been relating wages of the different groups to the overall unemployment rates for men. Since unemployment rates of manual workers are much higher than for non-manuals it might be that variations in the aggregate unemployment rate better reflect movements in the manual than the non-manual labour market.

Up until 1982, unemployed people were classified by occupation and thus manual and non-manual unemployment rates could be calculated. Table 2.17 shows, however, that over this period this makes no difference to our results.

A second possible explanation for this difference in behaviour is that the market for non-manual workers is essentially national in character (see also McCormick, 1991 and Minford and Stoney, 1991). Non-manual workers are willing to move between regions and in consequence if firms in a particular region are to attract workers they must be able to offer wages that fully compensate for differences in regional living costs and house prices. Much of the evidence on migration, eg. Pissarides and Wadsworth (1989), confirms that non-manual workers have a greater propensity to migrate. Also it is well-known that information on many types of non-manual work is advertised in national publications.

To investigate this hypothesis, we have made use of data collected on migration (Chapter 3) to contrast the influences on migration of non-manual as against manual workers. Again the analysis has to be confined to the period up to 1982 for reasons of data availability. The results, reported in Table 2.18, show migration rates of non-manual workers much more sensitive to unemployment differentials than is the case with manuals.

The wages of women, like those of non-manual men, seem influenced much more by living costs and particularly by house prices. While the economic

activity rate is significant in some equations, this seems to be capturing differences in supply behaviour rather than in labour market conditions.

Our first conclusion is therefore that there is a regional problem, but it is confined to manual men. For other workers there is no evidence that regional labour market conditions have any effect on wages.

However, within this sector it appears that regional intervention could be effective. If, for example, we were able to switch the demand for manual workers from a prosperous to a depressed region, in such a way that, taking the sectors to be of equal size, wages in the prosperous sector fall by one per cent and in the depressed sector rise by one per cent, and if the unemployment rate of manual workers was 10 per cent in the prosperous sector and 20 per cent in the depressed sector, then unemployment would fall by 2 percentage points in the depressed sector and rise by one percentage point in the prosperous sector (given a long-term coefficient of 0.1 in the wage equation). Put another way, for every 2 jobs created in depressed regions, one would need to destroy only one job in the prosperous regions to counterbalance the effect on overall wage pressure.

Insofar as both manual and non-manual workers are involved in most types of economic activity, increased employment of manual workers would entail increased employment of non-manuals also. However, this would take the form of reduced out-migration of non-manuals from the depressed regions rather than of changes in relative regional unemployment rates of non-manuals. If migration imposes social costs, e.g. in the form of congestion in the prosperous regions, then the reduction of such costs will be an additional benefit from any regional policy initiative.

Finally, we have to note that if regional policy actions raise wages and lower unemployment rates in the depressed regions the incentive for manual workers to migrate out of such regions will be reduced. But the

evidence from studies of migration (Chapter 3) is that the gross migration rates of manual workers are already very low, and, it appears, not very sensitive to unemployment rate differentials, and so reducing this incentive need not be a serious consideration at least in the medium term.

FOOTNOTES

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1 Not all authors adopt the real wage approach. For example, Hyclak and Johnes (1990) and Blackaby and Manning (1987) estimate traditional Phillips Curve specifications, relating the rate of change of money wages to the unemployment rate and the rate of price inflation. However they do not justify the use of this functional form, and, in the case of Hyclak and Johnes the estimated coefficient of less than unity on price inflation suggests that the model is mis-specified.

2 We have not investigated the effect of expected as distinct from realised inflation. If money wages are set on the basis of expected inflation, an unexpected rise in inflation will reduce real wages and an unexpected fall will raise real wages. In our empirical work, our main concern is with relative wages and we do not have any data on inflation expectations by region.

3 In each case dispersion is measured as the coefficient of variation. Thus an increase in dispersion means an increase in the proportional differentials between regions, and not simply an increase in the

absolute differences.

4 The reason for looking at the male as well as the female unemployment rate in that our measure of unemployment is based on the claimant count and in the case of women the overlap between the claimant count and those actively seeking work is little over half (as against around 90 per cent for men). Thus the claimant count unemployment rate for women may not be a reliable guide to the pressure of demand in the labour market. We also note that most women are employed in non-manual occupations, in many of which they will be in direct competition with men, whereas many men are employed in manual jobs which remain something of a male preserve.

5 We are very grateful to Charles Bean for discussions on this point.

6 It would clearly have been interesting to investigate more generally the effect of labour market conditions in one region on wages in another. Such investigations would need to be carried out on absolute rather than relative wage equations, and it turns out that the absolute equations are too poorly defined to allow further permutations of this type. It seems generally agreed that if there is a leading sector it would be the South East, however.

7 In their study, Hyclak and Johnes (1990), test for, and are unable to reject, the restriction of a common functional form across regions.

8 We have constructed the Gallant-Jorgensen statistic to test for common coefficients. This test fails, but in view of the fact that the freely estimated equations suffer from mis-specification it is not clear that anything can be inferred from this.

9 The exchequer savings are calculated on the assumption that benefit expenditures per unemployed person amount to £3,500 per year, while the average wage in work of manual men is 83 per cent of the average male

manual wage (£12,300) i.e. £10,200. Income tax and national insurance collected on this wage will amount to £3,250, making a total exchequer saving of just under £7,000 per year per person taken out of unemployment. (The assumption that the average earnings of unemployed manual worker is 83 per cent of the average manual wage is taken from the findings of the 1987 cohort study, see Erens and Hedges "Survey of Incomes In and Out of Work", SCPR, 1990, Table 307.)

NOTE 1

Firm-level Wage Equations

In this note we very briefly examine some recent empirical work on firm-level wage determination, i.e. equations of type (2.2) in section 4 of the paper. There exist numerous cross-section studies of wages in individual firms. Three recent examples are:

Blanchflower and Oswald (1989) using Workplace Industrial Relations Survey (WIRS) data

Gregory, Lobban and Thomson (1985) using Confederation of British Industry (CBI) data

Nickell and Wadhwani (1990) using EXSTAT/DATASTREAM panel data on 218 firms over 11 years.

Nickell and Wadhwani consider two different types of wage-setting behaviour by firms. In the first, following Mortensen (1970) and, slightly more closely, Jackman et al (1984), firms have short-run monopsony power in the labour market and set wages primarily with regard to the impact on labour recruitment. In the second wages are set by collective bargaining between the firm and a union. Nickell and Wadhwani show that the same variables are relevant in both models although the interpretion of the coefficients is different. They stress that in both cases the relevant variables consist of both what they term inside factors (i.e. firm specific) and outside factors (i.e. local or national: they are unable to distinguish these because this data set contains no information on location, and is in any case based on firms some of which have many plants in different regions). The firm specific variables they find most important are value productivity, union power (proxied by density and the mark-up), lagged employment, and liquidity variables such as the ratio of deposits to liabilities. The national outside variables are the national

average wage, the unemployment rate and the proportion of long-term unemployed.

Nickell and Wadhwani go on to explore if it makes a difference whether bargaining occurs at the level of the industry or at the level of the firm. They investigate this relationship by the inclusion of interactive terms between the level of wage bargaining and the various insider factors. This has the same effect as allowing the coefficient on the insider factor to vary between types of firms. Our general equation (2.4) for the wage set by the firm can be represented, in somewhat simplified form, by

$$w_f = \alpha_0 + \lambda(\alpha_1 x_1 + \alpha_2 x_2) + (1-\lambda)(\gamma_1 z_1 + \gamma_2 z_2) + \epsilon \qquad (2.2')$$

where λ is the weight given to insider factors. Then if

$$\lambda = \lambda_0 + \lambda_1 D$$

where D is a dummy variable representing the level of wage bargaining, we have

$$w_f = \alpha_0 + \lambda_0 (\alpha_1 x_1 + \alpha_2 x_2) + (1-\lambda_0)(\gamma_1 z_1 + \gamma_2 z_2)$$
$$+ \lambda_1 (\alpha_1 D x_1 + \alpha_2 D x_2 - \gamma_1 D z_1 - \gamma_2 D z_2) + \epsilon$$

Nickell and Wadhwani prefer to test for the effects of the level of wage bargaining through the introduction of interactive terms rather than by estimating different equations for the different types of firms. With regard to unemployment, their central result is an elasticity of -.1, implying that a rise in the unemployment rate from say 8 per cent to 10 per cent (a 25 per cent increase) will reduce wages other things equal by 2.5 per cent. (Because the unemployment variable they use is national unemployment, the variation in it is time series rather than the cross-section. Since the time series variation in unemployment rates in

all the regions in quite similar this result is consistent with either local or national unemployment rates influencing wages.)

Blanchflower and Oswald use the 1980 WIRS survey which covered 2000 establishments. Because they have data for only one year they cannot of course test for the effect of national variables. However, they have data on the location of the establishments surveyed, so they are able to investigate the effects of regional variables, in particular of unemployment rates. (They in fact use the unemployment rate of the county in which the establishment is located.) The insider factors they investigate include the performance, size and age of firms and various factors to do with union recognition and the closed shop. Again they are content to run a single equation across all firms, rather than thinking that different factors determine how firms set wages in different parts of the country. Their central result on unemployment is an elasticity of -.08 (for semi-skilled manuals) and -0.05 (for skilled manuals). These findings are clearly significant in statistical terms, and suggest that the unemployment rate in a county effects the level of wages set in establishments in that county. (Their main focus is on non-linearities in the relationship between unemployment and wages, a topic to which we will return.)

Gregory, Lobban and Thomas (1985) use qualitative data from the CBI pay databank to gauge the strength of various influences on pay determination. The factors they consider can again be divided into the firm-specific (such as profits, strikes, product market conditions), local (such as ability to recruit or retain labour, local wage comparability) and national (in particular cost-of-living effects and national pay comparability). Unfortunately they do not discuss whether the influences on settlements differ across regions.

The main conclusion of this note is that, given that investigations of wage-setting at the level of the individual firm have established a stable pattern of determinants of wage-setting, and there is no evidence that this pattern differs from one region to another, it follows that regional wage equations, being no more than statistical aggregates, must take the same form across regions. If the firm level data are consistent with equation (2) at the beginning of this section, then equations, (3), (4) and (5) are obtained simply by aggregation over firms.

NOTE 2

The Real Wage Function

The simplest characterisation of production technology allowing for differences in productivity across regions is a nested Cobb-Douglas production function:

$$Y_i = A_i\gamma(L_i\beta K_i{}^{1-\beta})^{1-\gamma}$$

where Y_i is the output of region i, A_i region-specific productivity, L_i employment in region i, K_i capital stock in regon i and β and γ lie between zero and one.

Then marginal productivity factor pricing implies that the wage rate and the rental rate on capital in region i (W_i and R_i) are given by

$$W_i = \beta(1-\gamma)A_i\gamma(L_i\beta K_i{}^{1-\beta})^{1-\gamma}/L_i$$

$$R_i = (1-\beta)(1-\gamma)A_i\gamma(L_i\beta K_i{}^{1-\beta})^{1-\gamma}/K_i$$

so the wage-rental ratio

$$W_i/R_i = (\beta/1-\beta)\ K_i/L_i$$

so

$$\log W_i = \log (\beta/1-\beta) + \log R_i + \log (K_i/L_i)$$

We may assume that outside the very short run capital is allocated between regions such that the return is equalised, so $R_i=\bar{R}$. If the proportion of the workforce in each region i is α_i (so that $\sum_i \alpha_i=1$), we have

$$\sum_i \alpha_i \log W_i = \log (\beta/1-\beta) + \log \bar{R} + \sum_i \alpha_i \log (K_i/L_i)$$

But $$\sum_i \alpha_i \log (K_i/L_i) = \log (K/L) + \sum_i \alpha_i \log \left(\frac{K_i/K}{L_i/L}\right)$$

where K is the aggregate capital stock and L total employment in the economy as a whole.

If the capital-labour ratios in each region are approximately the same as those in the economy as a whole (as is implicit in the common production functions and similar factor price ratios, the expression $(K_i/K)/(L_i/L)$ will be close to one. Hence we may approximate log (1+x) by x, so that

$$\sum_i \alpha_i \log \left[\frac{K_i/K}{L_i/L}\right] = \sum_i \alpha_i \left[\frac{K_i/K}{L_i/L} - 1\right]$$

but $\alpha_i = L_i/L$, and $\sum_i (K_i/K) = 1$, so to a first approximation

$$\sum_i \alpha_i \log \left[\frac{K_i/K}{L_i/L}\right] = 0$$

Hence

$$\Sigma \alpha_i \log W_i = \log (\beta/(1-\beta)) + \log \bar{R} + \log (K/L)$$

Thus a regional policy initiative which shifts capital between regions with no first round effect on aggregate variables will, to a first approximation, have no effect on the feasible logarithmic sum of real wages.

DATA APPENDIX

In the empirical investigations we focus on the determinants of average hourly earnings of full-time adult workers over the period 1974 to 1989. This is a reasonably long and up-to-date series which has the advantage of a considerable degree of consistency, both in terms of the method of compilation and in the geographical definition of the regions (where there were some quite significant changes associated with the local government reorganisation of April 1974).

The basic data source is the Department of Employment's New Earnings Survey (part E). It had been our intention to supplement this data with unpublished data from the New Earnings Survey held by the Department of Employment, but it proved impossible to reconcile some of the data from this sample with the published data, and this attempt had to be abandoned.

We focus on average hourly earnings as the best measure of wage rates and for this reason where possible we use a measure excluding overtime payments. However, for some of the less aggregated series this adjustment is not made, and therefore the average hourly earnings measure is inclusive of overtime. Unless otherwise specified we define wages as "average hourly earnings of full-time adults whose wages were not affected by absence over the sample, excluding overtime payments".

We consider a total of 14 regional level earnings variables - seven for males and seven for females - these were listed below.

(i) all employees;

(ii) manual employees;

(iii) non-manual employees;

(iv) manual employees in manufacturing;

(v) non-manual employees in manufacturing;

(vi) manual employees not in manufacturing;

(vii) non-manual employees not in manufacturing.

Manufacturing relates to divisions 2 to 4 of the 1980 standard industrial classification or divisions III to XIX of the 1968 industrial classification. Non-manual occupations are defined as groups I to IX of the CODOT classification.

Our unemployment series are claimant based and relate to wholly unemployed excluding school leavers obtained from the Department of Employment Gazette. Contemporaneous figures are made consistent for definition changes over our sample period by adjusting using consistent aggregate figures obtained from the Department of Employment. We take a quarterly average of our adjusted figures. We note that the recording of unemployment by broad occupation and industrial groups was discontinued in 1982. We are therefore able to disaggregate unemployment only into male and female unemployment rates.

With regard to the proportion of long-term unemployed we use only the ratio for men, because restrictions on benefit availability significantly reduce recorded long-term unemployment among women on the claimant count basis. Long-term unemployment is measured as the number of men unemployed for over 52 weeks and the proportion of long-term unemployed is this number divided by the unadjusted average of total male unemployed (average of January and July figures).

Employment levels refer to mid-year estimates of employees in employment and were obtained from Regional Trends (Employment).

Economic activity rates are obtained from published figures from Regional Trends (Employment) and are derived from Labour force Survey estimates.

The remaining variable is prices. We examine a number of separate price indices:

(i) The GDP deflator at factor cost (1985=100). This is the best measure of the price the employer receives for the output his workers produce, and thus of the firm's ability to pay. GDP deflator at factor cost is obtained from Table 2 of the Department of Employment Gazette.

(ii) Regional cost-of-living measures. Here it is useful to separate out house prices and non-housing prices. Regional house prices are based on a quarterly average, time series index for mix adjusted housing with level differences across regions captured by average dwelling prices for all Building Society borrowers in 1987. These figures were obtained from Regional Trends (Housing). We normalise regional house prices using the housing Retail Price Index obtained from the Department of Employment Gazette, September 1990, Table 6.4.

Figures for relative non-housing regional prices were obtained from the Regional Reward Survey and relate to retail prices based on consumers' expenditure less housing.

Finally we examine the impact of housing tenure on wages. Data on the proportion of householders in the local authority rental sector and on owner occupancy rates were obtained from Regional Trends (Housing) and figures were based on previous December estimates.

The data series are displayed in the form of charts in a data annex, available from the authors on request.

TABLE 2.1

NES Basic Classification of Workers

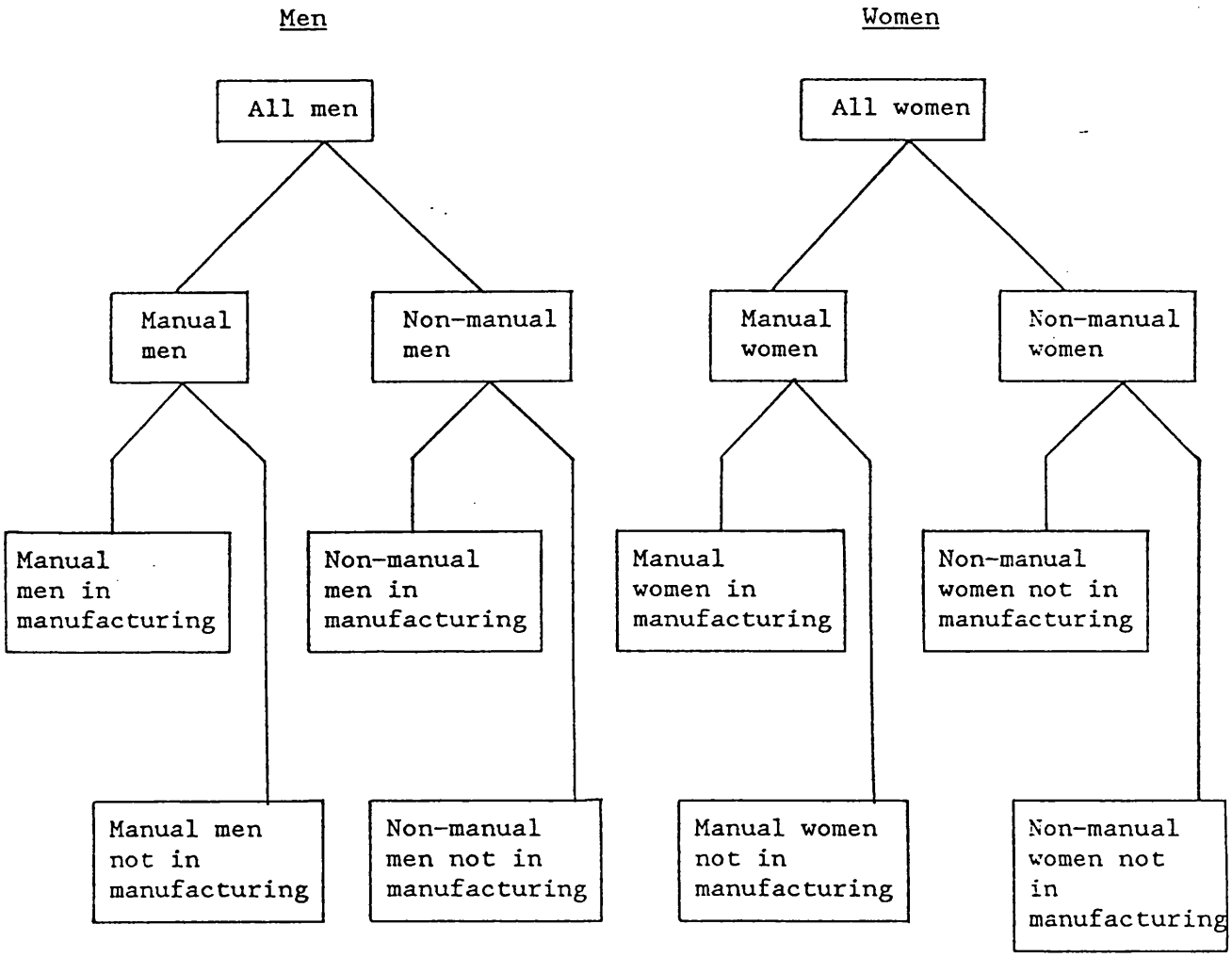


TABLE 2.2

Relative regional male wage equations, 1975-1989

Dependent variable $(\log w_i - \log w)_t$

Explanatory variables	$(\log w_i - \log w)_{t-1}$	$(\log u_i - \log u)_t$	Sargan χ^2_1	GJ χ^2_9	Long-run elasticity
All employed	0.91	-0.020	3.7	10.5	-0.22
	(10.1)	(1.1)			
Non-manuals	0.63	-0.031	0.8	8.9	-0.08
	(8.9)	(1.2)			
Non-manuals in manufacturing	0.36	-0.056	3.6	5.8	-0.09
	(4.5)	(2.8)			
Non-manuals not in manufacturing	0.62	-0.030	0.0	7.7	-0.08
	(8.9)	(1.7)			
Manuals	0.57	-0.054	3.7	8.4	-0.13
	(9.3)	(3.4)			
Manuals in manufacturing	0.40	-0.068	3.2	8.3	-0.11
	(6.3)	(4.7)			
Manuals not in manufacturing	0.67	-0.040	0.01	9.7	-0.12
	(9.5)	(2.8)			

Notes:

Equations estimated by pooled cross-section time series across our ten regions and 15 year sample (150 observations), using region specific fixed effects which are suppressed from the Table.
Estimation by instrumental variable two stage least squares.
Instruments used were $(\log w_i - \log w)_{t-1}$, $(\log u_i - \log u)_{t-1}$, and $(\log u_i - \log u)_{t-2}$.
The critical value for Sargan specification test statistic (one overidentifying restriction) at the 5% level of significance is 3.8.
Asymptotic t-statistics in parentheses. The critical value at the 5% level of significance is 1.6 (one-sided test).
The critical value for the Gallant-Jorgenson statistic (nine restrictions) at the 10% level of confidence is 14.7 (at 5%, 16.9).
The Gallant-Jorgensen (GJ) test statistic is constructed by comparing the difference in the criteria of the restricted (C_R) and unrestricted (C_u) equations, maintaining common instrument sets. Under the null hypothesis $(C_R - C_u)/s^2 \sim \chi^2_r$ where r denotes number of restrictions and s^2 the estimated standard error of the unrestricted equation.
u refers to male unemployment rates.

TABLE 2.3

Relative regional female wage equations, 1975-1989

Dependent variable $(\log w_i - \log w)_t$

Explanatory variables	$(\log w_i - \log w)_{t-1}$	$(\log u_i - \log u)_t$	Sargan χ^2_1
All employed	0.54 (5.1)	0.044 (1.2)	0.5
Non-manuals	0.34 (3.6)	0.034 (1.4)	0.6
Non-manuals manufacturing	0.67 (9.3)	-0.018 (0.7)	0.2
Non-manuals not in manufacturing	0.32 (3.8)	0.031 (1.3)	0.6
Manuals	0.36 (2.5)	0.0021 (0.1)	0.1
Manuals in manufacturing	0.37 (5.0)	-0.014 (0.6)	0.0
Manuals not in manufacturing	0.32 (3.9)	0.027 (1.1)	0.5

Notes:

As for Table 2.2.

u refers to female unemployment rates.

TABLE 2.4

Regional wage equations, men, 1975-1989

Dependent variable $w_{i,t}$
(pooled sample size 150 observations)

Explanatory variables	$w_{i,t-1}$	$u_{i,t}$	$\bar{u}_t$	$u_{SE,t}$	t	Sargan χ^2_3 (s.e.)
All employed	0.55	-0.061	0.060	0.036	0.0097	3.31
	(7.4)	(2.7)	(2.5)	(2.3)	(5.2)	(0.0201)
Non-manuals	0.48	-0.071	0.071	0.041	0.013	35.4
	(6.8)	(1.5)	(1.6)	(1.9)	(6.7)	(0.0258)
Non-manuals in manufacturing	0.45	-0.046	0.039	0.032	0.016	11.1
	(6.9)	(2.0)	(1.6)	(2.0)	(7.9)	(0.0216)
Non-manuals not in manufacturing	0.43	-0.038	0.051	0.033	0.013	42.4
	(5.9)	(1.2)	(1.5)	(1.5)	(6.7)	(0.0302)
Manuals	0.49	-0.063	0.065	0.025	0.0067	12.2
	(6.7)	(2.5)	(2.5)	(2.0)	(5.9)	(0.0167)
Manuals in manufacturing	0.37	-0.068	0.073	0.032	0.0091	7.4
	(5.0)	(3.5)	(3.6)	(2.6)	(6.7)	(0.0170)
Manuals not in manufacturing	0.54	-0.053	0.053	0.017	0.0059	10.3
	(6.9)	(2.2)	(2.0)	(1.0)	(5.0)	(0.0219)

Notes:

Equations estimated by instrumental variable two-stage-least squares. Instruments used were $w_{i,t-1}$, $u_{SE,t-1}$, $u_{SE,t-2}$, u_{t-1}, u_{t-2}, $u_{i,t-1}$, $u_{i,t-2}$ and t. Hence three overidentifying restrictions. Critical values $\chi^2_{3,0.05}=7.8$, $\chi^2_{3,0.10}=6.3$.
t denotes linear time trend.
Asymptotic t-statistics in parentheses. The critical value of the 5 per cent level of significance is 1.6 (one-sided test).
$\bar{u}_t$ refers to the average male unemployment rate across all regions except region i and the South East.
s.e. refers to the estimated standard error of each pooled equation.
All variables in logarithmic form.

TABLE 2.5a

Regional wage equations, men, 1975-1989

Dependent variable $w_{i,t}$
(pooled sample size 150 observations)

Explanatory variables	$\bar{w}_t$	$\bar{u}_t$	$u_{i,t}$	$u_{SE,t}$	Sargan χ^2_3 (s.e.)
All employed	0.84	0.12	-0.11	0.0057	0.1
	(22.2)	(2.2)	(4.9)	(0.1)	(0.0158)
Non-manuals	0.82	0.081	-0.061	-0.000027	0.2
	(24.6)	(1.8)	(1.9)	(0.0)	(0.0172)
Non-manuals in manufacturing	0.90	0.12	-0.084	-0.028	7.0
	(25.9)	(2.5)	(4.1)	(0.7)	(0.0178)
Non-manuals not in manufacturing	0.80	0.051	-0.044	0.019	1.2
	(22.4)	(1.1)	(1.9)	(0.5)	(0.0198)
Manuals	0.94	0.080	-0.098	0.019	0.7
	(19.5)	(2.5)	(5.2)	(0.8)	(0.0116)
Manuals in manufacturing	0.98	0.10	-0.12	0.016	0.6
	(22.0)	(3.1)	(8.3)	(0.6)	(0.0122)
Manuals not in manufacturing	0.87	0.095	-0.089	0.029	0.4
	(15.4)	(2.5)	(5.2)	(0.1)	(0.0148)

Notes:

$\bar{u}_t$ denotes the average male unemployment rate across all regions excluding the region i and the South East.
s.e. denotes the estimated equation standard error.
Equations estimated by instrumental variable two-stage least squares. Instruments used were w_{t-1}, $\bar{u}_{t-1}$, $\bar{u}_{t-2}$, $u_{i,t-1}$, $u_{i,t-2}$, $u_{SE,t-1}$ and $u_{SE,t-2}$ (three over-identifying restrictions).
Sargan test statistic distributed as χ^2_3 under null hypothesis of no structural mis-specification. Critical value at 10% level of confidence. $\chi^2_{3,\ 0.10}=6.3$.
All variables in logarithmic form.

TABLE 2.5b

Regional wage equations, men, 1975-1989

Dependent variable $w_{i,t}$
(pooled sample size 150 observations)

Explanatory variables	$\bar{w}_t$	$\bar{u}_t$	$u_{i,t}$	Sargan χ^2_2 (s.e.)
All employed	0.89	0.12	-0.12	0.5
	(33.1)	(6.1)	(6.0)	(0.0164)
Non-manuals	0.84	0.078	-0.062	0.1
	(39.1)	(2.6)	(1.9)	(0.0171)
Non-manuals in manufacturing	0.93	0.085	-0.083	2.6
	(47.7)	(3.9)	(4.0)	(0.0179)
Non-manuals not in manufacturing	0.81	0.069	-0.044	0.9
	(35.4)	(2.9)	(1.9)	(0.0197)
Manuals	0.95	0.098	-0.098	0.3
	(31.8)	(5.2)	(5.2)	(0.115)
Manuals in manufacturing	1.0	0.12	-0.12	0.4
	(39.0)	(7.8)	(8.3)	(0.0121)
Manuals not in manufacturing	0.90	0.093	-0.089	0.1
	(25.6)	(5.1)	(5.2)	(0.0148)

Notes:

Equations estimated by instrumental variable two-stage least squares. u refers to male unemployment rates. Instruments used were $\bar{w}_{t-1}$, u_{t-1}, $\bar{u}_{t-2}$, $u_{i,t-1}$, $u_{i,t-2}$ (two over-identifying restrictions).

Sargan test statistic distributed as χ^2_2 under null hypothesis of no misspecification. Critical value at 10% level of confidence $\chi^2_{2,\ 0.10}=4.6$.

Asymptotic t-statistics in parentheses. Critical value at 5% level of significance 1.6 (one-sided test)

s.e denotes estimated standard error of equation.

For all employed, manuals and non-manuals compositional effects were used to capture manual and manufacturing employment shares of which only the former were found to be negative and significant.

All variables in logarithmic form.

$\bar{u}_t$ refers to the average male unemployment excluding region i.

TABLE 2.6

Regional wage equations, men, 1975-1989

Dependent variable $w_{i,t}$
(pooled sample size 150 observations)

	Own region unemployment effects	
	Manuals	Manuals in manufacturing
South East	-0.10 (5.7)	-0.080(4.9)
East Anglia	-0.12 (6.8)	-0.12 (6.7)
South West	-0.14 (6.6)	-0.12 (5.6)
West Midlands	-0.15 (9.4)	-0.14 (10.2)
East Midlands	-0.14 (9.1)	-0.12 (8.1)
Yorkshire and Humberside	-0.12 (8.0)	-0.11 (7.8)
North West	-0.13 (7.0)	-0.098 (6.3)
North	-0.16 (8.3)	-0.12 (7.8)
Wales	-0.17 (9.0)	-0.14 (8.4)
Scotland	-0.14 (7.8)	-0.12 (7.2)
$\bar{w}_t$	0.98 (36.8)	1.0 (45.2)
$\bar{u}_t$	0.13 (8.3)	0.12 (7.5)
Sargan χ^2_{11}	19.2	24.9
($\chi^2_{11,0.10}$=17.3)		

Notes:

See Notes to Table 2.5b.
Equations estimated constraining for common national wage and unemployment effects but allowing for region specific own unemployment and fixed effects.
Instruments used were $\bar{w}_{t-1}$, $\bar{u}_{t-1}$, $\bar{u}_{t-2}$, $u_{i,t-1}$ and $u_{i,t-2}$ (eleven over-identifying restrictions).

TABLE 2.7

Regional male wage equations, 1975-1989

	Sargan test statistic χ^2_{11}	Range of own region unemployment effects	
All employed	25.8	-0.15 WA (7.5)	-0.072 SE (3.2)
Non-manuals	21.9	-0.19 NO (3.9)	-0.078 SE (2.3)
Non-manuals in manufacturing	14.9	-0.14 WA (5.5)	-0.062 SE (2.4)
Non-manuals not in manufacturing	27.1	-0.086 NO (3.2)	0.00 SC (0.1)
Manuals	19.2	-0.17 WA (9.0)	-0.10 SE (5.7)
Manuals in manufacturing	24.9	-0.14 WA (8.4)	-0.08 SE (4.9)
Manuals not in manufacturing	19.0	-0.15 WA (7.6)	-0.080 SE (4.0)

See Notes to Table 2.6.

TABLE 2.8a

Relative regional male wage equations, 1975-1989

Dependent variable w_i

Explanatory variables	$w_{i,-1}$	u_i	R_i	$\frac{\overline{PH}_i}{\overline{PH}}$	$\frac{PH_i}{PH}$	$\Pi_i^H \frac{PH_i}{PH}$	$\overline{\Pi}_i^H$	Sargan χ^2_2 (s.e.)
All employed	0.59	-0.030	0.16	0.25	0.069	0.23	0.49	1.8
	(5.1)	(1.6)	(2.9)	(0.7)	(3.1)	(1.6)	(2.7)	(0.00872)
Non-manuals	0.32	-0.0066	0.09	0.82	0.12	0.32	0.28	0.05
	(3.2)	(0.3)	(0.9)	(2.0)	(3.5)	(1.8)	(1.3)	(0.0128)
Non-manuals in manufacturing	0.13	-0.020	0.15	1.06	0.069	-0.06	0.43	2.0
	(1.4)	(0.7)	(1.6)	(2.3)	(2.0)	(0.3)	(1.6)	(0.0154)
Non-manuals not in manufacturing	0.42	0.015	0.12	0.43	0.099	0.53	0.27	2.1
	(5.0)	(0.5)	(1.4)	(1.1)	(3.0)	(2.5)	(1.1)	(0.0142)
Manuals	0.44	-0.051	0.068	-0.086	0.048	0.17	0.47	3.3
	(4.7)	(3.0)	(0.8)	(0.3)	(2.2)	(1.4)	(3.1)	(0.00864)
Manuals in manufacturing	0.37	-0.074	0.084	-0.26	0.030	0.11	0.42	1.6
	(4.7)	(3.5)	(1.1)	(0.9)	(1.3)	(0.7)	(2.3)	(0.0107)
Manuals not in manufacturing	0.48	-0.020	0.039	0.12	0.071	0.27	0.44	1.3
	(5.9)	(0.9)	(0.6)	(0.4)	(2.7)	(1.8)	(2.3)	(0.0110)

See over for Notes.

TABLE 2.8b

Relative regional female wage equations, 1975-1989

Dependent variable w_i

Explanatory variables	$w_{i,-1}$	u_i	$\frac{\bar{PH}_i}{\bar{PH}}$	$\frac{PH_i}{\bar{PH}}$	$\Pi i^H \frac{PH_i}{\bar{PH}}$	$\bar{\Pi}_i^H$	Sargan χ^2_1 (s.e.)
All employed	0.36 (4.0)	0.020 (0.7)	0.14 (0.3)	0.078 (2.7)	0.57 (2.5)	0.46 (1.4)	0.6 (0.0156)
Non-manuals	-0.0078 (0.6)	0.0082 (0.4)	0.62 (1.2)	0.093 (2.8)	0.70 (2.7)	0.50 (1.8)	0.03 (0.0165)
Non-manuals in manufacturing	0.47 (5.8)	-0.037 (1.5)	0.23 (0.5)	0.11 (3.1)	0.57 (2.4)	0.26 (0.9)	1.2 (0.0169)
Non-manuals not in manufacturing	0.24 (2.6)	0.029 (1.2)	0.099 (0.2)	0.067 (2.1)	0.56 (2.3)	0.31 (1.0)	0.2 (0.0174)
Manuals	0.27 (1.6)	0.0094 (0.4)	0.54 (1.1)	0.023 (0.7)	0.35 (1.4)	-0.26 (0.6)	0.003 (0.0150)
Manuals in manufacturing	0.33 (3.6)	-0.020 (0.9)	-0.20 (0.4)	0.081 (2.6)	0.30 (1.4)	-0.035 (0.1)	1.0 (0.0159)
Manuals not in manufacturing	0.27 (3.0)	0.028 (1.1)	0.49 (1.0)	0.014 (0.4)	0.10 (0.4)	0.20 (0.6)	0.2 (0.0184)

See over for Notes.

Notes to Tables 2.8a and 2.8b

See Notes to Table 2.2.

Instruments used were $w_{i,-1}$, $u_{i,-1}$, $u_{i,-2}$, $R_{i,-1}$, $R_{i,-2}$, $(P\bar{H}_i/P\bar{H})_{-1}$, $(PH_i/PH)_{-1}$, $\Pi^H_i\ (PH_i/PH)_{-1}$ and $\bar{\Pi}^H_i$. (2 overidentifying restrictions)

All variables in logarithmic form except R_i, Π^H_i and $\bar{\Pi}^H_i$. Further, all regional variables are as differences from their national values.

The Sargan test statistic is calculated as

$$\hat{u}'X'\ \frac{Z(Z'Z)^{-1}}{s^2}\ Z'X\hat{u}$$

where X is the matrix of explanatory variables, Z is the matrix of instruments, $\hat{u}$ is the residual vector and s^2 is the squared standard error of the equation. Under the null hypothesis of no misspecification the Sargan statistic is distributed as a chi-squared with degrees of freedom given by the number of overidentifying restrictions. The Sargan statistic generally tests for omitted variables and inappropriate choice of instruments. It is based on the null that Plim $\frac{Z'\hat{u}}{T} \to 0$ as $T\to\infty$. If, as in our work, the lagged dependent variable is included as an explanatory, and instrumental variable, the Sargan statistic also tests for serial correlation, since, if serial correlation were to exist

$$\text{Plim}_t \frac{\Sigma y_{t-1}' u_t}{T} \neq 0.$$

$\chi^2_{2,0.05}=6.0$, $\chi^2_{1,0.05}=3.8$.

Asymptotic t-statistics in parentheses. Critical value at 5 per cent level of significance for one-sided test 1.6 and 1.3 at the 10 per cent level.

s.e. denotes the standard error of each pooled equation.

Equations estimated with regional fixed effects which are suppressed from the tables. The small sample dynamic fixed effects bias tends to bias the coefficients towards zero by a factor of 1/15 (Nickell, 1981).

For all employed, manual and non-manual equations a composition effect was used to capture industrial and occupation differences across regions. We do not quote such composition effects in our Tables.

TABLE 2.9a

Relative regional male wage equations, 1975-1989

Dependent variable w_i

Explanatory variables	$w_{i,-1}$	u_i	R_i	act_i	$\frac{\bar{PH}_i}{\bar{PH}}$
All employed	0.40	-0.033	0.19	0.50	0.44
	(2.6)	(1.8)	(3.2)	(2.0)	(1.1)
Non-manuals	0.30	-0.005	0.086	0.31	0.78
	(3.1)	(0.2)	(0.8)	(1.0)	(1.6)
Non-manuals in manufacturing	0.081	-0.016	0.27	1.0	0.67
	(0.9)	(0.5)	(2.8)	(3.1)	(1.4)
Non-manuals not in manufacturing	0.42	0.014	0.096	-0.23	0.60
	(5.0)	(0.5)	(1.0)	(0.7)	(1.2)
Manuals	0.13	-0.060	-0.011	0.96	-0.00092
	(0.9)	(3.4)	(0.1)	(3.3)	(0.003)
Manuals in manufacturing	0.33	-0.073	0.15	0.67	-0.49
	(4.5)	(3.6)	(2.1)	(2.9)	(1.6)
Manuals not in manufacturing	0.39	-0.015	0.085	0.42	0.026
	(4.4)	(0.7)	(1.2)	(1.6)	(0.1)

Explanatory Variables (continued)	$\frac{PH_i}{PH}$	$\frac{\Pi^H{}_i PH_i}{PH}$	$\bar{\Pi}^H{}_i$	Sargan χ^2_2 (s.e.)
All employed	0.038	0.11	0.53	1.4
	(1.3)	(0.6)	(2.8)	(0.00906)
Non-manuals	0.11	0.25	0.18	0.7
	(3.0)	(1.3)	(0.8)	(0.0133)
Non-manuals in manufacturing	0.012	-0.17	0.18	2.3
	(0.3)	(0.8)	(0.7)	(0.0147)
Non-manuals not in manufacturing	0.11	0.53	0.31	1.6
	(2.9)	(2.4)	(1.2)	(0.0145)
Manuals	0.020	0.67	0.40	2.3
	(0.9)	(0.5)	(2.5)	(0.00899)
Manuals in manufacturing	-0.0076	0.042	0.27	3.6
	(0.3)	(0.3)	(1.4)	(0.0104)
Manuals not in manufacturing	0.060	0.25	0.35	3.3
	(2.2)	(1.7)	(1.9)	(0.0106)

See over for Notes.

Notes for Table 2.9a:

See Notes to Table 2.8.

Critical values $\chi^2_{2,0.05}=6.0$. $\chi^2_{2,0.10}=4.6$.

The estimated unemployed effect for manual employees in manufacturing is robust to introducing region specific time trends; truncating sample to cover the sub-period 1975-1985; to the exclusion of the South East or the East and/or West Midlands; robust to estimation by ordinary least squares and to using the lagged male unemployment rate.

TABLE 2.9b

Relative regional female wage equations, 1975-1989

Dependent variable w_i

Explanatory variables	$w_{i,-1}$	u_i	act_i	$\frac{\bar{PH}_i}{\bar{PH}}$	$\frac{PH_i}{\bar{PH}}$	$\Pi i^H \frac{PH_i}{\bar{PH}}$	$\bar{\Pi}_i^H$	Sargan χ^2_1 (s.e.)
All Employed	0.27	-0.014	-0.60	0.20	0.13	0.58	0.15	2.1
	(3.0)	(0.6)	(2.3)	(0.5)	(3.3)	(2.7)	(0.5)	(0.0146)
Non-manuals	-0.012	-0.0076	-0.72	0.48	0.15	0.79	0.25	0.8
	(0.9)	(0.3)	(2.0)	(0.9)	(3.5)	(3.0)	(0.8)	(0.0166)
Non-manuals in manufacturing	0.49	-0.040	-0.18	0.28	0.12	0.57	0.19	1.7
	(5.9)	(1.5)	(0.7)	(0.6)	(2.7)	(2.3)	(0.6)	(0.0174)
Non-manuals not in manufacturing	0.10	0.0038	-0.83	0.18	0.15	0.68	0.09	0.2
	(1.0)	(0.1)	(2.8)	(0.4)	(3.3)	(2.8)	(0.3)	(0.0171)
Manuals	0.27	0.010	0.056	0.51	0.020	0.33	-0.22	0.03
	(1.8)	(0.4)	(0.2)	(1.2)	(0.4)	(1.5)	(0.7)	(0.0145)
Manuals in manufacturing	0.33	-0.028	-0.32	-0.13	0.11	0.32	-0.15	2.2
	(3.6)	(1.1)	(1.3)	(0.3)	(2.5)	(1.4)	(0.5)	(0.0162)
Manuals not in manufacturing	0.27	0.025	-0.10	0.49	0.023	0.11	0.16	0.1
	(3.0)	(0.9)	(0.4)	(1.0)	(0.5)	(0.4)	(0.5)	(0.0184)

Notes:

See Notes to Tables 2.8a and 2.8b.
Critical values $\chi^2_{1,0.05}=3.8$ $\chi^2_{1,0.10}=2.7$.

TABLE 2.10

Regional economic activity rate equations (reduced forms), 1975-1989

Dependent variable act_i
(150 observations)

Explanatory variables	$act_{i,-1}$	$\frac{\overline{PH}_i}{\overline{PH}}$	$\frac{PH_i}{PH}$	Π_i^H	$\bar{R}^2$
Males	0.69 (10.3)	20.6 (2.4)	1.3 (1.7)	-1.5 (0.2)	93.4
Females	0.63 (10.0)	1.5 (0.2)	3.4 (3.5)	16.9 (1.7)	91.3

Notes:

Estimation by pooled cross-section time series Ordinary Least Squares with regional specific fixed effects suppressed from Table.
t-statistics in parentheses. Critical value at 5 per cent level of significance 1.6 (one-sided test).

TABLE 2.11

Relative regional female wage equations, 1975-1989

Dependent variable w_i

Explanatory variables	$w_{i,-1}$	act_i	$\frac{\overline{PH}_i}{\overline{PH}}$	$\frac{PH_i}{PH}$	$\frac{\Pi^H_i PH_i}{PH}$	$\overline{\Pi}^H_i$	s.e.
All employed	0.24 (2.3)	-0.90 (2.4)	0.16 (0.3)	0.17 (3.1)	0.67 (2.4)	0.32 (0.9)	0.0171
Non-manuals	-0.011 (0.8)	-0.72 (2.1)	0.59 (1.2)	0.16 (3.5)	0.77 (2.9)	0.20 (0.6)	0.0176
Non-manuals in manufacturing	0.51 (6.2)	-0.20 (0.7)	0.44 (0.9)	0.13 (2.7)	0.55 (2.0)	0.031 (0.1)	0.0177
Non-manuals not in manufacturing	0.09 (0.9)	-0.87 (3.1)	0.19 (0.4)	0.15 (3.3)	0.66 (2.8)	0.079 (0.3)	0.0171
Manuals	0.26 (1.2)	0.074 (0.2)	0.48 (1.1)	0.014 (0.2)	0.34 (1.3)	-0.20 (0.6)	0.0153
Manuals in manufacturing	0.36 (4.0)	-0.35 (1.4)	0.042 (0.1)	0.12 (2.8)	0.31 (1.4)	-0.30 (1.0)	0.0161
Manuals not in manufacturing	0.27 (3.2)	-0.12 (0.4)	0.37 (0.8)	0.019 (0.4)	0.088 (0.4)	0.24 (0.7)	0.0179

Notes:

See Notes to Tables 8a and 8b.
No overidentifying restrictions.

TABLE 2.12

Relative regional male wage equations, 1975-1989
(emulation effects)

Dependent variable w_i

Explanatory variables	$w_{i,-1}$	Manual wage	Sargan χ^2_2 (s.e.)
Non-manual	0.29 (3.1)	0.49 (1.2)	0.3 (0.0124)
	$w_{i,-1}$	Non-manual	Sargan χ^2_2 (s.e.)
Manual	0.25 (1.7)	0.24 (1.1)	2.5 (0.00818)
	w_{i-1}	Non-manuals in manufacturing	Sargan χ^2_2 (s.e)
Manual manufacturing	0.33 (3.2)	0.71 (1.3)	0.1 (0.0144)

Notes:

See Notes to Tables 2.8a and 2.8b.
Critical values $\chi^2_{2,0.05}=6.0$ $\chi^2_{2,0.10}=4.6$.

u_i, act_i, R_i, $\frac{P\bar{H}_i}{P\bar{H}}$, $\frac{PH_i}{PH}$, $\frac{\Pi_i^H PH_i}{PH}$, $\bar{\Pi}^H_i$ included as explanatory variables but not reported in the above table.

TABLE 2.13

Relative regional male wage equations 1975-1989
(Effects of overtime on wage equations)

Dependent variable w_i

Explanatory variables	$w_{i,-1}$	u_i	R_i	act_i	$\frac{\overline{PH}_i}{\overline{PH}}$
Manuals including overtime	0.46 (4.8)	-0.045 (2.7)	0.080 (0.9)	-	-0.091 (0.3)
	0.18 (1.4)	-0.054 (3.2)	0.026 (0.3)	0.86 (3.4)	-0.015 (0.05)
Manuals excluding overtime	0.44 (4.7)	-0.051 (3.0)	0.068 (0.8)	-	-0.086 (0.3)
	0.13 (0.9)	-0.060 (3.4)	-0.011 (0.1)	0.96 (3.3)	-0.00092 (0.003)

Explanatory Variables (continued)	$\frac{PH_i}{PH}$	$\frac{\Pi^H_i PH_i}{PH}$	$\overline{\Pi}^H_i$	Sargan χ^2_2 (s.e.)
Manuals including overtime	0.051 (2.4)	0.18 (1.5)	0.46 (2.9)	2.7 (0.00845)
	0.028 (1.3)	0.095 (0.8)	0.44 (2.9)	4.2 (0.00831)
Manuals excluding overtime	0.048 (2.2)	0.17 (1.4)	0.47 (3.1)	3.3 (0.00864)
	0.020 (0.9)	0.067 (0.5)	0.40 (2.5)	2.3 (0.00899)

Notes:

See Notes to Tables 2.8a and 2.8b.

Critical values $\chi^2_{2,0.05}=6.00$, $\chi^2_{2,0.10}=4.6$.

TABLE 2.14

Non-manufacturing manual men in particular industries by region

Agricultural share of manual non-manufacturing male employment (NES)

	SE	EA	SW	WM	EM	YH	NW	NO	WA	SC	GB
1974	3.0	16.7	4.9	2.2	4.8	4.0	0.9	1.8	1.8	6.2	3.8
1975	3.3	18.9	6.7	4.3	5.8	4.8	1.8	3.4	2.6	7.3	4.9
1976	3.1	17.8	6.9	4.6	6.8	4.4	1.6	3.7	3.1	8.1	4.9
1977	3.2	17.7	6.8	3.9	6.5	4.7	1.6	3.4	2.5	7.5	4.7
1978	3.0	18.9	6.4	4.1	7.1	4.9	1.7	3.5	2.7	7.2	4.8
1979	2.9	18.4	5.8	3.4	6.8	4.4	1.7	3.6	2.1	7.7	4.6
1980	3.0	12.6	6.1	4.1	6.3	4.4	1.7	3.4	2.2	6.5	4.4
1981	3.0	17.5	7.4	5.0	5.8	4.6	1.7	3.3	2.2	5.9	4.6
1982	3.0	16.2	7.6	4.3	6.0	4.7	1.9	3.2	2.0	6.1	4.5
1983	2.7	17.2	6.7	4.6	6.0	4.3	1.8	3.2	2.8	5.8	4.4
1984	2.9	15.6	7.4	4.4	6.0	4.3	2.1	3.6	2.7	5.6	4.5
1985	3.0	15.6	7.2	4.1	6.0	4.0	1.3	3.0	2.5	5.3	4.3
1986	3.3	14.5	7.3	4.2	5.9	4.9	1.8	3.9	3.3	5.7	4.6
1987	3.4	14.1	6.8	4.4	6.6	5.0	2.0	3.7	3.3	6.6	4.8
1988	3.0	13.6	6.5	3.9	6.3	4.9	1.6	3.0	3.1	5.8	4.3
1989	2.9	13.1	6.0	4.2	6.4	4.9	1.4	3.0	2.4	5.8	4.2

Mining share of manual non-manufacturing male employment (NES)

	SE	EA	SW	WM	EM	YH	NW	NO	WA	SC	GB
1974	0.7	0.0	4.4	9.5	22.2	16.4	2.9	19.2	17.6	6.2	7.6
1975	0.7	0.0	4.5	6.9	21.6	14.6	2.6	20.2	19.2	6.9	7.4
1976	0.7	0.0	3.6	6.7	20.3	16.0	2.1	17.1	17.4	6.2	6.9
1977	0.4	0.0	3.9	6.6	20.5	13.8	2.4	16.8	17.2	6.5	6.7
1978	0.4	0.0	2.7	4.8	18.2	14.1	2.0	16.4	16.1	6.8	6.2
1979	0.5	0.0	3.9	5.5	17.7	15.1	2.1	15.9	14.4	5.1	6.3
1980	0.5	0.0	3.7	5.1	19.2	13.7	2.1	15.7	15.2	5.5	6.1
1981	0.5	0.0	4.0	6.0	23.0	14.2	2.3	16.3	15.7	6.5	6.8
1982	0.6	0.0	3.8	7.2	19.6	13.8	2.4	15.1	14.0	7.2	6.5
1983	0.3	0.0	0.0	5.2	17.9	13.1	2.0	13.3	13.3	3.5	5.2
1984	0.2	0.0	0.0	5.1	16.8	13.5	1.9	11.8	12.4	2.9	4.9
1985	0.2	0.0	0.0	5.1	15.7	13.8	1.9	10.3	11.4	2.2	4.6
1986	0.1	0.0	0.0	6.5	16.6	12.3	1.6	9.8	10.6	2.2	4.5
1987	0.0	0.0	0.1	5.6	14.4	9.3	1.5	8.0	8.1	1.2	3.6
1988	0.8	0.0	0.1	4.8	10.1	8.5	1.0	6.4	6.3	1.5	3.2
1989	0.6	0.0	0.1	3.3	9.1	7.2	0.9	5.9	5.3	0.9	2.6

Construction share of manual non-manufacturing male employment (NES)

	SE	EA	SW	WM	EM	YH	NW	NO	WA	SC	GB
1974	20.0	24.8	24.2	24.7	20.5	23.0	25.1	29.8	27.2	30.3	23.9
1975	18.5	23.0	22.6	24.9	20.5	22.5	24.3	26.0	21.5	29.9	22.6
1976	18.3	21.6	22.2	22.3	18.6	20.1	23.5	27.0	24.3	29.6	21.9
1977	18.4	21.0	22.9	21.4	20.8	22.2	25.2	27.9	25.4	28.5	22.4
1978	18.7	21.2	23.8	21.8	18.8	22.7	23.7	28.1	24.7	30.0	22.4
1979	17.5	16.7	21.2	21.4	18.3	20.5	24.0	28.3	24.3	30.3	21.6
1980	18.2	17.0	20.2	21.6	18.7	22.5	25.0	27.3	23.5	30.8	22.0
1981	18.2	19.8	20.4	19.3	16.6	21.7	22.7	26.8	19.8	30.0	21.1
1982	17.7	19.0	18.9	17.6	17.4	19.3	22.7	25.8	22.0	28.5	20.4
1983	15.7	16.6	19.9	16.7	16.3	19.4	20.0	25.6	19.7	25.2	18.9
1984	14.6	16.7	19.8	17.1	16.7	19.4	19.1	26.4	18.8	25.3	18.5
1985	13.7	17.2	19.2	17.5	15.4	18.1	19.5	25.4	19.3	27.9	18.3
1986	13.4	14.3	17.5	18.8	14.3	17.4	18.8	24.6	20.0	25.4	17.5
1987	13.4	15.6	17.5	17.4	14.2	17.6	17.9	24.3	18.4	24.3	17.1
1988	13.0	16.5	18.6	17.4	15.4	18.6	18.5	27.1	20.5	24.5	17.6
1989	12.5	14.5	16.3	17.6	15.3	20.1	17.9	26.8	21.6	24.7	17.4

TABLE 2.15

Relative regional male wage equations, 1975-1989
Non-manufacturing manuals

Dependent variable w_i

Explanatory variables

	$w_{i,-1}$	u_i	u_i * d_{1985}	u_i * construction$_i$	u_i * mining$_i$	mining$_i$	$\bar{\Pi}_i^H$	Sargan χ^2_1
1	0.27	-0.024	-0.033	0.61	-0.33	0.25	0.60	0.6
	(3.1)	(1.4)	(3.2)	(1.5)	(1.2)	(2.9)	(3.5)	(0.00969)
2	0.29	-0.020	-0.033	0.61	-	0.24	0.54	0.4
	(3.3)	(1.3)	(3.1)	(1.5)		(2.8)	(3.0)	(0.00964)
3	0.36	-0.045	-	0.66	-0.28	0.31	0.63	0.2
	(4.0)	(3.0)		(1.6)	(1.0)	(3.6)	(3.5)	(0.0100)
4	0.38	-0.041	-	0.67	-	0.29	0.58	0.1
	(4.2)	(3.0)		(1.6)		(3.4)	(3.1)	(0.0100)
5	0.57	-0.038	-	0.71	-0.17	-	0.73	0.6
	(7.6)	(2.2)		(1.5)	(0.5)		(3.6)	(0.01013)
6	0.41	-0.012	-0.043	0.64	-0.25	-	0.67	0.04
	(5.2)	(0.7)	(3.9)	(1.4)	(0.8)		(3.5)	(0.0107)

Notes:

See Notes to Tables 2.8a and 2.8b.

Critical value for Sargan specification test statistic at 5% level 3.8.

Mining and construction refer to their respective NES employment shares within overall non-manufacturing manual employment. (See Table 2.14)

Average employment shares for GB over 1974-89 were 20.2% for construction, 5.5% for mining and 4.5% for agricultural fishing and food.

d_{1985} denotes a dummy variable for the years 1985-1989.

The inclusion of a compositional wage effect for agricultural employees was found to be insignificant.
House prices fail to enter with statistical significance into the above specification.

TABLE 2.16

Relative regional male wage equations, 1975-1989, (curvature effects), Manual men in manufacturing

Dependent variable ($\ln w_i - \ln w$)

Explanatory variables	$(\ln w_i - \ln w)_{-1}$	u_i	$\ln u_i$	$(\ln u_i)^2$	$(\ln u_i)^3$	Sargan (χ^2)
1	0.40 (4.8)	0.00033 (0.1)	-	-	-	0.2 (χ^2_2)
2	0.35 (5.0)	-	-0.057 (3.5)	-	-	0.7 (χ^2_2)
3	0.30 (3.5)	0.0041 (1.6)	-0.077 (3.9)	-	-	0.1 (χ^2_3)
4	0.34 (4.7)	-	-0.062 (2.6)	0.011 (0.3)	0.0021 (0.02)	6.8 (χ^2_4)

Notes:

See Notes to Tables 2.8a and 2.8b.

$(\ln w_i - \ln w)_{-1}$, R_i and act_i included as explanatory variables but not reported in the above Table.

Critical values $\chi^2_2, 0.05 = 6.0$; $\chi^2_2, 0.10 = 4.6$;
$\chi^2_3, 0.05 = 7.8$; $\chi^2_3, 0.10 = 6.3$;
$\chi^2_4, 0.05 = 9.5$; $\chi^2_4, 0.10 = 7.8$.

TABLE 2.17

Relative regional male wage equations, 1975-1982

Dependent variable ($\log w_i - \log w$)

Explanatory Variables	$(\log w_i - \log w)_{-1}$	unemployment rates		$(\log u_i - \log u)$
		males	all non-manuals	all manuals
Manuals in manufacturing	0.10	-	-	-0.11
	(1.2)			(4.6)
	0.13	-0.10	-	-
	(1.5)	(4.3)		
Manuals not in manufacturing	0.11	-	-	0.020
	(1.0)			(1.0)
	0.12	0.0045	-	-
	(1.1)	(0.2)		
Non-manuals in manufacturing	0.27	-	-0.013	-
	(2.7)		(1.3)	
	0.22	-0.039	-	-
	(2.2)	(1.2)		
Non-manuals not in manufacturing	0.043	-	0.0034	-
	(0.4)		(0.3)	
	0.047	-0.0012	-	-
	(0.4)	(0.04)		

Notes

See Notes to Tables 2.8a and 2.8b.

Occupation specific unemployment rates (men and women) constructed using manual/non-manual unemployment shares from the Department of Employment Gazette and manual/non-manual employment shares from the New Earnings Survey.

TABLE 2.18

Inter-regional migration, Great Britain, 1975-1982

Dependent variable $\ln(M_{ij}/L_i)$
(720 observations)

Explanatory variables				
u_i (manual)	0.032	(0.03)	0.036	(0.04)
u_i (non-manual)	5.03	(2.4)	5.0	(2.5)
R_i	-0.62	(2.4)	-0.59	(2.4)
u_j (manual)	-0.20	(0.2)	-0.22	(0.2)
u_j (non-manual)	-2.3	(1.1)	-2.1	(1.1)
R_j	0.44	(1.7)	0.41	(1.6)
V_i/V	*		-0.11	(2.7)
V_i/V (manual)	-0.063	(1.4)	*	
V_i/V (non-manual)	-0.039	(0.9)	*	
V_j/V	*		0.048	(1.2)
V_j/V (manual)	0.035	(0.8)	*	
V_j/V (non-manual)	0.001	(0.02)	*	
c_{ij}	-6.5	(2.1)	-6.5	(2.1)
M/L	0.97	(9.5)	0.97	(9.6)
u	-1.4	(1.1)	-1.4	(1.2)
$\underline{pH}_i/\underline{pH}_j$	0.23	(2.0)	0.23	(2.1)
$\overline{pH}_i/\overline{pH}_j$	-0.33	(0.3)	-0.29	(0.3)
w_i/w_j (manual)	-0.49	(1.2)	-0.53	(1.4)
w_i/w_j (non-manual)	0.50	(2.1)	0.51	(2.2)
$\overline{\Pi}_j^H$	-0.13	(0.1)	-0.055	(0.06)
$\bar{R}^2$ (%)	98.4		98.4	
s.e.	0.098		0.098	

Notes:

See Notes to Table 2.17.

M_{ij} is the number of people migrating from region i to region j and is constructed from the National Health Service Central Register. (Regional Trends, various)
c_{ij} denotes the squared difference in the share of production employment between region i and j.
V denotes number of unfilled vacancies recorded in Jobcentres (Gazette, various)

FIGURE 2.1

Wages and Employment in Two Regions

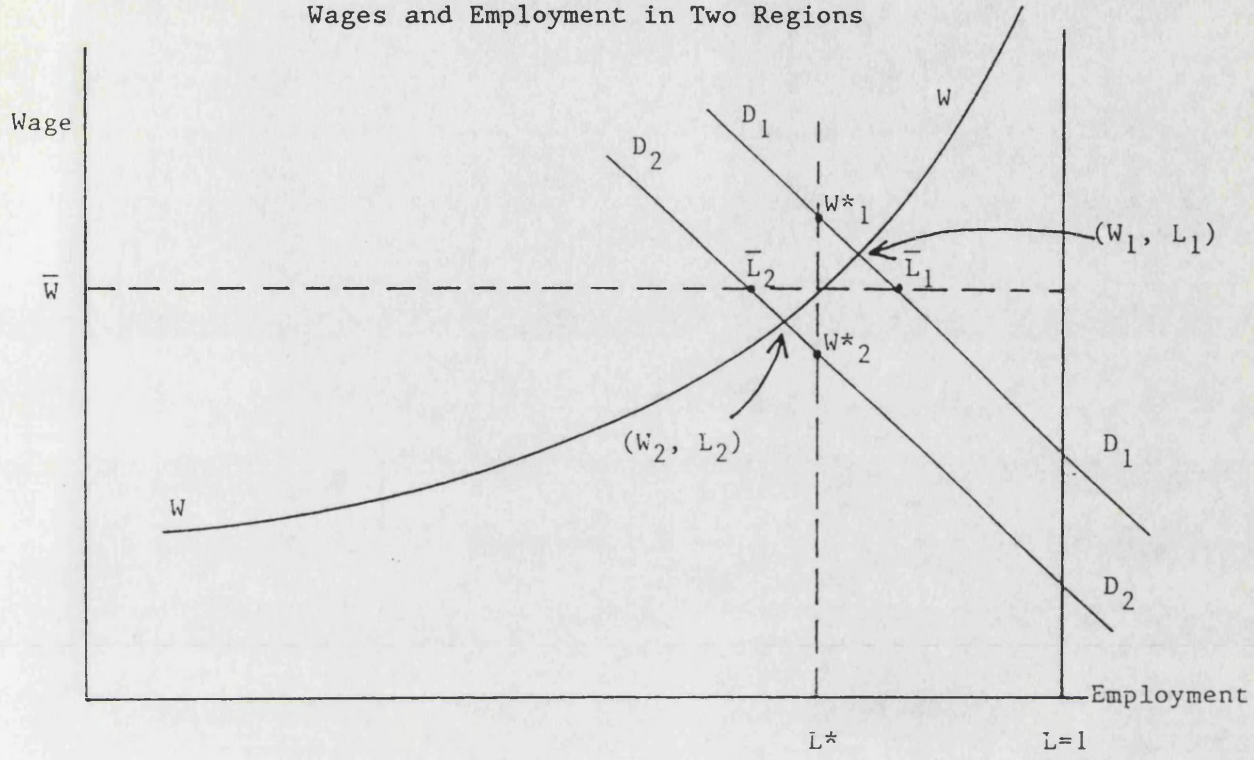


FIGURE 2.2

Regional Inequality and Unemployment

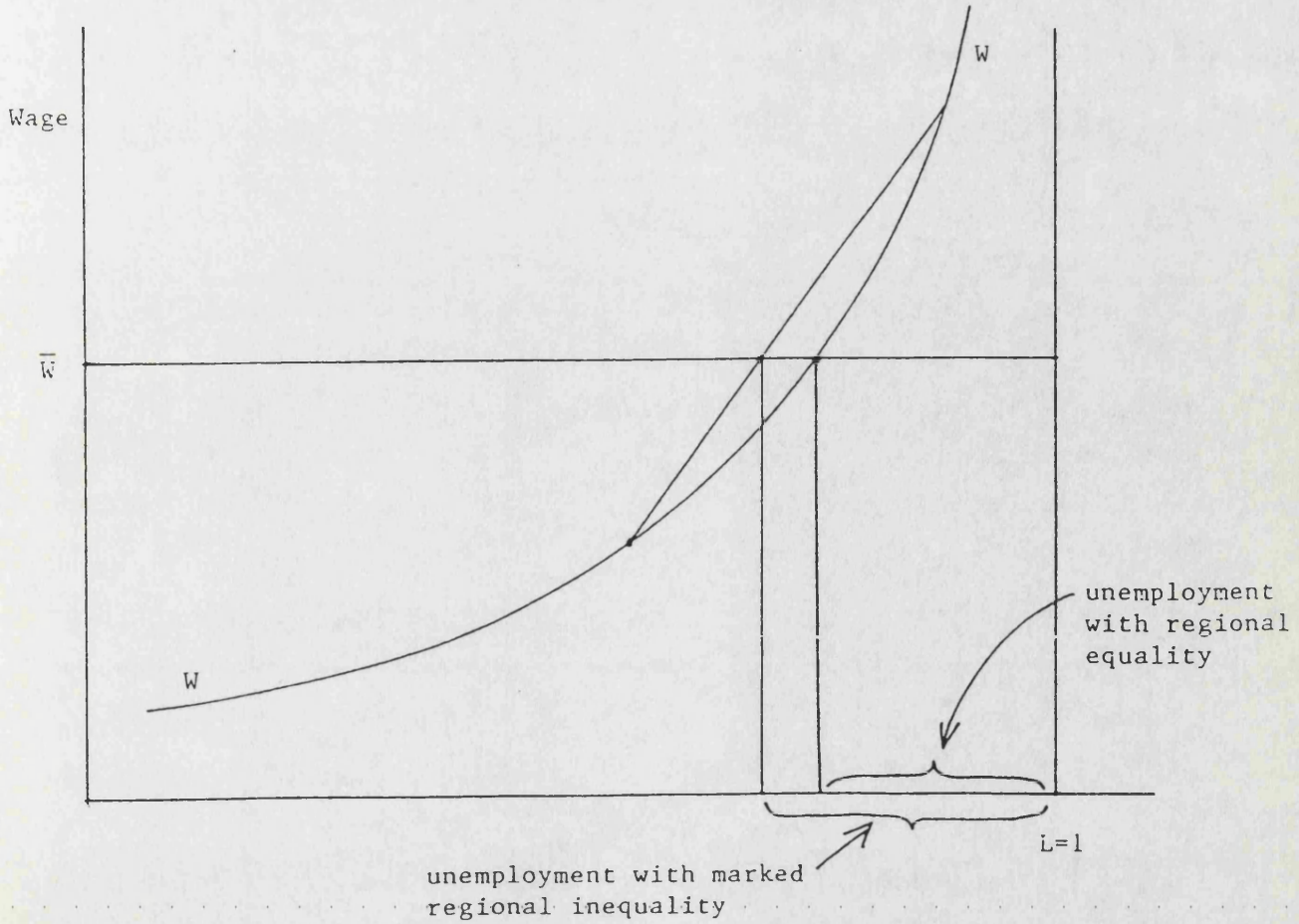


FIGURE 2.3a

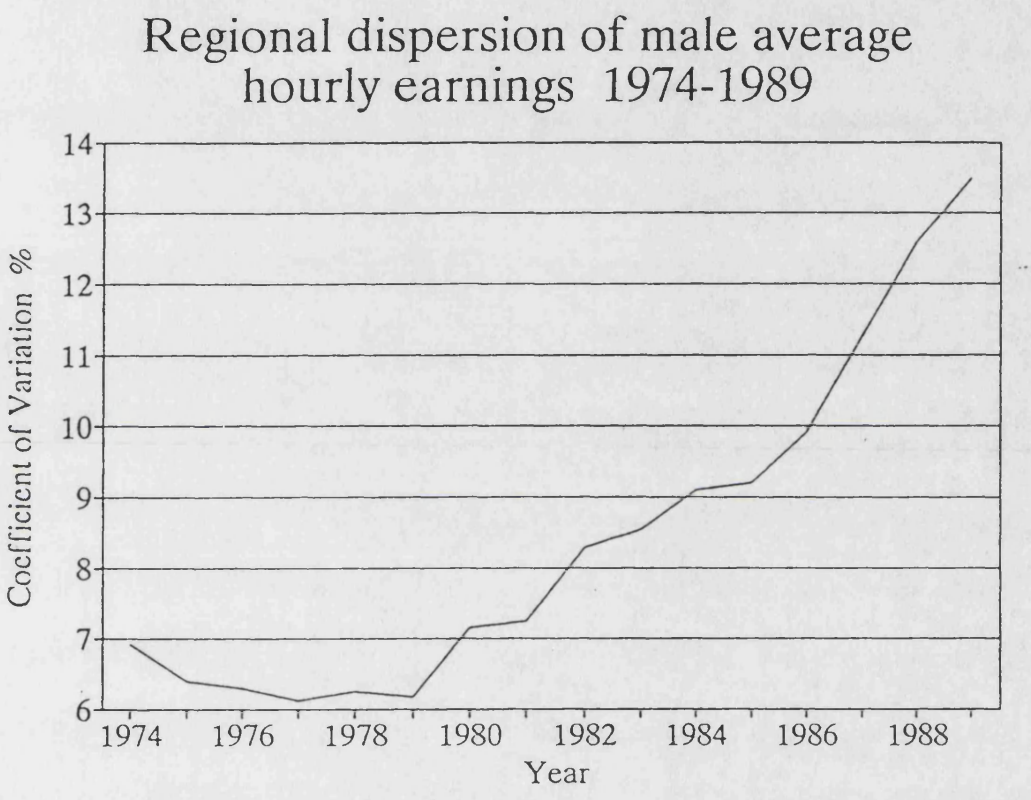

Regional dispersion of male average hourly earnings 1974-1989
Coefficient of Variation %
14
13
12
11
10
9
8
7
6
1974
1976
1978
1980
1982
1984
1986
1988
Year

FIGURE 2.3b

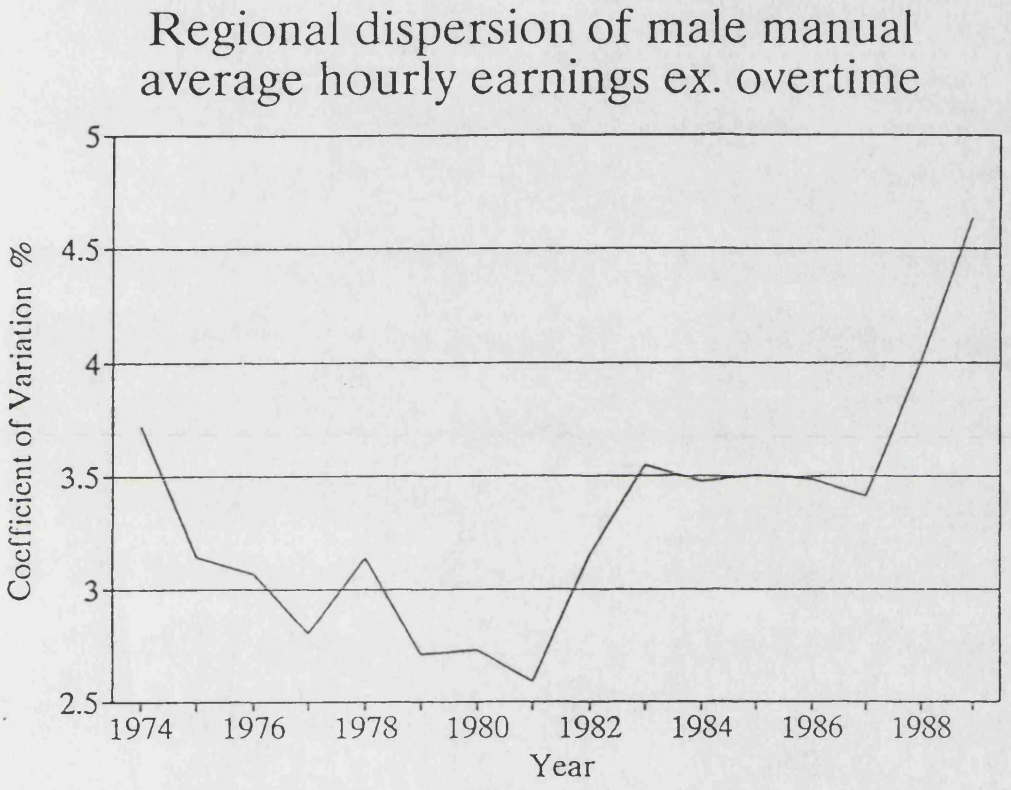

Regional dispersion of male manual average hourly earnings ex. overtime
Coefficient of Variation %
5
4.5
4
3.5
3
2.5
1974
1976
1978
1980
1982
1984
1986
1988
Year

FIGURE 2.3c

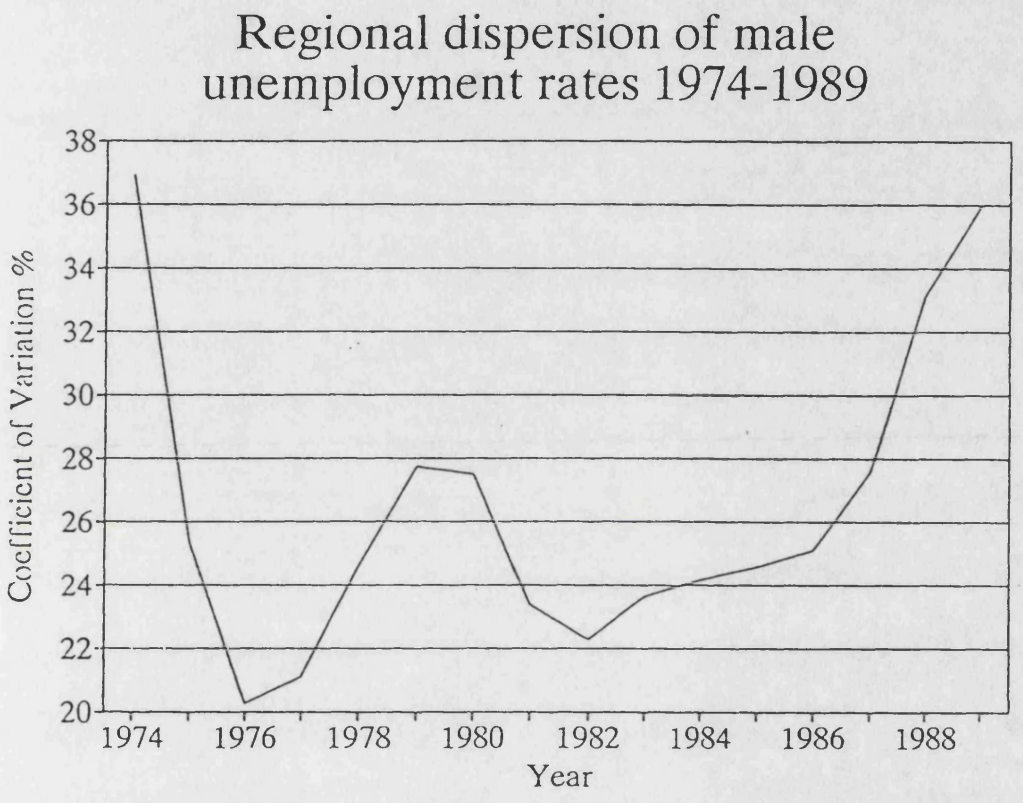

Regional dispersion of male unemployment rates 1974-1989
Coefficient of Variation %
38
36
34
32
30
28
26
24
22
20
1974
1976
1978
1980
1982
1984
1986
1988
Year

FIGURE 2.3d

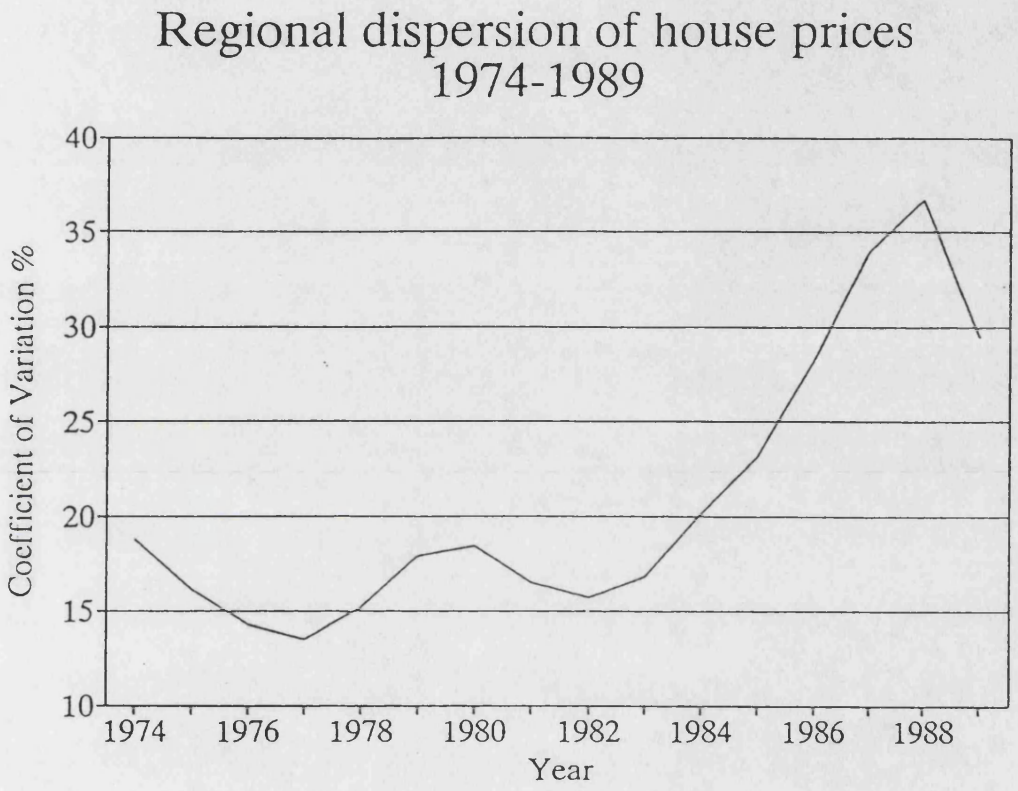

Regional dispersion of house prices
1974-1989
Coefficient of Variation %
40
35
30
25
20
15
10
1974
1976
1978
1980
1982
1984
1986
1988
Year

FIGURE 2.3e

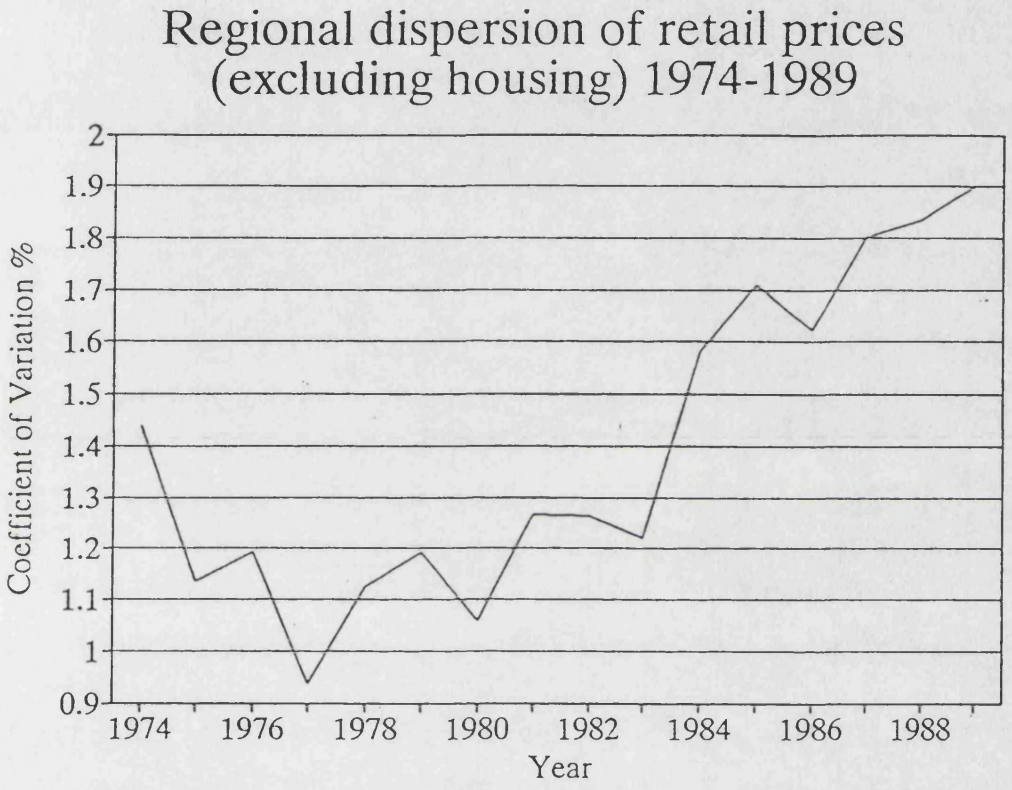

Regional dispersion of retail prices
(excluding housing) 1974-1989
Coefficient of Variation %
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
1974
1976
1978
1980
1982
1984
1986
1988
Year

FIGURE 2.3f

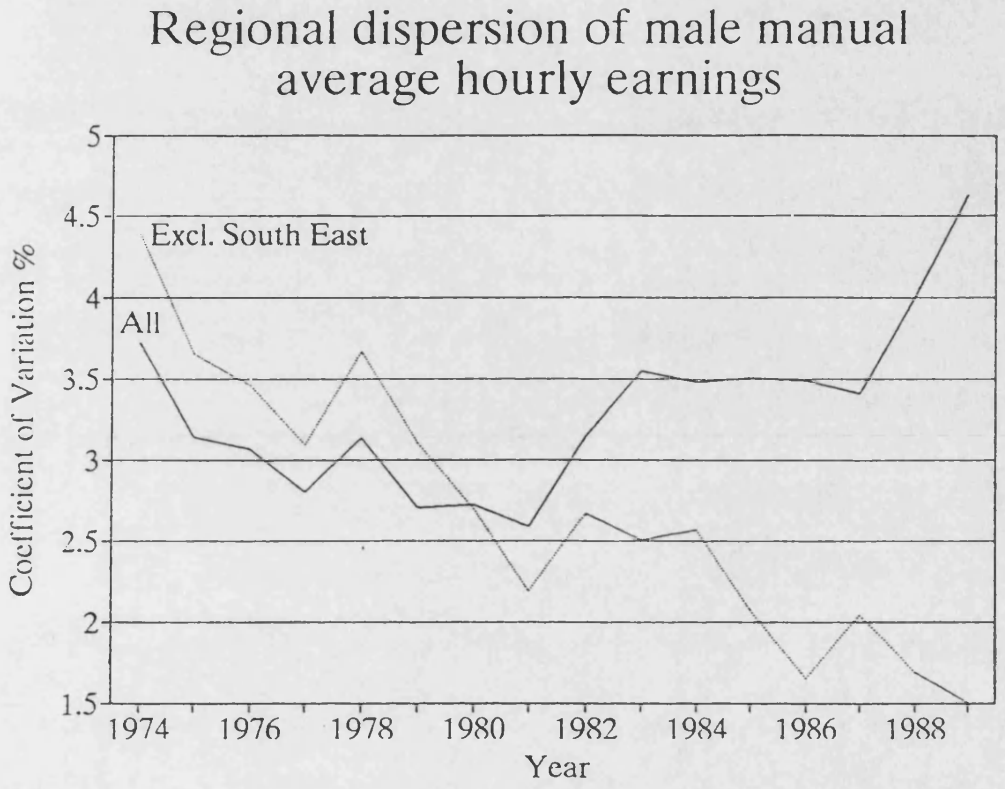
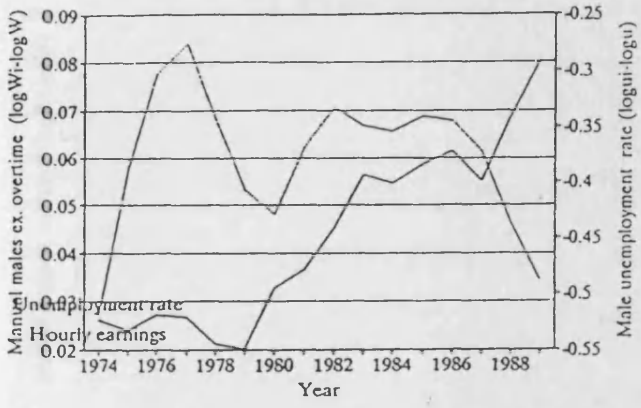
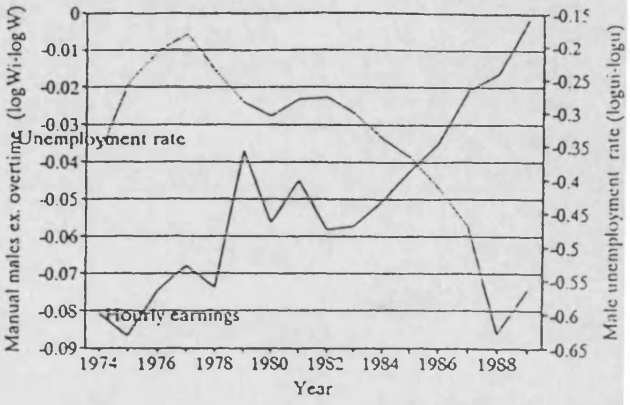

Regional dispersion of male manual average hourly earnings
Coefficient of Variation %
5
4.5
4
3.5
3
2.5
2
1.5
Excl. South East
All
1974
1976
1978
1980
1982
1984
1986
1988
Year

FIGURE 2.4

Relationship between relative regional unemployment and earnings : South East

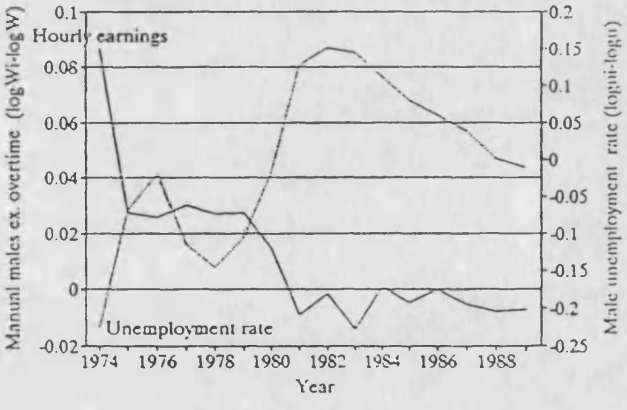


Relationship between relative regional unemployment and earnings : East Anglia

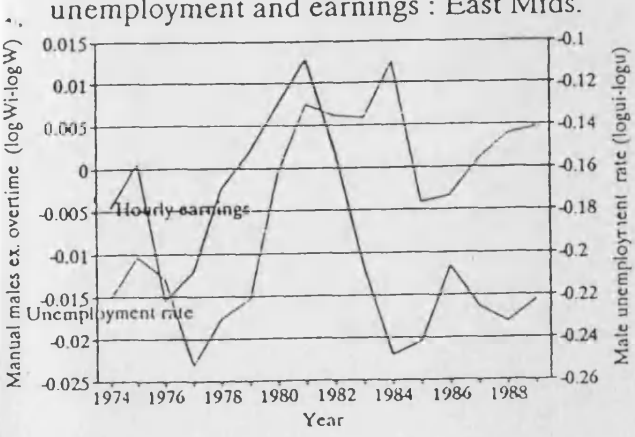


Relationship between relative regional unemployment and earnings : South West

Relationship between relative regional unemployment and earnings : West Mids.



Relationship between relative regional unemployment and earnings : East Mids.



Relationship between relative regional unemployment and earnings : Y and H.

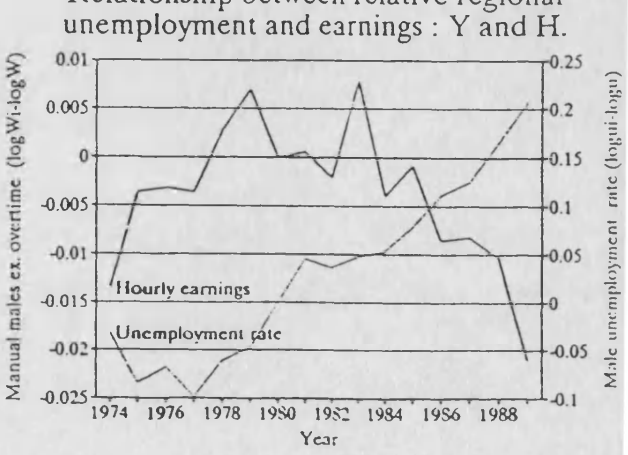
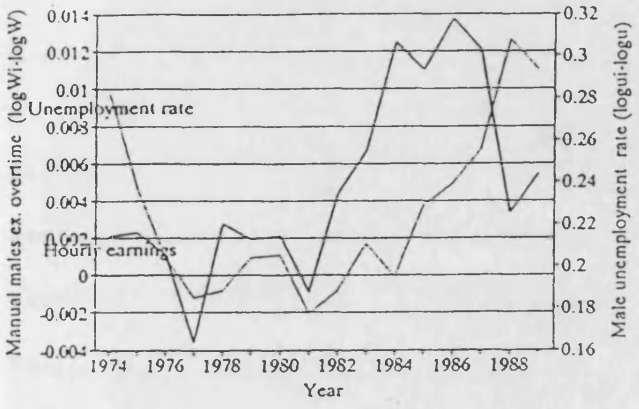
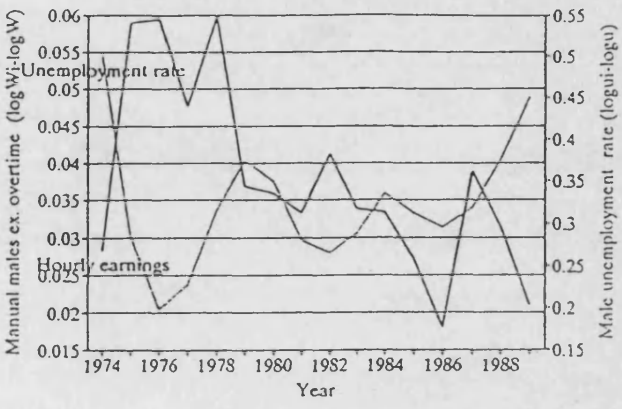


FIGURE 2.4 (cont.)

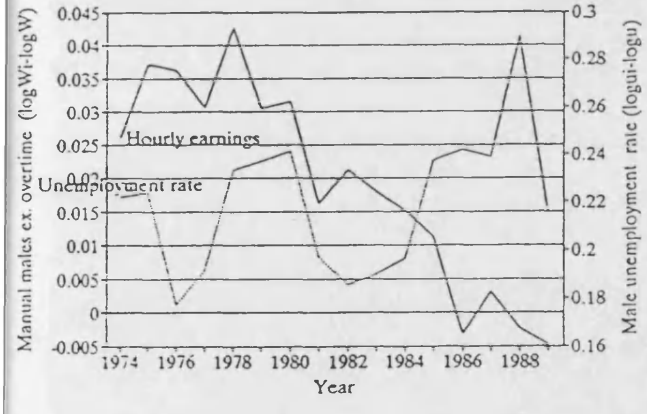
Relationship between relative regional unemployment and earnings : North West



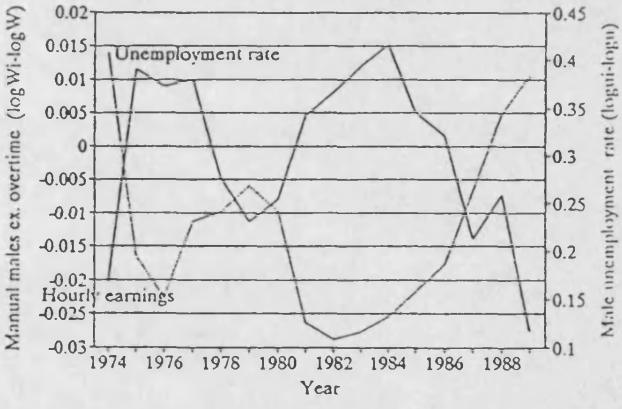
Relationship between relative regional unemployment and earnings : North



Relationship between relative regional unemployment and earnings : Wales



Relationship between relative regional unemployment and earnings : Scotland



CHAPTER 3

REGIONAL MIGRATION IN BRITAIN: AN ANALYSIS OF GROSS FLOWS USING NHS CENTRAL REGISTER DATA

3.1. Introduction

Migration is one of the mechanisms which can play a part in resolving structural imbalances in the labour market. Unemployed workers in a depressed region can find work by migrating to a prosperous part of the country where jobs are more plentiful. But empirical investigations have cast doubt on the effectiveness of migration as an equilibrating force. While gross migration flows (Fig 3.1) are quite large (in the UK about 1.6 per cent of people move between regions in any year), net migration flows are very much smaller. The flow of migrants from region i to region j is offset by a flow in the opposite direction of similar magnitude (Fig 3.2).

Net migration, which is the relatively small difference between the much larger gross flows, generally operates in an equilibrating direction (from high unemployment to low unemployment regions). But migration flows show a marked cyclical pattern, tending to rise in times of prosperity and to fall in a recession. Since regional differences in unemployment rates tend to be highest in a recession, it appears that migration is least effective when it is most needed.

The standard economic model of migration, based on human capital theory, is that people will migrate if the benefit measured in terms of the present value of the increase in expected lifetime earnings exceeds the cost of the move[1]. It is not easy on this approach to explain the magnitude of apparently perverse gross flows. More importantly, the human capital approach offers no explanation of the time series behaviour of aggregate migration, and in particular appears inconsistent with the

observation that migration flows often fall when unemployment differentials widen.

In this chapter we start from a different theoretical framework, namely that of job-matching. The basic concept is the "hiring function" which states that the number of engagements, or hires, depends on the number of people seeking work and on the number of job vacancies. In this framework migration is seen simply as a special case of job-matching in which a job-seeker in region i is matched to a job in region j. Although people can live in one region and work in another (Chapter 4), typically such job matches will involve the household migrating. It may be noted that, on this approach, migration is viewed as the consequence of successful job search rather than as a pre-condition for it. Given the existence of newspapers and telephones, let alone more recent developments in information technology, it seems to us no longer appropriate to assume that people must physically relocate themselves in an area in order to be able to look for work there.

Our approach suggests that there will be a higher rate of out-migration from regions of high unemployment, but for a reason quite different from that stressed by the human capital theory. On the hiring function approach, unemployed people are more likely to migrate because they are more active in job search. Our approach is thus consistent with the results of Pissarides and Wadsworth (1989a) who find that employed people are no more likely to migrate from areas of high than of low unemployment.

The hiring function approach also enables us to generate consistent explanations of gross and net migration. We set out the theory in Section 3.2, and offer an interpretation of the time series behaviour of aggregate migration.

The bulk of the Chapter is taken up with an attempt to model gross

bilateral (i.e. region i to region j) migration flows. Our migration data derive from the National Health Service Central Register. This register records all transfers of patients between Family Practitioner Committees (ie GPs) and constitutes a comprehensive record of all migration movements within Britain. (The data are described more fully in Section 3.3)

There are obviously innumerable reasons why people may move from one region to another. We have therefore focussed in the empirical work on the causes (or at least the empirical correlates) of the time series variation in the migration rate from region i to region j over the fifteen years for which we have data, 1974-89. Our main findings are:

i) that unemployment and vacancy rates have significant and well-defined effects which are consistent with the theoretical framework.

ii) that housing market variables are by and large less significant than labour market variables, but relative house prices do have a significant impact in the expected direction.

iii) that relative wages appear to have a perverse effect implying a higher rate of migration from high wage to low wage regions. Possible explanations include compositional effects (high wage-earners are more likely to move) and reverse causality (other things equal a higher rate of in-migration depresses wages).

3.2. A Model of Migration based on the Hiring Function

We start from a very simple model in which only unemployed people look for work, in which there are no systematic differences in job characteristics between regions and distance is immaterial in job search. In the economy as a whole, there are U unemployed people and V job

vacancies and the total number of engagements (job hirings) is given by the hiring function

$$H = H(U,V) \qquad H_1, H_2 > 0 \tag{1}$$

(for recent discussions, see Blanchard and Diamond, 1989, or Jackman et al, 1989, though the basic idea is due to Holt, 1970). The aggregate hiring function H is found to have constant returns to scale (Pissarides, 1986).

If we now imagine the economy divided into a number of regions, but retain the assumptions that location and distance are immaterial so that an unemployed person in a given region is equally likely to take up a vacancy in any part of the country, it will follow that the number of unemployed people in region i taking up vacancies in region j, M_{ij}, is given by:

$$M_{ij} = H.(U_i/U).(V_j/V) \tag{2}$$

where U_i is the number of unemployed people in region i and V_j the number of vacancies in region j.

Making use of the notation $\hat{u}_i$, $\hat{v}_i$ for the share of unemployment and the share of vacancies in region i respectively (ie $\hat{u}_i = U_i/U$; $\hat{v}_i = V_i/V$) we have

$$M_{ij} = H\, \hat{u}_i\, \hat{v}_j$$

The total outmigration from region i is

$$M_i^{out} = \sum_{\substack{j \\ (j \neq i)}} M_{ij} = H\, \hat{u}_i\, (1-\hat{v}_i)$$

The total in-migration to region i is

$$M_i^{in} = \sum_{\substack{j \\ (j \neq i)}} M_{ji} = \sum_{\substack{j \\ (j \neq i)}} H\, \hat{u}_j \hat{v}_i$$

$$= H\, (1-\hat{u}_i)\, \hat{v}_i$$

The net migration into region i is therefore

$$M_i^{in} - M_i^{out} = H\,(\hat{v}_i - \hat{u}_i) \qquad (3)$$

Finally, the total level of migration in the economy is given by

$$M = \sum_i M_i^{in} = H\,(1 - \sum \hat{u}_i \hat{v}_i) \qquad (4)$$

A comparison of equations (3) and (4) shows that while net migration is quite sensitive to small changes in relative shares of unemployment and vacancies across regions, gross migration is relatively invariant to such changes[2]. In fact, using British data over the period 1975-1984, the variation in engagements is a thousand times the variation in $(1-\sum\hat{u}_i\hat{v}_i)$ indicating that the variation over time in gross migration flows is, in the model, attributable almost entirely to variation in engagements and only very minimally to variation in sectoral imbalances[3]. As a check on the empirical validity of this approach, a regression of log M on log H and log $(1-\Sigma\hat{u}_i\hat{v}_i)$ over the period 1971-84 gives

$$\log M = \underset{(4.5)}{0.40}\ \log H + \underset{(1.5)}{5.2}\ \log (1-\Sigma\hat{u}_i\hat{v}_i) \qquad \bar{R}^2 = 0.724$$

$$\text{Sargan} = 0.2(\chi^2_1, 0.05 = 3.8)$$

By way of comparison, in Table 1 we briefly examine the correlates of aggregate migration with a number of other possible explanatory variables by simple instrumental variables time series regressions. While with only 19 annual observations (1971-89), it is clearly not possibly to carry out an exhaustive econometric analysis of this issue, the empirical results are quite striking. We first regress migration separately on our two hiring function variables, the engagement rate and the index of sectoral imbalance $(1-\Sigma u_i v_i)$. (Regrettably, data on total engagements are available only until 1984.) We next examine the effect of two measures of the pressure of demand in the labour market, unemployment and vacancies. It is noteworthy

that vacancies offer a better explanation than unemployment and in a regression including both variables vacancies drive out unemployment (see Table 1.1). We then look at the hypothesis that migration is essentially a housing market phenomonen with people being more likely to move when mortgage rates are low than when they are high. Finally we examine some variables suggested by the human capital approach, the variances of relative unemployment rates, of relative wage rates and of relative house prices.

Clearly the engagement rate provides by far the best 'explanation' of migration. In Fig.3, we plot the two series to show how closely they have moved. However, most of the variables, taken by themselves are significant and of the expected sign. The best of these others appears to be the variance of relative house prices. However, in an equation including both variables, it turns out that only engagements matter, and house price variance becomes wrongly signed and insignificant.

Our conclusions in this section are necessarily very broad-brush, but our empirical results appear to confirm our initial hypothesis that migration can usefully be regarded as a special case of hiring, with overall engagements in the labour market the dominant factor explaining aggregate migration.

3.3. An Analysis of the Inter-regional Migration

The time-series analysis of aggregate migration has been necessarily limited in its scope because we were working with only 19 observations. If we turn from aggregate to 'bilateral' (i.e. region i to region j) gross inter-regional migration flows, a much sharper picture can emerge. We have, for the ten standard regions of Great Britain[4], observations on the gross flow from each region to each of the other regions (90 observations)

for 15 years (1975-1989), that is 1350 observations.

We first describe the migration data, then derive an estimation equation from our theoretical model, and finally comment on the empirical results.

3.3.1 Migration Data

The data on migration derive from the National Health Service Central Register (NHSCR) and are collated by the Office of Population Census and Surveys. These data are based on transfers of doctors' patients between Family Practitioner Committees (FPC's) in England and Wales and Area Health Boards (AHB's) in Scotland[5]. While obviously not as comprehensive as the population census, these data offer a continuous series of annual figures for regional movers, covering the vast majority of households.

The NHSCR data source obviously poses certain problems[6]. Firstly, our theoretical framework is based on migration as a job search phenomenon while our data, which is based on population and not simply on labour force movements, includes retirement moves (retirement to the South West say), those who move home but who remain in the same job, and other somewhat extraneous movements such as university student flows[7]. In this respect, it is worth noting that about one-third of both unemployed and employed migrants do so for non-job related reasons[8].

Since there are clearly innumerable influences affecting migration flows other than simple measurable economic variables, we proceeded by assigning a fixed effect to each of the bilateral flows. The fixed effect will then absorb the effects of all variables which are constant over time, such as the distance between regions (for an analysis of the impact of distance on migration see Jackman and Savouri, 1991), differences in their climate or other features which affect retirement flows, differences in the number of higher education institutions across regions (for an analysis of

student flows see Savouri, 1991a) and other location attributes which are constant (or at least relatively static) over time.

Thus our hypothesis is that variations in regional migration flows over time can be explained largely in terms of economic factors. Provided we can assume that the relationship between changes in the explanatory economic variables and migration flows are the same for each of the bilateral flows, we have for estimation purposes a total pooled sample of 1,350 observations with 90 bilateral-flow fixed effects.

3.3.2 Analytical Framework

We turn now to the implications of the hiring function approach for bilateral regional migration flows. The basic equation is (2) on p.4:

$$M_{ij} = H(U_i/U), (V_i/V) \qquad (2)$$

The flow of migrants from region i to region j is the product of total engagements in the economy, the share of unemployment in region i and the share of vacancies in region j.

This equation was derived from a very simple model, and given that we now have many more observations, it is possible to relax the simplifying assumptions in favour of a more general and realistic, though inevitably more complex, formulation.

Most importantly, in our simple model we had assumed distance immaterial in job search. In practice, of course, this is not the case. Most people are unwilling to move and would prefer to take a job close to home. In aggregate there are about one million migration moves in a year (of which some will not be job related) as against about 7 or 8 million job engagements. Thus, unemployed people from region i seeking work in region j will effectively be im competition mainly with job-seekers resident in region j rather than job-seekers in the whole country. Similarly, when we

come to vacancies we take into account the fact that the likelihood of job-seekers in region i seeking work outside the region will be primarily influenced by the availability of jobs in region i, rather than by vacancies in the nation as a whole.

Slightly more formally, we may allow for the discouraging effect of a distance on job search by a discount factor, δ_{ij} where $\delta_{ij} = 1$ for i=j and $\delta_{ij}<1$ $i\neq j$. (As an example, in a gravity model one might have $\delta_{ij}=1/(1+d_{ij}^2)$ where d_{ij} is the distance between the centre of region i and the centre of region j.) Returning to equation (2), we now have the proportion of people seeking work in region j who are resident in region i given by:

$$\frac{\delta_{ij}U_i}{U_j+\sum_{i\neq j}\delta_{ij}U_i} \simeq \delta_{ij}\, U_i/U_j \text{ for } \delta_{ij} \text{ small}$$

Likewise, the proportion of vacancies effectively available to region i job-seekers which are located in region j is given by

$$\frac{\delta_{ij}V_j}{V_i+\sum_{j\neq i}\delta_{ij}V_j} \simeq \delta_{ij}\, V_j/V_i \text{ for } \delta_{ij} \text{ small}$$

Assuming distance in practice constitutes a substantial discouragement to job search, so the δ_{ij} terms are small, we can rewrite (2) as:

$$\begin{aligned} M_{ij} &= H(\delta_{ij})^2\,(U_i/U_j)(V_j/V_i) \\ &= H(\delta_{ij})^2\,(u_i/u_j)(v_j/v_i) \end{aligned} \qquad (2')$$

where u_i, v_i are the unemployment and vacancy rates.

Next, we allow for some effects of differences between regions. Job-seekers will obviously prefer to apply for jobs paying higher wages and thus potential migrants will tend to look for work in high wage rather than

low wage regions. Thus a higher proportion of job-seekers applying for vacancies in high wage regions will be resident outside the region and one might therefore expect that a higher proportion of jobs in high wage regions will be filled by in-migrants rather than by local residents[9]. The relevant variable in this context is of course the real wage, which takes into account differences between regions in both money wages and in the cost-of-living.

Other economic factors that may affect migration flows are the composition of employment and housing tenure. Workers may clearly have a better chance of getting a job in a particular region if employment opportunities there are similar to the worker's existing work experience. We measure this by a 'comparability index', c_{ij}, which is the square of the difference in the proportion of employees in manufacturing and construction industries between any two regions.

In the housing market, procedures for allocating local authority housing make it very difficult for local authority tenants to migrate between regions (Hughes and McCormick; 1981, 1985). We thus allow for the effect of the proportion of dwellings in a region which are local authority (or new town) tenancies.

Finally, we have up to now assumed the unemployed in region i (U_i) equal to the total number of job-seekers in region i. In a more general framework we must allow (i) that not all the unemployed seek, or have much chance of finding, work and (ii) that there are also employed people seeking other jobs. On the first of these points, it is well-known that the long-term unemployed are less effective at job search and less attractive to potential employers than other job-seekers[10]. We thus include the proportion of long-term unemployed in region i (R_i) as a further explanatory variable.

On the second point, suppose that the number of job-seekers in region i (S_i) consists of the unemployed in that region (U_i) plus some proportion (φ) of employed workers in that region (E_i). Then $S_i = U_i + \varphi E_i$.

Thus, the region i unemployment rate can be replaced by the proportion of job-seekers (employed and unemployed) in the labour force, s_i where

$$s_i = S_i/L_i = u_i + \varphi(1-u_i)$$

$$= \varphi + (1-\varphi)u_i$$

Similarly, in the destination region, $s_j = \varphi+(1-\varphi)u_j$

so $s_i/s_j = 1 + (1-\varphi)(u_i-u_j)/(\varphi+(1-\varphi)u_j) \simeq 1+(u_i-u_i)/(\varphi+u_j)$ (for small φ)

or $\log (s_i/s_j) \simeq (u_i-u_j)/(\varphi+u_j)$

Thus, if we were to estimate (2') in log linear form

$$\ln M_{ij} = \ln H + \ln(u_i/u_j) + \ln(v_j/v_i) + \text{constants}$$

we may to a first approximation allow for employed job-searchers by replacing the term in $\ln(u_i/u_j)$ by a term in (u_i-u_j).

Finally, there is the problem of the level of overall engagements. Our data series on total engagements stops in 1984, and rather than abandon the last five of our fifteen years of migration data, we have used total migration as a proxy for overall engagements. This procedure is supported by the theoretical analysis and empirical results of the previous section. It has the advantage of taking the broad time series movements in migration out of the bilateral flow equations, which can then focus on the determinants of region differentials in migration flows relative to the aggregate. (We do, however, in Table 3.3, present estimates using the aggregate engagement rate rather than the migration rate for the shorter time period for which it is available.)

3.3.3 Results

Our dependent variable is the migration rate M_{ij}/L_i, i.e. the proportion of the labour force in region i migrating to region j. The independent variables are those suggested by the generalised hiring function approach described in Section 3.2. The estimates are based on pooled time-series cross-section regressions for ninety bilateral migration flows between each of the ten standard regions for the fifteen years 1975-89.

The results are set out in Tables 3.2 and 3.3. While the equations appear satisfactory in terms of the t-statistics on individual explanatory variables, the Bresch-Godfrey test suggests the presence of first and third order autocorrelation. We are not greatly troubled by this for reasons we explain below. To summarise the main findings, the unemployment rate in the region of origin (u_i) has a consistent and very well-defined positive effect while that in the region of destination (u_j) has a negative and significant impact.

The effect of a high proportion of long-term unemployment (R) is to diminish out-migration (and encourage in-migration). This is consistent with the results of (e.g.) Jackman and Layard (1991) on the adverse effects of long-term unemployment on job search.

The vacancy shares ($\hat{v}_i$,$\hat{v}_j$) enter with the signs suggested by the theory, and with coefficients very closely equal and opposite, supporting the theoretical specification.

The overall migration rate (M/L) is highly significant, with a coefficient which is slightly, though not greatly, less than the value of unity implied by the theoretical model.

Turning to wages and prices, we have good data on money wages (from the New Earnings Survey) but no data of comparable quality on the cost of

living by region. The best measures we have are data on regional house prices (from the Department of the Environment) and figures, excluding housing (from the Regional Reward Surveys). We examine the impact of each of these factors, but we should stress at the outset that we do not have an accurate way of measuring relative real wages across regions. It turns out that we find correct signs on the two price variables, with that on house prices highly significant, but the effect of money wages (w_i/w_j) is perverse and significant. We discuss possible interpretations of the perverse wage effect below.

In the second column of Table 3.2 we allow also for the effect of housing tenure, again relative to the national average ($\bar{\Pi}_i H/\bar{\Pi} H$). It turns out that tenure in the region of origin has no significant impact on out-migration, but a high proportion of local authority property significantly discourages in-migration. The latter effect comes as no surprise, given that local authority waiting lists for housing give priority to local residents. But the finding that housing tenure in the region of origin has no effect on migration appears inconsistent with the results of Hughes and McCormick (1987; 1985) derived from Labour Force Survey data on individuals. A possible explanation is that it is not housing tenure as such which affects migration, but that tenure is standing as a proxy for some unobserved individual characteristic (such as income, on which there is no data in the Labour Force Survey Data). If local authority housing is associated with low incomes, and if low income households are less likely to migrate than those with higher incomes, there will be a correlation in the data on individual households between tenure and migration. Across regions, however, average incomes are quite similar while tenure proportions differ substantially. Hence the spurious correlation between tenure and aggregate out-migration will not appear at

the regional level.

We have considered a number of possible explanations for the perverse wage effect. One is that high wages may be correlated with high vacancy rates, and thus our vacancy rate variable, which is absent from most other studies, may be displacing a correctly signed real wage effect. We have tried omitting the vacancy rate from our equations, but the wage effect remains perverse.

It is also possible that wages and prices may be highly correlated, thus potentially lowering the coefficient on the money wage. To investigate this we have examined a number of measures of the real wage (giving different weights to house prices and to other prices). We have also tried a definition of the real wage giving various arbitrary weights to house prices while assuming other prices constant across regions. The upshot is that the data reject the hypothesis that the coefficient on the money wage should be equal and opposite to that on the price index, for all procedures for calculating the price index.

A more likely possible explanation for the perverse wage effect is that of labour force composition. High average wages in a region may reflect not so much higher wages for given jobs as a higher proportion of people in high wage activities. If high wage people are more likely to migrate, we would expect to see a higher rate of out-migration from high wage regions. In Column 3 of Table 3.2, we examine whether a disaggregation between manual and non-manual groups assists in explaining migration flows.

The result is that differentials in manual wages across regions appear to have no effect on migration, whilst the perverse effect remains with regard to non-manual wages. Not too much can be made of this result, however, as clearly compositional effects may be as important within the non-manual category as between manuals and non-manuals.

Another possible explanation for the perverse wage effect is that it is capturing not so much a migration of workers as a migration of jobs. As wages rise in a region jobs move out and this may lead to an out-migration rather than an in-migration of workers. It turns out that in this respect there has been a difference between the South East and the other regions. In the South East wages have risen rapidly while employment has grown, but in the other regions there has been a clearly defined negative relationship between employment growth and relative wages.

Our estimated reduced form equation[11] for employment growth is:

$$\dot{n}_i = \underset{(11.3)}{1.0}\ \dot{n} - \underset{(3.5)}{0.22}\ w_i \qquad \bar{R}^2 = 0.503$$

$$\text{s.e.} = 0.0207,\ \text{Sargan Test} = 1.0$$

$$\chi^2_{1,\ 0.05} = 3.8$$

where $\dot{n}_i$ is employment growth in region i, $\dot{n}$ is employment growth in nine regions of Britain excluding the South East and w_i is the wage of full-time manual men in region i relative to the average wage in the nine regions excluding the South East.

In Table 3.3, we repeat the analysis of Table 3.2, but separating out relative wage effects for the South East from those for the other regions. We also incorporate an index of firm relocation from the South East (kindly made available by Jones, Lang and Wootton) but this turns out to be only on the margin of significance. Our findings are that the higher relative wages in the South East do appear to be associated with higher in-migration to the South East, though they have no significant effect on out-migration (unless we allow for a quadratic house price effect in column (3)). For migration flows between other regions, the perverse effect remains. This provides some support for the labour demand explanation. Where high relative wages are associated with employment growth (as in the South East)

they are also associated with higher in-migration. Where high relative wages are associated with a decline in employment (as in the other regions) they are associated with a lower rate of in-migration. Finally, in column 4 we record the results of our preferred specification using the engagement rate instead of the migration rate, and thus estimating over the shorter period 1975-84. The equation can be compared with column 3 of Table 3.4 as a check that substituting the migration rate for the engagement rate does not alter our findings.

Table 3.4 illustrates the stability of our results, by examining the estimates of our preferred specification (Table 3.3, column 3) for successively shorter time periods. Our interest in doing this arises from concern over the presence of autocorrelation in our estimated equations. Since we have no lagged dependent variable, our estimates are consistent, but their efficiency is reduced by the presence of autocorrelation. A loss of efficiency would be detected by instability between equations estimated for different sample periods. Table 3.4 shows that this is not a problem with our results.

Having estimated inter-regional migration utilising the complete set of bilateral flows (1350 observations) we now examine the overall flows for each region in the form of separate out and in migration equations (150 observations each). The estimates of our preferred specifications are set out in Tables 3.5 and 3.6 respectively.

Starting with out migration flows we observe in Table 3.5 column (1) that the coefficient on overall migration is close to unity. Examining the estimates on labour market variables we note that own region unemployment encourages out migration while national unemployment and high regional vacancy shares both discourage regional moves. Turning to cost of living effects we see that high relative house prices encourage out migration but

that relative non-housing cost of living differences are not statistically significant. Relative nominal earnings differences are found - as in the case of our bilateral equations - to be perversely signed. In columns (2) and (3) we introduce the relocation of firms from the South East variable and the house price quadratic. Both are significant, but neither has much impact on our key economic variables.

We now turn to in-migration. In Table 3.6 column (1), we note that the coefficient on the national migration rate is close to unity. Low unemployment and a high relative vacancy share encourage in-migration. Turning to cost of living differences we see that high relative house prices discourage in-migration.

Relative nominal earnings effects take on a perverse sign as they do with out-migration. Again, however, if we separate out the South East, as in column (2), we find a positive wage effect for the South East in conjunction with a perverse effect in the other regions.

Finally, our preferred equation for net migration, where the net migration rate is measured as

$$m_i^{net} = \left[\frac{M_i^{in} - M_i^{out}}{L_i}\right] / \left[\frac{M}{L}\right]$$

is

$$m_i^{net} = F_i - \underset{(3.4)}{3.2}(u_i-u) + \underset{(2.2)}{16.5}\ (v_i-v) - \underset{(5.3)}{0.56}\ln\ (PH_i/PH)$$

$$\text{s.e.} = 0.0842 \qquad \bar{R}^2 = 89.7$$

is where F_i are regional fixed effects. It turns out that wage effects in the net migration equation are neither well-defined nor stable over time. We conclude therefore that the results of estimating overall in, out and net migration equations for the regions are consistent with those obtained from our bilateral flow analysis.

3.4. Conclusions

In this chapter we have estimated both aggregate time-series and pooled cross section-time series bilateral flow migration equations using data drawn on gross population migration flows across the ten standard regions of Great Britain. Our conclusions are:

(i) that migration can be viewed as a hiring or job search phenomenon as witnessed by the strength of aggregate time series correlation between migration and job engagements;

(ii) that high unemployment in a region raises out-migration because the unemployed search more than the employed, and reduces in-migration because of the 'crowding-out' effects of the job search of locally resident unemployed people;

(iii) that long term unemployment in a region reduces out-migration by reducing the search effectiveness or attractiveness of the unemployed; but raises in-migration for the same reasons;

(iv) that a high level of job vacancies in a region reduces out-migration and encourages in-migration.

(v) that high relative house prices encourage out-migration and discourage in-migration.

(vi) that housing tenure at the destination region affects migration flows, because a large local authority housing sector reduces in-migration due to allocation policies favouring local residents;

These findings provide an immediate answer to the question we posed in the introduction to this chapter. Why do migration flows fall in a recession when regional unemployment differentials tend to widen? The answer is that overall engagements fall in a recession. Firms adjust to reduced demand by cutting back on recruitment and this reduces the job opportunities for the unemployed, including those which involve moving from

one region to another.

While this observation may not appear particularly profound it does seem to us that the capacity to explain why migration tends to fall when regional unemployment differentials are at their greatest may be one of the more important insights of the hiring function approach, and a result which most clearly distinguishes it from the human capital model.

DATA SOURCES

M_{ij}: Inter Regional Movements.

Recorded internal population movements based on transfers of doctors' patients. CSO, Regional Trends (see Population), various issues. Figures pre-dating 1981 obtained from:

Office of Population Censuses and Surveys,
Migration Analysis Unit,
St Catherines House,
10 Kingsway,
London WC2B 6JP.

U: Total Unemployment excluding School Leavers, GB.

Department of Employment "X-11" Series. This series derives from a consistent definitional base for unemployment over our sample period. Quarterly Average. Available on request to the:

Department of Employment,
Caxton House,
Tothill Street,
London SW1H 9NF.

U_i: Regional Unemployment Stock.

Department of Employment Gazette, various issues. "Wholly Unemployed Excluding School leavers". As a result of definitional problems due to changes in benefit eligibility over our sample period, figures from contemporaneous sources are not consistent over time. To overcome this problem we use the Department of Employment's "X-11" consistent unemployment series to correct the regional unemployment levels. Quarterly average.

R_i: Proportion of Long Term Unemployment by Region.

This refers to the proportion of male unemployed over one year in the unemployed pool. Department of Employment Gazette, various issues. Average of January and July proportions.

V_i: Regional Vacancy Stocks.

Department of Employment Gazette, various issues. Total vacancies excluding both vacancies reported at Careers Offices and those based on the Community Programme. Monthly average.

r: Mortgage interest rate.

Central Statistical Office, Financial Statistics. Monthly average.

$\bar{\Pi}_i^H$: Tenure of Dwellings: Rentals from Local Authority or New Town.

CSO, Regional Trends (see Housing), various. December figures.

n_i: Employees in Employment by Region.

CSO, Regional Trends (see Employment) various. June figures.

pH_i: Regional House Prices.

Mix Adjusted Index of Dwelling prices, CSO, Regional Trends (see Housing) various issues. Quarterly average. Original source Department of the Environment. To obtain a time series for Regional House Prices we use 1987 Building Society valuations for dwelling prices, all borrowers. Regional Trends, 1989.

W_i: Regional Earnings.

We use Average Hourly Earnings excluding overtime payments for Full Time Adult Males. April figures. Department of Employment, New Earnings Survey (Part E).

P: GDP deflator. CSO Economic Trends, various issues.

$P\bar{H}_i$: Regional non-house prices based on consumers' expenditure less housing. Regional Reward Survey figures.

e: Engagements in the whole economy. Jackman et al (1989).

n_i^P: Proportion of employees in production, i.e. manufacturing and construction industries. Department of Employment Gazette, various.

c_{ij}: $(n_i^P - n_j^P)^2$

Relocation for the South East. Number of jobs relocated from Central London, 'The Decentralisation of Offices from Central London', an annual special survey by Jones, Lang and Wootton, Table 2.

For full details of sources for our regional data set see Savouri (1991b).

FOOTNOTES

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We are extremely grateful to Jonathan Wadsworth who made available to us his Labour Force Survey data archives, and to R. Layard, A. Manning, C. Pissarides and A. Rodseth for very helpful comments, and to Jill Walters for expert typing of successive drafts of the paper.

1 Recent empirical migration work has included: Hughes and McCormick (1981, 1985) drawing on cross section household data from the 1973 and 1974 General Household Surveys, Pissarides and Wadsworth (1989b) using data from the 1974 and 1984 Labour Force Surveys; Jackman, Layard and Savouri (1991) using regional net flows from the NHSCR; and Muellbauer and Murphy (1990) using gross flows from the NHSCR to and from the South East. Migration studies for Spain and Italy are to be found in Padoa-Schioppa (1991), and summarised in Savouri (1990).

2 The term $(1-\sum\hat{u}_i\hat{v}_i)$ may be thought of as an index of mismatch, which is akin to the Nickell index of mismatch $(1-\sum(\hat{u}_i\hat{v}_i)^{1/2})$ used in wage equations (Nickell, 1982) and see also Jackman and Roper (1987).

3 If $M=H(1-\sum\hat{u}_i\hat{v}_i)$

$$\text{var (log M)} = \text{var(log H)} + \text{var (log } (1-\sum\hat{u}_i\hat{v}_i)) + 2 \text{ covar (log H, log } (1-\sum \hat{u}_i\hat{v}_i)).$$

On British data for 1971-84, var (log H) is 0.029 and var $(\log(1-\sum\hat{u}_i\hat{v}_i))$ is 0.00003. (Given the very small variance of this latter term, the covariance can be ignored.)

4. We chose not to include migration flows to and from Northern Ireland in our regression analysis since they tend to be of a relatively small

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3 If $M=H(1-\sum\hat{u}_i\hat{v}_i)$

$$\text{var}(\log M) = \text{var}(\log H) + \text{var}(\log(1-\sum\hat{u}_i\hat{v}_i)) + 2\,\text{covar}(\log H, \log(1-\sum\hat{u}_i\hat{v}_i)).$$

On British data for 1971-84, var (log H) is 0.029 and var $(\log(1-\sum\hat{u}_i\hat{v}_i))$ is 0.00003. (Given the very small variance of this latter term, the covariance can be ignored.)

4. We chose not to include migration flows to and from Northern Ireland in our regression analysis since they tend to be of a relatively small

magnitude when broken down by region of origin and destination. Further we are unable to disaggregate for the South East between Greater London and the rest of the region due to data limitations over our sample period. (See Mitchell (1988) for an examination of migration flows to and from Greater London).

5. A 10 per cent sample of re-registration was previously drawn as the basis for estimates of population movements, but from April 1984 this was changed to 100 per cent (CSO Regional Trends 1988, p.145).

6 A full critique of the NHSCR data can be found in Devis (1984).

7 See Regional Trends, 1989 and 1990, Tables 9.12 and 9.14 respectively for student flows across regions for 1987 and 1988.

8 See Hughes and McCormick (1990, p.11), who use Labour Force Survey evidence.

9 This effect is partially offset by a reduced tendency for locally resident job-seekers to seek work outside the region. But this type of effect would be expected to be proportionately very much smaller since migration flows are small relative to total engagements.

10 Using data drawn from four years of General Household Survey, Schmitt and Wadsworth (1992) find that the degree of job search of the unemployed declines with duration, such that a dummy capturing unemployment duration over twelve months enters negatively and strongly in their job search equations.

11 Estimated by stacked instrumental variable two stage least squares. Instruments used were $w_{i,-1}$ and $w_i^*{}_{,-1}$ where w_i denotes relative male manual and w_i^* relative male hourly earnings. (One overidentifying restriction.)

TABLE 3.1
Determinants of Aggregate Migration 1971-89
Great Britain
Dependent variable: log migration rate(m)

Explanatory Variables (all in logs)	Estimated Coefficient (t-statistic)	$\bar{R}^2$(%)	Sargan (X^2_1)
*Engagement rate (e)	0.45 (6.0)	74.9	0.08
$(1-\Sigma\hat{u}_i\hat{v}_i)$	8.4 (1.9)	11.6	2.1
Unemployment rate (u)	-0.05 (1.5)	15.0	3.8
Vacancy rate (v)	0.25 (2.4)	36.2	0.9
Mortgage rate (r)	-0.50 (2.5)	26.5	0.1
Variance of relative:			
Unemployment rates (u_i/u)	1.8 (3.5)	33.4	2.0
Wage rates (w_i/w)	17.9 (3.5)	42.4	0.4
House prices (PH_i/PH)	1.8 (3.6)	45.2	0.02

Sources: see Data Annex.
Notes:

* 1971-84 (for consistency we tested all the other equations over the 1971-84 sub-period but this led to no difference of substance.)
Equations estimated using instrumental variables with one over identifying restriction X^2_1, 0.05 = 3.8.
A multi-variate regression of m on v and u generates estimates of 0.25(2.3) and -0.03(0.9) respectively ($\bar{R}^2$=35.9, Sargan (χ^2_1) = 0.5).

TABLE 3.2

Inter-Regional Migration Equations
Great Britain 1975-1989
(1350 observations)

Dependent Variable ln m_{ij}

Explanatory Variables	(1)	(2)	(3)
M/L	0.88(17.9)	0.87(17.8)	0.87 (17.8)
u_i	3.4 (8.6)	3.4 (8.6)	3.3 (7.9)
R_i	-0.31 (2.3)	-0.34 (2.5)	-0.40 (2.9)
u_j	-3.9 (9.7)	-3.8 (9.7)	-3.7 (8.8)
R_j	0.37 (2.7)	0.43 (3.1)	0.49 (3.5)
v_i/v	-0.054(2.1)	-0.053(2.0)	-0.055 (2.2)
v_j/v	0.045(1.7)	0.011(0.4)	0.0094 (0.4)
c_{ij}	-3.5 (2.7)	-3.3 (2.5)	-3.2 (2.5)
PH_i/PH_j	0.24 (6.0)	0.32 (6.9)	0.29 (6.7)
$P\bar{H}_i/P\bar{H}_j$	0.84 (2.0)	0.70 (1.7)	0.52 (1.2)
w_i/w_j (all)	0.58 (3.6)	0.36 (2.1)	-
w_i/w_j(manuals)	-	-	0.0045 (0.02)
w_i/w_j(non-manuals)	-	-	0.60 (3.4)
$\bar{\Pi}_j^H/\bar{\Pi}^H$	-	-0.57 (4.6)	-0.51 (4.3)
$\bar{\Pi}_i^H/\bar{\Pi}^H$	-	-0.097(0.8)	-
$\bar{R}^2$(%)	97.8	97.8	97.9

Notes:

For definitions of variables see data sources.
Equations estimated by using pooled, cross-section time series ordinary least squares with a complete set of 90 bilateral fixed effects (F_{ij}).
$\bar{R}^2$ [F_{ij}] = 96.6, analysis of variance using fixed effects alone.
t-statistics in parentheses. Critical value at one sided 5% level 1.6 and at 10% level 1.3.
All variables in logarithmic form except, u_i, u_j, R_i, R_j, c_{ij} and $\bar{\Pi}^H$.
The Bresch-Godfrey Test for serial correlation suggests first and third order autocorrelation in the residuals across all quoted equations.

TABLE 3.3

Inter-Regional Migration Equations
Great Britain

(1350 observations)

Dependent Variable ln m_{ij}

Explanatory variables	(1975-1989)			(1975-1984)
	(1)	(2)	(3)	(4)
M/L	0.84 (16.6)	0.87 (17.7)	0.81 (16.1)	-
E/L	-	-	-	0.53 (9.9)
u_i	3.1 (7.9)	3.1 (8.2)	3.2 (8.4)	4.1 (9.0)
R_i	-0.32 (2.2)	-0.33 (2.3)	-0.35 (2.5)	-0.68 (3.6)
u_j	-3.5 (9.0)	-3.5 (9.2)	-3.5 (2.5)	-2.4 (5.3)
R_j	0.38 (2.7)	0.35 (2.5)	0.33 (2.3)	-0.039(0.2)
v_i/v	-0.061 (2.4)	-0.057 (2.2)	-0.054 (2.1)	-
v_j/v	0.027 (1.0)	0.058 (2.3)	0.061 (2.4)	-
v_i/v_j	-	-	-	-0.063(2.7)
c_{ij}	-3.1 (2.4)	-3.1 (2.4)	-1.5 (1.1)	-1.9 (1.0)
PH_i/PH_j	0.31 (7.3)	0.26 (6.4)	0.26 (6.4)	0.26 (2.5)
$(PH_i/PH_j)^2$	-	-	0.26 (4.9)	0.24 (1.0)
$P\bar{H}i/P\bar{H}_j$	0.39 (0.9)	0.51 (1.2)	0.51 (1.2)	0.82 (1.3)
w_i/w_j	0.90 (4.7)	1.1 (5.6)	1.1 (5.7)	0.71 (3.3)
w_i/w_{SE}	-1.2 (3.6)	-1.2 (3.8)	-0.72 (2.1)	-0.91 (1.3)
w_{SE}/w_j	-0.46 (1.4)	-0.36 (1.1)	-0.88 (2.6)	0.039(0.1)
$\bar{\Pi}_j^H/\bar{\Pi}^H$	-0.49 (4.1)	-	-	-
Relocation from the SE	0.046 (1.6)	-	-	-
$\bar{R}^2$(%)	97.9	97.8	97.9	98.3

Notes:

See Notes to Table 2.

Earnings refer to average hourly earnings of full-time adult non-manual males.

TABLE 3.4

Inter-Regional Migration Equations
Great Britain

Dependent Variable ln m_{ij}

Explanatory Variables	1975-89	1975-87	1975-84	1975-81
M/L	0.81(16.1)	0.85(16.3)	1.0 (14.3)	1.1 (7.6)
u_i	3.2 (8.4)	3.0 (7.6)	3.3 (8.0)	2.7 (3.7)
R_i	-0.35 (2.5)	-0.30 (1.9)	-0.32 (1.8)	-0.39 (1.3)
u_j	-3.5 (9.1)	-3.3 (8.3)	-3.3 (8.0)	-2.4 (3.3)
R_j	0.33 (2.3)	0.27 (1.7)	0.32 (1.8)	0.49 (1.6)
v_i/v_j	-0.057(3.1)	-0.078(3.9)	-0.063(2.9)	-0.084(2.7)
c_{ij}	-1.5 (2.3)	-2.1 (1.5)	-1.2 (0.7)	-1.1 (0.3)
PH_i/PH_j	0.26 (6.5)	0.087(1.3)	0.26 (2.9)	0.22 (1.9)
$(PH_i/PH_j)^2$	0.26 (4.9)	0.26 (2.7)	0.14 (0.6)	0.22 (0.8)
$\bar{PH}_i/\bar{PH}_j$	0.51 (1.2)	0.58 (1.2)	-0.82 (1.3)	-0.21 (0.2)
w_i/w_j	1.1 (5.7)	0.84 (4.1)	0.71 (3.5)	0.65 (2.3)
w_i/wSE	-0.72 (2.1)	0.17 (0.3)	0.13 (0.2)	0.74 (0.7)
wSE/w_j	-0.89 (2.6)	-0.60 (1.1)	-0.74 (1.1)	0.42 (0.4)
$\bar{R}^2$ (%)	97.9	97.9	98.5	98.4

Notes:

See Notes to Table 2.

TABLE 3.5

Regional Out-Migration Equations
Great Britain 1975-1989
(150 Observations)

Dependent Variable ln (M_i/L_i)

Explanatory Variables	(1)	(2)	(3)	(4)
M/L	0.96 (24.3)	0.92 (22.4)	0.86 (19.3)	0.91 (24.3)
u_i	3.5 (8.7)	3.3 (8.1)	3.5 (8.8)	3.7 (8.9)
$\hat{v}_i$	-0.028 (1.3)	-0.030 (1.5)	-0.019 (0.9)	-0.046 (2.2)
u	-3.5 (8.2)	-3.8 (7.7)	-3.6 (8.4)	-3.8 (8.6)
PH_i/PH	0.14 (3.1)	0.12 (2.6)	0.23 (4.0)	0.19 (4.2)
$(PH_i/PH)^2$	-	-	0.31 (3.0)	-
$P\bar{H}_i/P\bar{H}$	-0.16 (0.3)	-0.23 (0.5)	-0.061 (0.1)	0.38 (0.8)
w_i/w	0.47 (3.3)	0.42 (2.9)	0.38 (2.7)	-
relocation SE	-	0.059 (2.6)	0.052 (2.4)	-
$\bar{R}^2$ (%)	98.6	98.7	98.8	98.5
s.e	0.0310	0.03003	0.0294	0.0321

Notes:

Equations estimated using region specific fixed effects (F_i) by stacked ordinary least squares.

$\bar{R}^2$ of fixed effects alone 91.1 (s.e=0.0795).

Asymptotic t-statistics in parenthesis. Critical value at 5% level of confidence for one sided test 1.6.

All variables in logarithmic form except u_i and u.

s.e denotes estimated equation standard errors.

Earnings refer to average hourly earnings of full-time adult non-manual males.

Our estimates are found to be robust to truncating the sample to 1986.

The Bresch-Godfrey test for serial correlation in the residuals suggests first and second autocorrelation in the residual

TABLE 3.6

Regional In-Migration Equations
Great Britain 1975-1989

(150 Observations)

Dependent Variable ln (M_j/L_j)

Explanatory Variables	(1)	(2)	(3)
M/L	0.87 (11.7)	0.86 (9.8)	0.93 (13.6)
u_j	-0.49 (3.3)	-0.53 (3.4)	-0.44 (3.0)
v_j/v	0.068 (1.8)	0.062 (1.6)	0.090 (2.4)
PH_j/PH	-0.30 (4.0)	-0.47 (3.9)	-0.34 (4.6)
$(PH_j/PH)^2$	-	-0.42 (1.6)	-
$P\bar{H}_j/P\bar{H}$	-0.86 (1.0)	-0.97 (1.1)	-1.3 (1.5)
w_j/w	-0.49 (1.8)	-0.68 (2.3)	-
$wSE/_w$	-	2.1 (1.7)	-
$\bar{R}^2$ (%)	98.0	98.1	98.0
s.e	0.0586	0.0583	0.0591

Notes:

Equations estimated using region specific fixed effects (F_j) by stacked ordinary least squares.

$\bar{R}^2$ of equation estimated with fixed effects alone 93.4 (s.e. = 0.108).
See also Notes to Table 5.

Our estimates are found to be robust to truncating the sample to 1986.

Figure 3.1

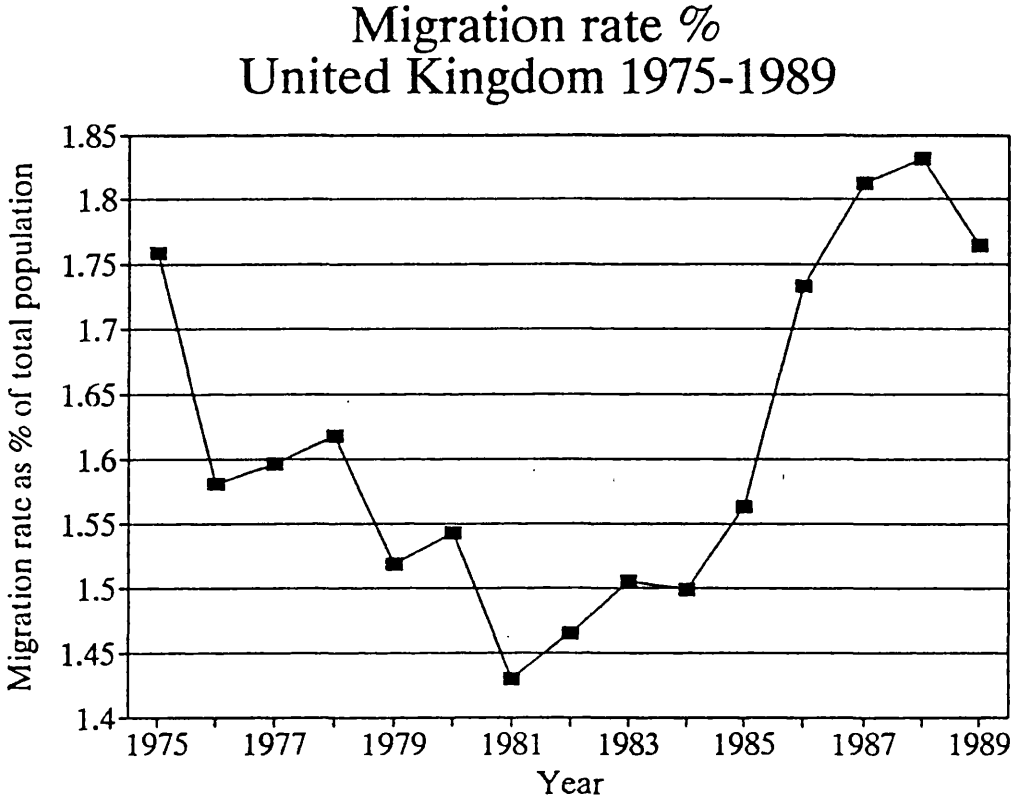

Migration rate %
United Kingdom 1975-1989
Migration rate as % of total population
1.85
1.8
1.75
1.7
1.65
1.6
1.55
1.5
1.45
1.4
1975
1977
1979
1981
1983
1985
1987
1989
Year

Figure 3.2

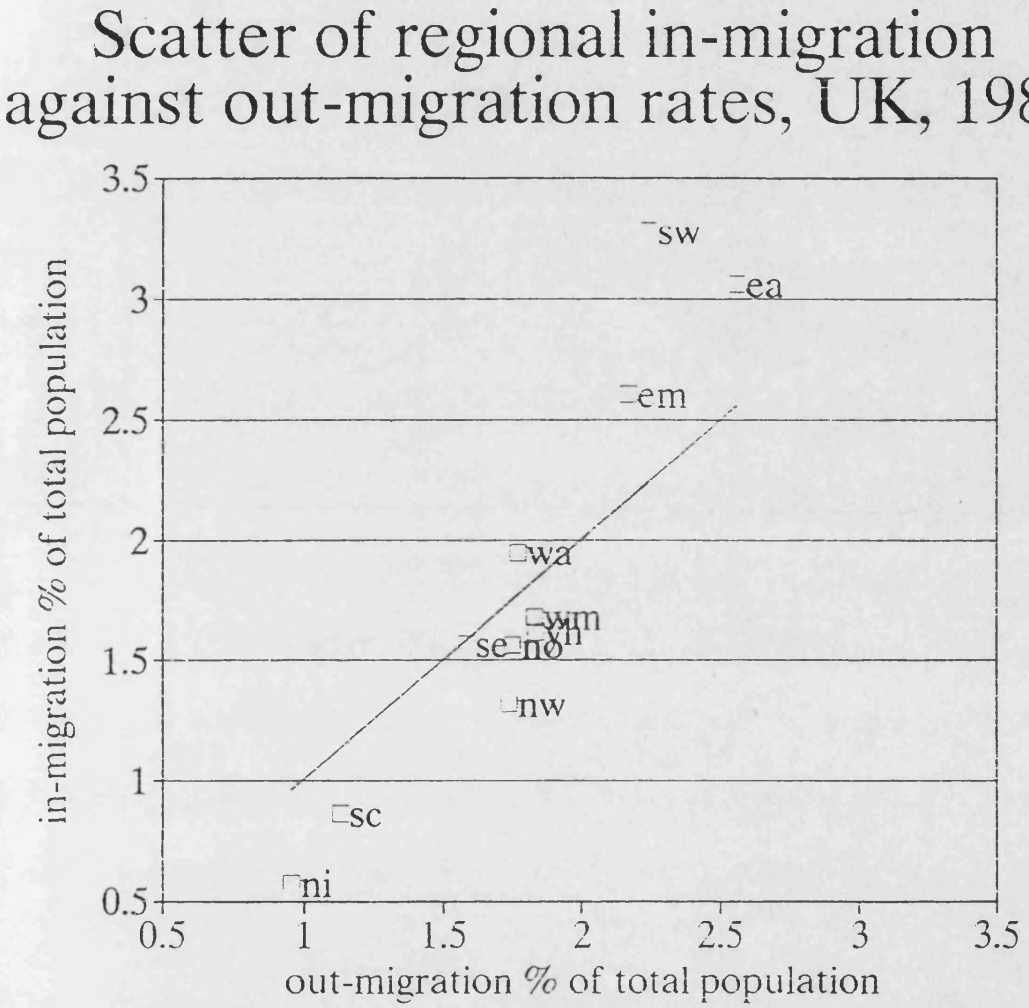

Scatter of regional in-migration against out-migration rates, UK, 1986
in-migration % of total population
out-migration % of total population
3.5
3
2.5
2
1.5
1
0.5
0.5
1
1.5
2
2.5
3
3.5
sw
ea
em
wa
wm
yh
se
no
nw
sc
ni

Figure 3.3

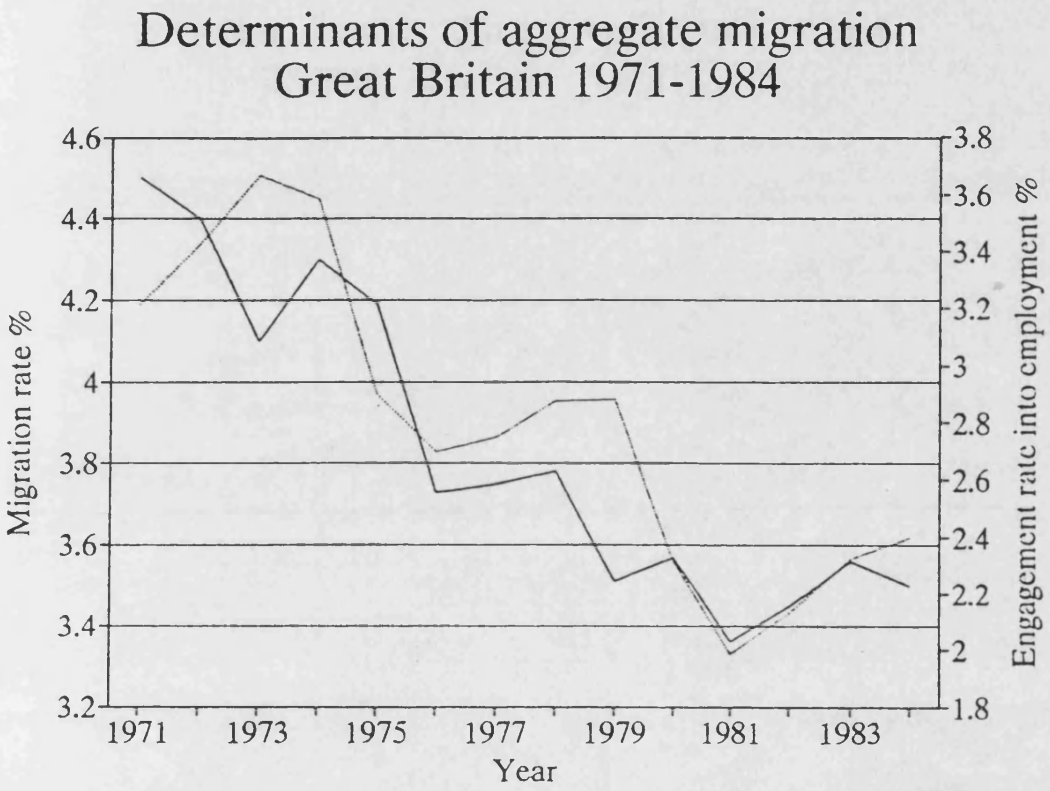
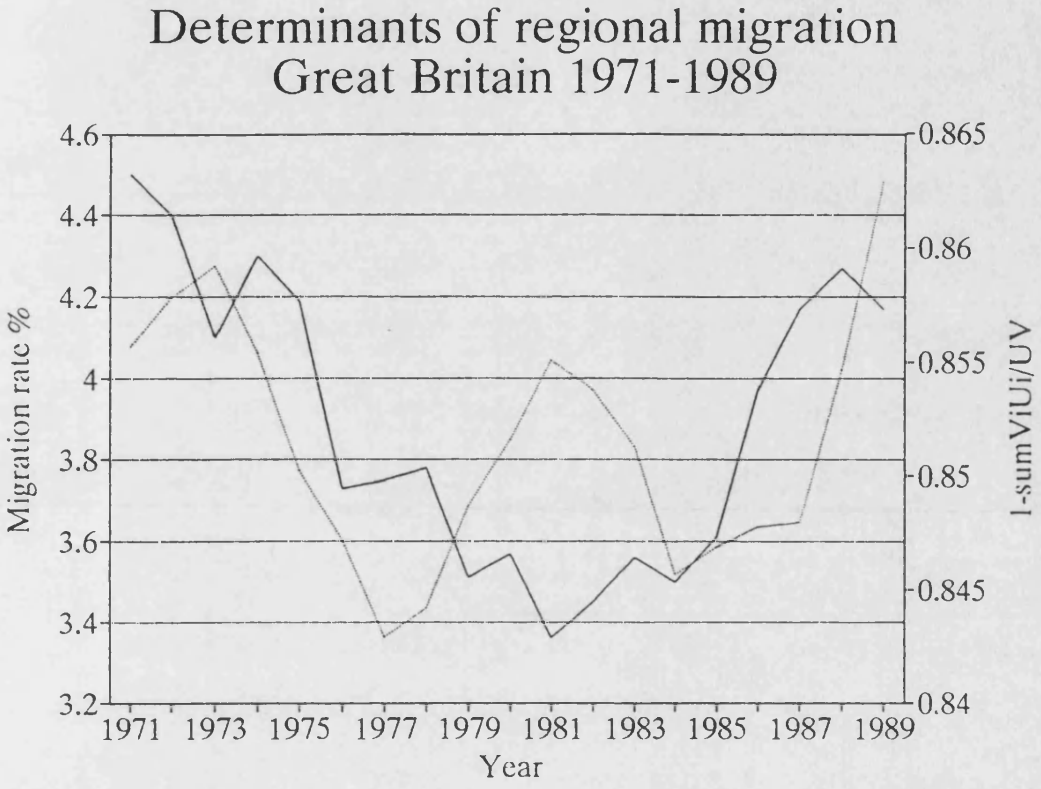

Determinants of aggregate migration
Great Britain 1971-1984
Migration rate %
Engagement rate into employment %
Year
4.6
4.4
4.2
4
3.8
3.6
3.4
3.2
3.8
3.6
3.4
3.2
3
2.8
2.6
2.4
2.2
2
1.8
1971
1973
1975
1977
1979
1981
1983

Figure 3.3 (cont.)



CHAPTER 4

REGIONAL MIGRATION VERSUS REGIONAL COMMUTING: THE IDENTIFICATION OF HOUSING AND EMPLOYMENT FLOWS[1]

4.1. Introduction

A comparison of regional unemployment rates across Great Britain indicates a high degree of persistence; across the ten regions of Britain the simple correlation coefficient for regional unemployment rates between 1974 and 1987 was 0.92 (Jackman et al, 1991). One explanation for such persistence is the lack of geographical labour mobility or migration, which is in turn, often associated with housing market rigidities (McCormick, 1991). A common view is that there cannot be a net movement of workers into a region of high labour demand because of housing supply inelasticities. In the local authority sector there is preferential allocation to local residents, while planning and land use controls hold back new housing development in the private sector.

But this view seems to neglect the possibilities that people can move their home from one region to another without changing their job while others may change their job without changing their home. In other words, if there are rigidities in the housing market, regional commuting may take on a more important role relative to migration as a means of alleviating regional inequalities. There is also, of course, the fact that some housing is occupied by retired, or non-working households, who can migrate without regard to labour market conditions.

Clearly in principle we may divide migrants into two categories, those who also change their job, and those who move

home without changing their job. (Those who change job without moving home will not be classified as migrants.) This point was first discussed by Gordon (1975) and later developed by Molho (1982). Both authors argued that one could distinguish the two types of migrants by reference to the distance of the move. It was, they suggested, to be expected that long-distance moves would consist of migrants who were also changing their jobs, whom they termed jobmovers[2], while it would only be close to regional boundaries or along well-developed transport routes that people might move home across regions without changing their job. Most migration models assume people move for job reasons; according to Gordon (1975, p.161) the failure of such models to allow for migrants moving home but remaining in the same job had led them to under-predict flows between adjacent regions, since they failed to capture pure housing moves, and over-predict flows across non-contiguous regions.

A related problem with recorded migration flows is that they do not identify commuters, i.e those workers who fill vacancies outside their region of residence without changing their region of domicile. If we assume that these latent inter-regional migrants are largely between adjacent regions, then the effect of vacancies on migration flows will tend to be under-recorded for flows between adjacent regions. That is, some job-moves would not be accompanied by housing moves and hence would not be recorded as migration, while some housing moves, which would count as migration, would not accompanied by job-moves.

As evidence for the contrasting motives for short against longer distance moves, the General Household Survey for 1976[3]

records that, when asked for the main reason for moving, only 4 per cent of those moving under 5 miles and 18 per cent of those moving between 5 and 50 miles answered "Job-Study reasons" while of those moving 50 miles or more 53 per cent gave this answer, the respective shares who answered "Housing reasons" were 33, 19 and 9 per cent (Table 4.1).

In attempting to overcome such identification problems, Molho (1982) argued that given an array of bilateral migration flows it was possible to identify certain cells as consisting exclusively of job-mover flows (i.e. the flows between non-contiguous regions) and that the model should be estimated over these flows alone. Molho went on to argue that the same model could then be estimated over flows between contiguous regions, and that a comparison of the estimates would give some indication of the magnitude and determinants of housing flows.

It may be helpful to illustrate these issues by means of a simple diagram. Let B_{ij} denote the net benefit from moving both job and home from region i to region j. Then if B^E_{ij} is the net benefit of a job move from i to j and B^H_{ij} is the net benefit of a home move from i to j, then

$$B_{ij} \equiv B^E_{ij} + B^H_{ij}.$$

In Figure 4.1, we plot B^E_{ij} and B^H_{ij} so that, for any given household, the prospective net benefit of a move from its present region i to some other region j can be identified by a point on the figure. Clearly a point in the north-east quadrant (marked 3 in the figure) indicates a move with both housing and employment benefits; the household will move home and change job. In the south-west quadrant, by contrast, both house and job moves

have negative benefits, and the household will stay put. The interesting cases are the north-west and south-east quadrants, and it is here that distance can affect the decision rule.

If regions i and j are contiguous in many cases the household will be able to uncouple housing and employment decisions. Thus, a point in the north-west quadrant (positive for employment, negative for housing) will lead to job moves without housing moves, i.e. to commuting. In the south-east quadrant (positive for housing, negative for employment) households may move without changing job. Thus households in zones 3, 4 and 5 will be recorded as migrants whilst those in zones 1, 2 and 3 will be inter-regional job movers.

By contrast, if regions i and j are not contiguous, the migration decision is essentially a joint decision involving the net benefits of the housing move and job move taken together. The decision rule is thus move both house and job if the sum of the net benefits (B_{ij}) is positive, that is if above the dashed line in Figure 1 (i.e. in zones 2, 3 and 4).

If migration equations are estimated over non-contiguous regions, and the results applied to contiguous regions, it might therefore be expected that they would:

(i) over-predict labour market effects (because some people in zone (2) who the equation predicts to migrate i.e. move home, will not do so but will change job without moving, these are our latent migrants.)

(ii) under-predict housing market effects (because some people in zone (5) will move house across adjacent regions without changing jobs, these are our pure home movers.)

We conclude therefore that while home mover flows will bias the observed flows across adjacent regions upwards; the failure to record commuters will bias observed flows downwards. We attempt therefore in what follows to isolate and identify such effects.

The effects of commuter and home-mover flows should result in regions of domicile and employment being different for a group of workers. In Figure 4.2 panel (a) we graph the share of workers <u>domiciled</u> in each region who commute to work across regional boundaries. In panel (b) we graph the proportion of jobs filled by workers who commute-in from surrounding regions[4]. Our figures suggest that just over 2 per cent of employees in England and Wales live and work in different regions. The overall figure conceals considerable regional differences while the regional figures themselves hide differences in the behaviour of men and women. Firstly, the figures for all commuters (panel (a)) range from under 1 per cent for the large market of the South East to 6 per cent for the East Midlands which has the West Midlands, East Anglia, the South East, the North West and Yorkshire & Humberside as immediate neighbours. Secondly, while almost 3 per cent of men domiciled in the North and 8 per cent of men domiciled in the East Midlands work outside of their domicile regions the comparable figures for women are just 1 and 4 per cent respectively. The extent to which domicile and work regions differ suggests that inter-regional job movements, which do not involve home moves, or inter regional home moves which do not involve changes of work-place, may not be enormous but nor on this data is it negligible particularly in relation to net

regional migration flows.

In this chapter we take a further look at these issues, making two innovations. First, our basic model of migration is based on a model of hiring which, as we have argued elsewhere (Chapter 2) appears to best fit the facts of regional migration in Britain. Second we analyse the difference between contiguous and non-contiguous moves not by partitioning the sample but by interacting contiguity with the relevant labour and housing market variables. This also allows the effects of contiguity to be more precisely identified - by the length of the common boundary rather than by a simple zero-one dummy.

Section 4.2 outlines the basic hiring function model, section 4.3 presents the empirical results and section 4.4 summarises the main conclusions.

4.2. A Model of Migration based on the Hiring Function

In Chapter 3 a model of inter regional migration was developed which considered migration flows as components of an inter-regional hiring process. The hiring based approach to migration argues that, in essence, migration is simply a subset of hirings within the economy, namely those where a job-seeker in one region is matched to a vacancy in another. In support this hypothesis, we can point (Figure 4.3) to the close correlation of aggregate migration and total engagements (hirings) in the economy. (Unfortunately, we have data on engagements only until 1984 so the top half of Figure 4.3 plots aggregate migration and vacancies, as a proxy for hirings, over the whole period 1971-89, while the lower half plots migration

and engagement from 1971 to 1984.)

The basic specification of the empirical model of bilateral (i.e. region i to region j) flows is

$$\ln m_{ij} = \ln m + \ln F_{ij} + \ln k_{ij}$$

where m_{ij} denotes the proportion of region i labour force migrating to region j (i.e. M_{ij}/L_i where M_{ij} represents total migrants and L_i the labour force); m denotes the aggregate migration rate; F_{ij} denotes bilateral fixed effects, and k_{ij} other factors.

Thus the hypothesis is that the bilateral migration flow between any two regions can be broken down into three components:

(i) the time series movement in aggregate migration which is dominated by the labour market variables which affect aggregate job hirings in the economy;

(ii) a fixed effect taking account of the distance between the two regions, climate and other geographic or demographic features which do not change significantly over time; and

(iii) other variables, in particular variables measuring relative economic conditions, which cause the time series movement of a particular bilateral flow to deviate from the national pattern.

The k_{ij} variables we are interested in are primarily labour market variables (unemployment, vacancies, wages and prices), and housing market variables (house prices).

This equation was estimated in Chapter 3 using population flow data[5] from the NHS Central Register across the standard planning regions of Great Britain for the period 1975 to 1989. The results were found to be consistent with the hiring model.

Migration flows were from high unemployment to low unemployment and from low vacancy share to high vacancy share regions, with relative house prices also important in determining the direction of these flows.[6] The base case result is summarised in Table 4.2 column 1, with the notation explained in the Note to the Table.[7] This model however is, in the previous terminology, one of employment flows. As noted in Section 4.1 and summarised in Figure 4.1 the failure to allow for either pure housing flows and latent migrant flows across contiguous regions will lead to mispecifications. It is to this that we now turn.

4.3. Results

4.3.1 House Price Effects

In Figure 4.4 we graph relative regional house prices and note the increase in dispersion over the period 1982-1988.

In Table 4.2, column 1, the base case estimates of our preferred migration equation have relative regional house prices, pH_i/pH_j, significant, with an increase in relative house prices encouraging net out-migration from a region. This may in part be due to some pure housing moves (where householders move from high to low house price regions taking advantage of capital gains implicit in moving to a cheaper but comparable house while commuting back to their original work-place). But it will also be explained by job moves where house price differentials may encourage job-seekers to swim against the tide and be more willing to move to areas of high unemployment (i.e. households in zone 4 of Figure 4.1).

It is of obvious interest to separate the house price

effects on housing streams from those on employment streams. We attempt to do this by interacting relative regional house prices (pH_i/pH_j) by the length of the common regional boundary ($bound_{ij}$) and present the results in Table 4.2 column 2. Our estimates for the lengths of the regional boundaries, derived from measurements along the map of the regions in Regional Trends, are presented in Table 4.3. The interacted term is positive and significant suggesting that the response of migration to a relative increase in house prices within a region is greater for flows to and from its immediate neighbours than for flows to or from more distant regions, and that where this contiguity effect exists, it is proportional to the length of the common regional boundary.[8] The interacted term suggests that the relative house price elasticity for regions with long common boundaries is about twice the house price elasticity for non-contiguous regions.

4.3.2 Labour Market Effects

We have now established that relative house price elasticities differ for flows between adjacent regions as against non-contiguous regions; and that this difference grew according to the length of the common regional boundary. We argued in Section 1 that the response to labour market differentials might, on the other hand, be smaller for flows between adjacent regions due to the exclusion of latent movers, i.e. those job seekers in adjacent regions who take up employment in adjoining regions without moving residence, by simply commuting to their new work-places (the bias due to the omission of zone (2) in Figure 4.1). Again, as with housing market effects, this bias might be measured by the length of the common regional boundary.[9] We

test for these effects by interacting our labour market variables by the length of common regional boundary for adjoining regions. We find that only for relative vacancy levels is the interacted variable significant and we list our results for this case (also including the relative house price interaction) in Table 4.2, column 3. Our results suggest that a relative improvement in employment opportunities has a stronger effect on flows between non-contiguous regions than it does for contiguous regions, and that, in fact, on our estimates, it disappears altogether for regions with long common boundaries. This is consistent with our argument that job-seekers can take advantage of a relative improvement in employment opportunities in neighbouring regions without moving house, by simply commuting to their new work-place, and that observed migration flows will not capture such inter-regional job filling.

We finish this section by examining the Molho (1982) partitioning procedure, and estimating our preferred migration equation over the sub-sample of flows between non-contiguous regions. Our results are presented in Table 4.4 column 2. By comparing column 1 (which replicates column 1 of Table 4.2, the base case) and 2 of Table 4.4 we find that this approach fails to identify differences in house price and vacancy elasticities between long and short distance flows (the estimates are within one standard deviation of one another). One explanation may be that, as noted above, using the simple dichotomy between contiguous and non-contiguous regions fails to capture the large inter-regional differences in common boundary lengths. We conclude that partitioning by non-contiguous regions alone is not

sufficient to identify housing and employment flow elasticities, while using the length of common regional boundary as an interacted variable allows us to do so.

4.4. Conclusions

As with earlier work, we find that an analysis of bilateral migration flows which fails to distinguish flows across adjacent regions from those across non-contiguous regions gives biased estimates of relative house price and vacancy elasticities.

Our findings are that these results are consistent firstly with the presence in short distance flows of home movers who simply change address between neighbouring regions but without changing their work-place and secondly with the absence from migration figures of job-seekers who take up employment in neighbouring regions without changing address. We have argued that home movers may take advantage of regional house price premiums while not changing their work-place while job-movers may take up employment in a neighbouring region while choosing to commute rather than move home, and that these independent job and house moves are sufficiently important to effect estimates of migration equations. We find also that such effects are most precisely estimated by interacting employment and labour market variables with the length of the common regional boundary rather than by partitioning the sample into contiguous and non-contiguous migration flows.

FOOTNOTES

1. The Centre for Economic Performance is financed by the Economic and Social Research Council. Financial support is also acknowledged from the Esmee Fairbairn Charitable Trust.

2. There are two exceptions; firstly, retirement effects where households move home over long distance but where no employment effects are present and secondly long distance commuters. In our empirical work we will assume that retirement flows are adequately captured by regional fixed effects (in fact prime age adults-15 to 44 year olds-form 60 per cent of total migration flows) and that long distance commuting forms a relatively small share of overall commuter flows.

3. Unfortunately this question has not been asked more recently.

4. 1981 figures for England and Wales are based on Population Census returns from the "Census 1981, Work-place and Transport to Work: England and Wales." No comparable data are available for Scotland.

5. While Gordon (1975) and Molho (1982) were able to analyse data on male migrants of working age we are restricted to using migration of all age cohorts and for both men and woman. See Jackman and Savouri (1991, Note 1) for an analysis of the NHS Central Register data.

6. While most models of migration have failed to include housing variables into their preferred specifications Jackman and Savouri (1991) allowed for a variety of housing variables of which only relative regional house prices were generally significant.

7. It will be noted that in the equation reported in Table 2 column 1 the wage effects for the South East take a different sign from those for other migration flows. In Jackman and Savouri (1991) we show that wage differentials for the South East tend to be demand driven (high wages associated with excess demand for labour) whereas for the other regions relative wages tend to be cost driven and unrelated to relative labour demand.

8. If instead of the length of the common regional boundary we interact the relative house price term with a dummy variable taking the value one for contiguous and zero for non-contiguous regions, the interaction term is no longer significant (t=0.5).

9. With the relative vacancy variable it turns out that the simple zero-one dummy specification works nearly as well (t=1.9) as the length of the common boundary.

DATA SOURCES

M_{ij}: Inter Regional Movements.

Recorded internal population movements based on transfers of doctors' patients. CSO, Regional Trends (see Population), various issues. Figures pre-dating 1981 obtained from:

Office of Population Censuses and Surveys,
Migration Analysis Unit,
St. Catherines House,
10 Kingsway,
London WC2B 6JP.

U: Total Unemployment excluding School Leavers, GB.

Department of Employment "X-11" Series. This series derives from a consistent definitional base for unemployment over our sample period. Quarterly Average. Available on request to the:

Department of Employment,
Caxton House,
Tothill Street,
London SW11 9NF.

U_i: Regional Unemployment Stock.

Department of Employment Gazette, various issues. "Wholly Unemployed Excluding School leavers". As a result of definitional problems due to changes in benefit eligibility over our sample period, figures from contemporaneous sources are not consistent over time. To overcome this problem we use the Department of Employment's "X-11" consistent unemployment series to correct the regional unemployment levels. Quarterly average.

R_i: Proportion of Long Term Unemployment by Region.

This refers to the proportion of male unemployed over one year in the unemployed pool. Department of Employment Gazette, various issues. Average of January and July proportions.

V_i: Regional Vacancy Stocks.

Department of Employment Gazette, various issues. Total vacancies excluding both vacancies reported at Careers Offices and those based on the Community Programme. Monthly average.

pH_i: Regional House Prices.

Mix Adjusted Index of Dwelling prices, CSO, Regional Trends (see Housing) various issues. Quarterly average. Original source Department of the Environment. To obtain a time series for Regional House Prices we use 1987 Building Society valuations for dwelling prices, all borrowers. Regional Trends, 1989.

W_i: Regional Earnings.

We use Average Hourly Earnings excluding overtime payments for Full Time Adult Males. April Figures. Department of Employment, New Earnings Survey (Part E).

P: GDP deflator. CSO Economic Trends, various issues.

P_i: Regional non-house prices based on consumers' expenditure less housing. Regional Reward Survey figures.

e: Engagements in the whole economy. Jackman et al (1989).

For full details of sources for our regional data set see Savouri (1991).

TABLE 4.1

Distance moved in last move by main reason for moving

Main reason for move	Distance of Last Move (Miles)		
	Under 5	5-49	50 or more
Housing Reasons	33	19	9
Environmental Reasons	9	12	6
Job-Study Reasons	4	18	53
Personal and Other Reasons	54	51	31

Source: General Household Survey, 1976, Table 5.50.

TABLE 4.2

Inter-regional migration
Great Britain 1975-1989

(1350 observations)
Dependent variable ln m_{ij}

Explanatory variables	(1)		(2)		(3)	
u_i	3.1	(8.2)	3.2	(8.2)	3.1	(8.1)
R_i	-0.33	(2.3)	-0.32	(2.3)	-0.31	(2.2)
u_j	-3.5	(9.2)	-3.5	(9.2)	-3.5	(9.1)
R_j	0.35	(2.5)	0.34	(2.4)	0.33	(2.4)
ln (V_i/V_j)	-0.057	(3.0)	-0.054	(2.9)	-0.072	(3.5)
ln (V_i/V_j)*bound$_{ij}$	*		*		0.018	(2.1)
c_{ij}	-3.1	(2.4)	-3.1	(2.4)	-3.1	(2.4)
ln m	0.87	(17.7)	0.87	(17.7)	0.87	(17.7)
ln (pH_i/pH_j)	0.26	(6.4)	0.24	(5.8)	0.24	(5.8)
ln (pH_i/pH_j)*bound$_{ij}$	*		0.045	(1.9)	0.052	(2.2)
ln $(\bar{p}H_i/\bar{p}H_j)$	0.51	(1.2)	0.56	(1.3)	0.55	(2.2)
ln (w_i/w_j)	1.1	(5.6)	1.1	(5.6)	1.0	(5.4)
ln (w_i/w_{SE})	-1.2	(3.8)	-1.3	(3.9)	-1.2	(3.7)
ln (w_{SE}/w_j)	-0.36	(1.1)	-0.38	(1.2)	-0.34	(1.0)
$\bar{R}^2$ (%)	97.8		97.8		97.9	

Notes: See over.

Notes to Table 2:

The equations were estimated using a complete set of 90 bilateral fixed effects (F_{ij}) by stacked Ordinary Least Squares.

90 observations for each of the 15 years of our sample.

t-statistics in parentheses. Critical value for one sided test at 5 per cent level of significance 1.6 and at 10 per cent level 1.3.

m_{ij} denotes the migration rate from region i to region j, m the aggregate migration rate, u denotes unemployment rates, R denotes the proportion of male long term unemployed, V denotes total notified vacancies, w denotes average hourly earnings excluding overtime of full time adult non-manual men, pH denotes house prices (from the Department of the Environment), $\bar{p}H$ denotes non-house prices (from the Regional Reward Survey) and c_{ij} denotes the squared difference in the employment shares in production industries. Sources of the data are described in the data appendix.

$bound_{ij}$ is a measure of the length of common regional boundaries, set to zero for non-contiguous regions. The average value for non-zero $bound_{ij}$ is 3.5, and the range 0.7 (NW-NO; SW-WA) to 6.5 (EM-YH).

On average 60 per cent of NHS Central Register flows are between adjacent regions.

In Jackman and Savouri (1991) the estimates from the specification of column 1 were found to be stable across the truncated samples: 1975-87, 1975-85, 1975-83 and 1975-81.

Truncating the specification of column 3 above to cover the sample 1975-83, we obtain estimates of -0.075 (2.9) for V_i/V_j and 0.02 (1.8) for $(V_i/V_j)*bound_{ij}$, while we obtain estimates of 0.21 (1.9) for (pH_i/pH_j) and 0.037 (0.6) for $(pH_i/pH_j)*bound_{ij}$, the respective figures for the sub-sample 1975-81, were, -0.11 (3.2), 0.03 (2.0), 0.20 (1.6) and 0.046 (0.6).

TABLE 4.3

Length of Common Regional Boundaries

Regions	NO	YH	EM	EA	SE	SW	WM	NW	WA	SC
North	...	4.4	0	0	0	0	0	0.7	0	4.1
Yorkshire & Humberside	4.4	...	6.5	0	0	0	0	3.6	0	0
East Midlands	0	6.5	...	3.5	3.7	0	5.1	1.3	0	0
East Anglia	0	0	3.5	...	5.3	0	0	0	0	0
South East	0	0	3.7	5.3	...	6.2	1.0	0	0	0
South West	0	0	0	0	6.2	...	3.1	0	0.7	0
West Midlands	0	0	5.1	0	1.0	3.1	...	2.2	6.1	0
North West	0.7	3.6	1.3	0	0	0	2.2	...	1.4	0
Wales	0	0	0	0	0	0.7	6.1	1.4	...	0
Scotland	4.1	0	0	0	0	0	0	0	0	...

Source: Regional Trends (1991 p.5)

Unit of measurement: map millimetres (scale 1mm = 32 miles)

TABLE 4.4

Inter-regional migration
Great Britain 1975-1989

Dependent variable ln m_{ij}

Explanatory variables	1350 obs (full sample)	840 obs (non-contiguous)
u_i	3.1 (8.2)	3.2 (5.9)
R_i	0.33 (2.3)	-0.33 (1.5)
u_j	-3.5 (9.2)	-4.0 (7.4)
R_j	0.35 (2.5)	0.47 (2.2)
ln (V_i/V_j)	-0.057 (3.0)	-0.070 (2.6)
c_{ij}	-3.1 (2.4)	-3.2 (1.6)
ln m	0.87 (17.7)	0.81 (10.7)
ln (pH_i/pH_j)	0.26 (6.4)	0.27 (5.0)
ln (pH_i/pH_j)	0.51 (1.2)	0.91 (1.4)
ln (w_i/w_j)	1.1 (5.6)	1.2 (4.3)
ln (w_i/w_{SE})	-1.2 (3.8)	-2.1 (4.4)
ln (w_{SE}/w_j)	-0.36 (1.1)	-0.27 (0.6)
$\bar{R}^2$ (%)	97.8	95.9

Notes: See Notes to Table 2.

FIGURE 4.1

Job moves and housing moves

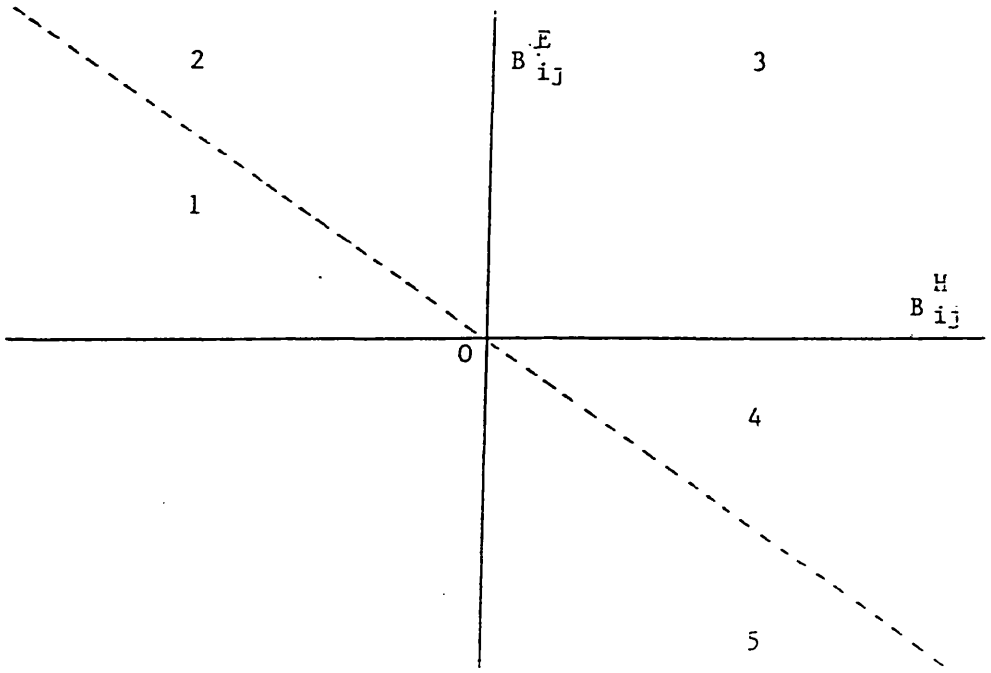
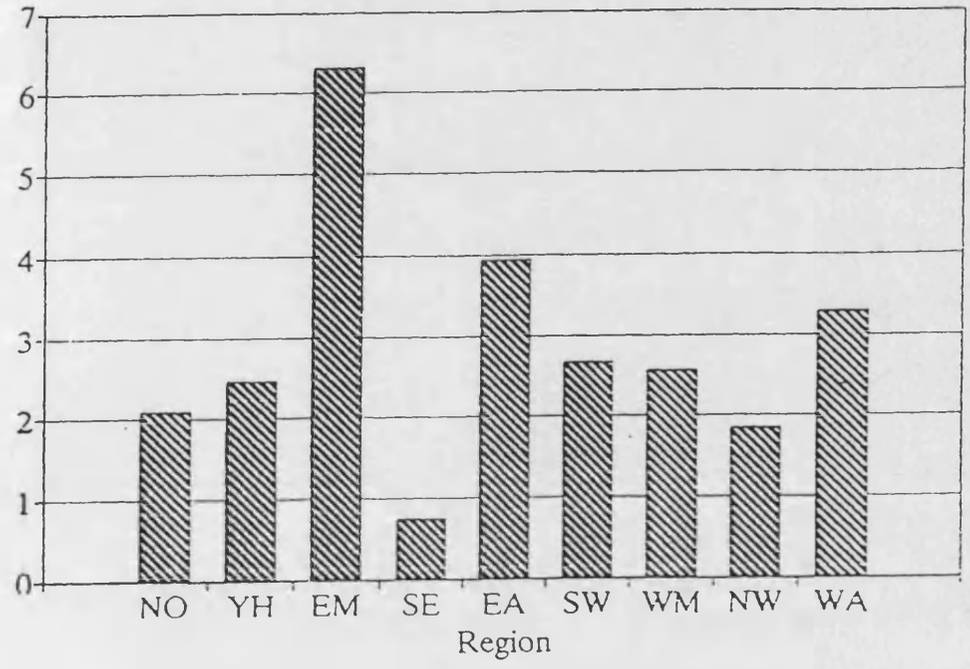


FIGURE 4.2

Percentage of employed residents working outside region



Percentage of employed resident outside region

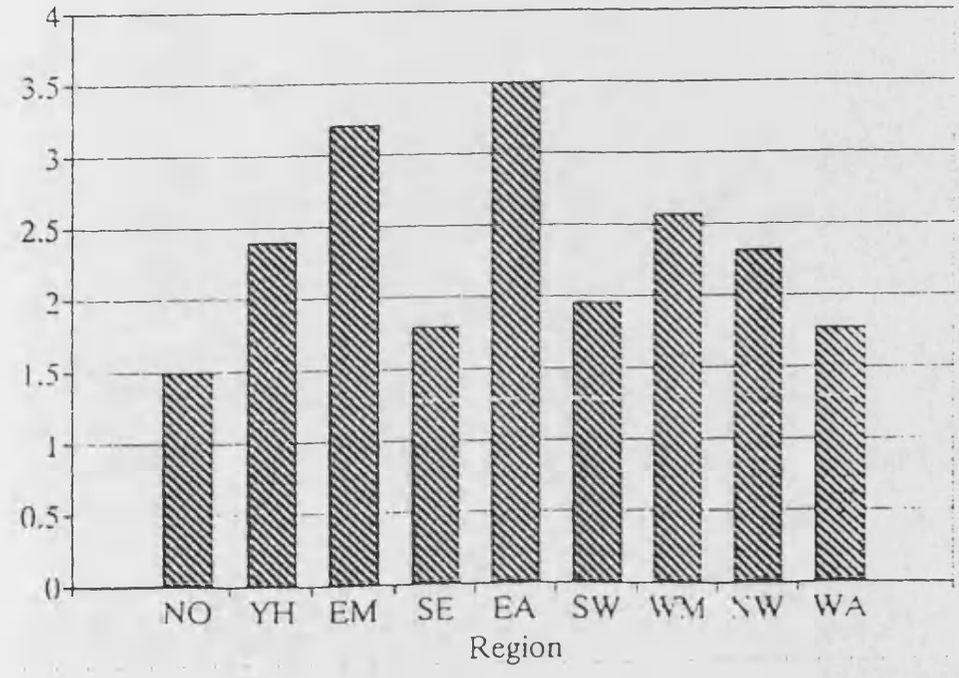
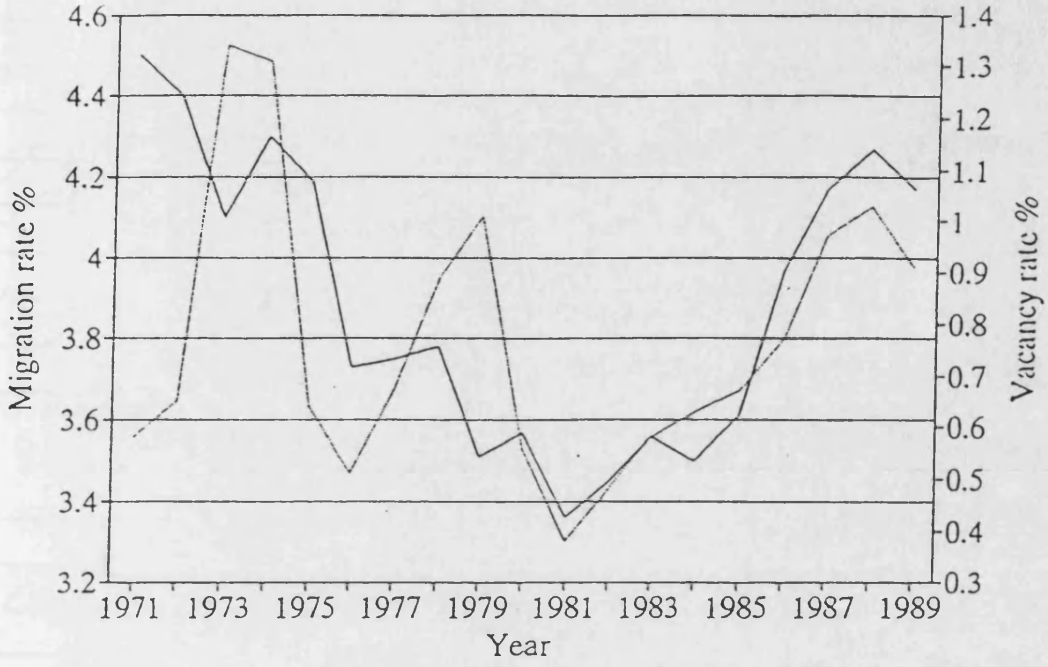


FIGURE 4.3

Regional migration GB 1971-1989



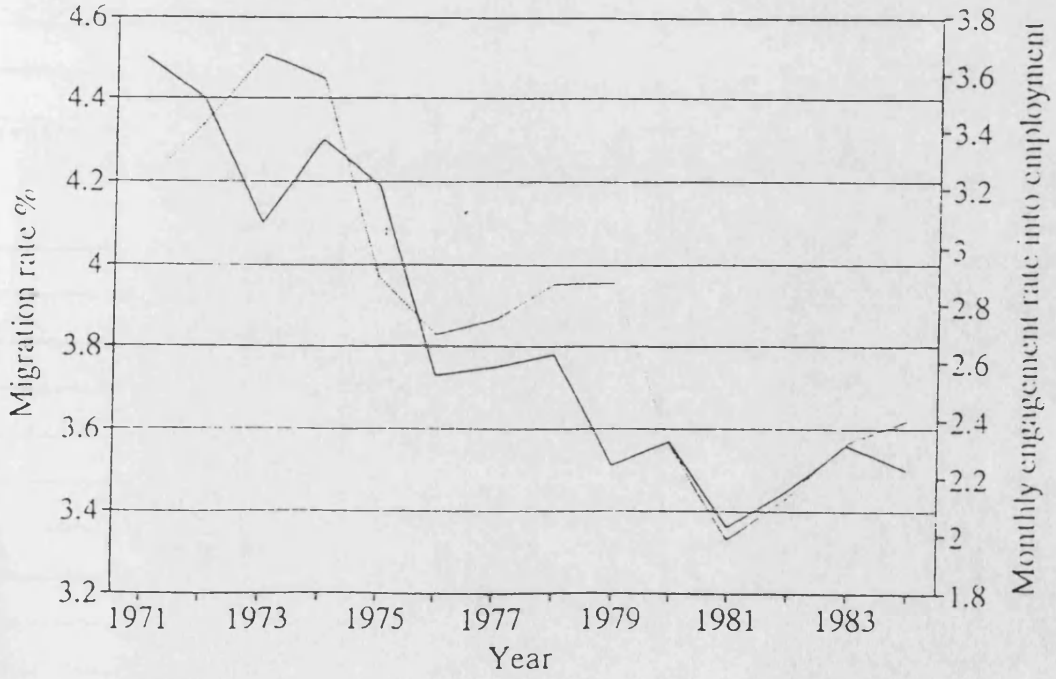
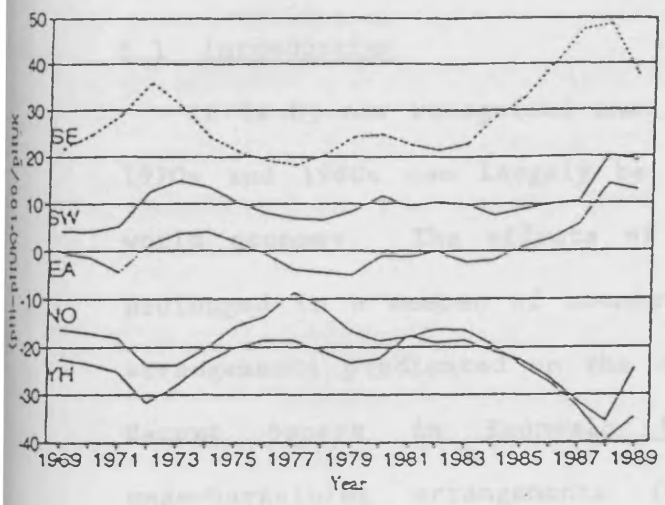
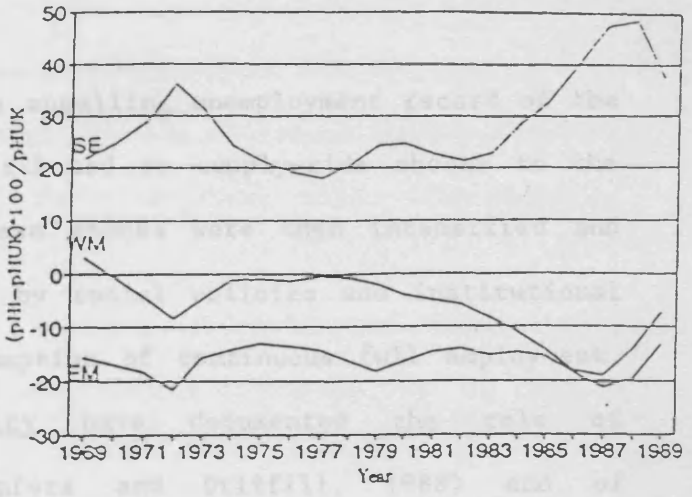
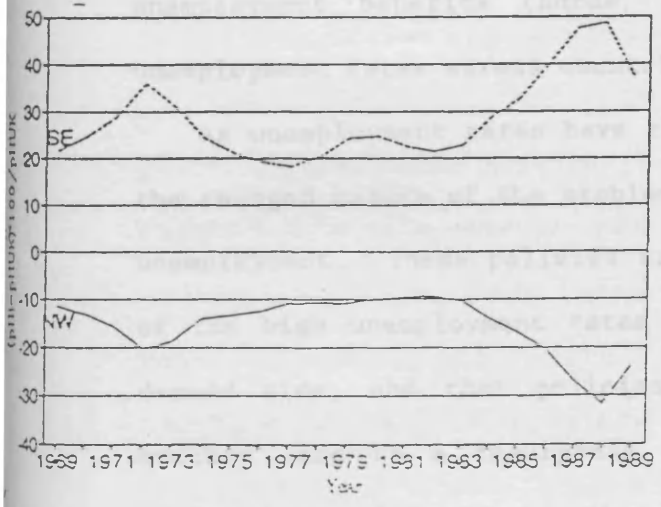


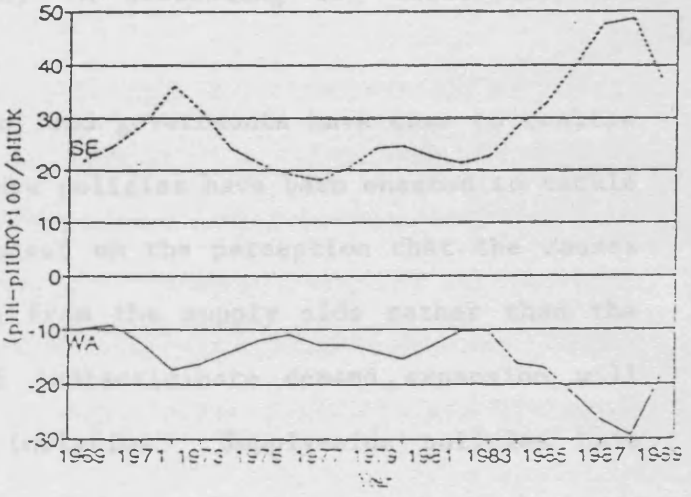
FIGURE 4.4

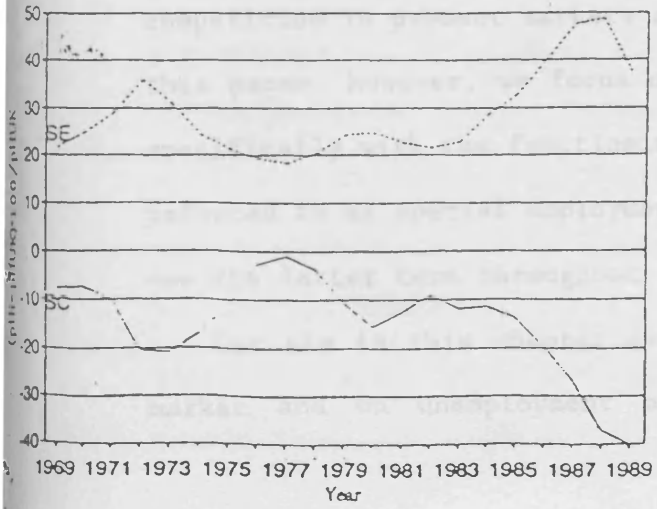
Regional house prices relative to UK











CHAPTER 5

LABOUR MARKET POLICIES AND UNEMPLOYMENT IN THE OECD

5.1 Introduction

It is by now recognised that the appalling unemployment record of the 1970s and 1980s can largely be attributed to supply-side shocks to the world economy. The effects of these shocks were then intensified and prolonged in a number of countries by social policies and institutional arrangements predicated on the assumption of continuous full employment. Recent papers in Economic Policy have documented the role of wage-bargaining arrangements (Calmfors and Driffill, 1988) and of unemployment benefits (Burda, 1988) in accounting for differences in unemployment rates across countries.

As unemployment rates have risen, and governments have come to realise the changed nature of the problem, new policies have been enacted to tackle unemployment. These policies are based on the perception that the causes of the high unemployment rates are from the supply side rather than the demand side, and that policies of indiscriminate demand expansion will quickly lead to a resurgence of inflation. Supply-side policies have ranged from reforms in taxation and social security to attempts to increase competition in product markets and to reduce the power of trade unions. In this paper, however, we focus on a sub-set of these policies having to do specifically with the functioning of the labour market. These policies are referred to as special employment measures or as labour market policies, we use the latter term throughout.

Our aim in this chapter is to examine the consequences on the labour market and on unemployment of expenditure on labour market policies.

Because the variations in such policies are more marked across countries than over time with any particular country, the most useful comparisons and contrasts that can be made are across boundaries. Recently comparable data from several countries have become available, thanks largely to the efforts of the OECD and the Statistical Office of the European Communities.

In particular, following the classification of labour market policies recently published by the OECD, we focus on these major components of labour market policy:

(i) Employment services, such as the provision of information, guidance or financial support to assist the unemployed in finding jobs.

(ii) Labour market training.

(iii) Direction creation and employment subsidies.

Public expenditure on policies of this type has risen rapidly in recent years. Expenditure has increased as unemployment rates have risen. In Figure 5.1 we plot average expenditure per unemployed person (normalised by per capita GDP) on these policies for the fourteen countries for which we have data against the average unemployment rate for those countries. While the time series data on spending on labour market policies is a bit rough and ready (see below), Figure 5.1 shows a clear tendency for a sustained rise in unemployment to be followed after a period of a few years by a significant expansion in expenditure on labour market policies.

To put these figures in perspective, in 1988 spending on labour market policies amounted to as much as 0.7 per cent of GDP in six of the industrialised countries (Belgium, Finland, West Germany, Ireland, New Zealand and Sweden) and even in the United States such policies of active intervention in the labour market cost one fifth of one per cent of GDP (Table 5.1).

Notwithstanding the substantial outlays on these programmes, economic analysis and evaluation of their effects has been sparse. In the 1970s, the rapid rise in unemployment was accompanied in many countries by accelerating inflation. Restrictive fiscal and monetary policies were seen as essential for the control of inflation and this climate imposed severe financial constraints on labour market policies. Governments were searching for policies which could reduce unemployment without costing much money or adding to inflationary pressures. In operational terms, labour market policies thus had the objective of maximising employment gains per unit of expenditure (the "bang for the buck"). The underlying economic logic of this approach was never entirely clear, though it continues to provide the basis for most attempts to evaluate programmes.

By the late 1970s, however, attempts were being made to analyse labour market policies as methods of reducing the natural or equilibrium rate of unemployment (Baily and Tobin, 1977; and see also e.g. Jackman and Layard, 1980; Johnson 1980). These approaches suffered from the problem that there was no generally accepted theory on what the natural rate of unemployment was, of how it should be modelled, or therefore of what types of labour market intervention might be effective in reducing it. The labour market was analysed in these studies in the conventional economic supply and demand framework, with unemployment generated by particular assumptions about supply behaviour or by the arbitrary imposition of wage or price rigidities.

More recent work has tried to allow for the fact that the labour market is unique among markets for its diversity of services traded and for the human dimension in both supply and demand decisions. Labour services cannot be branded and marketed in impersonal supermarket shelves. Despite this, many of the problems that befall this market can usefully be analysed

with the conventional supply and demand framework. But many others cannot. The problems and policies that we wish to analyse here are very much of the latter kind. Instead of the conventional supply and demand framework, we therefore use one based on the co-existence of unemployment and vacant jobs and on the equilibrium relation that holds between them, known as the u/v curve or 'Beveridge curve'. The microeconomic theory underlying this curve is consistent with the diversity of workers and of jobs which characterises the labour market and which accounts for the existence of unemployment.

We will show that, in many countries, in recent years the Beveridge curve has tended to shift out to the right, suggesting that the labour market is operating less efficiently in matching unemployed people to the vacancies available. This loss of efficiency in the labour market has led to higher unemployment. Labour market policies can then be seen in terms of improving the efficiency of the labour market and hence reducing the equilibrium unemployment rate.

We first provide a short account of the types of policies currently in operation. Next, we provide a framework for identifying and analysing the shocks that affect labour markets. Finally, we show how labour-market institutions and policies affect the market's response to the shocks. Our analytic framework enables us to do just that and prepares the way for an evaluation of the experiences of the major OECD countries. Although in the particular area of our concern the data are still far from perfect, we make use of them to argue that well-targeted policies can ease the burdens of structural adjustment on employment. Our estimates suggest that the effects of such policies on employment can be large relative to their budgetary costs.

5.2 Labour market policies

As noted in the introduction, the genesis of labour market policies was

essentially pragmatic, an ad hoc response to a clearly perceived social problem of high unemployment rates for which conventional economic analysis could offer no immediate solution. The policies are defined as those which work upon the malfunctioning - in one respect or another - of the labour market itself, rather than on wider economic policies (macroeconomic, industrial or fiscal) which can have an impact on unemployment.

Systematic analysis of labour market policies has only recently been made possible at an international level as a result of the OECD initiative to gather data on a comparable basis from its member nations. These data, and the classification procedures adopted, were set out in the OECD Employment Outlook for September 1988 (Chapter 3). Data for public expenditure on the main categories of labour market policies for 23 countries are given in Table 5.1.

5.2.1 Employment services and administration

The first category, employment services and administration (ESA), covers all public expenditure of employment exchanges relating to finding work for the unemployed. In most countries the government provides a network of employment exchanges and employers are encouraged (in some countries required) to notify vacancies. There is, therefore, relatively little variation in this item across countries. Where there is variation it is in the extent of assistance provides to unemployed people in terms both of the amount of guidance (the length and frequency of interviews and so on) and of practical help with making job applications. In a number of countries a major element of labour market policy has involved a much more intensive role for the employment services in providing information, guidance and assistance to long-term unemployed people. (Such programmes operate in many European countries: an example is the "Restart" programme recently launched in the UK).

The rationale for employment exchanges in general is clearly one of bringing together information about job opportunities to enable the unemployed to search more efficiently. But it has never been clear how important empirically has been a lack of information in hindering job search, and it certainly seems unlikely that there has been a significant deterioration in information flows in recent years. It is not obvious that in quantitative terms there is much of a payoff from increasing the information available to the unemployed.

Policies involving more intensive counselling, and assistance in applying for jobs, for the long-term unemployed derive from the concern that long-term unemployed people have especial difficulties in getting back into work. Because they have to surmount additional obstacles in the form of an erosion of skills, a loss of self-confidence or employer prejudice they need additional advice and assistance if they are to have a good chance of finding a job.

The countries spending most on employment measues as a percentage of GDP are West Germany, Canada and Sweden. However, a better measure of the quality of service provided is the ratio of expenditure to the number of unemployed people, and this figure is given in Column (5) of Table 5.1. (In the case of Sweden one measure of unemployment takes into account both "open" and "hidden" unemployment, i.e. the number of people employed on various labour market policy schemes, which are discussed below.) The highest expenditure per unemployed person on employment services is in Sweden. Other countries that do well on this measure include Norway and Switzerland.

While the corporatist and social democratic economic policies of Sweden and the other Scandinavian countries may not appear to have much in common with the highly decentralised and non-interventionist approach to economic

policy in Switzerland, in their approach to employment services the Scandinavians and the Swiss have much in common. In particular, employment services are organised around what may be termed the "employment principle", with the key objective being to find work for the unemployed rather than the "benefit principle" where the objective is to provide financial support for people while unemployed and looking for work. In both the Swiss and the Swedish systems there is pressure on the unemployed, which can be coupled with denial of benefit, both to look for work and to take suitable job offers. In Sweden there is also extensive provision of training schemes and the like, to which we return below. (For further discussion of employment services in Switzerland see Danthine and Lambelet, 1987, or, the OECD Annual Report on Switzerland for 1985-86).

5.2.2 Labour market training

The second heading, labour market training (LMT), is self-explanatory. This heading refers to training for people who have left school or other formal education, have in general had experience of employment, who have become unemployed and whose prospects of finding work are poor because of a decline in demand for the type of work they had been doing.

Such people face in the sharpest way the classic property rights problem of underprovision of training. Employers will be reluctant to train workers knowing that they can subsequently move off and work elsewhere and hence the employer cannot recoup the return on the investment in training. In many countries, employers' organisations within industries or sectors organise industry-wide training to which member firms are obliged to contribute. In others, government may already provide financial support towards the cost of courses and the like. While such policies are not specifically directed towards the unemployed, clearly employers are more likely to take on unemployed people who require some training more of

the costs of such training is to be borne by others.

Even so there is no great incentive for an employer to take on an unemployed, untrained person, and there is a place for government support for training of unemployed people even in countries where in general the provision of training is adequate. Such government support can take the form either of paying unemployed people to attend courses (this payment would normally be at about the same rate as unemployment benefit plus some out-of-pocket expenses as in Sweden), or paying employers to provide training to unemployed people they take on.

The variation in policy across countries in the provision of training for the adult unemployed is enormous. Measured in terms of expenditure as a proportion of GDP (column (2) of Table 5.1) Ireland, Denmark and Sweden do most in this respect, but measured in relation to the numbers of unemployed people (column (6)) Sweden is again far ahead. The Swedish policy of providing support for training for the adult unemployed was instituted at the end of the 1930s, and has not really been much changed by the onset of high unemployment rates in the rest of the world. It has perhaps shown its worth in helping the Swedish labour market to adjust to the shocks of the 1970s and 1980s, without the sharp rise in unemployment experienced elsewhere. (In Switzerland it will be noted that government spending on such activities is minimal but on the other hand employers' organisations are regarded as effective and very active in this area.)

5.2.3 Direct job creation and employment subsidies

The third type of policy, is direct job creation and employment subsidies (DJC/ES). This covers public works organised by local authorities or other agencies, the cost of which are borne by government provided unemployed people are taken on, and subsidies to employers in the private sector for hiring unemployed people. It also covers assistance to

unemployed people to become self-employed or set up their own businesses. Examples of direct job creation schemes include the relief work scheme in Sweden, the Community Programme in the UK and the Community Employment Programme in Australia. Subsidies to employers taking on, in particular, long-term unemployed people have been used in Australia, Austria, Denmark, Finland, West Germany, Ireland, the Netherlands and Sweden. Exceptionally in the UK, the government has given subsidies to long-term unemployed people themselves, for taking low-paid jobs, rather than subsidising employers.

The rationale for job creation has always been less straightforward than the justification for employment services or support for training. One cannot, for example, invoke partial equilibrium arguments such as that subsidies can reduce relative labour costs (unless, one holds that aggregate unemployment is the consequence of some arbitrary real wage rigidity). For a given level of aggregate demand in the economy it has to be asked whether job creation measures or employment subsidies can increase the total number of jobs. If the total number of jobs does not increase, the justification for shifting the work available from one line of activity to another, or from one individual to another, seems unclear. If the number of jobs does increase, it might be expected to affect pressure of demand in the labour market and thus jeopardise the objective of controlling inflation.

There have however been some supply-side arguments for job creation policies, particularly those linked to the long-term unemployed. For example, if employers are reluctant to take on long-term unemployed people because they are thought to have lost work habits, skills or self-confidence as a result of being unemployed, work experience is the only way of reversing these problems and restoring the productive potential

of long-term unemployed people. Similarly, if long-term unemployed workers have lost contact with the information network concerning new job vacancies, again additional assistance in the form of recruitment subsidies may be justified. In that sense, it is equivalent to training, even if no element of formal education is involved. Given the rigidity of pay structures it is very difficult for the long-term unemployed themselves to pay for such 'training', even if they had any money. There is also the argument that increasing the number of jobs, if it means employing more long-term unemployed people, will be less inflationary because the long-term unemployed have become to a large extent isolated from the active labour market and hence have a smaller effect on the balance of demand in that market.

5.2.4 Other programmes

It is worth mentioning that the OECD refers to two other categories which we exclude from our analysis. One is youth measures, which we exclude because it is so difficult to distinguish such measures from the regular and general support provided by governments for education and training for young people. In some countries, most notably West Germany, the school system develops into a system of vocational training and thus there is no need for seperate remedial sytems providing training for those who leave school and become unemployed. Arguably differences between countries in labour market spending or youth training are primarily a means of compensating for deficiencies in the formal education system rather than enhancing the efficiency of the labour market. Thus spending is highest in Ireland, Italy and the UK, and much lower in West Germany (OECD Employment Outlook, September 1988, ch.3, Table 3).

Because many training schemes involve some element of participation in work, and most jobs for young people involve some element of training, it

is natural to include the two together. But from a labour market point of view there is an important difference, in that however adequate the education and training system it can still be difficult to place a young person in their first job, particularly given the emphasis many employers place on work experience. In Sweden local authorities act as employers of last resort for young people and employ them working alongside existing staff for periods of up to six months in order to provide them with some work experience. Expenditure on such activities clearly forms part of labour market policy rather than education. But because we cannot separate out these components, we exclude youth programmes for our measure of labour market policy.

The second is measures for the disabled. This again suffers from severe definitional problems. Programmes which in one country will be part of health service expenditure in another fall into the labour market policy category.

Our preferred measure of the intensity of labour market policies across countries therefore is restricted to spending on the three headings we have described, measured in relation to the number of people unemployed. This figure for 1988 is given in the final column of Table 5.1.

5.3 The analytical framework

We make use not of the conventional labour supply and demand framework, but rather of a model allowing the coexistence of unemployment and job vacancies. We ask first what determines in equilibrium the unemployment rate and the stock of job vacancies, and then discuss how these variables change in response to economic shocks and to policy changes.

We find it helpful to think of the determination of unemployment and vacancies in terms of two curves, the first being the Beveridge curve, or u/v curve, which we interpret as the condition of flow equilibrium in the

labour market, and the second being the vacancy supply curve which traces out combinations of unemployment and vacancies consistent with optimising wage setting and employment behaviour on the part of firms and workers.

5.3.1 The Beveridge (UV) curve

The Beveridge curve is a relation between job vacancies and unemployment that traces points for which the flow into unemployment is equal to the flow out of it. Since when the flow into unemployment is equal to the flow out of it the stock of unemployment cannot be changing, the Beveridge curve traces points for which unemployment is stationary.

We first describe the logic underlying the Beveridge curve. The Beveridge curve is a meaningful relation for two reasons. First, frequent job changing and movement in and out of the labour force by workers, the birth and death of new firms, and job turnover in existing firms induced by structual change and other reasons, bring about a continuous and sizeable flow of workers and jobs into unemployment. Second, the many different requirements imposed by jobs on potential workers and the many different attributes of the available workers, some of which may not be immediately observable, imply that even if the number of jobs and workers match each other exactly, it is unlikely that those flowing into unemployment will instantly find a good job match. Thus vacant jobs and unemployed workers co-exist at all times and are engaged in a process of search and information processing that eventually leads to exit from unemployment.

Now given the processes that move workers in and out of unemployment, a higher rate of job vacancies must be associated with a lower rate of unemployment. With more vacant jobs in the market the unemployed workers engaged in search will find it easier to locate productive job matches. Thus, if the Beveridge curve is plotted in a diagram with the number of job vacancies (or the rate of job vacancies, using the labor force as a

normalizing variable) on one axis and the level or rate of unemployment on the other, it will have negative slope (Figure 5.2). Points on the curve show combinations of vacancies and unemployment where the latter is not changing. Above the curve there are more jobs for given unemployment, so unemployment is falling, and below it jobs are fewer, so unemployment is rising.

5.3.2 The vacancy supply (VS) curve

The basic idea is that it will be profitable for firms to take on more workers, and thus to post vacancies, when the marginal (revenue) product of labour is high relative to the wage, and relative to the costs of recruiting additional workers. A high unemployment rate tends to depress wages, and to make it much easier to recruit workers, and hence encourages firms, other things equal, to expand employment by creating job vacancies.

The first component of this approach then is the relationship between wages and job vacancies. The number of jobs (i.e. employment plus unfilled vacancies) that come into the market depends on the relation between labour productivity and the real cost of labour, as in conventional labour-demand analysis. In a market where the allocation of workers to jobs takes place in a decentralized manner, after search, job application and job screening, it also depends on the cost of hiring and on the quality and quantity of the unemployed labour force. Thus, if we plot the number of jobs against the real wage rate, we should get a downward-sloping curve that shifts to the right when labour productivity increases and when there are more or better qualified unemployed workers; and shifts to the left when the cost of hiring or the non-wage costs of jobs increase.

There are some differences between this curve and the conventional demand for labour curve, which we shall utilize in our empirical work. The curve that we have described determines the number of jobs, i.e. employment

and job vacancies. When there is turnover, jobs stay vacant for a non-trivial length of time, and the relation between employment and the number of jobs is not a simple mechanical one but depends on economic conditions. In Figure 5.3 we plot this curve in a diagram with job vacancies on one axis and real wages on the other, holding employment along the curve constant. Employment is still undetermined. We refer to this curve as the vacancies curve and denote it by VC.

At a given wage rate, if employment is higher, the marginal productivity of labour is less if there are diminishing returns in production, and so profit from the marginal job is also less. So at higher employment firms will want to open fewer vacancies at any given wage rate and so the vacancies curve in Figure 5.3 is further to the left. With a given labour force, higher employment implies lower unemployment, so the vacancies curve also shifts left because of the reduced availability of labour. With lower unemployment, and holding the quality of the labour force constant, there are fewer workers knocking on firms' gates for jobs. Firms are likely to find it more difficult to recruit and so may close up some jobs at given wages. This effect has attracted a lot of attention in the search literature but is not as important for the applications that we shall discuss in this paper.[1] Nevertheless, in general we should expect higher employment (lower unemployment) to be associated with a vacancies curve further to the left than the one in Figure 5.3.

The curve VC then depicts the number of vacancies firms will create, given the level of employment, as a function of the wage. The next stage is to determine wages. We think of wages as the outcome of an explicit or implicit bargain between firms and workers. If there are more vacancies in the market, other things equal, workers are in a stronger position to bargain for higher wages. The firm concedes because with more competition

from other firms for workers, it is running the risk of losing its workforce if it does not. The wage curve linking wages to vacancies, will shift to the right whenever there is an exogenous increase in wage 'pressure', caused for example by an increase in union militancy. Other exogenous causes of wage pressure include unemployment benefits, which reduce the cost of unemployment to workers, and any other policy that reduces purchasing power for given gross wages, such as income and expenditure taxes. It shifts to the left whenever exogenous factors increase the bargaining power of firms relative to that of unions. Legislation designed to control the power of unions is a pertinent example.

The wage curve is related to a conventional supply of labour curve but it is fundamentally different from it because it depends as much on the workers' bargaining position as on the firms'. It is therefore influenced by both 'supply' and 'demand' conditions. Finally, the rate of unemployment is an important influence on wages in bargaining models; when unemployment is lower given the number of job vacancies, wages are higher because workers are in a stronger bargaining position vis-a-vis firms. thus, higher employment (lower unemployment) shifts the wage curve in Figure 5.3 to the right (again assuming a given labour force).

The intersection of the vacancies and wage curves gives the equilibrium wages rate and the equilibrium number of job vacancies in the market. This equilibrium, however, is for given employment, which still remains undetermined. In order to complete the picture of the labour market and determine employment we bring into the analysis the Beveridge curve.

5.3.3 Labour market equilibrium

Equilibrium vacancies and unemployment are given by a combination of the curves in Figures 5.2 and 5.3. We have already argued that different levels of unemployment are associated with different sets of curves in

Figure 5.3. Higher unemployment shifts the vacancies curve up and to the right and the wage curve up and to the left. The higher unemployment therefore brings into the market a bigger number of jobs for two reasons; because wages are reduced and because more jobs open up for given wages. The effect of higher unemployment on wages is ambiguous in the diagrammatic analysis of Figure 5.3. The direct effect through the loss of workers' bargaining strength, however, is likely to dominate the indirect effect through the number of jobs.[2] The broken lines in Figure 5.3 are drawn in this light.

The intersection points in Figure 5.3, when unemployment is varied, trace an upward-sloping curve in Figure 5.2. We term this curve VS, for supply of job vacancies. The intersection of the Beveridge curve (labelled UV) with the VS curve gives the equilibrium rates of unemployment and job vacancies. With knowledge of the labour force, employment and the number of jobs can also be determined. Thus we have now determined all the unknowns and the analysis of the effects of exogenous change, including labour market policies, can begin.

5.4 Three types of change

Figures 5.2 and 5.3 are useful of analysing certain problems. Foremost among these is the question of the sources of change in unemployment, and by implication the sources of driving forces of the cycle.[3] We consider the implications of three different types of change for the curves of Figure 5.3, which will form the background to our empirical evaluation of labour market policies in the 1970s and 1980s.

5.4.1 Aggregate activity shocks

Aggregate economic disturbances will typically in this framework be represented by (temporary or permanent) shifts of the vacancy supply (VS) curve in Figure 5.2.

Aggregate demand shocks, including fiscal and monetary policy, change the demand for labour at given real wages. A fall in demand shifts the vacancies curve in Figure 5.3 to the left, and if the fall is severe enough to cause a rise in job separations, it also shifts the UV curve of Figure 5.2 to the right. But the increase in job separations is unlikely to last for more than a short period after the impact of the shock and the drop in voluntary separations that accompany recessions is likely to counteract it to some extent. So the main change behind the fall in demand is the leftward shift of the vacancies curve.

Another type of aggregate shock would be a change in exogenous wage pressure variables, e.g. a rise in union militancy, or an increase in taxation. These types of shocks have their main impact on the wage curve in Figure 5.3, but again on the vacancy supply curve in Figure 5.2. Changes in unemployment benefits might be expected to effect both the WC and hence VS curves, through their effect on wage bargaining, and on the Beveridge curve through their effect on search intensity.

Thus the main impact of aggregate activity shocks is on the VS curve. A deflationary aggregate demand shock, for example, will shift the VC curve in Figure 5.2 to the right. Hence the VS curve in Figure 5.3 shifts to the right, implying a smaller supply of job vacancies at all levels of unemployment. From point A equilibrium moves down to point B (Figure 5.4). The path of the economy from A to B is likely to be a half loop below the UV curve, as vacancies fall on impact and unemployment begins rising in response to a reduced rate of job matchings.

If demand recovers without any other changes in the economy, equilibrium returns to A through a leftward shift of the VS curve and vacancies and unemployment trace the second half of an anticlockwise loop above the UV curve. Thus, demand shocks unaccompanied by structural change

or by supply-side shocks trace anticlockwise loops around a more or less stationary UV curve. These loops were noted in the early literature on the Beveridge curve and discussed as one of the 'stylized facts' of business cycles.[4]

A permanent shock, say due to an increase in union power, will lead to a sustained higher unemployment rate coupled with a permanent reduction in vacancy rate.

5.4.2 Structural or mismatch shocks

Structural changes such as sectoral shifts in the demand for final output leads to shifts in the UV curve to the right. A structural change in demand leads to more job separations, as the sectors that experience the drop in demand shed more labour. In the steady state the higher separations will be matched by more separations rate either vacancies or unemployment or both need to be higher.

Rightward shifts in the UV curve are also caused by changes that reduce the matching effectiveness of workers and job vacancies. An increase in the geographical dispersion of vacancies and unemployment or in the compatibility of the skills of workers with the skill requirements of jobs are examples of increases in mismatch. Increases in mismatch lead to a fall in the matching rate at given vacancies and unemployment and so to shift out of the UV curve. A similar shift in the UV curve and for similar reasons is caused by a fall in the search intensity of workers or by an increase in the choosiness of either workers or firms. As with mismatch, either of the latter two changes reduces the rate at which unemployed workers are matched to vacant jobs at given vacancies and unemployment and so to a shift out of the UV curve. A similar shift in the UV curve and for similar reasons is caused by a fall in the search intensity of workers or by an increase in the choosiness of either workers or firms. As with

mismatch, either of the latter two changes reduces the rate at which unemployed workers are matched to vacant jobs at given vacancy and unemployment stocks.

A rightward shift in the UV curve causes an increase in the equilibrium rate of both vacancies and unemployment. Equilibrium in Figure 5.4 moves from point A to a point such as C, with the dynamic path traced by a stationary VS curve. Thus, even at this general level of analysis, an empirical distinction emerges between aggregate demand shocks on the one hand and structural (or mismatch or search effectiveness) shocks on the other. In vacancy-unemployment space demand shocks trace negatively-sloped anticlockwise loops, structural shocks give rise to positively-sloped (though probably flat) paths.[5]

5.4.3 Hysteresis

The foregoing contrast between demand shocks and structural shocks has attracted more attention in the United States than in Europe. A similar question that is of more interest in the European context is the question of 'hysteresis'; that is, mismatch, search effectiveness and other changes of a structural nature that accompany or follow a fall in demand and which persist longer than the demand shock.

The argument is that big changes in unemployment such as the ones observed in the 1970s and early 1980s in Europe themselves cause mismatch problems and reductions in the search effectiveness of unemployed workers. An important and much discussed mechanism that causes these problems is long-term unemployment. Big increases in unemployment lead to proportionally even bigger increases in the duration of unemployment. If the long-term unemployed lose skills and the will to search for new job openings, relocate etc., the degree of mismatch between vacancies and unemployed workers increases and workers' search effectiveness falls.[6]

Another factor that causes similar problems is internal adjustments in firms' production practices, which may become more frequent at times of depressed demand. If demand is buoyant firms are busy producing for sale. The high demand yields them sufficient profit and the incentive to engage in time and resource consuming reorganization of their internal practices is reduced. But if demand is slack and profits suffer the incentive to reduce costs by internal reorganization increases. Most frequently such adjustments involve redundancies of workers who are not easily employable elsewhere.[7] Harold Wilson's July 1966 measures are a good example of this. Aggregate demand was reduced in order to give British industry the incentive to 'shake-out' unproductive labour.

Hysteresis through long-term unemployment, structural change or any other reason, shifts the UV curve to the right. But the shift now comes after a downward shift of the VS curve, because the hysteresis comes after a fall in demand. Thus, the dynamic path in Figure 5.4 now starts from A and moves towards B, but it then turns outwards towards point D. If the demand fall that caused the shift in the VS curve in the first instance is temporary, the dynamic path then turns up but not towards its initial equilibrium point A. Hysteresis usually lasts longer than the demand shock. The path from B moves towards point C, on a UV curve that is further away from the origin than the original curve. If the shock is permanent and if the rise in unemployment is accompanied by hysteresis, the path that the economy follows in Figure 5.4 again starts at A and moves down towards point B, but before it settles at B turns towards point D.

5.4.4 Summary

Thus different kinds of shocks produce different dynamic paths in vacancy-employment space. Inspection of real-data diagrams may therefore give some idea of the type of shock that has caused a change in

unemployment. More precise analysis will require better techniques. Given, however, the sharp differences between some of the paths in Figure 5.4, we reasonably expect to be able to differentiate between at least three types of change: the closed anticlockwise loops of temporary aggregate changes, A-B-A; the positively-sloped paths of exogenous structural or mismatch shocks, A-C; and the open loops of aggregate activity shocks with hysteresis, A-B-C or A-B-D. The distinction between a temporary demand shock and a longer-lasting one due, e.g. to changes in wages pressure, is more difficult to draw from a diagram, because of the similarity of the paths A-B-C and A-B-D. This distinction is also more difficult to analyse within our econometric framework than within a framework that estimates the wage equation as one of the structural equations, as for example in the work of Layard and Nickell (1987). In our work we concentrate primarily on policy measures that affect the process that matches workers to job vacancies.

5.5 A first look at the Beveridge diagrams

Figure 5.5 shows the weighted average unemployment and vacancy rates for the 'world' (that is for all the countries in our sample). Part (a) of the figure plots them against time and part (b) against each other, in a space similar to that of Figure 5.4. The plots against time reveal a similar cyclicality in both vacancies and unemployment with some trend. The trend is much stronger in unemployment than in vacancies. Much of the cyclicality in vacancies and unemployment, however, is due to the behaviour of the two series in the United States, which makes up about 40 per cent of the sample. If the United States observations are excluded (Figure 5.6), the cyclicality in both vacancies and unemployment is reduced and the upward trend in unemployment increased.

In terms of our previous analysis, the cyclicality in vacancies and

unemployment is due to temporary shifts of the supply of vacancies curve in Figure 5.4; the trend fall in vacancies to longer-term rightward shifts of the same curve; and the trend rise in unemployment both to the longer-term shifts of the vacancy curve and to rightward shifts of the Beveridge curve. Referring back to Figures 5.2 and 5.3, we can then argue that the temporary shifts in the supply of vacancies curve are most likely due to changes in the demand for labour at given wages, as shown by shifts of the vacancy curve in Figure 5.3; and the longer-term shifts in the supply of vacancies curve to changes in wage pressure at given unemployment rates, as manifested by shifts in the wage curve.

A look at the Beveridge diagrams for the world, part (b) of Figure 5.5 and part (b) of Figure 5.6 when the United States is excluded, suggests that all three types of shifts described in the preceding paragraph may have taken place. There are three discernible cycles in these diagrams. One that started in 1970 or earlier and terminated in 1973; one that started in 1973 and terminated in 1979; and one that started with the downturn of 1979 (1980 when the United States is excluded) and continued to the end of the sample. Each cycle is characterized by a reversible downward shift of the supply of vacancies curve, though when the United States is excluded the reversal in 1978 had hardly taken hold when the 1980 downturn occurred. But in each cycle, the range of the fluctuation in vacancies is further down from the range in the previous cycle, indicating a longer-lasting downward shift of the supply of vacancies curve alongside the cyclical fluctuation.

An equally notable feature of the world Beveridge diagrams is that none of the three loops around the downward sloping UV curve returns to its starting point: 1979 is to the right of 1973 and 1989 is to the right of 1979. Thus the Beveridge curve must have shifted to the right each time,

suggesting that there may have been some worsening in structural problems or in mismatch. In each case, however, the shift of the Beveridge curve came after a recession. Thus on average the rise in world unemployment appears to be closest to the third case that we discussed in the preceding section; that is, to the case of hysteresis following recession.

A look at the country diagrams shows that there are some interesting contrasts between the countries in the sample. Figure 5.7 gives the Beveridge diagrams for all the countries in the sample (plus Switzerland and New Zealand) and in Table 5.2 we suggest a classification of countries according to the three cases discussed in the preceding section, with reference to the cycle that began in 1979-80 or later. The letters under each column refer to the paths in Figure 5.4.

The United States in the 1980s offers the best example of a country that has been subject to aggregate shocks but to no structural change or search-related shocks. Its behaviour contrasts with that of the world average and with that of Germany and the United Kingdom, which appear to be typical cases of aggregate shock followed by persistence. France appears to fit best a description of negative and irreversible aggregate shocks. Pure outwards shifts of the Beveridge curve, unaccompanied by demand shocks, are rare and appear to have affected only two of the smaller countries in two short periods.

5.6 The role of labour market policies and other institutional factors

5.6.1 Labour market policies

The policies included under the general heading of labour market policies are mainly meant to improve the employability of particular groups of unemployed workers.

Labour market policies can affect all three relationships that form our analytic framework. Employment subsidies can increase the supply of jobs

at given wages, while employment services and training programmes can affect the rate at which unemployed workers find jobs at given number of vacancies. In this paper the policies that we consider affect mainly the job-finding rate at a given vacancy rate; that is, policies that either inadvertently affect the Beveridge curve or explicitly make it more favourable. We consider the channels through which they operate in turn.

The target groups are usually the long-term unemployed, though other 'hard-to-place' groups (such as youths who left school early) are often also identified. The net effect of such policies (if successful) is to increase the rate at which unemployed workers find suitable jobs out of a given stock of available vacancies. Thus in terms of our analytic framework they increase the job-matching rate for given vacancy-unemployment stocks and so shift the Beveridge curve towards the origin. Their equilibrium effects are likely to be a reduction of both unemployment and vacancies.

Labour market policies of the kind considered under this heading is likely, however, to have some other influences on the vacancy-unemployment relation. If labour market policies improve the marginal rate of job matching, in addition to the average rate discussed above, they are likely to make the Beveridge curve flatter. A flatter Beveridge curve implies that a given improvement in job availability (increase in the number of job vacancies) decreases unemployment by more; so labour market policies in this case increase the employment benefits of a given programme of job creation.

Labour market policies may also speed up the recovery from a given shock to employment. We argued that adjustments to the equilibrium vacancy-unemployment relation take time and trace anti-clockwise loops around the Beveridge curve. An effective labour market policy may speed up

the adjustment to the equilibrium relation by making it easier for displaced workers to find suitable jobs and removing other inertia in the operation of the jobs market.

Other institutional arrangements also affect the functioning of the labour market:

5.6.2 Unemployment insurance

The effects of unemployment insurance on unemployment is a much debated issue.[8] In the job-search literature the mechanism that attracted most attention is the effect of unemployment insurance on the choosiness of unemployed workers. The alleged effect is that unemployment benefits reduce the cost of unemployment and so enable the unemployed worker to increase his reservation wage or reduce his search intensity. The effect of either of these is to reduce the rate at which unemployed workers meet suitable job vacancies and so shift the Beveridge curve outwards.

But another important channel through which unemployment insurance affects unemployment is wage determination. Higher unemployment benefits increase the bargaining strength of workers or of their representatives, and so increases the wage rate at given labour-market tightness. This mechanism shifts the wage curve of Figure 5.3 up and so it shifts the supply of vacancies curve of Figure 5.2 to the right.

Both mechanisms of the preceding two paragraphs increase equilibrium unemployment, though one increases and the other decreases equilibrium vacancies. Since the mechanism that works through the wage rate increases unemployment by reducing the number of job vacancies, in a regression of unemployment with vacancies as one of the right-hand side variables we are not likely to be able to identify it. But the choosiness effect can be picked up because it operates at given vacancies and unemployment.

Another effect of unemployment insurance on job search, which is often

neglected in theoretical discussions because it requires some kind of hard-to-model market failure, might actually lead to a reduction of equilibrium unemployment at given vacancies. The argument is that unemployed workers who might be constrained by the lack of savings, cut off from labour-market contacts and generally feeling excluded from the networks that bring together jobs and workers, may feel more part of the market when a comprehensive unemployment insurance system is in place to cater for them. In other words, the unemployment insurance system becomes part of the formal labour-market networks and those who are part of it feel more attachment to the labour market than those who are left out of it.

If the latter argument is correct, those receiving unemployment benefit may be closer to labour-market contacts than those who do not, and so countries with elaborate insurance systems may experience a higher rate of job matching than countries with less complete coverage.[9]

Thus the actual level of unemployment benefit may or may not influence the Beveridge curve adversely (even ignoring the last favourable mechanism, the evidence from job-search studies is far from conclusive). But a second aspect of the unemployment insurance system, the length of time that unemployed workers can claim benefit, is likely to influence the curve adversely. The choosiness argument applies for as long as benefits are available. The longer an unemployed worker expects to qualify for benefit the more choosey he is likely to be. When benefits are expected to run out, reservation wages decline progressively during search, increasing the probability of finding a job.[10] The attachment argument also leads to the conclusion that when benefits are expected to run out the worker is more likely to move into employment more quickly. When the expectation is that benefits will soon run out, workers are likely to intensify their job search activity to avoid the risk of losing their labour market links.

Thus, given the level of benefit, longer qualification should shift the Beveridge curve out from the origin.

5.6.3 Corporatism

Corporatism has been debated widely in terms of its influence on the wage determination process.[11] The argument is that wages in corporatist economies respond faster to a rise in unemployment or to external shocks that are expected to cause a rise in unemployment than they do in non-corporatist economies. So the increase in unemployment following a negative shock is likely to be less and last for a shorter period of time in corporatist than in non-corporatist economies.

The argument so far does not involve the Beveridge curve. Unemployment in corporatist economies rises by less because wages fall faster when there is a negative shock. In terms of Figures 5.2 and 5.3 this argument implies that corporatist economies have a flatter wage curve, so the vacancy curve in Figure 5.2 does not shift much in response to negative shocks. But other features of corporatism are likely to imply a Beveridge curve closer to the origin than in non-corporatist economies.

Firstly, we have argued that a rise in unemployment, regardless of source, may cause hysteresis through long-term unemployment or other reasons. Corporatist economies are likely to respond fast to this threat and contain the factors that are likely to cause hysteresis. Thus non-corporatist economies are more likely to experience the shifting UV curve that brings about the open loops A-B-C of Figure 5.4, than corporatist economies are. Corporatist economies are more likely to experience the closed loops A-B-A, and the grouping of countries in table 5.2 confirms this. The Beveridge curve of a corporatist economy is consequently likely to be on average closer to the origin than the Beveridge curve of a non-corporatist one.

Secondly, a corporatist economy is likely to be more egalitarian in its wage choices than a non-corporatist one. The wages commanded by a given individual in different industries or different locations are therefore likely to be closer to each other in the corporatist economies than in the non-corporatist ones. Since the returns to search are less when wages are more uniform across locations, unemployed workers in corporatist economies are not as likely to hold out for a good wage offer as are unemployed workers in non-corporatist economies. With less search taking place, the Beveridge curve in corporatist economies is again likely to be closer to the origin than in non-corporatist ones.

Finally, corporatism is as much a state of mind and an implicit commitment to help each other in the labour market as an explicit institutional arrangement for wage determination. Labour market policies are likely to be more frequently reviewed, better targeted and command more support from unions and employer groups than in non-corporatist economies. Thus they are also likely to be more successful. The scarcity of good data and inherent difficulties in quantifying the intensity and success of policies make it difficult to construct a policy variable that will fully capture the many different aspects of labour market policies. Corporatism may capture some of these unobserved features of policies. Corporatist economies are likely to have Beveridge curves closer to the origin than non-corporatist economies are, because the unobserved aspects of their labour market policies are likely to be more successful in reducing unemployment at given vacancy rates than in non-corporatist economies.

Thus, in summary, labour-market policies targeted to the long- term unemployed and the hard-to-place and corporatism are likely to shift the Beveridge curve inwards; the duration of unemployment benefits is likely to shift it outwards; and the level and coverage of unemployment benefit is

likely to have small and ambiguous effects though on balance it is expected to shift the Beveridge curve outwards.

5.7 Results of the empirical analysis

5.7.1 Methodology

We test the effects of the various labour-market policies discussed in the preceding section by estimating regressions for Beveridge curves for the fourteen countries in our sample. The argument underlying our estimation is that the unemployment-vacancy relationship in each country is subject to two types of shocks, common world shocks and country-specific shocks. World shocks may include some policy changes that are common to all countries, but generally we do not believe that these are important or that they can easily be quantified. Our analysis of policy effects concentrates on country-specific aspects, and with one exception only it derives all effects by comparing country experiences. In order to avoid having to model the common world shocks that affect each country's unemployment-vacancy relationship, we estimate our regressions by following a two-step procedure. In step 1 we regress the logarithm of unemployment and the logarithm of vacancies on nineteen zero-one dummy variables, for the nineteen years in our sample. Thus, each dummy takes value 1 in one year only and zero elsewhere. The coefficients on the dummies identify the world shocks (the graph of these coefficients looks very similar to part (a) of Figure 5.5, as can be seen in Appendix Figure 5.1, Part (b)). We then take the residual from these regressions, which now reflects only country-specific influences, and in step 2 we regress the unemployment residual on the vacancy residual and on a set of four other variables: policy variables, country fixed effects (that is, a different intercept for each country), one-year lag of the dependent variable, and country-specific time trends.

5.7.2 Individual country estimates of the Beveridge curve

Table 5.3 gives the unconstrained estimates of the vacancy-unemployment relation for each country when the policy variables are excluded. The fixed effects identify the position of the Beveridge curve for each country when we control for the other variables and they show a plausible pattern. The vacancy-unemployment relation slopes down in all countries except Austria and the Netherlands (where the coefficients are poorly determined), and it also exhibits lagged adjustments in virtually all countries. We refer to the coefficient on vacancies as the slope coefficient and to the coefficient on lagged unemployment as the persistence coefficient. The country-specific time trends are significant in some countries and generally they are correlated with the fixed effects. We include them in all regressions that follow but do not report them or discuss them further.

5.7.3 Effects of labour market policies

In column (1) of Table 5.4 we replace the country fixed effects by the policy variables. Thus these regressions investigate whether policy differences between countries can explain the differences in the location of the Beveridge curve. The results of this investigation confirm that policy variables can play this role. The Gallant-Jorgenson test for the replacement of the country constants by a common constant and policy variables is below its critical 5 percent value, indicating that policy variables explain the differences in the country intercepts. We discount the idea that this substitution might be spuriously due to the fixed effects being badly determined, by observing that the Gallant Jorgenson test for the replacement of the country fixed effects by a common intercept convincingly rejects this hypothesis. As expected, labour market policies and corporatism shift the Beveridge curve inwards and the duration of unemployment benefits shift it outwards. The replacement ratio also shifts

the Beveridge curve outwards but in the unconstrained regressions of column 1 its effect is not well defined. Generally, we found that the coefficient estimated for the replacement ratio was the least well determined of the policy coefficients that we estimated, often changing magnitude and significance with small changes in the specification of the equations.[12]

Our labour market policy variables are firstly the 1985 level of expenditure per unemployed worker as a country dummy (that is, it takes a single value for each country) and secondly two other zero-one dummy variables for policy changes within countries. The two dummy variables are the only policy dummies that capture some within-country variation in policy. Policy dummy 1 changes from zero to one when a new labour market policy is introduced in the country in question. Policy dummy 2 changes from zero to one when a second labour market policy is introduced in a country, where appropriate (see Main Labour Market Programmes 1970-88). Thus these two dummies capture the effects of new policies. In contrast, the variable 'labour market policy' captures the effects of broad differences in the extent of labour market intervention in different countries.

The variable 'labour market policy' takes values ranging from 2.7 (for the United States) to 25 (for Sweden), with a mean value of 8.13 Thus on average it implies, for example, (using the unconstrained estimates in column 1) that the United States Beveridge curve is to the right of the 'world' curve by about 13.8 per cent of world unemployment, whereas Sweden's curve is to the left of the world curve by about 44 percent.

The first dummy for policy change takes value 1 for ten countries (Australia, Austria, Belgium, Denmark, Finland, France, Germany, Netherlands, Sweden, United Kingdom) and the second policy dummy takes value 1 for four of these countries (Australia, Denmark, France, United

Kingdom). The second policy change appears to have been more effective on average than the first, where they both occurred. The countries with one policy change have, after the change, a Beveridge curve 7.8 percent to the left of where is was before, whereas the four countries with two new policies have a curve that is now about 23 percent to the left of the original position. These dummy variables are a little crude, but for most countries they are the only data available. However, for five countries (the Nordic countries and the UK) we are able to construct time series data on expenditure on labour market policies. We re-estimated the regression in Table 5.4 column (1) using this data. In four of these five countries there is a clear and statistically significant effect of labour market policies on unemployment at given vacancies.

The experience of labour market policies may explain in part the difference between the world vacancy-unemployment relation in 1979 and the same relation in 1989. Both years were peaks of cycles, but the 1989 point is proportionally closer to the 1979 point than the 1979 point is to 1974. New labour market policies in the 1980s pushed the 1989 point to the left, thus avoiding the open loops around the UV curve that characterised the 1970s.

The duration of benefits ranges from 0.5 years (in Canada, Japan and the US) to indefinite, which we specify as 4 years for the purposes of the regressions (in Australia, Austria, Belgium, Finland, Germany, Netherlands and the UK). The Beveridge curve of the latter group of countries is a full 56 percent of unemployment to the right of the Beveridge curve of the former group of countries. The replacement ratio has a smaller effect, as expected. The smallest value it takes is for the UK, at 0.36, and the highest for Denmark, at 0.9. The observation for Denmark, however, is an outlier: most countries are concentrated around 0.6. But even the big

difference between the ratios for the UK and Denmark can explain a difference in the location of the Beveridge curve that is about 15 percent of unemployment.

Finally, corporatism measured by the Calmfors-Driffill index of centralisation of wage bargaining, ranges from 0 (for Canada) to 15 (for Austria), with a mean value of 8.1. Given the similar magnitude of variation of this variable and our measure of labour market policies, it is clear from the estimated coefficients that corporatism is quantitatively more important than the pure cross-sectional variations in labour-market policies. But as we argued in the preceding section, corporatism in this context is perhaps best thought of as a proxy for unobserved features of labour market policies. At a corporatist value of 15, the Austrian Beveridge curve is about 41 percent to the left of the average and the Canadian curve about 49 percent to the right of it.

In columns (2)-(4) of Table 5.4 we test whether labour market policy has any other effect on the vacancy-unemployment relationship, besides its influence on the location of the curve. The results reported in column (2) examine the role of labour market policies in the determination of the response of unemployment to vacancies. Labour-market policies make the vacancy-unemployment relationship flatter, so a small increase in vacancies is more effective in reducing unemployment than otherwise. The interactive effect is very strong, so slopes across countries appear to differ substantially. The restriction that when controlling for labour market policies slopes are statistically similar is accepted, so the specification in column (2) is a more parsimonious version of the unrestricted specification in column (1).

The results reported in column (3) show that countries with labour market policies recover more quickly from recessions: persistence is

negatively related to labour market policies. The negative effect of labour market policies on persistence appears robust, and the restrictions on the persistence coefficients needed to test for this effect are not satisfied (see the Gallant-Jorgenson test at the bottom row of the table). Column (4) imposes restrictions on both the slope and the persistence coefficients of the Beveridge curves. Although the results are similar to the results of the previous two columns, the combined intersections are not accepted at the 5 per cent level (but on the margin of acceptance at the 1 per cent level).

5.8 Conclusions

We have followed an approach based on the vacancy-unemployment relationship (the Beveridge curve) to evaluate the sources of change in unemployment in fourteen OECD countries and the role played by labour market policies in containing the rise in unemployment. Our conclusions are:

1. Both in the 1970s and 1980s, the increases in unemployment originated in falls in the demand for labour. In most countries the initial rise in unemployment persisted because of changes on the supply side that reduced the job effectiveness of the unemployed.

2. Labour market policies intensified in the 1980s. This substantially reduced unemployment, on average, from what it could have been, had the 1970s experience been repeated.

3. Labour market policies, such as training programmes, help to the unemployed in their job search, explicit placement programmes for hard-to-place groups etc., help to shift the vacancy-unemployment relation towards the origin and they also make it flatter. Thus, at given vacancies, countries that pursue these policies have less unemployment, and when they experience an increase in their vacancies their unemployment

falls by more (in proportional terms) than in other countries. Labour market policies also speed up the adjustment to equilibrium, by reducing the influence that past unemployment has on future unemployment.

4. Our estimates permit a rough assessment of the cost-effectiveness of labour market policies. Using 1985 levels of expenditure as a measure of labour market policy we have estimated in Section 5.6 that at given vacancies the unemployment rate in Sweden is for example, reduced by about 2 percentage points relative to that of the United States. To achieve this, Sweden spends about 1 percent of GDP more than the United States on labour market policies (see Table 5.1). Table 5.6 presents the same comparison for other countries.

5. Unemployment benefits increase unemployment at given level of vacancies. But the effect of the level of benefits is small when compared with the effect of the maximum duration of benefits. Countries where benefits run out after say six or twelve months experience a more favourable vacancy-unemployment relation than countries that pay benefits indefinitely.

6. Corporatism shifts the vacancy-unemployment relationship inwards, giving rise to less unemployment at given vacancies. We interpret this effect of corporatism as arising from the fact that corporatist countries are more likely to reach consensus on the appropriate labour market policies and work for the success of the policies.

FOOTNOTES

* Financial Support from the Department of Employment and the Economic and Social Research Council is gratefully acknowledged.

1 See for example Diamond (1982), Mortensen (1982) and Pissarides (1984). The reason for the importance of this effect in search models is that it is an 'externality' that implies that the equilibrium rate of unemployment is inefficient. Our discussion in this paper does not touch on efficiency issues. Some of these issues are discussed in an empirical context in Pissarides (1986).

2 Formal models always confirm this, giving a positive relation between wages and the rate of unemployment. See Pissarides (1990, chapter 1) for formal demonstration in a framework similar to the one described here and Blanchflower and Oswald (1990) for a variety of arguments and empirical evidence in the context of union models.

3 For an analysis of this problem in a framework very similar to the one in this paper see Jackman, Layard and Pissarides (1989), Pissarides (1986) and Blanchard and Diamond (1989). The early uses of this apparatus - needless to say not in its present-day refined state - were partly to provide justification for various measures of the excess demand for labour used in wage inflation (Phillips curve) studies, as in the classic papers by Dow and Dicks-Mireaux (1958) and Lipsey (1960), and partly to classify unemployment into various types, as in the study by Thirlwall (1969). Our work is more closely related to the latter type of analysis, though rather than use the apparatus to classify unemployment into various types, which we do not believe to be either meaningful or useful, we use it to classify the causes of change of unemployment into different types. The short papers by Gujarati (1972) and Taylor (1972) also used Beveridge curves to study some of

the causes of change in unemployment in the 1960s.

4 See for example Phelps (1968) and Hansen (1970).

5 On this question see Abraham and Katz (1986) and Blanchard and Diamond (1989).

6 See in particular Layard and Nickell (1987) for the argument in the British context, and Jackman and Layard (1991) for time-series evidence that long term unemployment reduces the search effectiveness of workers.

7 See Davis (1987) for evidence on this and related issues.

8 See Atkinson and Micklewright (1990) for a survey.

9 Some theory for the apparent perverse effect of unemployment insurance on the job finding rate was provided by Mortensen (1977), though the mechanism that he emphasized is related to entitlement of benefit and not to market failure. Evidence that those receiving benefit are closer to job-matching networks than those who are not was presented by Wadsworth (1991) by using the British Labour Force Survey.

10 See for example Shavell and Weiss (1979).

11 See for example Calmfors and Driffill (1988) and the originators of the economic debate, Bruno and Sachs (1985).

12 Because of data limitations the replacement ratios that we use in the regressions have no time variation, so the coefficient estimated is for country differences only.

13 The regressiona are based on 1985 data, as we only have data for this year for benefit durations, corporatism and the replacement rate. More recent data for expenditure on labour market policies for 1988 is given in Table 5.1.

TABLE 5.1

Public Expenditure on Labour Market Programmes: 1988

	% of GDP				Per unemployed person as % of output per person				
	ESA (1)	LMT (2)	DJC/ES (3)	Total (4)	Unemployment Rate	ESA (5)	LMT (6)	DJC/ES (7)	Total (8)
Australia	0.1	0.05	0.06	0.21	7.2	1.3	0.6	0.8	2.7
Austria	0.11	0.07	0.03	0.21	3.5	3.0	1.9	0.8	5.8
Belgium	0.18	0.14	0.68	1.00	10.2	1.6	1.2	6.0	8.8
Canada	0.2	0.2	0.02	0.42	7.7	2.4	2.4	0.2	5.0
Denmark	0.11	0.51	0.03	0.65	8.6	1.2	5.4	0.3	6.9
Finland	0.09	0.27	0.41	0.77	4.5	1.9	5.7	8.7	16.3
France	0.13	0.28	0.04	0.45	10.1	1.2	2.5	0.4	4.0
Germany	0.23	0.32	0.22	0.77	6.2	3.5	4.8	3.3	11.6
Greece	0.07	0.12	0.2	0.39	7.6	0.9	1.5	2.4	4.7
Ireland	0.15	0.52	0.3	0.97	16.7	0.7	2.6	1.5	4.8
Italy	0.08	0.03	0	0.11	10.6	0.7	0.3	0.0	0.9
Japan	0.03	0.03	0.13	0.19	2.5	1.2	1.2	5.1	7.4
Luxemburg	0.05	0.02	0.07	0.14	1.6	3.1	1.2	4.3	8.6
Netherlands	0.09	0.21	0.06	0.36	9.5	0.9	2.0	0.6	3.4
New Zealand	0.08	0.5	0.21	0.79	6	1.3	7.8	3.3	12.4
Norway	0.11	0.07	0.02	0.20	3.2	3.3	2.1	0.6	6.0
Portugal	0.11	0.26	0.13	0.50	5.6	1.9	4.4	2.2	8.4
Spain	0.09	0.12	0.4	0.61	19.1	0.4	0.5	1.7	2.6
Sweden	0.2	0.51	0.2	0.91	1.6	6.1	15.7	6.1	28.0
Switzerland	0.07	0.01	0	0.08	2.1	3.3	0.5	0.0	3.7
Turkey	0.01	0.03	0.05	0.09	15.9	0.1	0.2	0.3	0.5
United Kingdom	0.14	0.14	0.2	0.48	9	1.4	1.4	2.0	4.9
United States	0.06	0.11	0.01	0.18	5.4	1.1	1.9	0.2	3.2

Notes: ESA - Employment Services and Administration
LMT - Labour Market Training
DJC/ES - Direct Job Creation and Employment Subsidies
Figures in France and Luxembourg are for 1987

Sources: Public expenditure on labour market programmes: OECD Employment Outlook, July 1989, pp.205-207.
Unemployment: OECD Economic Outlook, No.45, June 1989, Tables R17 and R18.

TABLE 5.2

Three types of change in the 1980s

Demand-side shock (A-B-A)	Supply-side change (A-C)	Demand-side shock Supply-side persistence (A-B-C) or (A-B-D)
Austria 80-86	Austria 86-88	Australia
Denmark	Norway 85-88	Belgium
Finland		Canada
France		Germany
Netherlands		Japan
Norway 80-85		United Kingdom
Sweden		
United States		

TABLE 5.3
Sample 1971-1988
Dependent Variable $(u_i-\bar{b}_t)$

Country	Fixed Effect	$[v_i-\bar{d}_t]$	$[u_i-\bar{b}_t]_{-1}$	Trend	Sargan*	Gallant Jorgenson**	SE***
Australia	0.18	-0.12	0.43	0.00046	2.6	1.3	0.090
	(2.3)	(0.8)	(2.2)	(0.09)			
Austria	-0.32	0.42	0.64	0.023	3.5	0.7	0.113
	(1.2)	(0.5)	(4.0)	(1.2)			
Belgium	0.35	-0.24	0.21	0.04	1.4	0.08	0.058
	(3.3)	(3.9)	(1.0)	(3.7)			
Canada	0.54	-0.31	-0.074	-0.035	3.0	0.004	0.037
	(5.6)	(4.5)	(0.4)	(5.6)			
Denmark	-0.31	-0.19	0.53	-0.0011	9.4	11.6	0.20
	(0.9)	(1.5)	(2.7)	(0.09)			
Finland	-0.092	-0.43	0.35	-0.0051	4.5	0.7	0.11
	(2.3)	(4.0)	(2.7)	(0.9)			
France	0.13	-0.23	0.40	0.0027	0.07	0.04	0.054
	(2.4)	(3.5)	(2.9)	(0.7)			
Germany	0.32	-0.29	0.59	0.020	4.8	6.9	0.148
	(1.6)	(1.5)	(3.5)	(1.6)			
Japan	-0.48	-0.35	0.30	-0.0097	6.7	0.3	0.056
	(1.8)	(1.3)	(0.7)	(1.4)			
Netherlands	0.17	0.007	0.68	0.0044	3.1	0.02	0.100
	(2.1)	(0.06)	(5.2)	(0.4)			
Norway	-0.78	-0.74	0.41	-0.006	6.4	9.5	0.169
	(2.0)	(1.5)	(1.4)	(0.4)			
Sweden	-1.06	-1.3	-0.0001	-0.022	1.0	0.7	0.142
	(4.7)	(3.8)	(0.04)	(2.1)			
United Kingdom	0.68	-0.51	0.65	0.018	9.2	2.5	0.086
	(2.8)	(1.9)	(5.1)	(3.0)			
United States	0.43	-0.20	0.30	-0.035	5.5	1.5	0.079
	(2.4)	(2.0)	(1.5)	(2.6)			

Notes:
Estimation by 2SLS.
Instruments used were $(v_i-\bar{d}_t)_{-1}$, GDP_{-1} (lagged real GDP) and M_{-1} (lagged real imports).
Trend (1985) = 0.
Asymptotic t-statistics in parenthesis. Critical value at 5% level -1.8 and at 10% level 1.3 $[t_{(18-4)}]$.
* Sargan specification test statistic. Critical value for mis-specification at 5% level 6.0 [χ^2_2 two overidentifying restrictions].
** Gallant Jorgensen test for 1st order serial correlation. Critical value at 5% level 3.8 [χ^2_1].
*** Standard error of equation.

Notes (cont.):

To eliminate world 'shocks' from national unemployment and vacancy rates we estimated:

$$\hat{u}_{it} = \bar{b}_t + \hat{e}_{i,t} \qquad R^2 = 38.7\%$$

$$\hat{v}_{it} = \bar{d}_t + \hat{n}_{i,t} \qquad R^2 = 12.7\%$$

where $\bar{b}_t$ and $\bar{d}_t$ are time dummies for years 1970-1988 (see Appendix Table 2 and Appendix Figure 1) we then used the residuals from these equations for estimator purposes.

All variables in logarithmic form.

TABLE 5.4

Sample 1971-1988
Dependent Variable $(u_i-\bar{b}_t)$

Country	Fixed Effect	$[v_i-\bar{d}_t]$	$[u_i-\bar{b}_t]_{-1}$	Trend	Accommodate Stance	Sargan*	Gallant** Jorgenson	SE
Denmark	1.1	-0.39	0.057	0.09	-0.12	0.9	0.0	0.24
	(1.6)	(2.3)	(0.2)	(2.2)	(2.4)			
Finland	0.59	-0.46	0.37	-0.03	-0.019	1.3	1.0	0.137
	(1.6)	(3.8)	(2.3)	(2.0)	(1.9)			
Norway	-0.27	-0.49	0.61	-0.007	-0.01	8.2	9.9	0.156
	(0.5)	(1.3)	(2.0)	(0.5)	(0.7)			
Sweden	-0.32	-0.87	0.0019	-0.04	-0.017	3.5	0.5	0.087
	(1.0)	(4.0)	(0.01)	(3.6)	(2.0)			
United Kingdom	0.77	-0.49	0.82	0.032	-0.041	5.3	0.8	0.080
	(5.1)	(3.7)	(5.9)	(3.9)	(2.3)			

Notes:

Estimation by 2SLS:
Instruments used were $(v_i-\bar{d}_t)_{-1}$, AS_{-1}, GDP_{-1} and M_{-1}.
Asymptotic t-statistics in parenthesis. Critical value at 5% level 1.8 and at 10% level 1.3.
* Sargan specification test statistic. Critical value for mis-specification at 5% 6.0. $[\chi^2_2]$.
** Gallant-Jorgenson Test for first order serial correlation. Critical value at 5% level 3.8.

Accommodate Stance:
For Nordic countries based on figures from Calmfors and Nymoen (1990). 'Ratio (in per cent) between the work force in programmes and the sum of the work force in programmes and in open unemployment for 1985-1988 we spliced on labour market spending per unemployed person per unit of GDP.'
For United Kingdom figures based on equivalent ratio for the Community Programme (see Appendix Figure 5.6).

TABLE 5.5

Policy Influences on the UV Curve

Intercept	0.12	-0.04	-0.36	-0.28
	(0.5)	(0.2)	(2.5)	(2.6)
Labour Market Policy (LMP)	-0.026	-0.026	-0.014	-0.016
	(2.7)	(4.2)	(2.2)	(4.1)
Policy dummy 1	-0.078	-0.042	-0.043	-0.035
	(2.2)	(1.3)	(1.2)	(1.2)
Policy dummy 2	-0.15	-0.10	-0.11	-0.073
	(2.9)	(2.2)	(2.1)	(1.9)
Benefit duration	0.16	0.14	0.22	0.14
	(3.5)	(4.4)	(5.8)	(6.0)
Replacement ratio	0.28	0.31	0.67	0.48
	(0.7)	(1.1)	(3.0)	(2.8)
Corporatism	-0.060	-0.036	-0.080	-0.038
	(2.4)	(3.0)	(4.8)	(5.1)
log vacancy rate	*	0.094	*	0.10
		(1.3)		(2.3)
log vacancy rate interacted with LMP		-0.032		-0.029
		(3.3)		(4.3)
log lagged unemployment rate	*	*	0.77	0.81
			(12.5)	(20.4)
log lagged unemployment rate interacted with LMP			-0.027	-0.017
			(4.2)	(4.1)
time trends	*	*	*	*
Gallant-Jorgensen Test of restrictions	10.2	14.8	16.8	43.3
(Critical at 5% level value)	(14.1)	(21.1)	(21.1)	(36.4)

Notes:
Estimation by 2SLS on pooled country equation.
Standard error of unrestricted pooled equation 0.113. Asterisk denotes that country specific estimates allowed for.
Instruments used were $(v-\bar{d}_t)_{-1}$, GDP_{-1} and M_{-1}.
Asymptotic t-statistics in parenthesis. Critical value at 5% level of significance 1.6. [t∞].
Results largely robust to (i) quadratic trends (ii) extension of estimation to period 1968-1989 and (iii) use of original OECD vacancy data.
GJ test for replacement of country fixed effects by single constant 79.1 critical value at 10% level of confidence 22.4. [χ^2_{13}].
Using implied step function (see Appendix Figure 5.5). We obtained:

LMPSTEP	CORP	DUR	RHO	GJ test of restrictions on country constants (critical value at 5% level of significance χ^2_9)
-0.013	-0.093	0.14	-0.085	12.7
(1.9)	(2.6)	(1.5)	(0.08)	(16.9)

TABLE 5.6

Cost-Effectiveness of Labour Market Policies

	Budgetary Cost	Unemployment Effect
Australia	0.35	3.20
Austria	0.23	0.97
Belgium	1.13	4.10
Canada	0.49	1.20
Denmark	0.60	4.60
Finland	0.76	2.86
France	0.44	3.98
Germany	0.58	2.26
Japan	0.16	0.41
Netherlands	0.35	1.79
Norway	0.44	1.39
Sweden	1.17	2.44
United Kingdom	0.45	2.15
United States	0.2	0.50

Notes:

The Budgetary cost is expenditure on labour-market policies in 1985, expressed as a percentage of GDP. The unemployment effect is calculated as $100u_{85}[\exp\{0.026LMP + 0.078PD1 + 0.115PD2\}-1]$ where u_{85} is each country's unemployment rate in 1985.

Figure 5.1

World unemployment rate and world labour market policies

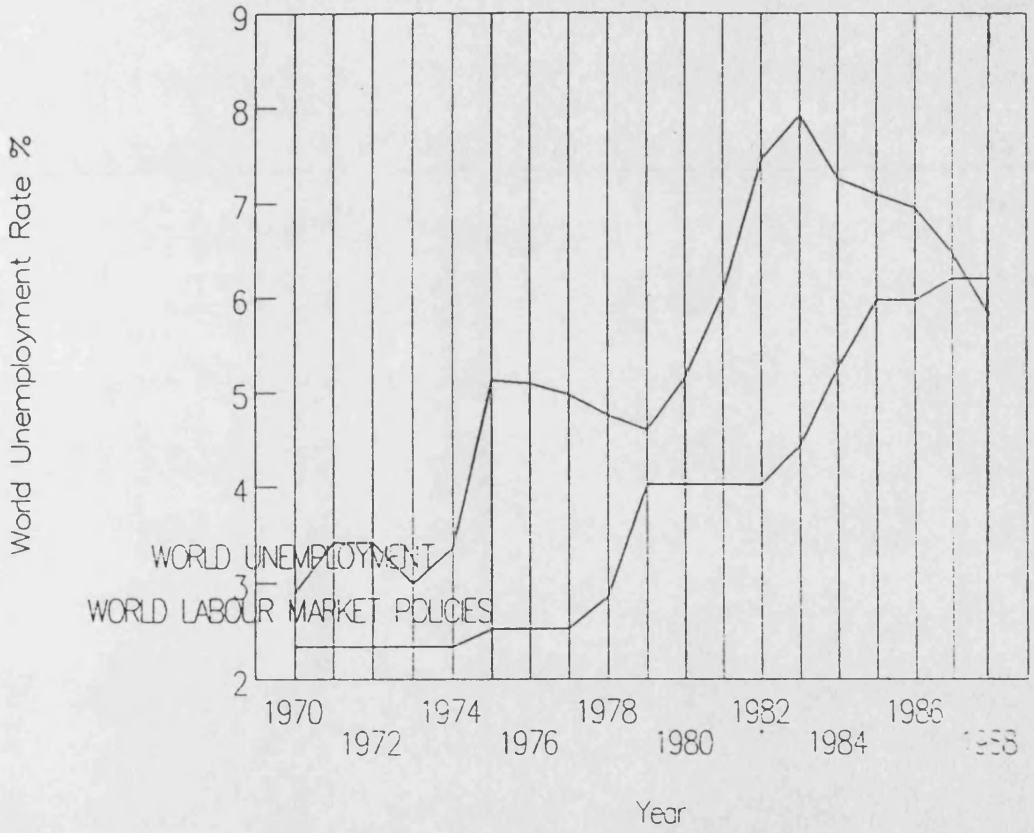


Figure 5.2

Equilibrium unemployment and vacancies

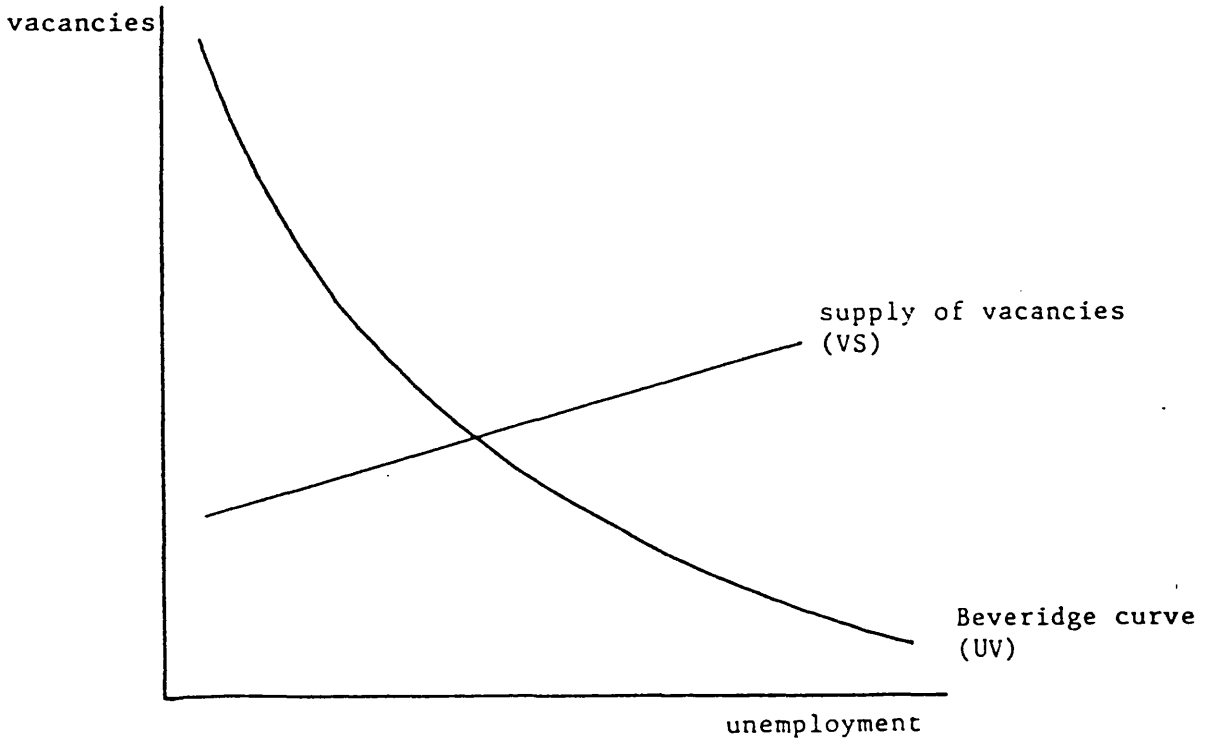


Figure 5.3

Vacancies and wages for given employment

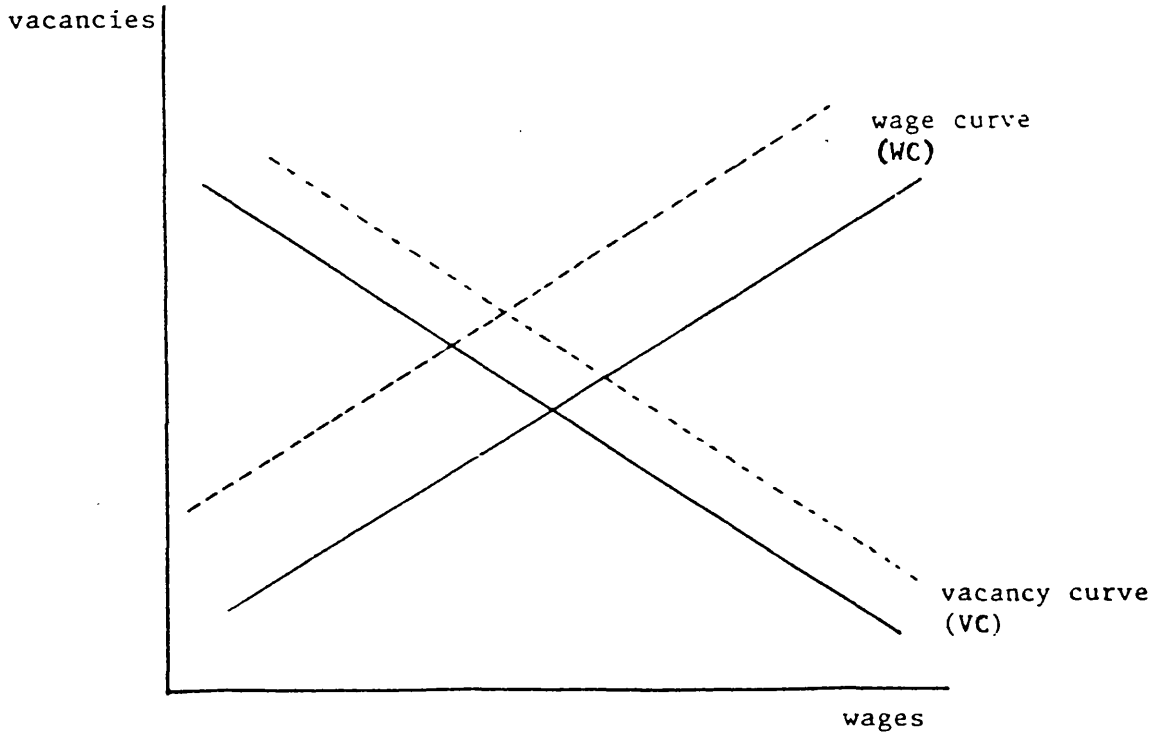


Figure 5.4

Three types of shock in the Beveridge curve

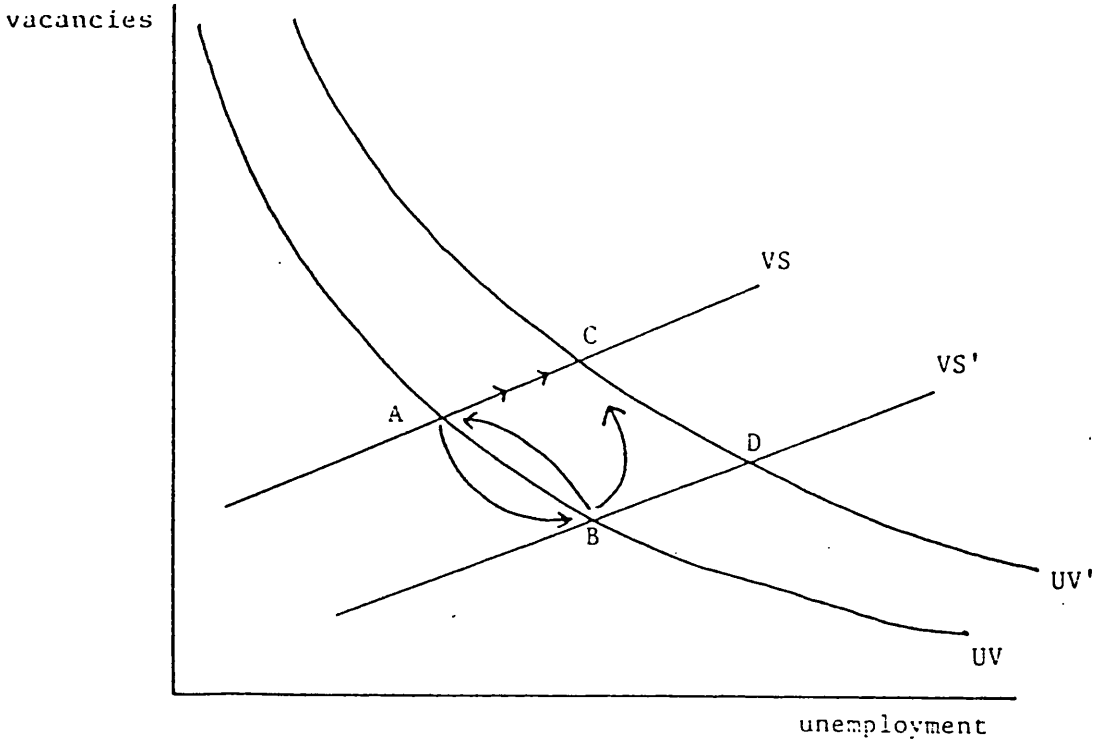
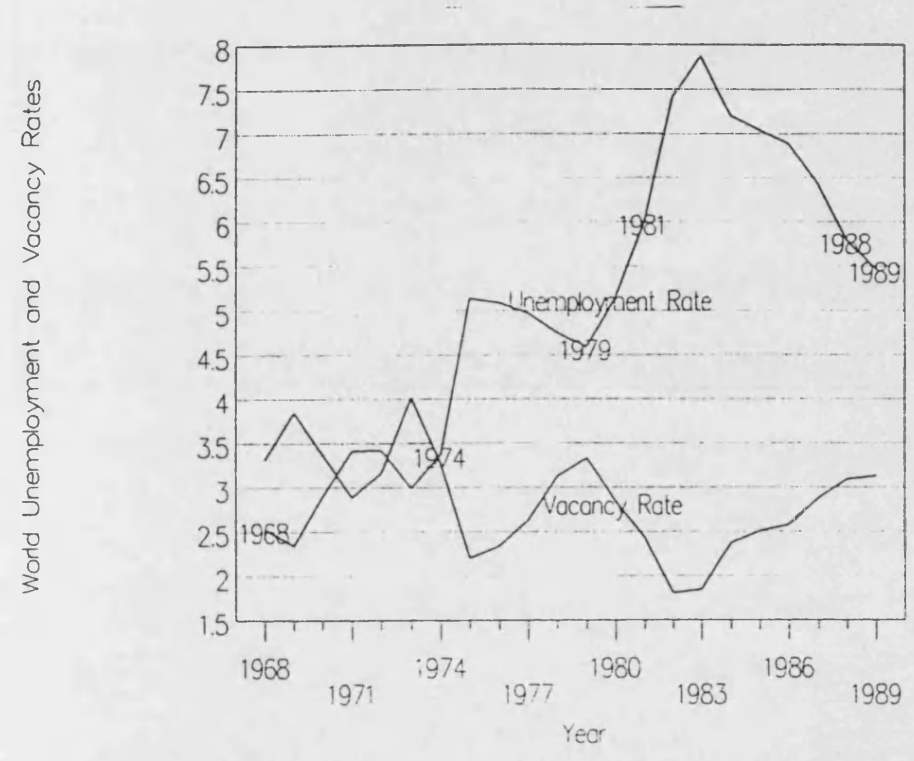


Figure 5.5

World unemployment and vacancy rates
1968-1989



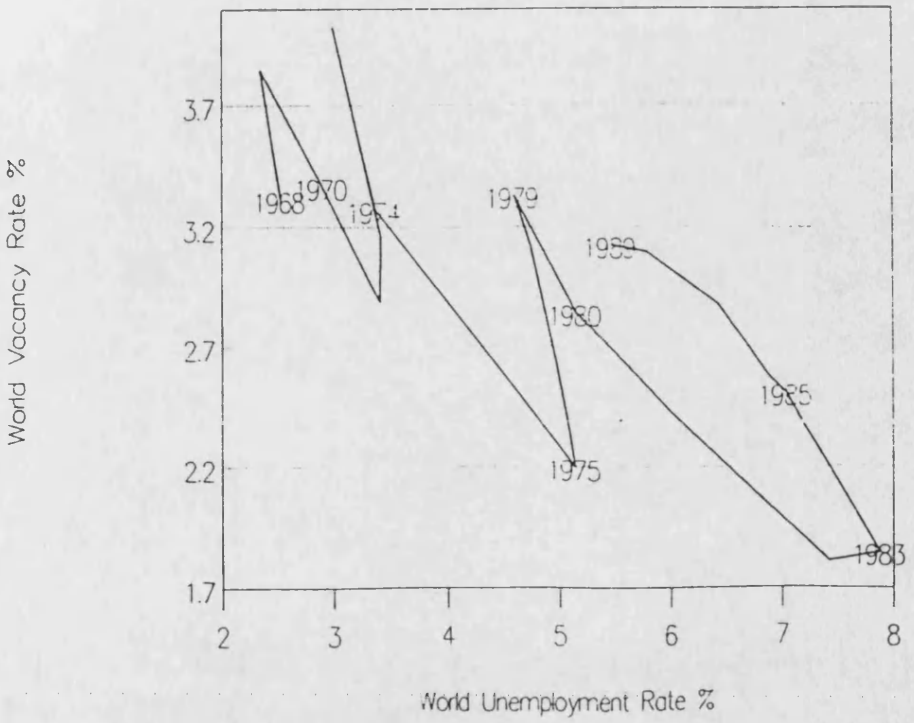
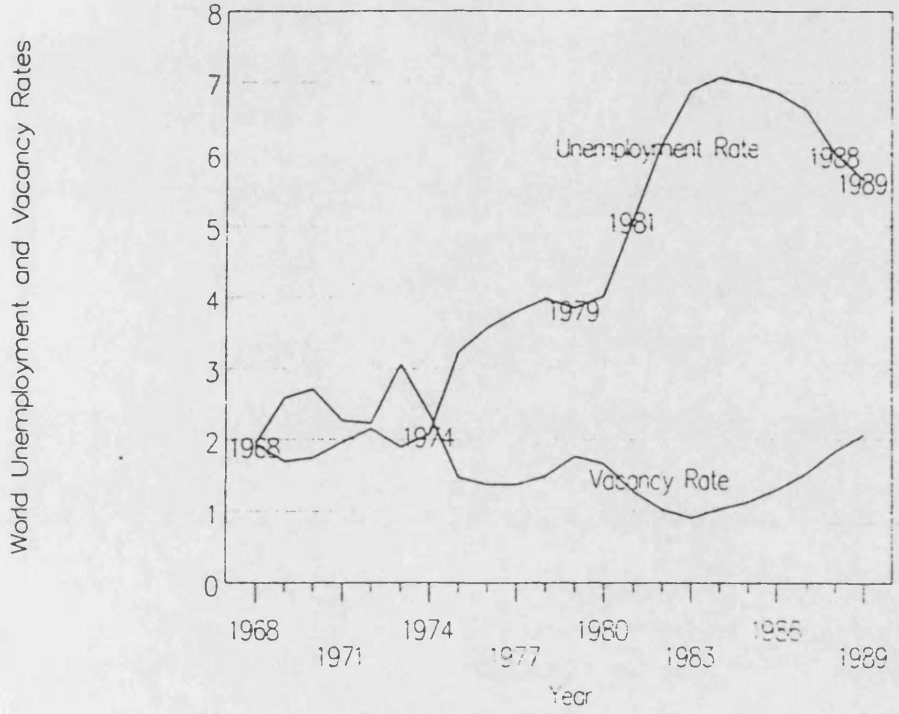


Figure 5.6

World unemployment and vacancy rates
excluding the United States



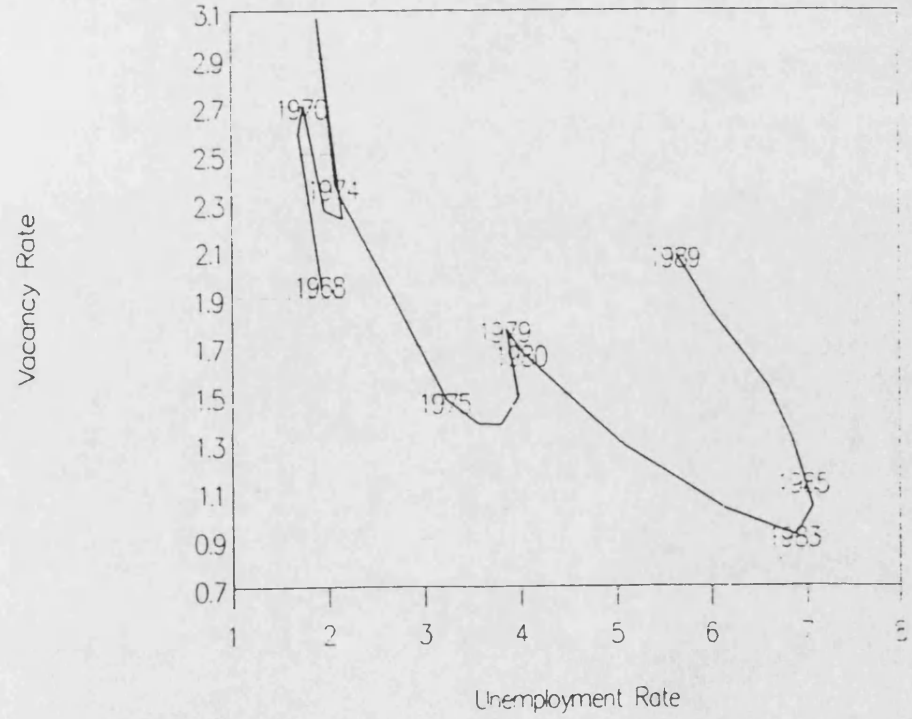


Figure 5.7

National unemployment-vacancy relationships

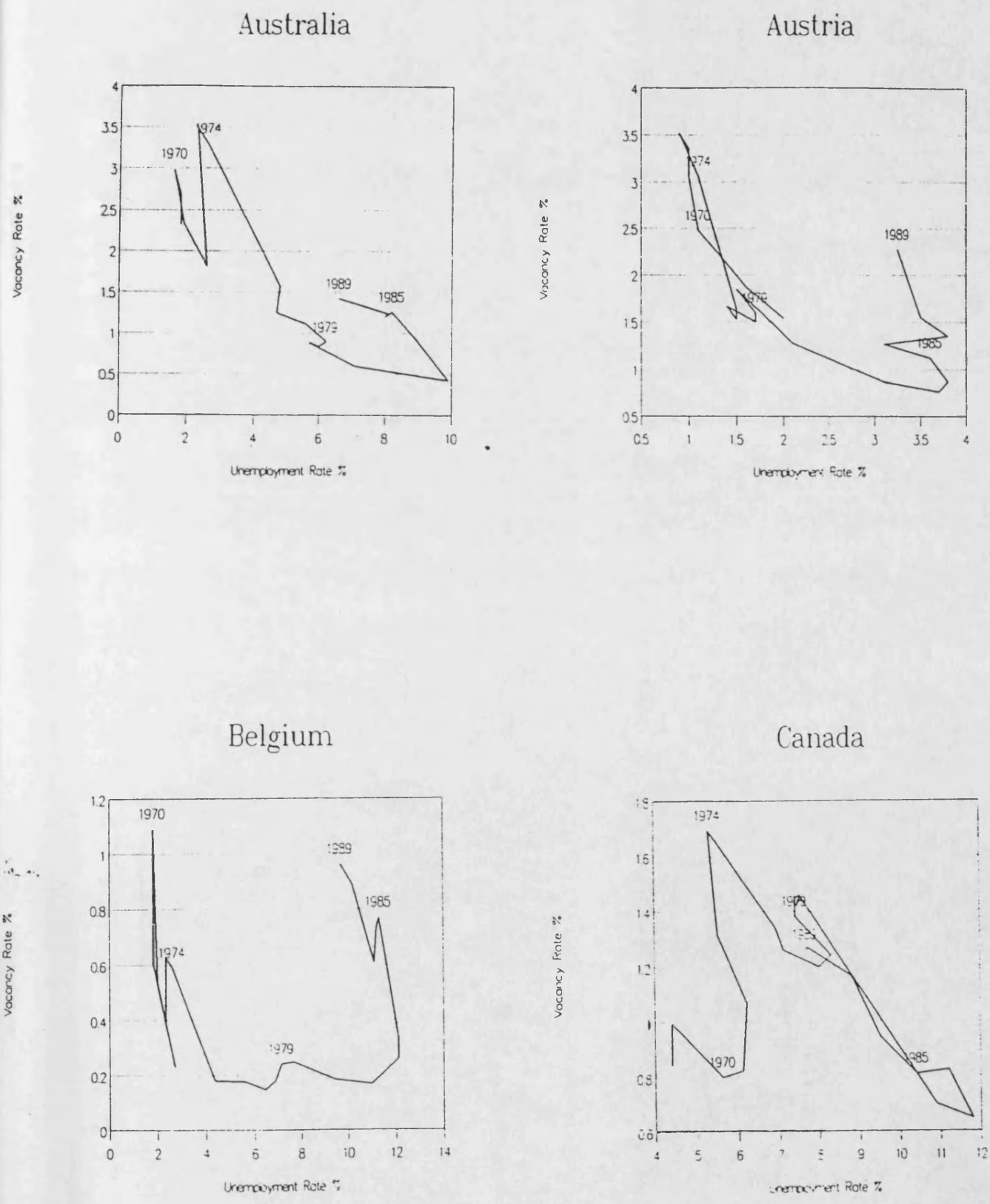
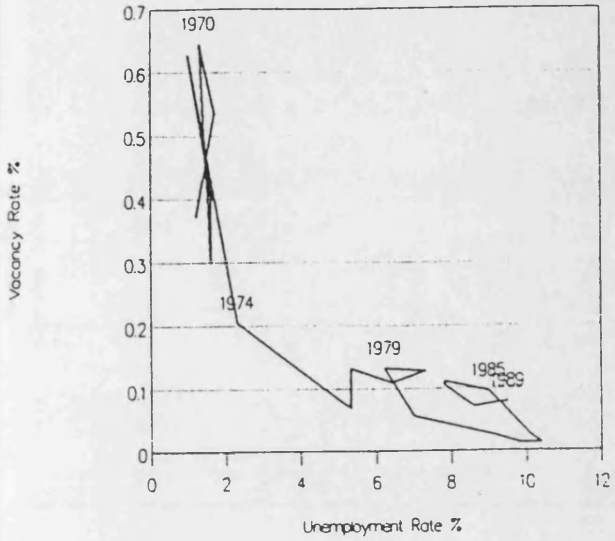


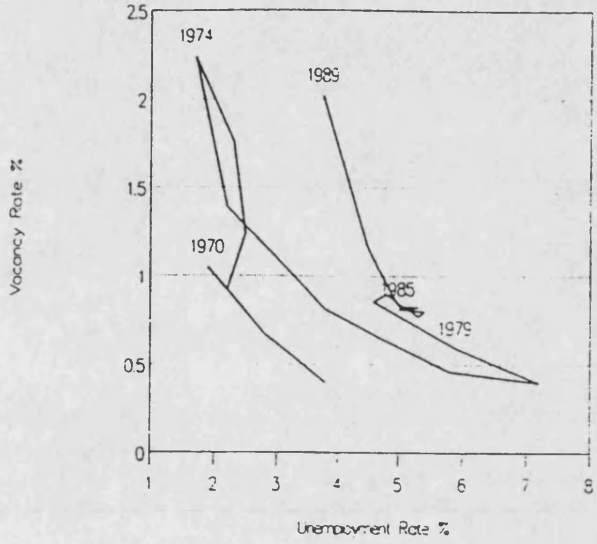
Figure 5.7 (cont.)

National unemployment-vacancy relationships

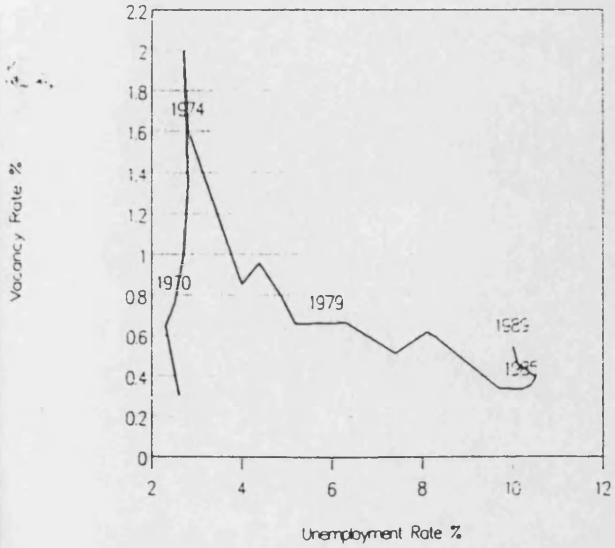
Denmark



Finland



France



Germany

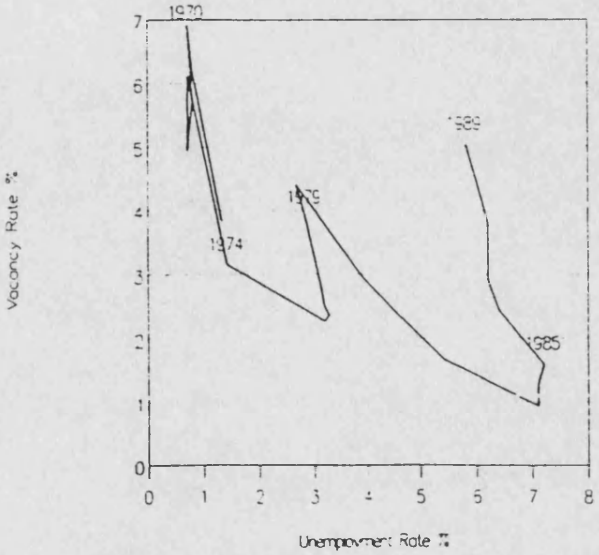
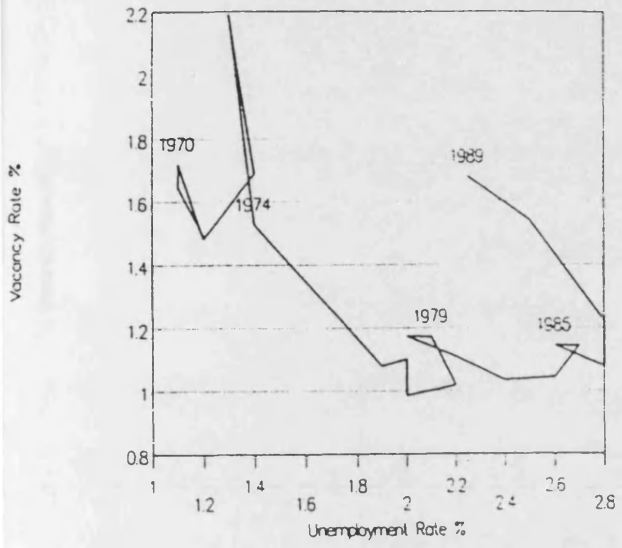


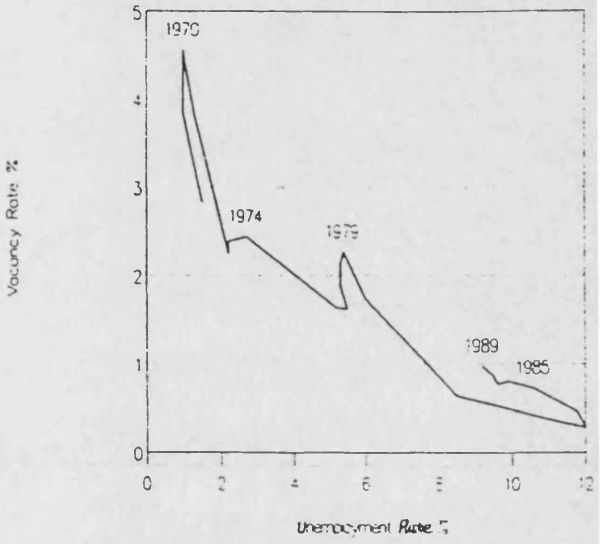
Figure 5.7 (cont.)

National unemployment-vacancy relationships

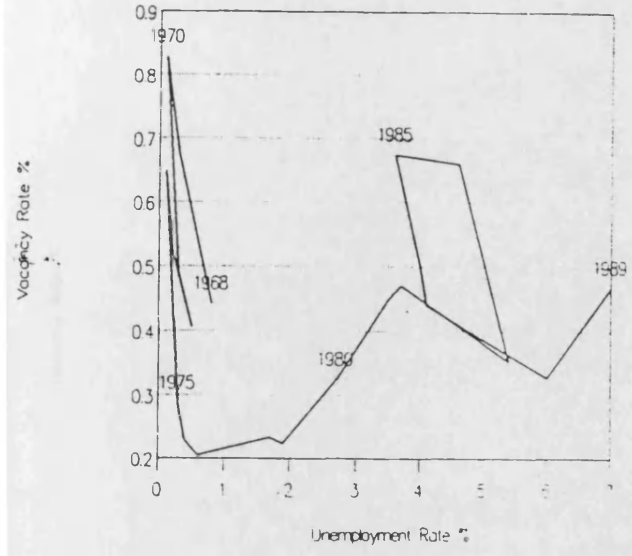
Japan



Netherlands



New Zealand



Norway

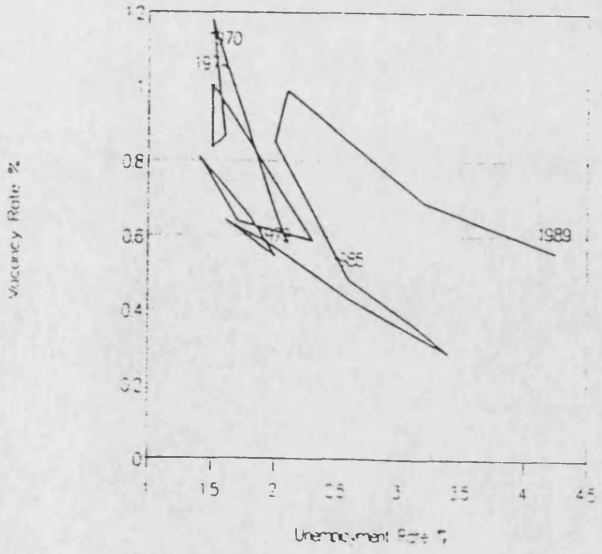
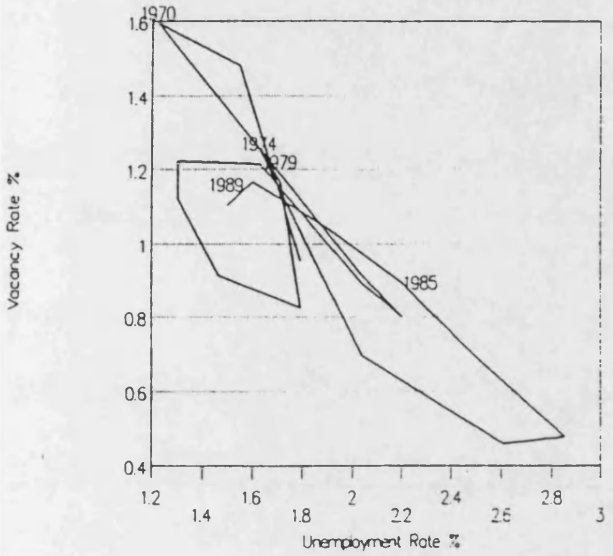


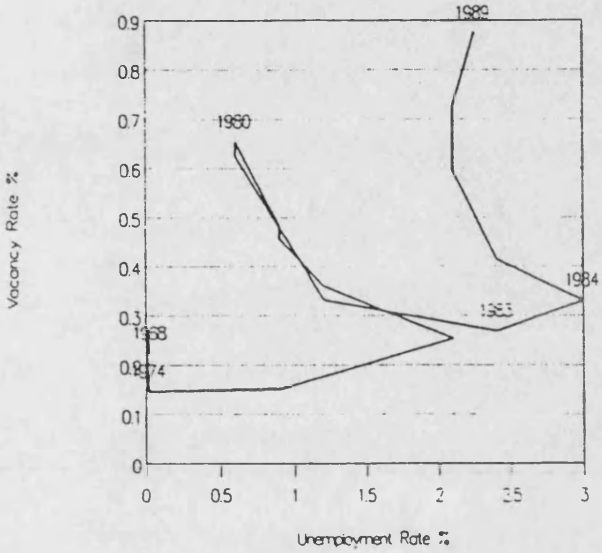
Figure 5.7 (cont.)

National unemployment-vacancy relationships

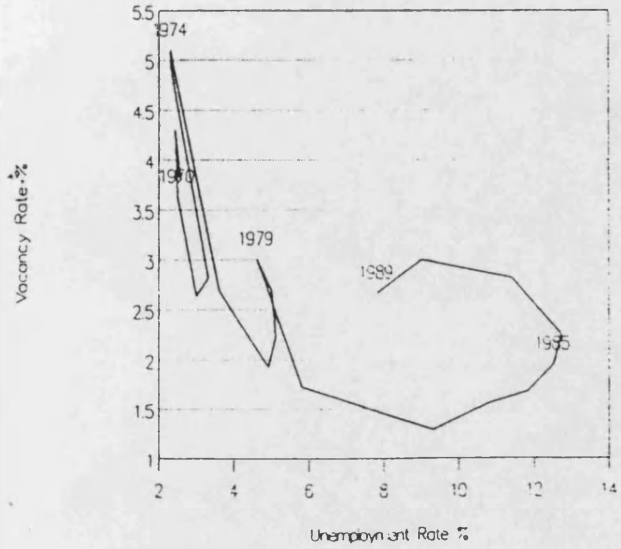
Sweden



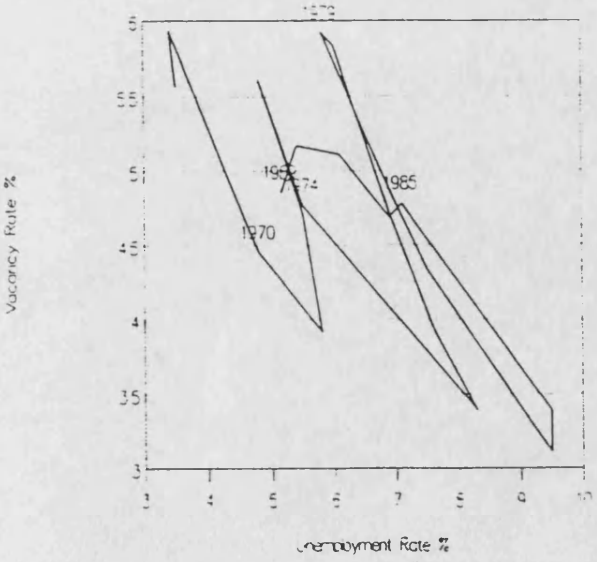
Switzerland



Great Britain



United States



APPENDIX A

Main Labour Market Programmes 1970-1988

OECD Employment Outlook September 1987

Australia:

1983 Community Employment Programme "to provide the disadvantaged unemployed with temporary work in special schemes".

1985 Jobstart "to enhance the employment prospects of LTU"

Austria:

1985 Training contracts ("Action 8000" Programme) to provide training for LTU by training subsidies.

Belgium:

1982: Troisieme circuit de travail (Third Sector Employment) funding of special employment initiatives for those unemployed for over two years.

Denmark:

1979 EIFL Programme "to restore motivation and self-confidence" and special training courses.

1983 Job Offer Scheme.

Finland:

1984 Wage subsidies to aid LTU.

Germany:

1983 Integration Assistance Subsidy, wage subsidies to LTU.

France:

1975 Contract Emploi-formation. Special training contracts with employers.

1983 Operation Long term unemployed involving 'appraisal' interviews.

Netherlands:

1984 "Plough back scheme" and voluntary work by LTU.

Sweden:

1984 Wage subsidy for LTU.

United Kingdom:

1983 Community Programme and Enterprise Allowance Scheme

1987 Restart Programme.

APPENDIX B. DATA

Unemployment OECD Economic Outlook, No.45, June 1989. Table R17 'Standardised', Unemployment Notes, except in Denmark and Austria, for which we use R18, 'National definitions' and for the UK for which we use Department of Employment 'X11' Unemployment Series, which is adjusted for the various changes in the definition of unemployment in the UK.

Adjustment for breaks in standardised series

For Belgium adjust 1970-1982 by 11.7x12.1/12.9x12.6

For Germany adjust 1970-1983 by 7.1/8.0

For Sweden adjust 1970-1986 by 2.2/2.7

For Switzerland scaled by a factor of 3 to conform to Labour Force Survey figures.

For Italy scale by 10.6/11.8 (1987 ratio of LFS to standardised figures).

Vacancies: OECD Main Economic Indicators : Historical Statistics and Main Economic Indicators, May 1989.

For UK use corrected figures from Jackman, Layard and Pissarides (1989)

For Germany use Franz (1990) corrected vacancy figures

For US and Canada indexes available. To create series of vacancy levels we use Abraham (1983) adjustments.

We scale remaining countries by a factor of 1.7 except Sweden for which reporting of vacancies is compulsory.

Labour force : OECD Main Economic Indicators : Historical Statistics and Economic Outlook, No.45, June 1989, Tables 37 and 38.

Labour Market Programmes : OECD Employment Outlook, July 1989 and Employment Outlook, September 1987.

In constructing Labour Market Programmes per unemployed person for Sweden we measure unemployment to include those on labour market programmes in addition to those in "open" unemployment. This reduces the figure for Sweden for expenditure on Labour Market Policy by a half.

APPENDIX TABLE 5.1

'World' Unemployment and Vacancy Rates

	World Rates %	
Year	Unemployment Rate	Vacancy Rate
1968	2.53	3.32
1969	2.34	3.85
1970	2.90	3.37
1971	3.41	2.89
1972	3.42	3.16
1973	2.99	4.02
1974	3.37	3.27
1975	5.14	2.20
1976	5.09	2.34
1977	4.97	2.63
1978	4.75	3.12
1979	4.60	3.33
1980	5.15	2.84
1981	6.00	2.43
1982	7.41	1.81
1983	7.88	1.84
1984	7.20	2.37
1985	7.04	2.51
1986	6.89	2.58
1987	6.43	2.88
1988	5.79	3.08
1989	5.47	3.12

Notes:

Computed as weighted averages of national vacancy and unemployment rates over our 14 country OECD data set.
Weights used were relative 'Labour Force' shares averaged over 1968-1989.
Simple correlation coefficient between World Unemployment rate and World Vacancy rate -0.81.

APPENDIX TABLE 5.2

Capturing World Unemployment and Vacancy 'Shocks'

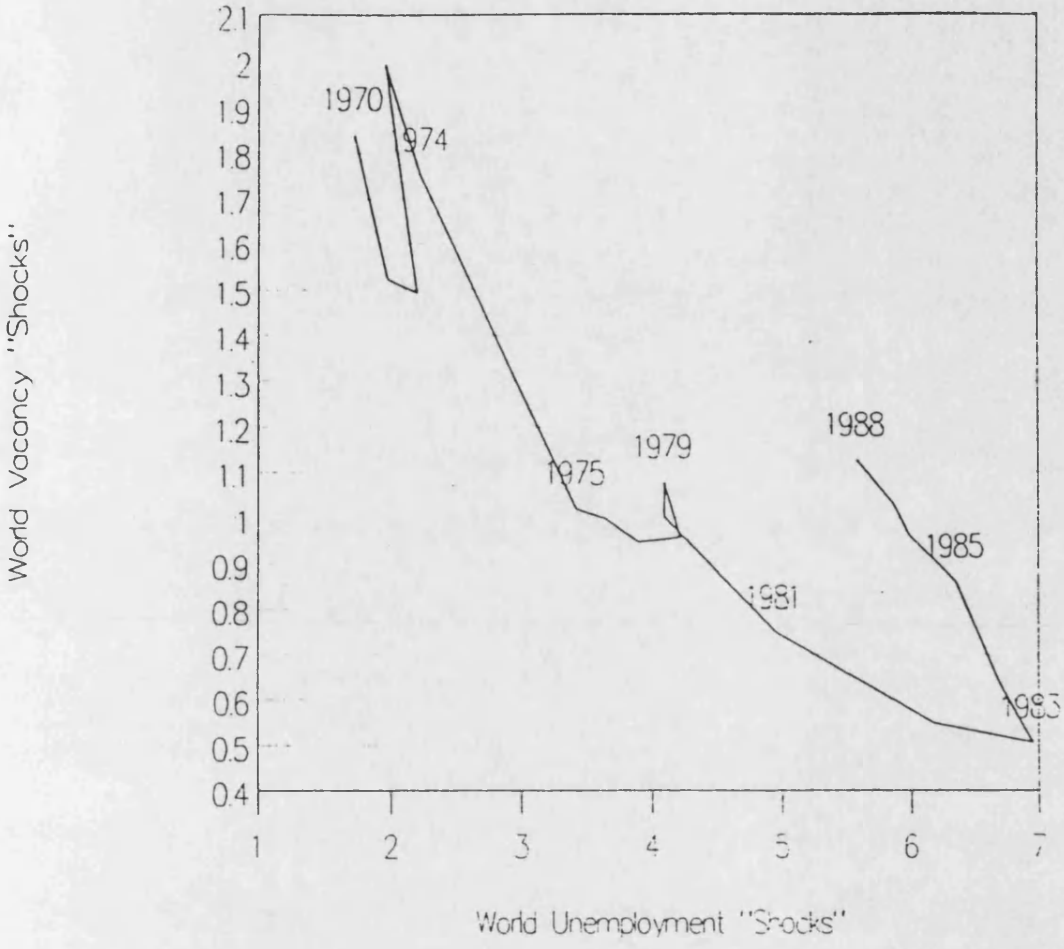
Year	Unemployment 'Shocks'	Vacancy 'Shocks'
1970	1.7	1.8
1971	2.0	1.5
1972	2.2	1.5
1973	2.0	2.0
1974	2.2	1.8
1975	3.4	1.0
1976	3.6	1.0
1977	3.9	0.9
1978	4.2	1.0
1979	4.1	1.1
1980	4.1	1.0
1981	5.0	0.7
1982	6.2	0.5
1983	7.0	0.5
1984	6.7	0.6
1985	6.4	0.9
1986	6.0	1.0
1987	5.9	1.0
1988	5.6	1.1

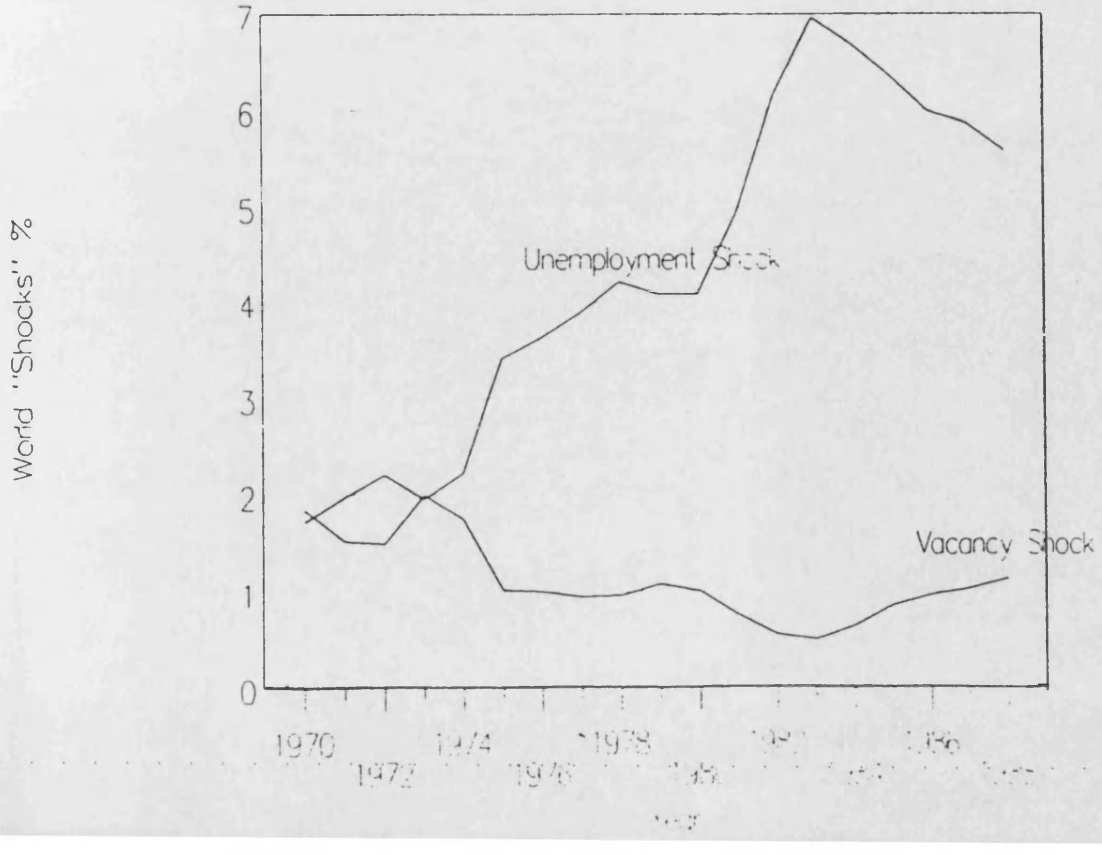
Notes:

Figures obtained by taking the exponential of the estimates of time dummies obtained from a pooled 14 country time series regression over the period 1970-88 explaining country (log) unemployment and vacancy rates using year time dummies. The estimates obtained for the time dummies from the later procedures are in fact unweighted averages across countries of the logarithms of unemployment and vacancy rates respectively.
Estimation by Ordinary Least Squares.
R^2 for unemployment 38.7%.
R^2 for vacancies 12.7%.
14 Countries: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Japan, Netherlands, Norway, Sweden, United Kingdom and United States.

APPENDIX FIGURE 5.1

(See APPENDIX TABLE 5.2)

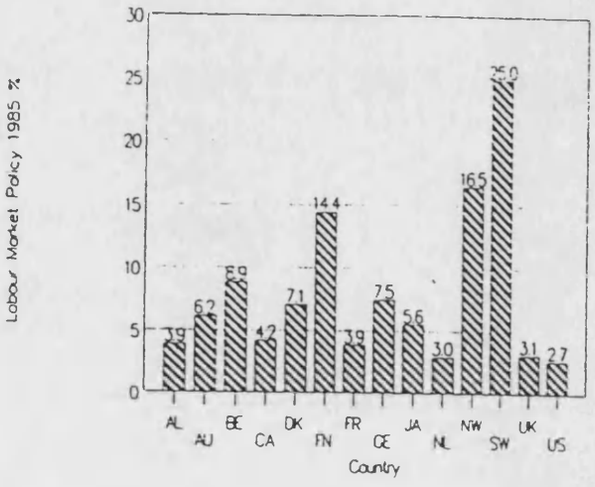




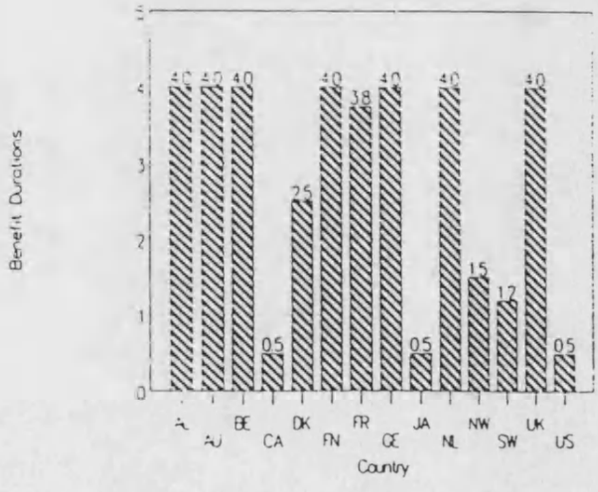
APPENDIX FIGURE 5.2

Institutional Indicators

Labour Market Policy Per Unemployed Person as % of Output per Person 1985



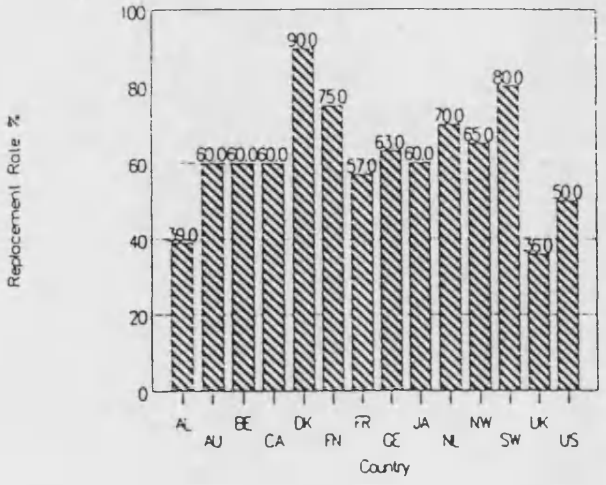
Duration of Unemployment Benefits 1985, in Years



APPENDIX FIGURE 5.2 (cont.)

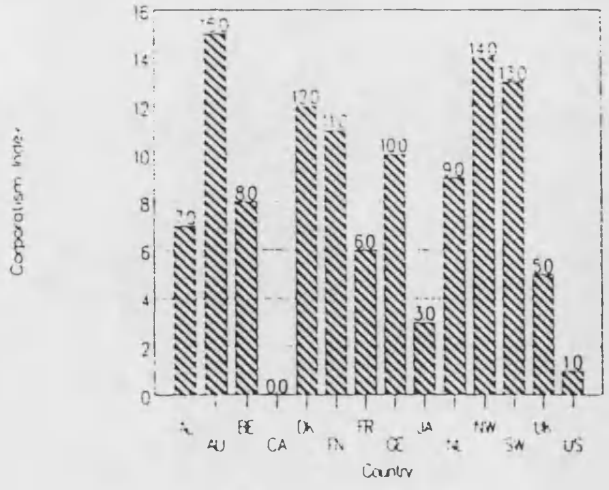
Replacement Rate %

1985



Corporatism Index

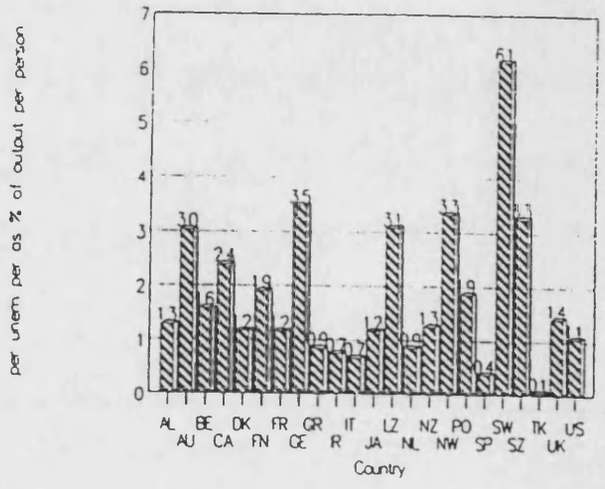
Calmfors and Drifill



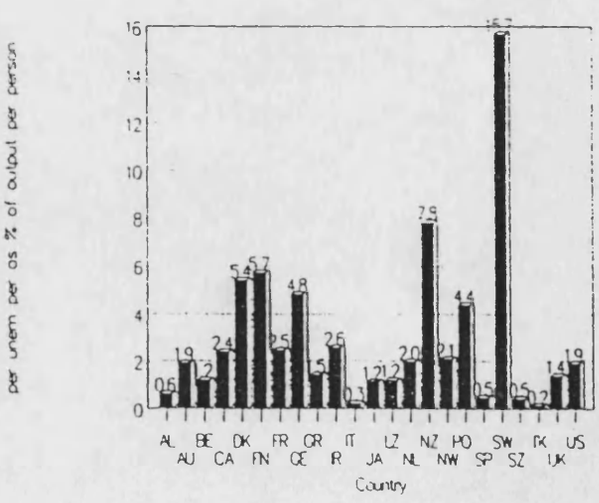
APPENDIX FIGURE 5.3

(see Table 1)

Public Expenditure on Employment Services and Admin: 1988

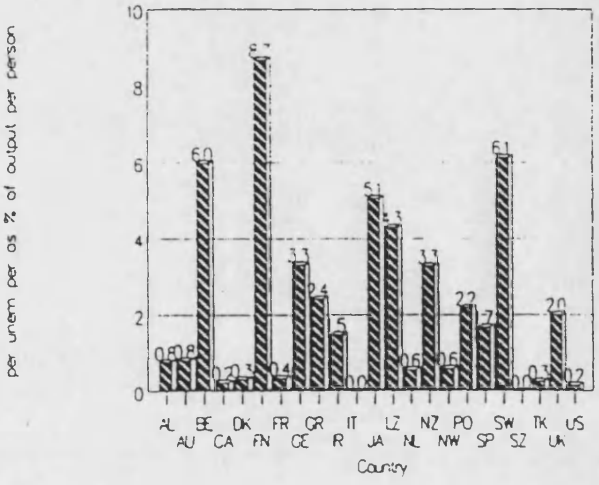


Public Expenditure on Adult Labour Market Training: 1988

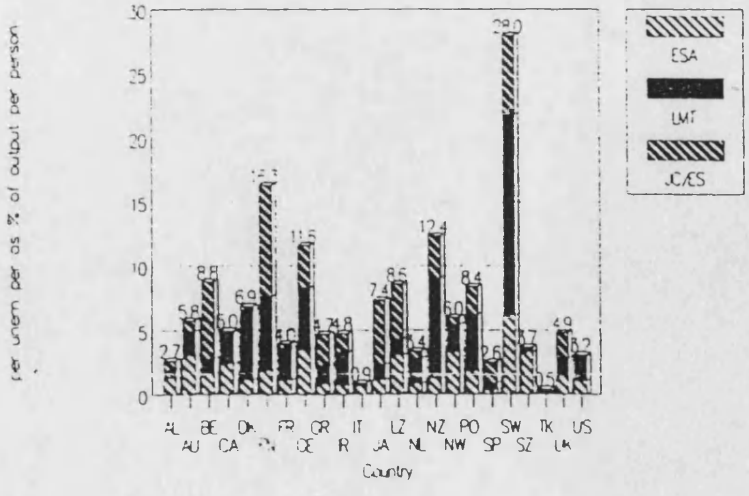


APPENDIX FIGURE 5.3 (cont.)

Public Expenditure on Direct Job Creation + Employment Subsidies: 1988



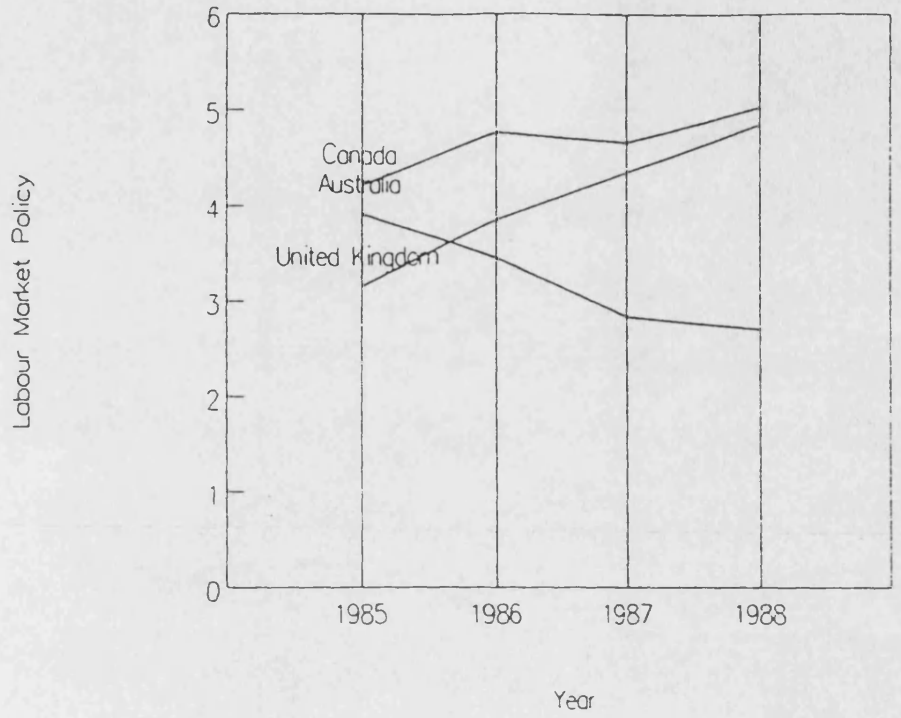
Public Expenditure on Labour Market Programmes: 1988

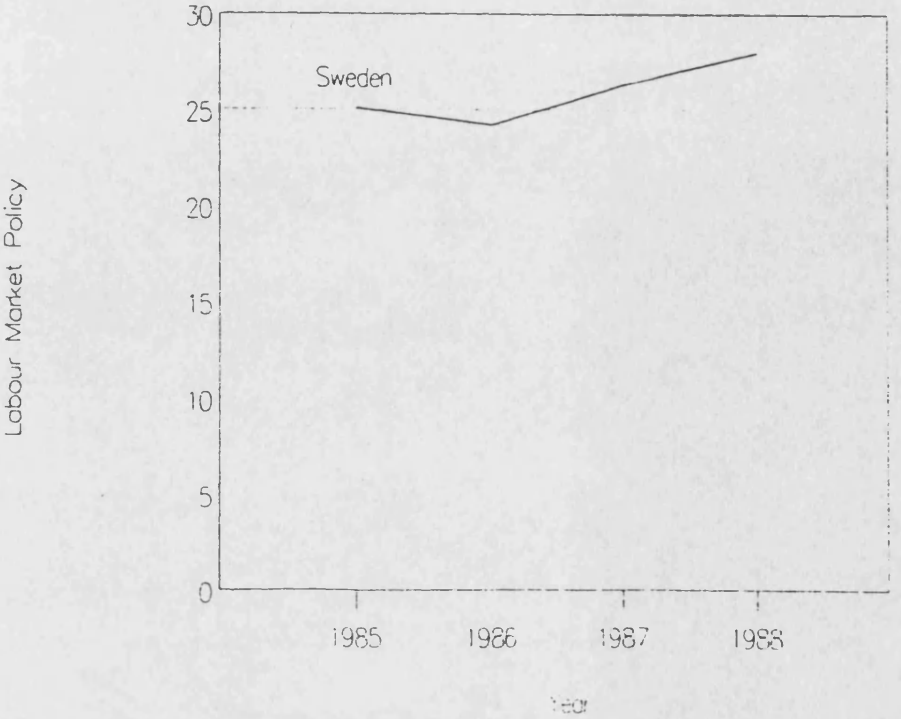


APPENDIX FIGURE 5.4

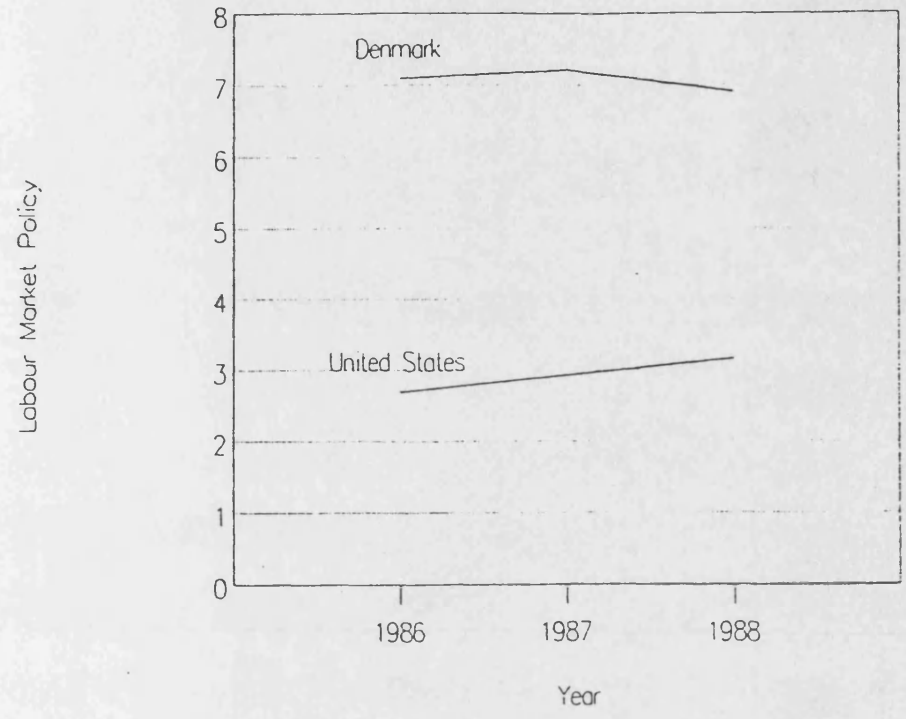
Labour market spending per unemployed person at % of GDP 1985-1989

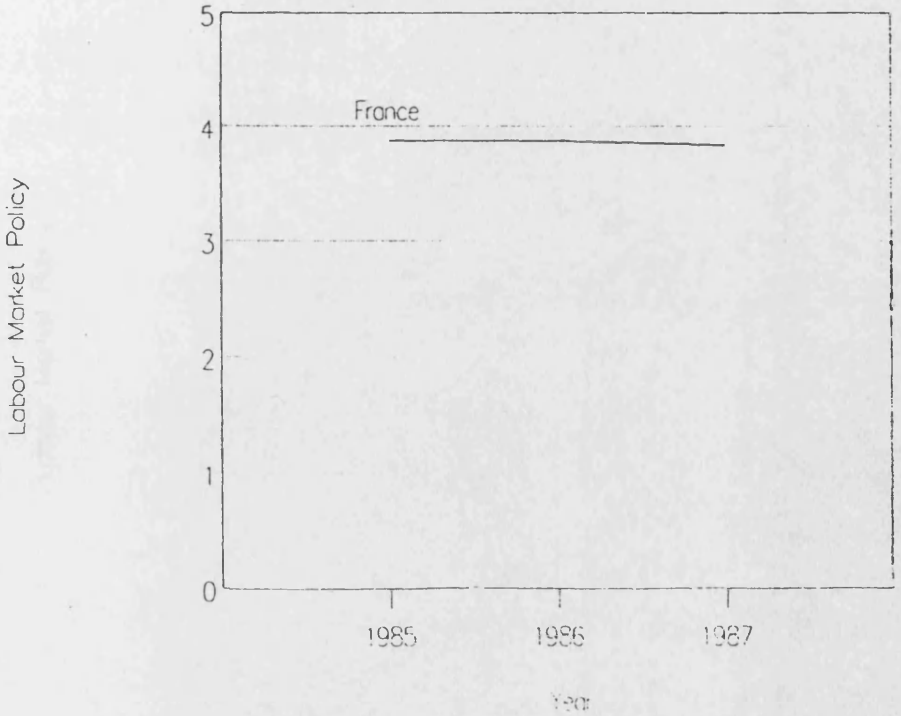
(Employment Outlook July 1989)



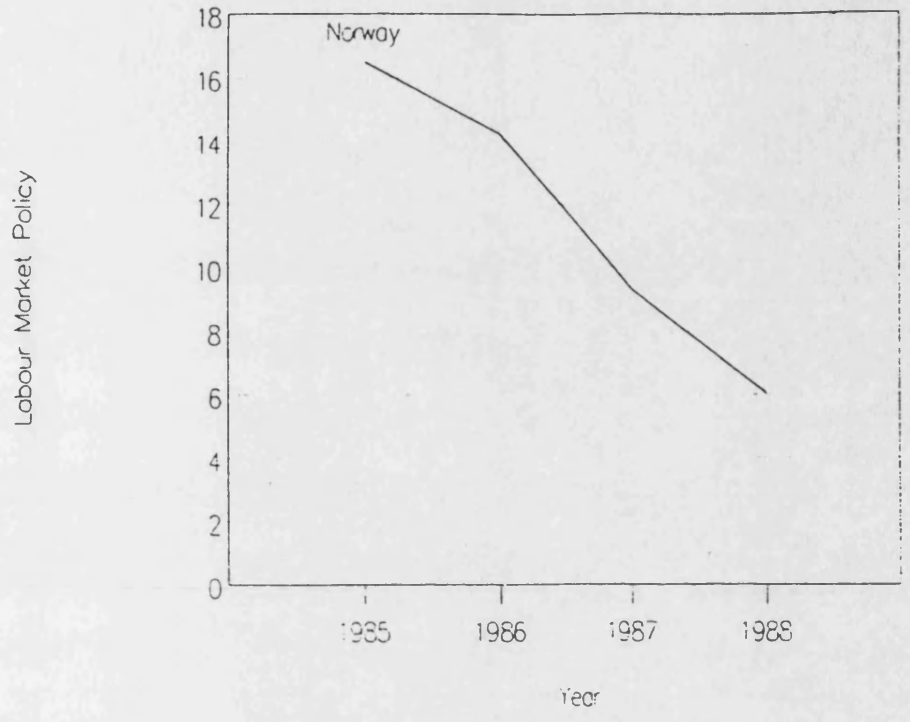


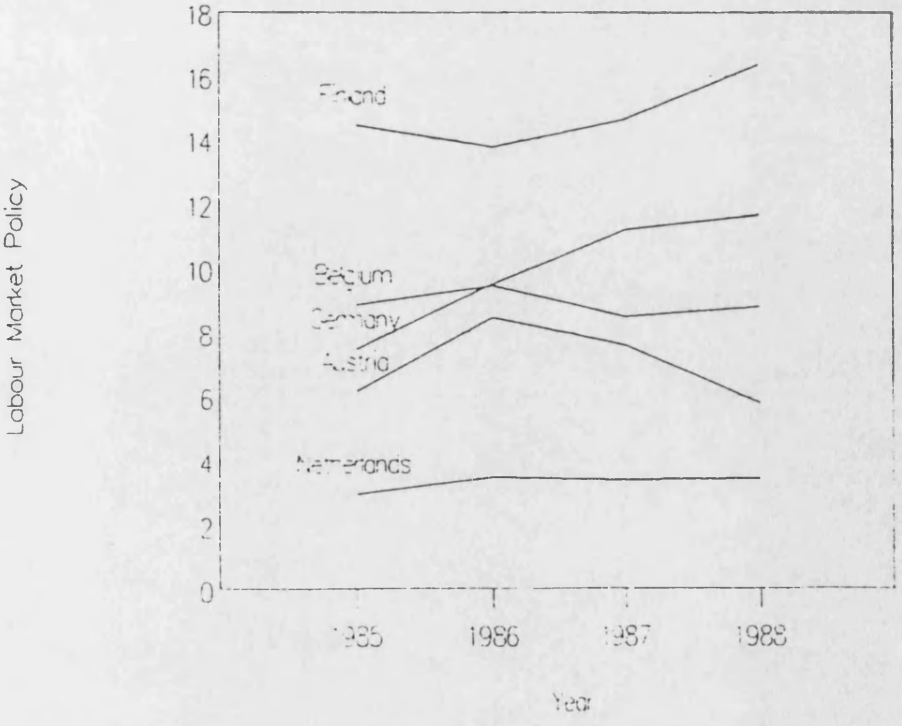
APPENDIX FIGURE 5.4 (cont.)



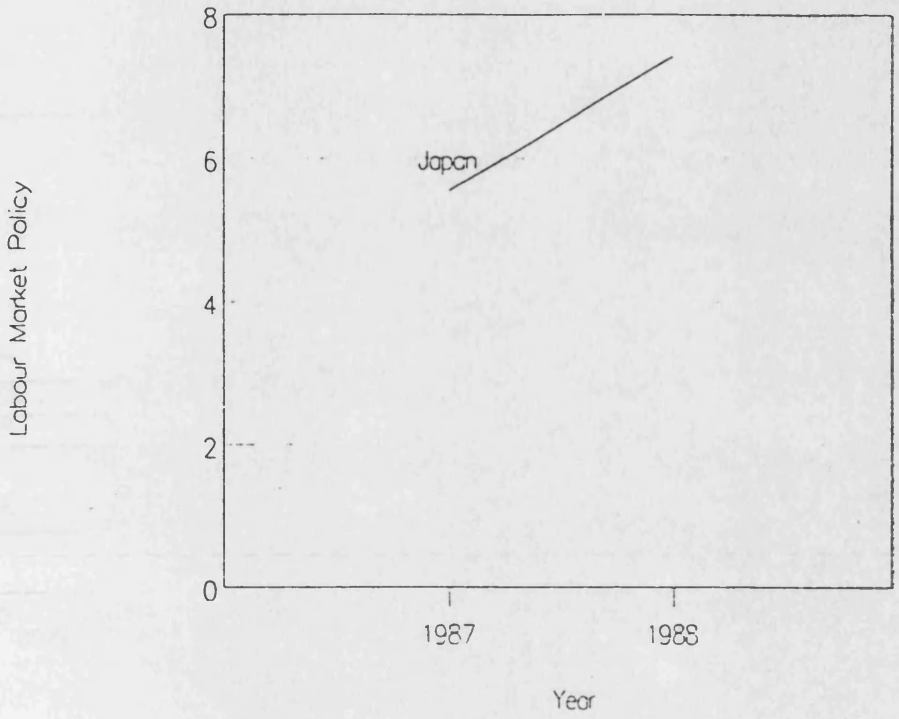


APPENDIX FIGURE 5.4 (cont.)



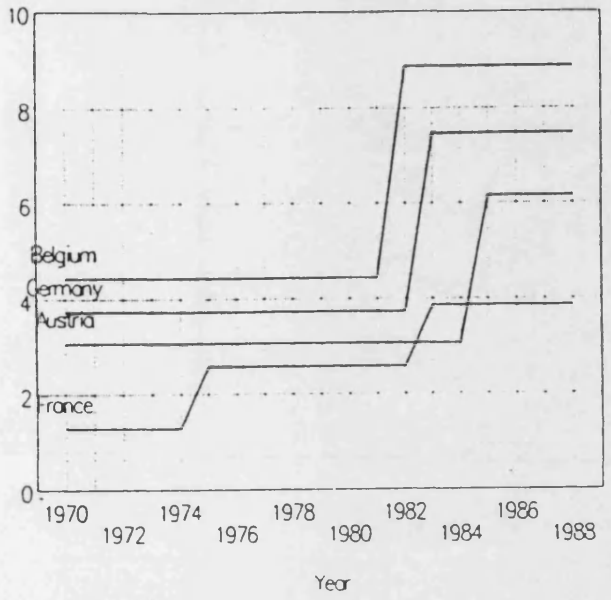


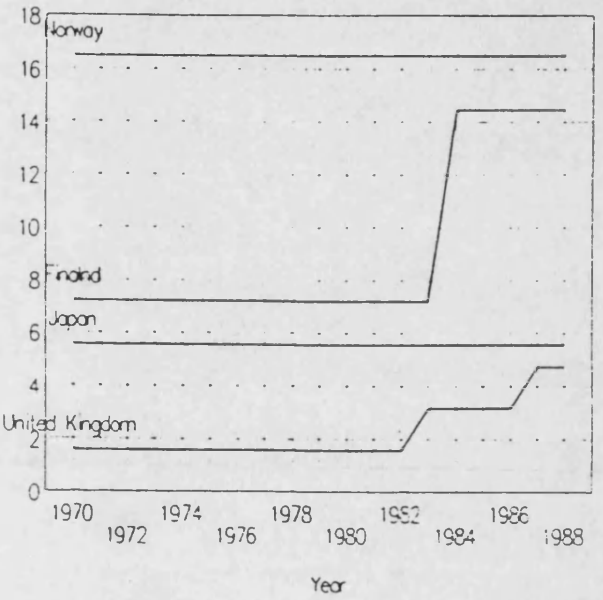
APPENDIX FIGURE 5.4 (cont.)

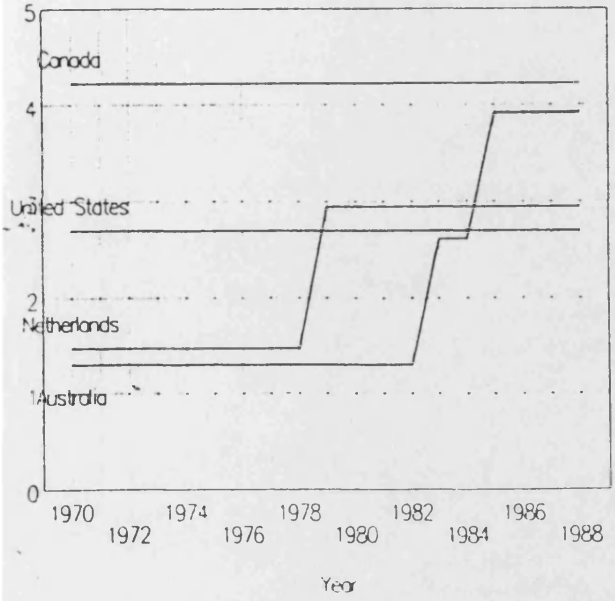


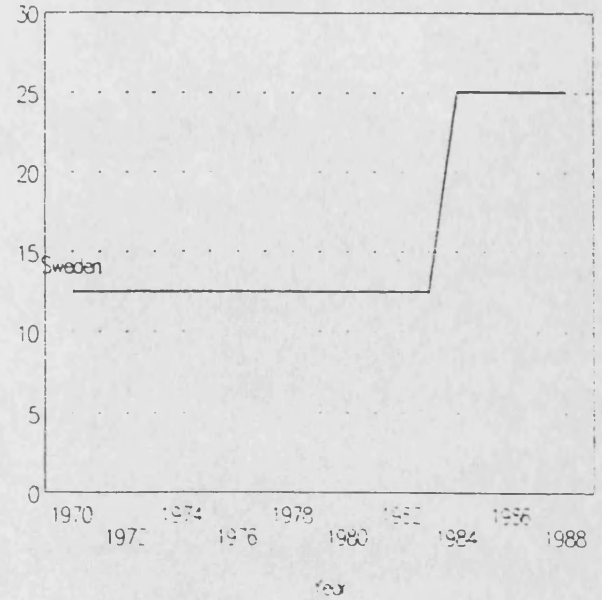
APPENDIX FIGURE 5.5

(See Main Labour Market Programmes and APPENDIX FIGURE 2)

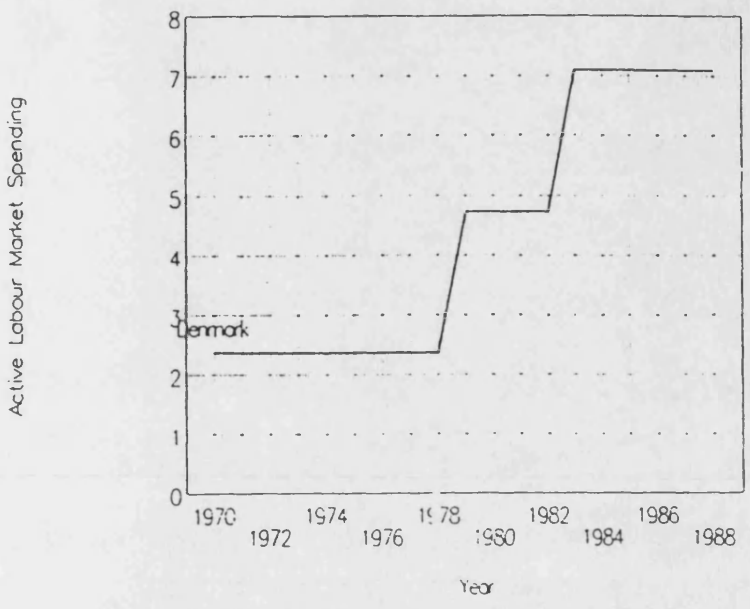






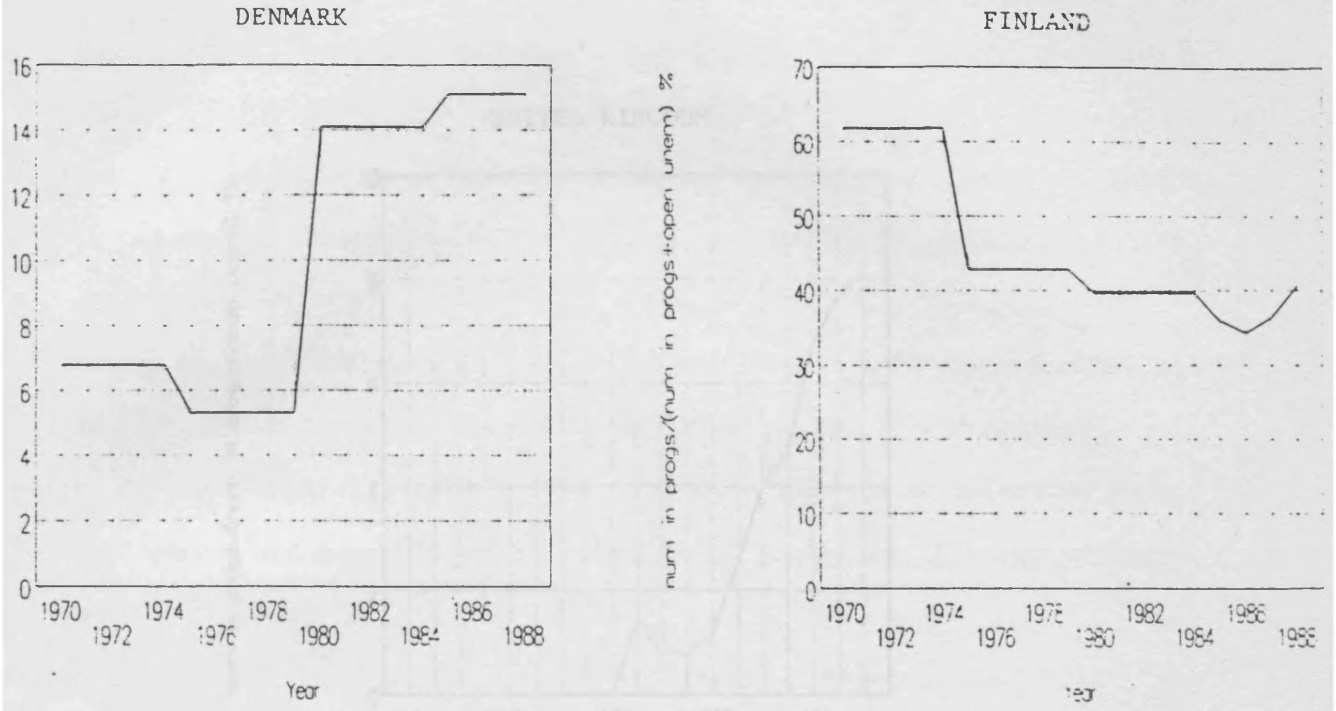


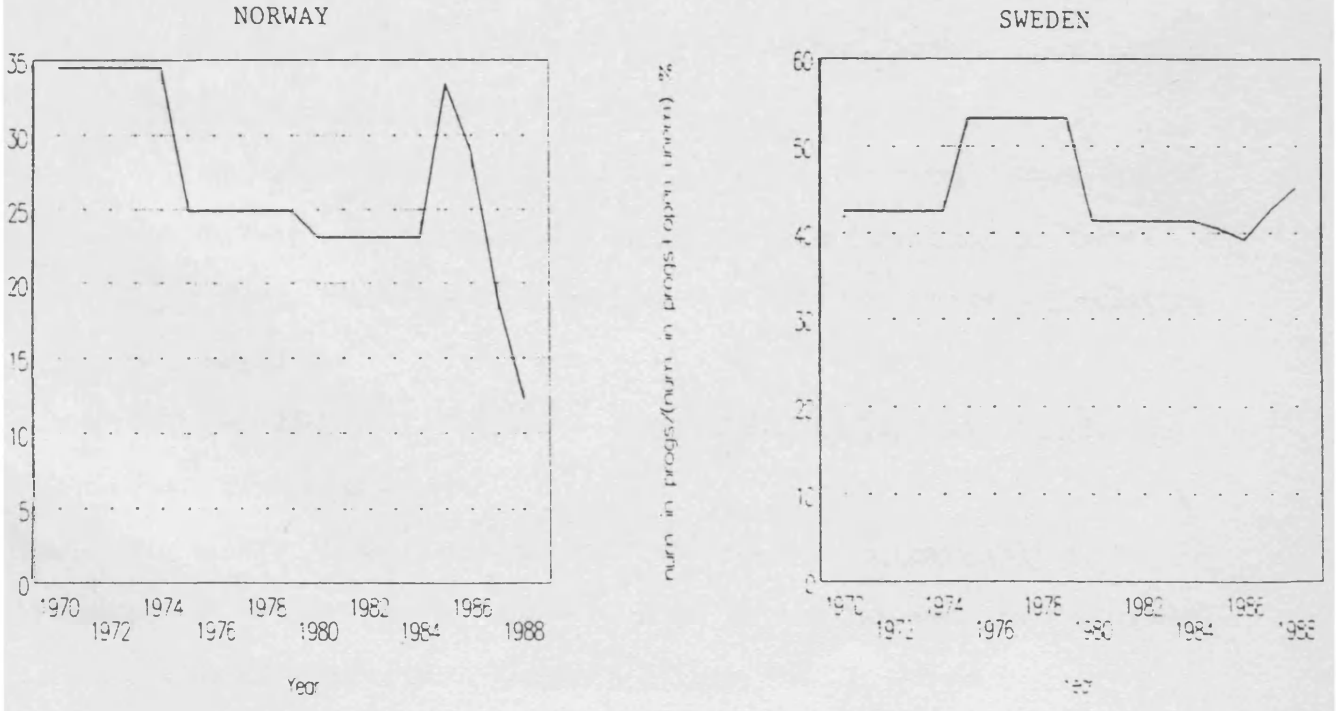
APPENDIX FIGURE 5.5 (cont.)



APPENDIX FIGURE 5.6

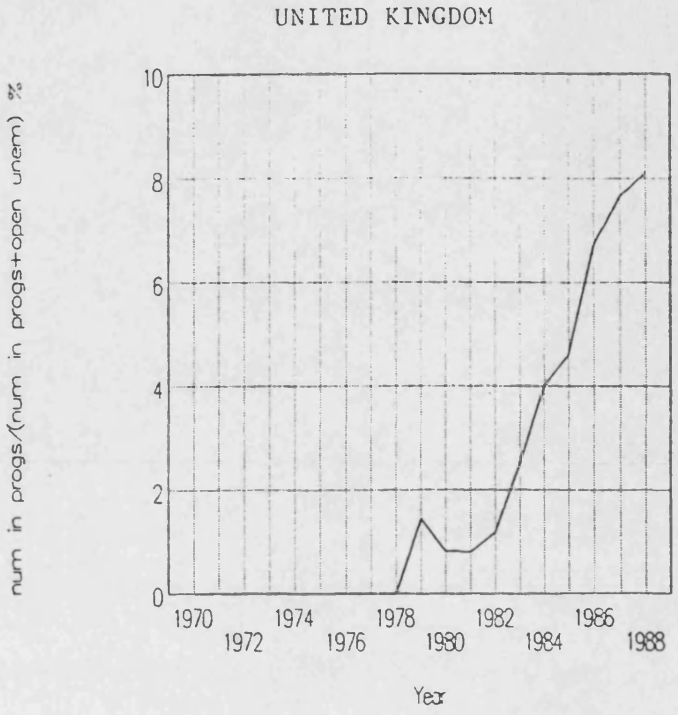
Accommodate stance of labour market policies





APPENDIX FIGURE 5.6 (cont.)

Accommodate stance of labour market policies



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