DYNAMIC WAGE-BARGAINING
IN LABOUR MARKETS:
THEORY AND EVIDENCE

Renuka Metcalfe
University of Surrey

A Thesis Presented to the Department of Economics of the
University of Surrey for the Degree of Doctor of Philosophy

March 2006
Copyright © 2006 by Renuka Metcalfe
Acknowledgements

I wish to acknowledge the excellent supervision of Professor Paul Levine and Stephen Drinkwater. I am most grateful to them both for all their wholehearted and sincere help. I would also like to acknowledge the econometric guidance of Stephen Drinkwater. I also thank all members of the Department and secretaries. I thank my mother for some of the financial assistance. It is impossible for me to thank everyone who has provided me with support. They are far too numerous to mention by name. However, I also thank Peter Ingram, and in addition, I would also like to thank Peter Harper for his help and support.
Abstract

This thesis first presents an empirical investigation, using WERS98 data, confirming that wages are bargained in accordance with a firm's financial performance. The impact of the future financial performance variable is positive and significant. This is in contrast to results attained in the past, with the imposition of the static Nash bargaining solution in wage determination models, which is oblivious to the fact that the relationship is inherently ongoing.

This empirical result was complemented by another empirical study and a theoretical result. The second empirical study examined in detail, using ordered probit estimation, the importance of recruitment and retention of labour in wage determination and affirmed this phenomenon. This is congruent to the finding that more prosperous establishments across industries, regions and bargaining groups over the duration of the eighteen years that are analysed, are the ones that are more likely to consider the recruitment and retention of labour a major bargaining consideration. Additionally, I find that recruitment and retention of labour is a very important bargaining consideration that is affected by the size of the bargaining group, the introduction of new technology, and establishments with different methods of measuring company performance.

Complementing the first empirical result and pursuing its consequences with the added ingredient of full rationality, this thesis presents a new development of a classical problem, one which presents itself in various forms, as dynamic bargaining, dynamic search and matching, dynamic tenure rent-sharing in insiders and outsiders, and so forth. It may be conceived as a non zero sum, two-agent dynamic game in an ongoing relationship. The two agents considered in this treatment are the firm and worker. In this development a few general assumptions are made relating to the behaviour of both the agents in a dynamic environment. As a consequence, a solution to the classical labour economic models and equilibrium value are found to be functions of time. When this characterisation is embedded into the labour market, the full model can generate outcomes of a unique equilibrium, with saddle-path stability. This is impossible if one imposes a steady-state Nash solution in any of the important aspects of the dynamic model as in the past. The theoretical examination confirms that if wages are bargained with the added ingredient of rationality, they are then in accordance with the firm's financial performance, which reinforces the first empirical result of this thesis.
Despite their importance, none of the above studies have been attempted in the past.
Contents

1 Introduction 1

2 The Insider-Outsider Theories: A Review 5

2.1 Introduction ................................................................. 5
  2.1.1 Wage Determination Theories................................. 6

2.2 Seminal Insider-Outsider Models................................. 15

2.3 Incorporation of the Insider-Outsider Distinction 25
  into Trade Union Models and Their Implications............... 25
  2.3.1 Union Preferences.................................................. 25
  2.3.2 Dynamic Insider-Outsider Models.......................... 31
  2.3.3 Heterogeneous Insiders........................................ 33
  2.3.4 Bargaining Structure............................................. 34

2.4 More Recent Developments of the Insider-Outsider Models.... 36

2.5 Empirical Tests of Insider-Outsider Models: Literature Review 47
  2.5.1 Are Unions/Incumbent Workers Mainly 48
    Interested in Increasing Wages?................................... 48
  2.5.2 Do Shocks Generate Unemployment Persistence?........... 51
  2.5.3 Are Wage Adjustments Asymmetric?.......................... 54
  2.5.4 Do Wages Depend on 'Insider' Factors 57
    such as Firm's Level of Productivity and Profits?.............. 57
  2.5.5 Does Unemployment have a Negative 68
    Effect on Wage Settlements?....................................... 68

2.6 Conclusions............................................................... 81

3 Does Forward Looking Behaviour Matter in Wage Determination? 85

3.1 Introduction .............................................................. 85

3.2 Factors that have an Impact on Wage Determination............ 89

3.3 Empirical Specification............................................... 96
4 An Analysis of the Importance of Recruitment and Retention of Labour in UK Wage Settlements

4.1 Introduction..................................................................................... 115
4.2 Characteristics of Those Establishments Likely to Consider Retention and Recruitment a Very Important Factor in Wage Settlements........... 119
4.3 Data............................................................................................... 128
4.4 Preliminary Data Analysis of the Influences on Wage Settlements....... 132
4.5 Modelling the Importance of the Recruitment and Retention of Labour 148
4.6 Results........................................................................................... 153
4.7 Conclusions.................................................................................... 169

5 The Dynamic Bargaining Problem in Labour Markets

5.1 Introduction..................................................................................... 172
5.2 Trade in the Labour Market Model.................................................. 175
5.3 The Matching Function and the Beveridge Curve............................. 176
5.4 The Firm: The Value of a Job and a Vacancy.................................... 178
5.5 The Worker: The Value of Employment and Unemployment............. 179
5.6 A Bargaining Model Between Firms and Workers............................ 182
   5.6.1 The Bargaining Process.............................................................. 182
5.7 Market Equilibria................................................................. 186
5.8 Calibration of the Model............................................................... 189
   5.8.1 Unemployment................................................................. 190
   5.8.2 Vacancies................................................................. 190
   5.8.3 Wages................................................................. 191
   5.8.4 Other Data Series................................................................. 192
   5.8.5 Calibration Values................................................................. 192
List of Tables

2.1 Seminal Insider-Outsider Models................................................................. 16
2.2 Studies where the IO Distinction is Incorporated into Trade Union Models 26
2.3 Studies on the Probability of Employment on the Labour Demand Curve 27
and Outsiders Accorded some Weight in the Overall Union Preferences...
2.4 Studies Utilising the Stone-Geary or Closely Related Utility Functional Form 29
2.5 Studies Showing a Low Level of $\theta$, indicative of a Greater Acceptance 30
of Variability of Employment...........................................................................
2.6 Dynamic Insider-Outsider Models............................................................... 32
2.7 Heterogenous Workers............................................................................. 34
2.8 Bargaining Structure............................................................................. 36
2.9 More Recent Developments of Insider-Outsider Models......................... 40
2.10 Studies on Asymmetric Adjustment of Wages in Insider-Outsider Models 41
2.11 Studies on the Irrelevance of the Asymmetric Adjustment in Insider 43
Outsider Models..............................................................................................
2.12 Studies on Employment Adjustment and Unemployment Persistence.... 43
2.13 Studies Critiquing the Employment Adjustment and Unemployment 45
Persistence Outcome......................................................................................
2.14 Studies on Wage Equations..................................................................... 46
2.15 Studies on Whether Unions/Incumbent Workers are Mainly Interested in 49
Increased Wages.............................................................................................
2.16 Study Critiquing the Monopoly Union Model........................................... 51
2.17 Study on Unions Strongly Preferring Wages............................................. 51
2.18 Studies on Whether Shocks Generate Unemployment Persistence...... 53
2.19 Studies on Asymmetric Wage Adjustments............................................. 56
2.20 Do ‘Insider Factors’ Have an Impact on Wages? 58

Studies Using Aggregate Level Data.............................................................
2.21 Do ‘Insider Factors’ Have an Impact on Wages? 60

Studies Using Industry Level Data.................................................................
2.22 Do 'Insider Factors' Have an Impact on Wages?

Studies Using Firm Level Data

2.23 Do 'Insider Factors' Have an Impact on Wages?

Studies Using UK/British Survey Data

2.24 Do 'Insider Factors' Have an Impact on Wages?

Studies Using US Survey/Canadian Contract Data

2.25 Does Unemployment Have a Negative Impact on Wage Settlements?

Studies Using Aggregate Level Data

2.26 Does Unemployment Have a Negative Impact on Wage Settlements?

Studies Using Industry Level Data

2.27 Does Unemployment Have a Negative Impact on Wage Settlements?

Studies Using Firm Level Data

2.28 Does Unemployment Have a Negative Impact on Wage Settlements?

Studies Using UK/British Survey Data

2.29 Does Unemployment Have a Negative Impact on Wage Settlements?

Studies Using US Survey/Canadian Contract Data

2.30 A Study Which Considers Wages to Not be A Convex Function of Insider and Outsider Factors

2.31 Studies Which Defy the Labour Demand Curve Interpretation for the Impact of Variables such as Profit and Productivity on Wages

3.1 Factors Influencing Wages (in percentages)

3.2 Summary Statistics for the Wage Settlements for all Sectors, Future Financial Performance and the Establishment Financial Performance Variables

3.3 Summary Statistics for Explanatory Variables in the WERS98

3.4 Wage Equations for the Largest Occupational Group (Excluding Managers) Across all Sectors in the UK, 1998

4.1 Settlement Durations: 1979 – 2000
4.2 Nominal, Real Average and Nominal Zero Settlements Annually: 1979 – 80 to 1996 – 97
4.3 Determinant Ratings: Percentage of Respondents Citing the Determinant as 'Very Important', 1979/80 – 1996/97
4.4 Descriptive Statistics for the Importance of the Recruitment/Retention of Labour in Exerting Upward Pressure on the Level of Settlements:
4.5 Mean Settlement by Expected Productivity, 1986/87 – 1996/97
4.6 Descriptive Statistics for Explanatory Variables in the CBI Pay DataBank
4.7 Ordered Probit Results of the Need to Improve Ability to Recruit/Retain Labour as a Factor Exerting an Upward Pressure on Level of Wage Settlements
4.8 Some Additional Estimates
4.9 Ordered Probit Estimates: of the Need to Improve Ability to Recruit/Retain Labour as a Factor Exerting an Upward Pressure on the Level of Wage Settlements During Economic Cycles
5.1 Baseline Calibration Values
5.2 Equilibria, where \( NBS = ITE \) and Costs and Utility Functions are Linear
5.3 Equilibria, with Non-Linear Costs and Utility Functions
List of Figures

4.1  Annual Nominal and Real Wage Settlement Increases, 1979/80 – 96/97........... 134
4.2a Annual Nominal Wage Settlements in Economic Cycle 1: 1979/80 – 1982/83........ 134
4.2b Annual Real Wage Settlements in Economic Cycle 1: 1979/80 – 1982/83........... 135
4.3a Annual Nominal Wage Settlements in Economic Cycle 2: 1983/84 – 1988/89....... 135
4.6  Average, Nominal and Real Wage Settlement Increases, Recruitment/Retention as a Very Important Factor and Unemployment Rates: 1979/80 – 1996/97............. 145
4.7  Expectation of Productivity to Increase or Decrease in the Next 12 months....... 146
CHAPTER 1
INTRODUCTION

Forward-looking behaviour and its consequences, and a thorough examination of the importance of recruitment and retention of workers, is feasible and useful for analysing more realistic/plausible wage determination. The core chapters in this thesis firstly, empirically show, using two different types of dataset, how wages are determined, which is in contrast to all previous studies in labour economics; second, they provide an analysis of how to analyse the consequences of forward-looking behaviour within a rational expectations equilibrium framework.

The first part of the very first sentence is shown in the core chapters 3 – 5 of this thesis, where I provide two empirical studies to show that forward-looking behaviour and the recruitment and retention of labour as major bargaining considerations, reflects reality. This analysis uses two different datasets, estimation techniques and data structures, permitting generality for my arguments. I then explain the feasibility of how to theoretically demonstrate the consequences of forward-looking behaviour with full rationality. It follows that my arguments are robust from the important theoretical, as well as as from an empirical perspective.

Lindbeck and Snower have developed a very fruitful theory of the game between firms and workers in their book *Insider- Outsider Theory of Employment and Unemployment*. Their book comprehensively develops a theory where incumbent workers exert excessive influence in the wage-bargaining process, on account of their tenure with the firm. This exertion of power by incumbents whilst bargaining with the firm, and the ensuing higher wage, has hitherto been analysed in steady-state, although the firm and workers are in an ongoing relationship. My theory, in contradistinction, is essentially dynamic. This is assumed at every aspect of the game, after having shown empirically, first, that forward-looking behaviour matters in wage determination. In addition, I also establish empirically that recruitment and retention is important in wage determination in detail, for which no attempt has been made in the past.

The notion of dynamic equilibria in wage-bargaining is the basic ingredient in my theory. This notion yields a generalisation of the concept of the solution of an in or out-of-steady-
state wage-bargaining/labour\textsuperscript{1} market model with static wage equations. It turns out from my simulations of the labour market, that such imposition of steady-state wage equations in an out-of-steady-state model, for example, leads the economy to instability. That is, the equilibrium points appear to be simply opposing the correct strategies.

In chapter 5, I consider dynamic equilibria in a labour market model with random matching and strategic bargaining. Lindbeck and Snower and all other wage determination studies focus on steady-state wages, or, if dynamics are discussed at all, merely impose Nash's axiomatic bargaining solution, as in Pissarides (2000). Imposition of the Nash solution out of steady-state is tantamount to assuming that agents are myopic. In my game, I assume that workers and firms are forward-looking and pursue the consequences of this behaviour, with the added ingredient of full rationality, and show that this generates qualitatively different equilibria. I consider situations where there is no delay in bargaining, and hence, there is immediate trade equilibria (ITE henceforth). The concept of expectation with foresight is crucial in my theory and this is what drives most of the thesis. The consequences of using ITE, as opposed to the Nash bargaining solution, is that first, we can examine whether the equilibrium is subgame perfect; second, we can analyse whether the equilibrium is well behaved, unique and saddle-path stable; third, simultaneously/synonymously assess whether forward-looking behaviour is consistent with stable and unique outcomes in wage-bargaining. These outcomes complement the empirical establishment of the forward-looking behaviour of bargainers in Chapter 3.

In terms of results in labour economics, I show that with the consequences of forward-looking and rational behaviour in the bargaining process, the full system of the labour market has a unique equilibrium, which is saddle-path stable in nominal prices and real economic activity. The examination of the full system of the labour market is infeasible in the same model with steady-state/myopic bargaining, these type of equilibria are not possible in such a model. Thus, the forward-looking nature of the bargaining solution makes a qualitative difference. My discussion has highlighted the fact that the imposition of a steady-state wage in a dynamic environment will yield distorted results. Chapter 5 provides a wholesome theoretical analysis of the consequences of forward-looking wage-bargaining. I also provide empirical verification in support of the forward-looking and rent-sharing behaviour in chapters

\textsuperscript{1}As in the out-of-steady-state labour market model of Pissarides (2000) and in the steady state model of Lindbeck and Snower (1988).
3 and 4 respectively.

The rest of the thesis is organised as follows:

In Chapter 2, I review all the insider-outsider models of wage determination, with respect to both the theoretical and empirical contributions of the theory, and I also highlight important gaps in the literature that this thesis will bridge. This chapter also shows how my contribution fits into the literature.

In Chapter 3, I empirically verify the other main element of Theorem 1 in Chapter 5 of this thesis, which is that forward-looking behaviour matters in wage determination and which is also the main foundation of this thesis. The results of the cross-section data estimation for approximately 2,000 firms, which strongly demonstrate that future financial performance has a positive and significant impact on wage settlements.

In Chapter 4, I provide a comprehensive empirical verification of the importance of recruitment and retention as a wage determinant. That is, it was shown in Theorem 1 that the negotiated wage is monopolistically priced and the agents are forward-looking. This is manifested in establishments reporting the importance of recruitment and retention of labour as a major bargaining consideration, using cross-sectional time-series data provided by the Confederation of British Industry. The data enable the identity characterisation of the establishments who consider the recruitment and retention of labour as a very important factor in wage-bargaining. Using ordered probit estimation, I am able to identify the regions, industries and bargaining groups in which the need to retain and recruit as a very important factor in exerting upward pressure in wage settlements is highest. In particular, my results show that it is the more prosperous/successful firms which report that the recruitment and retention of labour is a major bargaining consideration. That is, there is a positive correlation between the prosperity of an establishment and their reporting of the recruitment and retention of labour being a very important bargaining consideration. These results provide strong complementary support for the first empirical chapter of this thesis, which was investigated in the context of the insider-outsider theory, which is sustained by labour-turnover costs. While there are ample theories on some types of labour turnover models (for example insider-outsider theory, on which I applied my empirical analysis in particular), no endeavours have been made to provide a comprehensive empirical analysis of the relevance of turnover models.
In Chapter 5, I analyse dynamic bargaining and show that the wage is a differential function of time in equilibrium. This is in contrast to previous studies, which have imposed steady-state wages in a dynamic environment, or, if out-of-steady-state dynamics are considered in labour market models, the steady-state wage is imposed. I then derive a differential equation representation of equilibrium in a labour market. Third, I embed the solution to the dynamic bargaining game into the labour market model and describe labour market equilibria.

In Chapter 6, I conclude by providing the main results of this thesis, citing the limitations of this research and suggesting extensions for future research, which are naturally those which stem from the research conducted in this thesis.
CHAPTER 2

THE INSIDER-OUTSIDER THEORIES: A REVIEW

2.1. INTRODUCTION

Unemployment and wage determination have always interested economists and policymakers. Explanations of changes in unemployment, both secular and cyclical, emanate importantly from the models of wage determination. A central theme in the wage determination literature has been to understand how the procedure of wage-setting and the process by which bargainers negotiate, affect the wage outcome.

A two-person ongoing bargaining situation occurs when two individuals who have the opportunity to collaborate for mutual benefit in a long-term relationship in a number of ways. In the simpler case, considered in most of this thesis, in contrast to earlier studies, no action which has repercussions for the future taken by one of the individuals without the consent of the other can affect the welfare of the other one. In addition, considering that in a two-person ongoing bargaining situation between a firm and worker, labour from the latter constitutes the most fundamental and essential factor of production, it is crucial that a detailed examination of the recruitment and retention of labour is accomplished and not only as part of a general enquiry into wage determination as has been done in the past. This deficiency is addressed in Chapter 4.

Wages are the remuneration paid to workers by a firm in return for their labour services. The firm utilizes the labour services to produce output, which the firm sells to maximise its profit, while workers maximise their utility in terms of the wages they receive. Given these incentive incompatibilities between these two agents, as they both want to enhance their respective objectives, one way to reach a mutually beneficial agreement is to utilize the forward-looking Nash solution to determine wages. Earlier studies focus on steady states or impose the static Nash solution, when dynamics are discussed at all. This determination of wages is only accomplished in steady states and essentially assumes myopia on the part of the bargainers. This shortcoming is addressed in Chapter 5.

Prior to my development of dynamic bargaining in labour markets in the succeeding chapters, it will be useful to review past studies on wage determination. The two agents
who determine wages are conventionally considered to be firms and workers. The objectives of the firm generally are to maximise profits, and the workers generally want to maximise utility. There is some debate concerning the objectives of unions. Certainly, according to one of the main theories of wage determination; most insider-outsider theories (IOT, henceforth or IOM for model and IO for insider-outsider), first comprehensively developed by Lindbeck and Snower (1988) (LS henceforth), insiders are not interested in the employment prospects of unemployed workers (outsiders).

Many non-competitive models of wage determination have been proposed, most notably union bargaining and efficiency wage theory (henceforth EWT). It is well known, that labour markets are imperfect and there can be a considerable amount of involuntary unemployment, for example, not in the UK currently, but it is true in Germany. The employment and unemployment statistics in the 1980s, when unemployment was persistently high, despite high wages, particularly in Europe, excited a great deal of interest. IOT was one of the theories developed to explain this persistency. This particular hypothesis which states that wage setting is dominated by insiders, that is, incumbent workers with tenure (they could be union or non-union members), has gained popularity amongst economists and policymakers. This chapter focuses particular attention on IOT.

It is the purpose of this chapter to provide a summary of the literature of the main theories of wage determination, focusing on IO theories as an example, to identify/highlight the lacuna in the literature, that my thesis will bridge.

2.1.1. Wage Determination Theories

A whirlwind tour of the main theories of wage determination, which have informed empirical studies over the years, will now be conducted, with particular attention being accorded to the EWT, since IOT is an offshoot of the labour turnover and union threat models of EWT. The discussion will provide an indication of the variables used in the empirical specification in chapter 3. Special attention of course, will be focussed on IOT.

These extant theoretical determinants of wages, shown below, appear to focus more on predicting wage levels rather than pay adjustments, which accrue to reflect the change in circumstances that have occurred since the previous pay was determined. I analyse pay adjustments in Chapters 3 and 4 to formulate a more satisfactory empirical specification.
We now turn to the theories of wage determination put forward by other authors.

**Neoclassical labour market theory**

In the competitive labour market theory, labour supply is assumed to be perfectly elastic, i.e., the firm can hire as much labour as they like at the going wage rate. If there is a gain i.e., an improvement in the financial performance of the firm this will be translated into increased output and employment at the going wage, prior to the improvement in financial performance. Here higher wages are paid to workers in short supply.

**Imperfectly competitive labour and product markets**

Imperfectly competitive labour market theories gives rise to different predictions. If the firm is a monopsonist, the prediction is that the firm will pay each worker's reservation wage and if identical wages are paid to all workers, the wage will be less than the value of the workers’ marginal product. A variant of this model is the dynamic monopsony model of Burdett and Mortensen (1998), where they show that larger firms pay higher wages and these firms are also subject to lower quit rates and find hiring is easier and cheaper, thus enabling them to increase in size. Green, Machin and Manning (1996) also find that the correlation between wages and firm size will be prominent where the labour market is more monopsonistic.

Where the firm is a monopolist or near monopolist in the product market, the firm may pay higher wages, since the firm faces less competition in the product market. But the trade unions representing all or most of the employees may wish to negotiate the wages with the firm. In such cases, both the firm and the trade union may negotiate the employment level and wages. This form of bargaining is known as the efficient bargaining model. In other cases, only the wage is bargained for by both the agents, and the firm unilaterally determines employment. This form of bargaining is the right-to-manage model. The bargaining models predict higher wages, as the trade unions are better able to seek the rent accruing to the firm.

**Efficiency wage theory**

Another imperfectly competitive labour market theory is the efficiency wage theory. The main assumption of the EWT is that workers exert greater effort when higher wages are paid. All models of wage determination refer to the payment of higher wages to increase
encourage efficiency and/or productivity. The notion that high wages encourage efficiency is explicitly and extensively discussed in EWT. It will be useful to consider very briefly, the source of insider power, since IOT is a special case of EWT, as noted previously.

In the EWT, higher wages are paid to elicit greater effort. The fundamental notion underlying EWT is that wages in excess of the market clearing wage are paid to provide an incentive to yield greater efficiency per unit of output, resulting from greater effort from its workforce. The firm pays higher wages to provide incentive to yield greater effort from its workforce. Leibenstein (1957) first put forward this notion for underdeveloped countries. The fundamental assumptions of the theory are: first, firms exert market power in the wage determination process and firms have imperfect information on the productivity of their workers. Since firms have imperfect information about individual worker's productivity, firms use wages to augment information dissemination. There are several reasons for paying efficiency wages; first, payment of higher wages provides an incentive for workers to not shirk and to exert greater effort (see, for example, Shapiro and Stiglitz (1984) and Wadhwani and Wall (1991)), who show that there is a positive correlation between higher wages and productivity. Second, higher wages are paid to attract better quality applicants to apply for the post, thereby attempting to alleviate adverse selection. Third, higher wages also dissuades a firm's workers from forming a union. Fourth, payment of higher wages discourages workers from quitting, thereby, reducing the firm's turnover costs. Fifth, higher wages increase goodwill amongst employees, that is, if the firm share its profits when it is financially performing well, then in return the worker will exert greater effort (that is, both parties can be perceived as exchanging gifts), thereby enhancing productivity, see Akerlof, 1982). Thus, firms have an incentive to pay wages in excess of the market clearing level.

All models of the EWT suffer from a number of problems. First, the weakness of the shirking model is that posting of bonds upon entering the firm, which will be forfeited if employees shirk or quit; or payment of an entry fee, which is returnable at the normal retirement age, can obviate the need to pay efficiency wages. However, for legal and moral hazard reasons, i.e., the incentives for the firm to announce that performance was inadequate and retain the bond, and for imperfect capital market reasons (Akerlof and Katz (1989)) we do not observe the posting of bonds in the real world. But, we do observe wage profiles in the primary sector, which can be seen as a form of 'bond posting'. The difficulty is that the
original shirking model was not intended to provide explanations of unemployment in the primary sector.

The weakness of the adverse selection model is that higher wage offers do not preclude less able workers from applying for posts. The weakness of the union threat models is that the payment of higher wages does not prevent workers from acting as though they belong to a union. This is where the explanation provided by the IOT comes in; it provides an additional reason to prevent the formation of a union, thereby rehabilitating the union threat model of the EWT. The difficulty with the turnover model is that the payment of higher wages does not prevent workers from quitting. Again, this is where IOT comes in, by providing a potent reason for reduced labour turnover, i.e., persistence in employment.

Evidence in support of the payment of efficiency wages include Krueger and Summers (1988). Using panel data they find that the difference in wages when an individual changes job to another industry is similar to the industry wage differential. Krueger and Summers have ruled out that industry wage differentials are due to demand shifts. They find the correlation between the industry wage differential in 1974 and 1984 is 0.97. However, this study did not rule out measurement error or endogeneity problems. Murphy and Topel (1987) attempted to overcome the first problem and found that wage differentials across industries were due to unmeasured quality effects. But these unmeasured quality effects rendered their results biased upwards. Gibbons and Katz (1992) also found wage differentials to exist across industries, which cannot be explained by competitive models. Pencavel (1972) and Freeman (1980) find that there is a negative correlation between quits and higher wages. In interviews with the UK firms, Kaufman (1984) found that higher wages are paid to induce greater effort and in fairness to workers. Wadhwani and Wall (1991) as noted, have shown there is a positive relation between higher wages and productivity and that the latter increases when the level of unemployment rises. However, the results are flawed, as they have not adequately explained the inclusion of the unemployment variable in their model, that is, the effect of unemployment on productivity. Fairris and Alston (1991) have also shown that efficiency wages are paid to workers.

The most plausible empirical studies of EWT were conducted by Capelli and Chauvin (1991) using a time-series study, and Leonard (1987), who used cross-section data. In the for-
mer study, the structure of the data set\(^2\) they utilised controls for a number of problems that confronted other tests on efficiency wage effects. In the latter study, he examines EWT at the level of the firm, utilising detailed occupational classification to act as a control on worker quality, which is preferable to the ubiquitously used age and education measures. However, Leonard estimated a production function, with explanatory variables which included wage premiums and supervisory intensity. Such testing for substitution between two factors of production by regressing wage premiums on the supervisory intensity attracts several criticisms. Factor combination is a function of factor prices and, possibly, scale. Second, the choices of levels for both factors of production are endogenous and jointly determined, thereby rendering the interpretation of a positive correlation between supervisory intensity and wage premiums unsatisfactory and unconvincing.

These studies have provided some, although not conclusive, evidence in support of EWT; specifically, overall the evidence for efficiency wage theory is inconclusive.

IOT reduces to the union threat model and the labour turnover model of EWT as a special case as noted. Specifically, IOT is a comprehensive development of both the union threat model and the labour turnover models of EWT. It is a special case of the former, as insiders are paid higher wages to prevent them from striking, giving rise to a lockout or causing other general disruptions to the firm. The labour turnover model of EWT is a special case of IOT since payment of higher wages to insiders will discourage a high turnover, which is costly to the firm.

Accordingly, IOT accords greater power to the workers to elicit higher wages than that paid by firms (in accordance with the EWT explanation). As a consequence, insiders exert labour market power in the wage-bargaining process.

Another theory that is developed from the EWT is the dual labour market hypothesis. This theory assumes that workers in the primary sector are better paid, have good working conditions, employment security and have promotional prospects, while in the secondary sector, workers are lower paid, experience scant employment security and have less promotional prospects. Due to their employment in the secondary sector, they are less attractive to employers in the primary sector. This theory predicts that there is a positive correlation between earnings and tenure.

---

\(^2\) That is, they use a very precise measure of shirking obtained from the company's internal records.
Insider-outsider theory

Higher wages are paid to workers, on account of labour turnover costs. Thus, workers with tenure seek to share the gains arising from the firm's financial performance, irrespective of whether the gains are current or future, and firms pay higher wages to incumbent workers.

IOT is based on the notion that if wage-bargaining is a prevalent feature of the labour market, the interactions between employment and the group of insiders may give rise to substantial employment and unemployment persistence (Blanchard and Summers 1986). Although the association of pay being related to profits goes back to Dunlop (1944), the seminal contributions to the development of the IOT are Blanchard and Summers (1986, 1987) and LS's (1986, 1988a, 1988c). Other important contributions to the insider-outsider literature, include Solow (1985), Gottfries and Horn (1987), Carruth and Oswald (1987), Begg (1988) and Drazen and Gottfries (1990).

IOT was initially most comprehensively developed by LS to provide an explanation for the unemployment persistence, notably in Europe. Their research has attracted a good deal of attention and has become particularly influential.

Sanfey (1995b) provides a distinctive survey of IOs in union models, which focuses on the role played by the insider-outsider distinctions in modifying trade union models. It must be noted that LS emphasises that insiders can exert power in the wage-setting process individually or collectively through union representation, which Sanfey (1995b) acknowledges. This chapter differs from the IO survey in Sanfey (1995b) in not just the objectives, but also in a critical fundamental respect. We differ with respect to the former, since the purpose of my review, is to provide the background of the pertinent labour economics literature, to highlight and identify my contributions to the literature. We differ also from Sanfey's focus on summarising the modification of traditional union models, which have been incorporated with the IO distinction, within a static LS IOT framework. Sanfey's survey makes no attempt to incorporate non-union models, since IOT is applicable to both union and non-union models. Hence, the survey is restricted to union models that have incorporated the IO distinction to modify these models. In contrast, I review the IO explanation for wage determination in both union and non-union settings and check how robust this explanation is in the light of the existing theoretical and empirical studies.

The extension to non-union setting is important, as it exposes the full and true potency
of the IOT, in the spirit it was written. Insider power can be exerted individually and in non-union settings as well, in line with the correct predictions of the IOT, i.e., the theoretical foundations for insider effects on wage determination are not restricted to union models - several alternatives are examined in LS (1986, 1988a), Solow (1985) and Nickell and Wadhwani (1990). To focus solely on the unionised setting is an unappealing feature of his survey. In particular, it fails to emphasise the full power of IOT, particularly as union density has inexorably decreased both in the US and the UK. Also the sharing of rents, and for example, accepting a decrease in wages if the firm is not in good financial health, do not require a unionised setting\(^3\). In addition, incorporating the IO distinction to the monopoly union has endowed it with some strange properties. Jones and McKenna (1989) find the treatment of outsiders distorts the characteristic features of the monopoly union model and gives it unappealing properties. In Sanfey's survey, none of this is evident. But a partial survey of any kind is unattractive, and his survey is no exception. Moreover, with respect to theoretical studies, for example, the source of insider power, the impact of insider membership rules, and how they relate to and differ from each other, with respect to these main features, are not fully examined in Sanfey. On the basis of the empirical evidence, I seek to evaluate the pertinence of the IO models in providing an explanation for wage setting. This is important, as we can then evaluate the power of IOT in detecting movements in unemployment. This has important policy implications.

Like Sanfey, this chapter focuses on the insider-outsider distinction in transforming union models. Unlike Sanfey, this review considers the influence and relevance of insider power in wage-setting in all IOMs, irrespective of whether the workers exert insider power collectively or individually. In this review, I focus on the importance of the insider-outsider distinction in conventional trade union models, all other IOMs and the econometric findings to date.

The main deficiency with the IOT literature is that it does not consider the importance of incorporating future financial performance when determining wages. This is a serious omission. Even the most casual empirical observation, or the industrial relations facts of life, indicate that workers and their firms tend to gain together when the future financial performance is seen to be healthy, and vice versa, and this is reflected in the wage bargain. For example, there is a body of evidence that suggests that workers are prepared to take a

\(^3\)To put it another way, the latter is a sufficient, but not a necessary condition. But clearly, insiders represented collectively are more powerful.
wage cut, if the firm's financial health is poor (see, for instance, Smith, 2000). Naturally, my review highlights this deficiency and proposes a means of incorporating this formally. Indeed, the goal of this thesis is to bridge this important lacuna.

Insiders exert bargaining power in the division of rents. LS analyses extensively and explicitly reviews the sources of this insider power. To motivate this review, it is natural and useful to consider what these are.

The main sources of insider power, emanate from labour turnover costs, including hiring and firing costs, and threats and costs associated with non-cooperation and harassment of entrants, so as to raise their disutility from working in excess of the utility they derive from it. On the basis of this power, insiders extract rent from the firm. Extant theories have only considered extracting current rent, but the following chapters will show that forward-looking behaviour is important, and the consequences of this behaviour. In addition, although turnover costs sustains the extant theories, these studies have also made no attempt to empirically show the importance of recruitment and retention of labour in detail, which is also established in a following chapter.

These costs suggest that the firm will not be a viable concern if insiders are replaced by outsiders at a lower wage. The potential gain to the firm is outweighed by the costs of such an action in addition to the loss of training invested in and payment of severance pay to workers. There are several costs associated with replacing workers. Even the new workers will incur hiring costs, such as, search (advertising), screening (interview), negotiation costs, training and severance payments and the implementation of expensive firing procedures. Moreover, a high turnover is detrimental to the firm, as the workers obtain firm-specific skills which are not readily replaceable. Non-cooperative activities, by creating a productivity differential, have an adverse affect on the firms' profitability, amongst other things, in turn its stock prices, as do harassment activities targeted at entrants. Such activities are designed to dissuade firms from employing entrants, so as to create and increase the wages demanded by incumbent workers. Furthermore, exertion of effort is essential to increase productivity, as in EWT. If the current wage is associated with workers' past effort performance, then an increase in a firm's rate of labour turnover decreases its workers' expected future effort reward. This decline in effort reward has a negative substitution and positive income effect. If the former dominates, productivity falls, due to a decline in the effort exerted. Thus, the firm incurs an
effort-related cost of labour turnover, which is damaging to the firm.

According to LS (1988c), IOT explains how trade unions derive their power, thus, trade union models have been modified to take account of the IO distinction, so it would be useful to make this source explicit. Besides, the basic distinction of wage determination is between theories involving trade unions and wage-bargaining, and theories where workers can bargain as individuals, as in IOT. Since traditional trade union models are a special case of IOT, I will also review how these models have been transformed to account for the IO distinction, and the theoretical implications of such modification from the wide range of models and the empirical verification to date.

The past literature has extensively analysed the importance of distinguishing between ‘insiders’ and ‘outsiders’ in both the union and non-union models. The literature has incorporated these modifications in both one-period models, where the union/incumbent workers are indifferent to the welfare of the outsiders, and in dynamic models. In the former, the traditional union maximands have been modified, as noted, to incorporate the IO distinction. This is attained in the literature by adopting various modelling approaches with inherent degrees of variations, including the assumption that all workers/unions are homogenous and they care about real wages of the employed workers and the level of employment. The literature also puts more structure on the basic utility function of the workers, by assuming the function is either of the expected utility, the related utilitarian function or impose a particular functional form, such as Stone-Geary. Some studies also associate the probability of employment to the labour demand curve. According no weight to the outsiders in union/worker preferences is rather unrealistic, so other studies have accorded some weight to outsiders, but less than that of the incumbent workers. As noted above, the alternative utility function to use is a specific functional form, such as the Stone-Geary utility function. This has found favour in the literature on account of its tractability, including its amenability to econometric testing. Other single-period union maximands in IOT assume that unions are only concerned about deviations in employment from the level at which all insiders are employed.

As these single-period models, fail to account for dynamic considerations (such as, unions/workers lasting for multiple periods and negotiating repeatedly), some studies have considered dynamic union models. In addition, the assumption of homogeneity of workers, is rather unrealistic, so some studies have introduced heterogenous workers into traditional union/labour
market models, which incorporates the IO distinction.

To gauge the implications of these models, the preferences of the firm need to be embodied and the bargaining/structure needs to be modelled. Three bargaining models have gained immense popularity in the literature. A wide range of theoretical implications and predictions emanate from these models, notably, wage rigidity, asymmetric adjustment and employment persistence. Of course, a whole host of empirical tests have been conducted to verify the IO models.

Thus, the natural organisation of my literature review, is in four parts and is as follows: Section 2.2 reviews the seminal models. Section 2.3 reviews the incorporation of the IO distinction into trade union models and their implications, including, how union preferences have been transformed to embody insiders and outsiders in both single period and dynamic models. I then review studies which examine the impact of incorporating heterogenous workers, such as the length of service with the firm, into union preferences. I then consider the literature on bargaining models between unions/workers and firms. Section 2.4 reviews the more recent developments of IO models, in conjunction with the predictions of IO models, some of which are model dependent and others are more robust to variations in union preferences or the form of the bargaining. Section 2.5 reviews the empirical tests conducted by the IO models, in accordance with the questions that were analysed most. Within these questions, I summarise the outcomes in accordance to one source of variation, which is the degree of aggregation used in these studies. Section 2.6 concludes by highlighting and identifying my thesis's contributions to the literature.

2.2. SEMINAL INSIDER-OUTSIDER MODELS

This section provides a review of the seminal and earlier developments of IO models.

The seminal contributions to the IO literature are Blanchard and Summers's hysteresis model of unemployment persistence (1986, 1987) and LS's (1986, 1988a, 1988c) IOM. I have chosen these models as the most important, since they are the earliest developments/contributions to the IOT and are the most influential. Most studies are developments of these studies in the IO literature. The reason for reviewing the seminal studies is because they aptly embody the true spirit of the IOT. These studies were the first to develop the concept of incumbent workers using their market power to raise wages and cause employment persistence, as in the
LS model and hysteresis in the Blanchard and Summers model. More details of these models are provided below.

All seminal and earlier studies utilize a two-period model, with the exception of LS and Drazen and Gottfries (1990), where the former uses a one-period and the latter uses an infinite-time model. In addition, all seminal and earlier models use the monopoly union bargaining framework, with the exception of LS (1988c) and Carruth and Oswald, who use the right-to-manage and efficient bargaining models respectively. See Table 2.1.

<table>
<thead>
<tr>
<th>Insider-Outsider Study</th>
<th>Sources of Market Power</th>
<th>Time Period</th>
<th>Wage Bargaining Model</th>
<th>Partial/General Equilibrium Framework</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lindbeck and Snower, 1988c, 1992</td>
<td>Labour turnover costs; firm-specific human capital</td>
<td>One Period</td>
<td>Right to Manage</td>
<td>Partial</td>
</tr>
<tr>
<td>Solow 1985</td>
<td>Firm-specific human capital</td>
<td>Two Periods</td>
<td>Monopoly</td>
<td>Partial</td>
</tr>
<tr>
<td>Gottfries and Horn, 1986</td>
<td>Labour turnover costs</td>
<td>Two Periods</td>
<td>Monopoly</td>
<td>Partial</td>
</tr>
<tr>
<td>Carruth and Oswald, 1987</td>
<td>Labour turnover costs</td>
<td>Two Periods</td>
<td>Efficient bargaining</td>
<td>Partial</td>
</tr>
<tr>
<td>Begg, 1988</td>
<td>Firm-specific human capital</td>
<td>Two Periods</td>
<td>Monopoly</td>
<td>Partial</td>
</tr>
<tr>
<td>Drazen and Gottfries, 1990</td>
<td>Labour turnover costs</td>
<td>Infinite Time</td>
<td>Monopoly</td>
<td>Partial</td>
</tr>
</tbody>
</table>

Blanchard and Summers (1986) develop intertemporal models of insiders lowering the employment prospects of outsiders and accepting higher wages for themselves. Again, insiders are assumed to set wages and the firm unilaterally chooses employment, ex post, after the revelation of product market conditions. The instantaneous utility of the insider is linear in the probability of employment and the wage.

How does this model help explain how insiders translate contraction in employment opportunities into higher wages? An adverse shock is not anticipated prior to the wage-setting contracts employment. Now the fall in insider membership is associated with the lowering of wages. With the recovery of the demand for labour, higher wages are accepted, leading to lower employment prospects for the outsiders.

Blanchard and Summers provide a provocative account of how insiders can contribute to the hysteresis effect in particular, but it has some flaws. My first objection is that there are limits to the extent which insiders can drive up wages without the outsiders undercutting them. This constitutes a logical problem in their model, since the wages would be increasing without bound and the employment contracting without limit (Hall, 1986). Vetter and
Andersen (1994) show that insiders will not raise their wage a great deal, as the higher they raise their wage, the higher the incentive for outsiders to underbid to gain insider status.

The second objection is that insiders need to be not only uncertain about the state of labour demand, but also uncertain about who is going to be laid off in a trough. In addition, wage determination behaviour is dependent solely on changes, not levels of employment (Hunter 1988, Booth 1995). This seems rather absurd, as economies with different levels of employment should experience similar wage claims. Fourth, why has high labour turnover of the labour force not lead to a fall in employment, if unions are only interested in incumbent insiders in wage-bargaining? Fifth, the strong version does not take into account the fact that in the long-run, there is an association between the level of employment and the size of the labour force, Layard and Bean (1989). Sixth, the strong version again does not take into account the bargaining strength of the firm, like all the seminal models, enabling the firm to go directly to the outsiders at some cost (Blanchard and Summers, 1987).

Moreover, the model ignores the effects of conditions in other than what labour markets, other than labour markets have on the persistence of unemployment (Adams, 1988). According to Adams (1988, 393 – 4), the structure of financial markets is important, as it has an impact on the conditions on which finance will be available for the setting up of new firms and a firm's incentive to bargain with outsiders directly.

Some of the criticisms I raise here are also applicable to other seminal models. (See also my Theorem 1 of Chapter 5, where I show the wage determined in equilibrium is both monopolistically priced and is a differential function of time.)

IO models provide a distinct explanation of wage determination on account of turnover costs. Many of its testable implications are consistent with the following stylised facts:

(i) It shows why payment of wages in accordance to tenure leads to substantial wage dispersion

(ii) It shows why workers' with tenure earn higher wages than a new entrant to employment.

(iii) It shows why workers' wages are positively correlated with firm or industry-specific skills.

(iv) It explains why large firms on average pay high wages, for example, large profitable firms on average are associated with greater wages.
Any model that is consistent with these stylised facts is clearly an important contribution to the theoretical literature within labour economics.

However, for tractability, LS and all other main theories of wage determination, assume that each bargained wage is separable from and linear in \( t \), and agents have a constant discount rate, since the bargainers are myopic, i.e., each bargainer posts a static bargained wage which is fixed for the entire period till the next bargaining round. In addition, despite IOT being a comprehensive development of labour turnover theory, the importance of recruitment and retention is not empirically established in detail by LS or any other authors in the past.

In addition, for tractability, LS assumes gains to trade between unemployed workers and insiders and firms and also assumes that these agents are not forward-looking when bargaining for wages and employment. I relax these assumptions, consequent to empirically establishing these agents are forward-looking. I pursue the consequences of this behaviour theoretically: here each firm and workers can costlessly realise gains to trade and the wage can be costlessly changed at any time. This is a crucial extension for the following reason. In the LS model, all firms make the same profits. However, some firms have more workers than others. If any firm were permitted to deviate from the fixed wage and could change the wage, it would lower it to the workers' reservation wage, thereby extracting their full search rents and bargain in accordance to the future performance of the firm. LS rules this out by the assumption that firms are never allowed to change wages. But this is an unappealing property of their model. In particular, incorporating full wage flexibility and exhibiting forward-looking behaviour would lead to a very different type of equilibrium.

In addition, there is a body of evidence, for example, Fernandez and Glazer (1991), Halter and Holden (1991), Holden (1994), which suggests that to model wage-bargaining that corresponds to that of the real world, it is necessary to incorporate the long-term nature of the firm-worker relationship. In other words, these studies have shown that labour market games are not a one-shot game. Indeed it is an ongoing game and analysis of labour market outcomes should reflect this. LS does not allow agents to be fully rational, as a consequence of being forward-looking, when bargaining for wages in particular. If they did then a different equilibrium would emerge. I in contrast permit agents to be fully rational, consequent to establishing that agents are forward-looking empirically. The equilibrium that emerges is not qualitatively different in my chapter 5, in the limit as \( t \to \infty \) or equal discount rates, but not
otherwise.

Like LS, chapter 5 of this thesis is consistent with the four stylised facts mentioned above. Unlike LS (when firms have identical productivity), it also implies that larger firms make greater profits. The equilibrium characterised here converges to the LS's insider-outsider equilibrium in the limit as $r_f = r_w$ and $t \to \infty$. Their assumption that wages cannot be altered, does not affect the qualitative nature of the equilibrium in this limiting case.

Currently in this chapter of the thesis, I am adhering to the spirit of the LS model, accepting wages of both unemployed workers and insiders as given, as stated earlier. In my theoretical model in chapter 5, I show that agents operate in a nonstationary environment and we need to take this into account, in contrast to the LS model, thereby rendering the agents in my model as forward-looking in contrast. The enrichment of the characterisation of these wages which both agents (firms and workers) find acceptable, rendering it dynamically consistent, for example, will follow in chapter 5.

Similar results to that of LS have been found by Solow (1985) who emphasised the importance in wage-bargaining of internal pressures as opposed to external pressures, such as the rate of industry-wide, regional, national unemployment rates. He recognised the power of insiders in appropriating higher wages following higher demand for a firm's products. He stresses the conflict of interests between the employed and the unemployed workers. The focus of his paper is on skill differences and long-run considerations. Solow (1985) develops a two-period model, where the firm starts with established workers who are experienced. It is assumed recruits are less productive initially. Recruits are given insider status after one-period's employment. The insiders do not take into account the interests of the recruits in the first year, but they do so in the second year. The firm wants to increase its workforce, and insiders, on the other hand, are interested in curtailing the membership of insiders. The insider group quotes wages $w_{11}$ and $w_{12}$, for inexperienced workers, for the two periods. The firm chooses employment of both insiders and outsiders unilaterally. To exclude outsiders from the current period, the insiders set wages sufficiently high, so as to prevent the recruitment of entrants in the next period. As the current productivity of entrants is assumed to be sufficiently low, they will be laid off. Due to the assumption of fluctuating demand conditions for its products, the firm only hires workers if their productivity exceeds the wage.

\footnote{Or any other author(s).}
These outsiders will be hired in period 2, if the firm faces favourable demand conditions. But recruitment will be hampered if insiders translate favourable market conditions into higher wages for themselves.

Solow (1985) did not utilize the Nash solution to solve for wages, which is the common method of determining wages, nor are turnover costs (specifically bargaining of severance pay) modelled explicitly.

Carruth and Oswald (1987) suggested the incorporation of the insider-outsider distinction into the traditional labour contracts. This is a vital step, as the IOT according to LS (1988c) provides an explanation for union models, of how unions derive their clout and also since the traditional union models are a special case of IOT. It also follows that such an incorporation will specify union preferences over all employment levels, not just below current membership levels. With such incorporation, they find that insiders tend to increase their wages at the expense of the employment prospects of outsiders. Product price rises are reflected in changes in wage and employment levels. When product prices increase, first, wages are rigid and employment rises; then as product prices continue to increase, employment stays fixed, so as to translate the product price increases into higher wages for insiders. With the next rise in product prices, insiders opt for increased employment and wages stay the same.

But Jones and McKenna (1989) find such an integration renders the monopoly union model to have some strange and unattractive properties, as noted. The weaknesses of the Carruth and Oswald formulation is that there is no differential between an employed outsider and an unemployed outsider. Hence, no weight is accorded to the former. They show that unions would attach importance to employed outsiders if it values future membership. The second weakness is that there are no economically significant differentials between the insider and the employed outsider. They find that, even with full wage coverage, there are some benefits which only the insiders enjoy. Hence, McKenna and Jones propose an alternative characterisation of the IO distinction into this traditional trade union model, which restores the monopoly union model.

However, this does not detract from the power of IOT’s explanation for wage-setting, although the earlier studies have embodied this in a static Nash equilibrium, when discussing the determination of wages in this conventional way.

In addition, again in Carruth and Oswald (1987), turnover costs, notably, the bargaining
Gottfries and Horn (1987) also find that insiders tend to lower employment for outsiders and accept higher wages for themselves. Like Blanchard and Summers (1986) they develop an explicit intertemporal model, where outsiders are assumed not to undercut insiders. Again, unanticipated shocks to labour demand lead to a fall in employment. But when labour demand recovers to the status quo ante, as there are fewer workers following a negative shock in the previous period, insiders translate this into higher wages and lower employment opportunities for outsiders. As a consequence, fewer outsiders will be recruited. Thus, a negative shock will both increase insiders’ wages and decrease the employment prospects of outsiders. They also show that insiders have precedence in accepting the jobs that are available in any period. Their model shares the same monopoly union assumption of Blanchard and Summers (1986), where again insiders set the wage and the firm chooses employment unilaterally.

Thus, the objections I raised with the Blanchard and Summers (1986) models is unfortunately applicable here as well, i.e., the model requires not just uncertainty about the state of demand, but also uncertainty about the layoff queue.

Begg (1988) also finds that insiders raise their wages and decrease the employment opportunities of outsiders, using a monopoly union model in common with most IO models within an overlapping generations framework. He uses dynamic game theory to study the objectives of firms and insiders. Insiders set the wages of both entrants and themselves. If insider wages are lowered, due to increases in recruitment, insiders will increase the entrant’s wage immensely to preclude the hiring of outsiders.

McCausland (1998) includes training costs to the Begg (1988) model and finds that this may generate multiple employment equilibria. He uses the same overlapping generations framework, and the monopoly union model, where the union (insiders) sets the wages for both insiders and outsiders, and demonstrates that the presence of training costs may give rise to multiple equilibria. He shows that adverse technological shocks shift employment from a high to a low employment equilibrium, which is the local attractor in the steady-state. Even if the technological state reverts to its original state, low employment equilibrium may remain the local attractor.

Gottfries and Sjostrom (2000), with the inclusion of training costs, examined under what conditions the Begg (1988) result can be attained, specifically, the association between insider
and entrant wage, where the entrant wage is set sufficiently high so as to curtail the latter's recruitment. They demonstrated a rigid seniority wage schedule, which is resistant to business cycle shocks or any other factor that may contribute to the alteration of the insider wage. The seniority schedule is a reflection of the training costs and productivity differential between insiders and entrants. Thus, Gottfries and Sjostrom (2000) find that the insiders will not raise the outsiders' wage overly high, as in the Begg (1988) story, to preclude their recruitment.

The result of Gottfries and Sjostrom (2000) is not unique. They rule out the inclusion of severance payment, which is a major component of turnover costs, which sustains the extant IOT. Gottfries and Sjostrom's reason for such exclusion is that it induces quits. This seems rather counterfactual, casual empirical observation suggests that several firms pay these but exodus has not been noticed as a result. In addition, casual empirical observation also suggests that frequent changes of jobs is not seen as a good signal by a prospective employer, indicating that there is a body of evidence to suggest that severance pay is paid, see for example Pissarides (2001). If insider wages are set to reflect perfect price discrimination by both firms and insiders as in this thesis, there will be no incentive for the insider to even contemplate quitting, as a result of the inclusion of severance payment, which is also set as a result of perfect price discrimination by both agents, in this thesis.

However, Zwick, Bunke, Maks and Muysken (1995) show that, when the potential outsider wants to invest in human capital, due to his expectations of becoming an insider in the future, he may outperform the insider in this respect. The insider would find that it is in his interest to forestall the outsider, so that the insider can recover all the rents generated.

Related to the issue of wage-setting is unemployment, since the former detects movements in the latter. IOT can also exhibit employment hysteresis, which can emanate from insiders dominating wage determination, as first shown by Blanchard and Summers (1986), which was based on Gregory (1986) and Gottfries and Horn (1987). These studies assumed that insiders are rather indispensable, in the sense that they are not substitutable by outsiders. The cause of hysteresis is due to the fact that the optimal insider-wage depends on current insiders, which in turn depends on past employment of insiders (I shall not be considering this possibility in this thesis).

Kiander (1993) finds the exercising of the bargaining power arising from labour turnover costs, and the provision of credible threats, depends on the fixed and storage costs and
the profitability of the firm. Although he provides a distinct explanation for the sources of credibility of the workers' strike threat and bargaining power, there are a number of flaws with Kiander's analysis. As it stands, it is logical faulty. In addition, Kiander's result is not a subgame perfect equilibrium.

To recapitulate, LS provides a distinct explanation for unemployment, but suffers from problems. It is unfortunately an inherently static model: it specifies that insiders (workers with tenure) exert market power in the wage-negotiating process on account of tenure. They exercise this power in the wage-bargaining process in their sole interest without taking no or full interests of the outsiders. It is assumed that there are gains to trade between firms, insiders and outsiders. The insiders negotiate high wages for themselves and accept low employment for outsiders.

This outcome in terms of both wages and employment is jointly inefficient, for both agents. If turnover costs are to sustain the theory, we need to examine the dynamics of the turnover costs properly within a game theoretic or rational expectations framework. The thesis adopts the former route. As agents are bargaining in non-stationary environments, it is crucial to take into account the fact that bargainers are forward-looking, and hence it is crucial to take into account the future financial performance of the firm when bargaining wages. This important gap is prevalent in the static IOT. This gap will be bridged by this thesis, specifically, chapter 5, where I pursue the consequences of forward-looking behaviour.

It is well known that a product market monopolist can discriminate among consumers with private information by using a non-uniform price schedule, see for example, Spence (1977), Mussa and Rosen (1978), Goldman, Leland and Sibley (1984), Maskin and Riley (1984).

The non-uniform model has not been applied to factor market monopolists, such as trade unions, with the exception of Kuhn (1988). Despite its simple and powerful result, no work has hitherto considered applying non-uniform pricing to factor market monopolists, i.e., where firms extract rent from different types of workers whose only distinction arises from tenure in the previous period, within a game theoretic equilibrium framework.

The usefulness and realism of the IO theory have been questioned. In a study by Andersen and Vetter (1995), it was shown that the possibility for insiders to extract rents from exogenous turnover costs is restricted due to the fact that higher are the current rents to
nsiders, the more aggressively outsiders will seek to attain insider status in the future. It has been shown that with homogenous workers, with the only distinction being the age, i.e., young workers are outsiders and older workers are insiders (who receive a wage above the reservation wage), unemployment will be unequally distributed. Senior workers are often those most vigorously arguing against lower wages for youth (see Andersen and Vetter 1995). Non-myopic firms tend to hire more workers and the cyclical response is stronger during booms than in the trough, (see Vetter and Andersen, 1991).

A general criticism applicable to all the above studies and previous studies in labour economics, is that a subgame perfect equilibrium with rationality in wage-bargaining is not modelled. In this thesis, we pursue the consequences of forward-looking and rational behaviour in the bargaining process.

Thus, the goal of this thesis is to analyse the dynamics of the game between workers and firms within a game theoretic equilibrium framework, that is, in a strategic bargaining environment, utilising variables which depict the fact that forward-looking behaviour matters; these variables are notably those which reflect the future financial performance of the company. It will be shown that these variables will be taken into account when bargaining. This will provide us with novel and important insights in the game between insiders, outsiders and firms. This will deepen our understanding of pay settlements. Our model also benefits from potentially possessing empirically testable predictions, many of which will potentially be consistent with the stylised facts noted above.

Next I turn to the role of insider-distinction in transforming the traditional trade union models, and the theoretical implications which ensues⁵.

⁵The point of reviewing IOMs in trade union models, is to show how pervasive IOT has become.
2.3. INCORPORATION OF THE INSIDER-OUTSIDER DISTINCTION INTO TRADE UNION MODELS AND THEIR IMPLICATIONS

IOT is in fact, a comprehensive development of the union threat model of the EWT, which is a special case of IOT. The informal reason for this is because IOT explains in detail why firms have to pay higher wages to hamper workers from disrupting production by engaging in strike activity and so forth. Thus, the IOT also explains how the trade unions derive their power. In acknowledgment of this, trade union models have now been modified to take account of this. The purpose now is to review how the IO distinction has been incorporated into the conventional trade union models, and the theoretical implications that emerge from these modified models.

2.3.1. Union Preferences

Single Period Models

There is no consensus among economists as to what should be included in the union maxims. A widely held view is that the utility function should maximise variables such as employment and pay. This point will not be reviewed here. But I shall review how the trade union models have been redesigned to take account of the IO distinction. Table 2.2 summarises the studies that have taken this distinction into account.

I assume homogeneity among insiders, in terms of characteristics, human capital, earnings and all have an equal chance of being laid off. Since the literatures postulates that union cares about both employment and wages, the union's utility function can be expressed as

\[ U(w, n, U_1, U_2 > 0. \] (1)

where \( U = \) utility function, \( w = \) wage and \( n = \) employment. Most studies are based on (1). Most studies modify (1), by assuming the utility function is of the expected utility form, utilitarian form, or impose a specific functional form or models, for example, Stone-Geary, see Oswald (1985).
## TABLE 2.2
STUDIES WHERE THE 10 DISTINCTION IS INCORPORATED INTO TRADE UNION MODELS

<table>
<thead>
<tr>
<th>Study</th>
<th>Utility Function Encompassed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oswald</td>
<td>Study Modifying the Unions' Utility Function</td>
</tr>
<tr>
<td>1985</td>
<td>Expected Utility, Utilitarian or the imposition of a specific functional form, such as Stone-Geary</td>
</tr>
</tbody>
</table>

### A: Theoretical Studies

- **Gotfries and Horn** (1987) Expected utility of a representative insider maximised
- **Sampson** (1988) Maximises the sum of the expected utilities of members
- **Black and Buckley** (1989) Maximises only the welfare of its members for low levels of demand
- **McDonald** (1989) Union which maximises exclusively the utility of its employed members
- **Holden** (1990) Insiders are solely concerned about insiders and negotiate a wage which sustains just the insiders at the expense of the outsiders. Moderate wages may be sought to avert lay-offs amongst insiders
- **Creedy and McDonald** (1991) Insiders maximise their utility (wages) subject to the constraint that all insiders are in employment
- **Huisinga and Schiantarelli** (1992) Utilitarian union function; cares solely about maximising the total utility of the insiders

### B: Empirical Studies

  - Wage equations estimated for a sample of large Japanese firms. Wage equations also estimated for varying firm sizes. Equation estimated by Generalised Method of Moments technique (GMM, henceforth)
  - Firm level wage equation estimated by GMM
- **Blanchflower, Oswald, and Garrett** (1990) British Workplace Industrial Relations Survey (henceforth, WIRS2) on 2019 firms of 1984
  - Wage equations for unskilled, semiskilled and skilled workers estimated
  - Unrestricted wage equation estimated. F tests conducted for the joint significance of insider variables. Interindustry variation between union power and insider forces examined

The utilitarian approach can be expressed as

\[ U = nu(w) + (m - n)u(b) \]  

where \( m \) = union membership and \( b \) is the alternative option. If the union is more interested in securing employment for its members (insiders), and shows no interest for outsiders, then

(2) should be modified to

\[ U = nu(w) + u(b) - u(w)) \max (0, m - n) \]

i.e., the union only cares about outsiders if \( m > n \) (where unemployed remain members).
A plethora of papers encompass this concept, including Gottfries and Horn (1987), Sampson (1988), Black and Bulkley (1989), McDonald (1989), Brunello and Wadhwani (1989). Nickell and Wadhwani (1990), Holden (1990), Creedy and McDonald (1991), Blanchflower, Oswald and Garrett (1990), Nickell and Kong (1992) and Huizinga and Schiantarelli (1992). Studies have also shown the probability of employment being on the labour demand curve, (see for example, Gottfries and Horn (1987)).

They assume the labour demand curve at $t$ is expressed as

$$n_t = D(w_t)\varepsilon_t$$  \hspace{1cm} (4)$$

where $D_w < 0$ and $\varepsilon$ is a random variable with a time invariant distribution $G$ with zero mean and finite variance. Gottfries and Horn (1987) assume that first, wages are set prior to the revelation of the value of $\varepsilon$ (but with complete information of $G$); second, employment is set on the labour demand curve; third, employment is equal to the last period’s employment. Then the probability of retention is

$$\sigma = \int_0^\infty \min[(D(w_t)\varepsilon_t)/n_{t-1}, 1]dG(\varepsilon)$$  \hspace{1cm} (5)$$

If outsiders' interests are taken into account to some extent, then this can be readily embodied into the above specifications, as in for example, Chapman and Fischer (1984), Nickell and Andrews (1983) and Jones and McKenna (1989). In the latter, employment of outsiders is considered beneficial, as the recruitment of outsiders will now boost membership, and these entrants may become insiders in the future. See Table 2.3.

### TABLE 2.3

<table>
<thead>
<tr>
<th>Study Modifying the Unions Utility Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study</td>
</tr>
<tr>
<td>Gottfries and Horn 1987</td>
</tr>
<tr>
<td>Chapman and Fischer 1984</td>
</tr>
<tr>
<td>Jones and McKenna 1989</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Study</th>
<th>Data Source</th>
<th>Testing Method</th>
<th>Utility Function Encompassed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nickell and Andrews 1983</td>
<td>Annual UK data from various sources, including National Income and Expenditure and Bank of England Quarterly Bulletin and Economic Trends Annual Supplement; 1951-1979</td>
<td>Labour demand and real wage equations estimated</td>
<td>Union utility function in terms of both employment and wages maximised of the insiders. Some weight, $\sigma$ is provided to unemployed outsiders and $0 \leq \sigma \leq 1$</td>
</tr>
</tbody>
</table>
In the Stone-Geary utility function, as in for example, Dertouzos and Pencavel (1981)

\[ U = (w - w^*)^\theta (n - n^*)^{1-\theta} \] (6)

where \( w^* \) and \( n^* \) are interpreted 'reference' values of \( w \) and \( n \) respectively. If these are zero, then \( \theta \) shows the relative weight of wages to employment as in Dertouzos and Pencavel (1981). Studies that use this or other specific functional form, for example, CES, include Pencavel (1984a, 1984b, 1985, 1989), Hersoug et al. (1986), Pencavel and Holmlund (1988), Lockwood and Manning (1993), Pehkonen (1990) and Doiron (1992).

Such functional forms are tractable and amenable to econometric testing. Naturally, there is a positive correlation between \( \theta \) and insider strength. Low values of \( \theta \) indicates their interests in increasing employment.

The Stone-Geary functional form has been extended as in Pencavel (1989) to

\[ U = (w - w^*)^\theta (n - \psi l - n^*)^{1-\theta}, \quad 0 \leq \psi \leq 1 \] (7)

where \( l = \) labour force and \( \psi \) is indicative of the strength of insider forces (all variables are in logs). See Table 2.4. As in Pencavel (1989), a high value of \( \psi \) indicates outsiders’ interests are taken into account and a low value of \( \psi \) indicates the insiders’ interests in securing higher wages at the expense of the recruitment of outsiders. \( \theta \) is interpreted as the coefficient of relative risk aversion. One must be sceptical of the interpretation accorded to \( \theta \). Some studies have shown that low values of \( \theta \) should be indicative of greater acceptance of variability to employment for example, Pencavel (1989), Pehkonen (1990), Pencavel and Holmlund (1988). But in a bargaining approach, for instance, wages may be invariant to changes in product demand. See Table 2.5.

Some studies have shown that insiders only care about deviations in employment from that of full membership (for example, Blanchard and Summers (1986), Manning (1988)). Then the specification may be expressed as

\[ U = -(n - m)^2 \] (8)

It seems rather absurd to suggest that insiders will accept any wage, provided \( m = n \).
<table>
<thead>
<tr>
<th>Study</th>
<th>Data Source</th>
<th>Testing Method</th>
<th>Utility Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vertouzos and Pencavel 1981</td>
<td>International Typographical Union (ITU, henceforth) of the Cincinnati Post data and other local unions data from Typographical Journal. Wage data for typographers from ITU Bulletin, lineup data from April issues of Editor and Publisher. Published Bureau of Labour Statistics and Department of Commerce publications were other data sources; 1946-1965</td>
<td>Structural parameters estimated by maximum likelihood</td>
<td>Evidence of the Stone-Geary utility function</td>
</tr>
<tr>
<td>Pencavel 1984a</td>
<td>ITU data on US newspaper industry of ten cities. Data on the production processes also obtained for the Cincinnati Post; 1946-1965</td>
<td>The marginal rate of substitution of wages for employment estimated</td>
<td>Stone-Geary utility function, with the elasticity of substitution between wages and employment ranging from zero to unity</td>
</tr>
<tr>
<td>Pencavel 1984b</td>
<td>US Annual observation of variables including wages and employment describing ITU and the newspaper industry in ten cities. Data from various publications of the ITU and the newspaper industry; 1946-1965</td>
<td>Reduced-form estimation of the Stone-Geary utility function. In addition, estimation of the Marginal Rate of Substitution equation from an Addilog objective function</td>
<td>The elasticity of substitution is 0.5</td>
</tr>
<tr>
<td>Pencavel 1985</td>
<td>Swedish Quarterly mining and manufacturing sector data; 1965.1-1982.4</td>
<td>Estimating the difficulties of applying these models at the macroeconomic level by maximum likelihood estimation</td>
<td>Expected utility of a union member is a combination of the weighted average, of the utility of the real wage received in employment and the utility of real income received, employed at his outside option</td>
</tr>
<tr>
<td>Pencavel 1989</td>
<td>UK annual data; 1953-1979</td>
<td>Current and lagged wage equations estimated by instrumental variables Structural parameters for real wages, employment and labour force estimated by nonlinear three-stage least squares</td>
<td>Stone-Geary utility function</td>
</tr>
<tr>
<td>Hersoug, Kjær and Rodeeth 1986</td>
<td>Norwegian data from the manufacturing sector, obtained from various sources including Norwegian wage rates from the Norwegian Federation of Employers and various data from National Accounts</td>
<td>Parameter estimates for alternative expectations of import prices and unit wage costs estimated by maximum likelihood Determinants of employment and hours of work equations from 1950-1983 estimated by instrumental variable. Wages, employment and hours of work equation are estimated by OLS and Non-Linear Least Squares. The structural parameters of these three equations are estimated by full information maximum likelihood</td>
<td>Union utility is a function of real wage and the employment rate and resembles the CES</td>
</tr>
<tr>
<td>Pencavel and Holmlund 1988</td>
<td>Swedish data from the mining and manufacturing sector; 1950-1983</td>
<td></td>
<td>Stone-Geary utility function. The elasticity of demand for employment with respect to the real wages is -0.68</td>
</tr>
<tr>
<td>Pohkonen 1990</td>
<td>Annual Finnish data on manufacturing and mining sector drawn mainly from the dataset of the Bank of Finland; 1965-1987</td>
<td>Estimation of the first-order condition for rational union behaviour based on Stone-Geary functional form and reduced rate wage and employment equations also estimated</td>
<td>Stone-Geary utility function. The long-run real wage elasticity of employment is approximately -0.35. The point estimate of β in equation (7) ranged from 0.02 and 0.11</td>
</tr>
<tr>
<td>Doiron 1992</td>
<td>Canadian data which includes inputs, outputs, non-labour inputs, wages and employment in the wood products industry in British Columbia; 1963-1983</td>
<td>Bargaining model between labour union and representatives of the British Columbia Wood products industry, is estimated. Parameters of the union objective function and the firm’s technology are estimated</td>
<td>A CES utility function with employment and the differential between wages and alternative wages as argument</td>
</tr>
</tbody>
</table>

**Study Extending the Stone-Geary Functional Form A Study Using Aggregate Data**

| Pencavel 1989 | UK annual data; 1953-1979 | Current and lagged wage estimated by instrumental | Stone-Geary utility function extended by incorporating |
TABLE 2.4 (CONTINUED)

<table>
<thead>
<tr>
<th>Study</th>
<th>Data Source</th>
<th>Testing Method</th>
<th>Utility Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Extending the Stone-Geary Functional Form</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A Study Using Aggregate Data</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>structural parameters for real wages, employment and labour force estimated by non-linear three stage least squares</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>and assessing the importance of the measure of the IG considerations in the union functional form</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The point estimates did not provide a great deal of support for the IO distinction. However, these results are imprecise</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TABLE 2.5

STUDIES SHOWING A LOW LEVEL OF $\theta$, INDICATIVE OF A GREATER ACCEPTANCE OF VARIABILITY OF EMPLOYMENT

<table>
<thead>
<tr>
<th>Study</th>
<th>Data Source</th>
<th>Testing Method</th>
<th>Role/Relevance of $\theta$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pencavel 1986</td>
<td>UK annual data; 1953-1979</td>
<td>Current and lagged wage estimated by instrumental variables (IV, henceforth). Structural parameters for real wages, employment and labour force estimated by non-linear three stage least squares</td>
<td>Lower values of $\theta$ suggests a greater acceptance of variability of employment vis-a-vis wages</td>
</tr>
<tr>
<td>Pencavel and Holmlund 1988</td>
<td>Annual Finnish data on manufacturing sector drawn from the dataset of the Bank of Finland; 1960-1967</td>
<td>Estimation of the first-order condition for rational union behaviour based on Stone-Geary functional form and reduced form wage and employment equations also estimated</td>
<td>The point estimate of $\theta$ varied from 0.02 to 0.11, but on average is not significantly different from zero. Estimates of $\theta$ from reduced form equation is 0.03 and is statistically significant. These results suggest a greater acceptance of flexibility in employment. Unions relative aversion to fluctuations in employment are lower</td>
</tr>
<tr>
<td>Pencavel 1989</td>
<td>Swedish data from the mining and the manufacturing sector; 1950-1983</td>
<td>Determinants of hours of work from 1950-1983 and employment equations estimated by IV. Wages, employment and hours of work equations are estimated by OLS and Non-Linear Least Squares. The structural parameters of these three equations are estimated by full information maximum likelihood</td>
<td>Lower values of $\theta$, suggests a greater acceptance of variability of employment. The point estimate of $\theta$ varied from 0.02 to 0.11, but on average is not significantly different from zero. Estimates of $\theta$ from reduced form equation is 0.03 and is statistically significant. These results suggest a greater acceptance of flexibility in employment. Unions relative aversion to fluctuations in employment are lower</td>
</tr>
</tbody>
</table>

A: Theoretical Studies

B: Empirical Studies

Studies Showing that Insiders Only Care About Deviations In Employment From That of Full Membership

<table>
<thead>
<tr>
<th>Study</th>
<th>Data Source</th>
<th>Testing Method</th>
<th>Utility Function /Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blanchard and Summers 1987</td>
<td>Insiders concerned with the full employment of insiders and deviations from this level</td>
<td>Wage, employment, unemployment processes equation estimated for the UK, France, Germany and the US</td>
<td>Substantial hysteresis in Germany, France and the UK as opposed to the US, where it is considerably lower. Incumbent workers are solely concerned about their employment as opposed to the outsiders. Membership effects is attributed to be a major source of hysteresis, particularly during troughs without much reliance placed on unions</td>
</tr>
</tbody>
</table>

Studies Showing that the Union Maximises a Linear Combination of the Probability of Both Employment and the Wage

A: Theoretical Study

B: Empirical Study

Studies Showing that the Union Maximises a Linear Combination of the Probability of Both Employment and the Wage

<table>
<thead>
<tr>
<th>Study</th>
<th>Data Source</th>
<th>Testing Method</th>
<th>Utility Function /Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blanchard and Summers 1986</td>
<td>OECD data bank and D. Grubb, see Grubb, 1984; 1953-1984</td>
<td>Wage, employment, unemployment processes equations estimated for the UK, France,</td>
<td>On account of membership considerations, union is solely concerned about full employment of all incumbent members, in contrast to the unemployed</td>
</tr>
</tbody>
</table>
TABLE 2.5  
(CONTINUED)

<table>
<thead>
<tr>
<th>Study Source</th>
<th>Testing Method</th>
<th>Utility Function / Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1953-1984</td>
<td>Germany and the US</td>
<td>Incumbent workers maximises their wages (utility). A series of adverse aggregate demand shocks stimulate more unemployment, which provided the impetus for further wage increases by the incumbents. These are maximised contingent upon all insiders being employed</td>
</tr>
</tbody>
</table>

Other studies have shown that the union maximises a linear combination of the probability of both employment and wage, for example, notably Blanchard and Summers (1986), Burda (1990). It appears rather unrealistic to suggest that unions can bargain for a massive wage.

All the studies considered so far have been single-period static models. The main drawback of these studies is that in a non-stationary environment, agents (bargainers) will be forward-looking in their behaviour accordingly.

This leads us to consider dynamic insider-outsider models.

2.3.2. Dynamic Insider-Outsider Models

The single period models are distinctive, but static, and cannot fully account for some of the characteristics of bargaining; first, bargaining models are of a long-term nature; second, it follows that decisions taken today will have repercussions for the future; third, it also follows, \( m \) and thus the number of insiders is not constant through time, but changes over time in accordance with \( n \). Some studies have attempted to specify the utility function in a dynamic context. We consider these models now.

When dynamics are introduced in the modelling of trade union behaviour in a dynamic context, studies have generally used one of the three models. The first approach assumes that the union has an infinite-time horizon, the second model assumes the union lives for finite multiperiods, mainly, two periods, and the third, assumes an overlapping generations model of the union. I will consider all these approaches in turn.

In the infinitely lived union models, \( m \) adjusts completely over time to any changes between \( n \) and \( m \). Insiders take into account the interests of the future members' and incorporate their utility in the union maximands (Kidd and Oswald, 1987). Thus, their model does not have the kink. Miaouli (1990) does attempt to embody this kink. Insiders in
this study also takes into account future members utility, but each period, the indifference curves are horizontal at the point \( n = m \). Another modification is taking into consideration quits in their specification, see Huizinga and Schiantarelli (1992).

Some studies show an intertemporal extension of (8), where the union is only interested in deviations of \( n \) from the level at which all insiders are employed, as found in Manning (1988), Lockwood and Philippopoulos (1994) and Miaouli (1990). But the objections raised with respect to (8) are applicable here as well.

In the finite horizon models, two periods are commonly analysed, as in Gottfries and Horn (1987), Solow (1985) and Vetter and Andersen (1991, 1994). The model is solved using backward induction, then the impact of first period \( n \) on second period wages, for example, can be examined. Solow (1985) shows that unions can also set the wage for both themselves and recruits. Entrants in the first period become insiders in the second period, with the same probability of retention in the second period as the insider in the first period. Turning to overlapping generations approach; Begg (1988) shows that unions set both their and the recruits' wage, and the union utility function ensures all insiders are employed, i.e., from second and final year of employment. See Table 2.6.

### Table 2.6

<table>
<thead>
<tr>
<th>Study</th>
<th>Utility Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kidd and Oswald</td>
<td>The union takes into account the utility of the future members and</td>
</tr>
<tr>
<td>Oswald</td>
<td>incorporates this in the union maximands. Membership adjusts over time to any</td>
</tr>
<tr>
<td>Miaouli</td>
<td>Embody the IO kink, analysing union behaviour in terms of wage and employment</td>
</tr>
<tr>
<td>Huizinga and Schiantarelli</td>
<td>Unions which permit quits each period. The troughs for large negative shocks are</td>
</tr>
<tr>
<td>Lockwood and Philippopoulos</td>
<td>concerned about deviation from employment from the level at which all insiders are</td>
</tr>
<tr>
<td>Miaouli 1990</td>
<td>The unions in an intertemporal extension of (8) solely maximise employment</td>
</tr>
<tr>
<td>Gottfries and Horn 1987</td>
<td>Two-period model is solved using backward induction. The expected utility of a</td>
</tr>
<tr>
<td>Solow 1985</td>
<td>representative incumbent member is maximised</td>
</tr>
<tr>
<td>Vetter and Andersen 1991, 1994</td>
<td>Unions set both their and the recruits wage and the union utility function ensures</td>
</tr>
<tr>
<td>Begg 1988</td>
<td>all insiders are employed, that is, from second and final year of employment</td>
</tr>
</tbody>
</table>

**Finite Horizon Models**

- Two-period model is solved using backward induction. Then the impact of first period employment on second period wages is examined. The expected utility of a representative incumbent member is maximised.
- In common with all two-period models, it permits the setting of two-period contracts by the union. The entrants in the first period become insiders in the second period, with the same probability of retention in the second period as the insider in the first period. Expected utility from being retained in both periods is maximised.
- Two period model is investigated using backward induction, then the impact of the first period employment on second period wages is analysed.
2.3.3. Heterogenous Insiders

Next I consider studies that have introduced some heterogeneity amongst insiders. Two issues have been addressed. It has been commonly observed in the literature, mainly non insider-outsider literature, that intrafirm wage differentials exists on account of seniority. This fits with the empirical observation. This has been omitted in the IO literature for various reasons, mainly because they are not generally used, as both low and high paid workers exert the same market power in the wage setting process.

Several studies have considered the issue of insiders differing in terms of seniority. It has been commonly observed that wages are positively correlated to seniority. However, this has not been incorporated in the IO studies, with the exception of Solow (1985) and Begg (1988). The reasons for the omission include tractability, but mainly because low and high paid workers are not in favour of a two-tier wage schedule, as found in Kaufman (1984), Heetderks and Martin (1991). Another possibility for heterogeneity amongst insiders is when lay-offs are on last-in, first-out basis (LIFO) or any other a priori determined and publicly known basis.

In the IO case, where lay-offs are made according to inverse seniority, and governed by majority voting, then as long as a substantial amount of insiders will not be laid off and if they are not risking promotion probabilities (see Brunello (1990a)), insiders will only be interested in maximising wages, as shown in Oswald (1986a, 1986b, 1993), Weitzman (1987), Layard and Bean, (1989), Layard (1990), Beckerman and Jenkinson (1990), Blanchflower (1991) and Gottfries (1992). Inverse seniority rules are not always enforced, due to the uncertainty in the labour demand, see Farber (1986). Second, sometimes lay-offs rules may be overruled by other factors, such as skills (see, Turnbull, 1988). Third, plant or firm-specific considerations may naturally take precedence, such as closure of unprofitable plants, as demonstrated in Manning (1993).

The implications of LIFO are less clear cut, in a dynamic setting. In Drazen and Gottfries (1990), negative shocks causes some senior workers to be laid off. However, in Roberts (1989) multiple equilibria arise due to the possibility of successive voting driving the median voter out of his employment. Therefore, I turn next to the preferences of the firm and the bargaining structure. See Table 2.7 for a summary of the studies that have taken into account heterogenous workers.
TABLE 2.7
HETEROGENOUS WORKERS

<table>
<thead>
<tr>
<th>Study</th>
<th>Utility Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solow 1985</td>
<td>Studies showing wages rise with seniority</td>
</tr>
<tr>
<td>Begg 1988</td>
<td>Seniority enhances the wages of the incumbent workers</td>
</tr>
<tr>
<td>Kaufman 1984</td>
<td>Studies showing why two tier wage schedules are not preferred</td>
</tr>
<tr>
<td>Heeterdels and Martin 1991</td>
<td>Low and high paid workers are not in favour of two-tier wage schedules</td>
</tr>
<tr>
<td></td>
<td>Low and high paid workers do not consider the two tier wage schedules advantageous</td>
</tr>
<tr>
<td>Brunello 1990a</td>
<td>Studies showing union utility is not to maximise wages under majority voting</td>
</tr>
<tr>
<td></td>
<td>Combination of 10 considerations with majority voting precludes</td>
</tr>
<tr>
<td></td>
<td>workers from solely maximising wages due to promotional probabilities</td>
</tr>
<tr>
<td>Oswald 1986a, 1986b, 1993</td>
<td>Studies showing where insiders are solely interested in maximising wages</td>
</tr>
<tr>
<td>Weitzman 1987</td>
<td>Unions indifference curves are</td>
</tr>
<tr>
<td>Layard and Bean 1989</td>
<td>horizontal at n = m/2. Under</td>
</tr>
<tr>
<td>Layard 1990</td>
<td>majority voting, the decisive voter</td>
</tr>
<tr>
<td>Beckerman and Jenkins 1990</td>
<td>is the one with median seniority.</td>
</tr>
<tr>
<td>Blanchflower 1991</td>
<td>who opts solely to maximise</td>
</tr>
<tr>
<td>Gottfries 1992</td>
<td>wages on account of his employment being secure</td>
</tr>
<tr>
<td>Farber 1986</td>
<td>Studies showing that inverse seniority rules may not always hold</td>
</tr>
<tr>
<td>Turnbull 1988</td>
<td>in aiding employees to solely maximise wages</td>
</tr>
<tr>
<td>Manning 1991</td>
<td>Insiders are not solely interested in raising wages on account of inverse seniority</td>
</tr>
<tr>
<td>Drazen and Gottfries 1989</td>
<td>due to the uncertainty of the labour demand, particularly if the wage is set ex ante</td>
</tr>
<tr>
<td>Roberts 1989</td>
<td>Factors such as skills may overrule layoffs on account of inverse seniority</td>
</tr>
<tr>
<td></td>
<td>The profitability of plants may take precedence prior to seniority</td>
</tr>
<tr>
<td></td>
<td>of the worker, in the closure of unprofitable plants</td>
</tr>
<tr>
<td></td>
<td>Studies of the implications of LIFO in a dynamic context</td>
</tr>
<tr>
<td></td>
<td>There are only senior and junior workers. Union set the wage</td>
</tr>
<tr>
<td></td>
<td>There is a possibility of successive voting driving him out of his employment</td>
</tr>
</tbody>
</table>

The main criticism of the dynamic union models is that again, no account is taken of the fact that the bargaining agents are in a non-stationary environment, and thus the agents will be forward-looking in their behaviour and that recruitment and retention is a major bargaining concern.

The main assumption with the studies on heterogenous workers, is that the union is uninterested in employment beyond a certain point. To obtain a clearer idea of the implications of these models, we need to embody the preferences of the firm and thus model the bargaining structure.

2.3.4. Bargaining Structure

It is standard for wages to be determined by bargaining between firms and workers, due to problems arising from incentive incompatibility. Most bargaining models which are mentioned below use the Nash-bargaining solution. Three bargaining models have been extensively discussed by economists in the literature, namely, the monopoly union model (MUM henceforth), the efficient bargain (EBM henceforth) and the right-to-manage model (RMM henceforth).

The characteristics of these models are as follows: the monopoly union model, specifies that the wage is set unilaterally by the union and the firm then determines employment
unilaterally from the firm’s profit-maximising labour demand function (see Dunlop (1944)). In the RMM, the union and firm bargain over wages, but the firm then sets employment unilaterally. In the EBM, both the firm and union bargain over both pay and employment. These models are popular in the literature, see for example, Leontief (1946), Fellner (1947), McDonald and Solow (1981), Oswald (1985), Manning (1987), Holmlund (1989), Ulph and Ulph (1990), Kaufman and Martinez-Vazquez (1990), Creedy and McDonald (1991) and Christofides and Oswald (1991). Most studies utilize the Nash solution.

\[ \text{Max} : (U - U^*)(\pi - \pi^*)^{1-\theta} \]  

(9)

where \( U^* \) and \( \pi^* \) = threat points of the union and the firm respectively and \( \theta \) = the measure of the bargaining strength of the union.

All three models are shown to be special cases of a general class of models in Manning (1987). However, there are a multitude of models that are in between his specifications. It follows that it may not be appropriate to assess whether the wage and employment outcomes are in accordance to one of the three bargaining models, that is, EB, MU or the RM model. Espinosa and Ree (1989) show that, where both the agents negotiate repeatedly over time, the typical wage-employment outcome will be between the monopoly union and efficient bargain cases, depending on the rate of time preference of the bargainers. See Table 2.8, which summaries the studies on bargaining structure.

Most studies in the insider-outsider literature utilise one of the three bargaining models noted above.

**Theoretical predictions**

These models embody a wide variety of theoretical propositions and implications, some of which have been empirically tested extensively in the literature; the aim now is to categorize which implications are model dependent, or robust to variations in specifications and modifications such as union goals or the form of the bargaining. Since I do this below when I review theoretical propositions and implications of IOMs generally, I will not consider them here.
TABLE 2.8
BARGAINING STRUCTURE

<table>
<thead>
<tr>
<th>Study</th>
<th>Bargaining Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dunlop 1944</td>
<td>MUM</td>
</tr>
<tr>
<td>Leontief 1946</td>
<td>MUM</td>
</tr>
<tr>
<td>McDonald and Solow 1981</td>
<td>MUM, EBM</td>
</tr>
<tr>
<td>Oswald 1985</td>
<td>RMM, EBM, MUM</td>
</tr>
<tr>
<td>Manning 1987</td>
<td>MUM, RMM, EBM</td>
</tr>
<tr>
<td>Holmlund 1989</td>
<td>MUM, RMM, EBM</td>
</tr>
<tr>
<td>Ulph and Ulph 1990</td>
<td>EBM, RMM</td>
</tr>
<tr>
<td>Kaufman and Martinez-Vasques 1990</td>
<td>MUM, EBM</td>
</tr>
<tr>
<td>Christofides and Oswald 1991</td>
<td>EBM</td>
</tr>
</tbody>
</table>

Study which finds all three bargaining models as a special case of a general class of models

Manning 1987

Utilising a Nash solution it is shown all three bargaining models are a special case of a general model

Espinosa and Rhee 1989

In a dynamic context, the wage-employment outcome is between the monopoly union and the efficient bargain formulation

2.4. MORE RECENT DEVELOPMENTS OF INSIDER-OUTSIDER MODELS

We review the additional and the more recent developments of IOMs. Relatively more attention will be focused on the most important developments. A large variety of theoretical implications and predictions emerge from these IOMs. My aim is to separate out groups of theoretical implications and predictions which are model-specific, from those that are more robust to variations in specifications and modifications.

It is useful to consider first the implications and propositions about wage rigidity. Wage rigidity can arise in a variety of ways, including in EWT and implicit contract theory.

I shall first consider the question of whether wages are rigid in IOMs.

Shaked and Sutton (1984) applying the Rubinstein (1982) model, shows that firms dominate the bargaining process, which precludes the existence of wage rigidity, flexibility upwards, employment adjustment or unemployment persistence, which arise on account of the insider power. Dominating the bargaining process permits the firm to be in an asymmetric position in relation to the worker. This in turn permits the firm to broaden its range of alternatives available to the firm in the bargaining. The firm does this by structuring the bargaining process, in a way which is most advantageous to the firm, including increasing the bargaining period slightly.
There are four criticisms to note here. First, my main source of concern is that there exists an asymmetry between the bargaining position of the firm and the insider. If an agreement has not been reached within a certain time $T$, it permits the firm to substitute the insider as a bargaining partner to the outsider. It is this asymmetry between the bargaining positions of the firm and insider which sustains the Shaked and Sutton model. This seems a very one-sided affair. In practice, no such asymmetry between the bargaining positions of the firm and worker exists. Put it another way, casual observation suggests this asymmetry does not prevail, as clearly insiders can bargain with other firms at any time. What they have omitted to show, more importantly, why insiders do not do this. (I will not consider this in detail here, but my theoretical analysis chapter will).

Second, the model assumes that they assume turnover costs are embodied in the fixed number of times the firm and the insider are supposed to bargain with each other. Thus, this substitutability between the bargains with an insider and outsider depends on the length of this time period. In reality, turnover costs are a monetary costs as opposed to a temporal constraint on bargaining. In addition, switching partners incurs a monetary cost (see Manzini and Snower, 2002). Third, as in Rubinstein (1982), bargaining occurs prior to production, and if the agent disagrees, they earn nothing. Thus, in Shaked and Sutton’s model, this implies that when workers disagree, they will engage in a strike. Hence, it is inappropriate, and indeed attracts strong criticism, to apply the Rubinstein model straightforwardly.

There is a considerable body of evidence, for example, Fernandez and Glazer, 1991, Halter and Holden, 1991, Holden, 1994, which suggests that to model wage-bargaining which corresponds to that of the real world, it is necessary to incorporate the long-term nature of the firm-worker relationship; thus, the main objective of the bargainers will be to agree on the division of the flow of profits. If I incorporate this into the bargaining between a firm and insider, it is the bargain over the division of the flow of per period payoffs, i.e., wages and profits retained by the firm, per period. Fourth, although, Shaked and Sutton recognise and indeed, assume that replacing workers involves time and expense, this recognition or assumption is not realised in their model. In addition, they also do not provide an explanation as to what criterion is used to reject the insider’s offer and vice versa, or what criterion leads to an agreement between the firm and the outsider.

Carruth and Oswald (1987), Black and Buckley (1989) and Huizinga and Schiantarelli
(1988) address the issue of wage rigidity using the efficient bargain model. Holden (1990) compares the monopoly union bargaining framework with the right-to-manage framework. All three studies assume that the utility function is utilitarian and the union's indifference curve is downward sloping in $w - n$ space until where $n = m$.

Carruth and Oswald (1987), using wage simulations, demonstrate that as the product price ($p$) increases, wage ($w$) is rigid and $n$ increases, until $n = m$. Further increases in $p$ are translated into higher wages and depriving outsiders of employment, i.e., $n$ is fixed. The increments in wages continue until a certain point and $w$ becomes rigid again and $n > m$. Thus, wage rigidity occurs when $n \neq m$. In Huizinga and Schiantarelli (1988), however, $w$ increases in all three stages, i.e., $n < m$, $n = m$, $n > m$, but it is most pronounced when $n = m$. The contrasting results in both these studies arise mainly due to the use of different functional forms used for the firm's production technology.

Black and Buckley (1989) show both $w$ and $n$ are rigid over a range of $p$, when $n = m$. Union utility is maximised subject to the firm's total profit constraint. The main assumption is that if members are unemployed, the employed members redistribute their wages to the unemployed members, until the marginal utilities of both types of workers utilities are the same. A similar result, is found in Miaouli (1990), where the union sets nominal $w$, to retain employment at all periods in the future. A similar result emerges in Fitzenberger and Franz (1999). In the context of aspects of an IOM, they show that the employment performance is better when unions give precedence to employment, compared to wages, and show a long-run orientation to wages. This result implies that for employment to take precedence over wages in the union objectives, wages have to be rigid at some phase to sustain the precedence of employment, as in for example, Black and Buckley (1989) and Miaouli (1990). With these union objectives, $w$ must be rigid, in certain phases, to ensure $n$ is at least equal to $m$.

Jones and McKenna (1989) find when $n > m$, the union may give more weight to current employed outsiders, if it values future membership. It is not abundantly clear, though why it is interested in future membership. Holden (1990), applying the Manning (1987) model to compare the monopoly union model, where, $\theta$, the measure of bargaining strength = 1, and the right-to-manage model where $\theta$, the measure of bargaining strength, is $< 1$, shows that, for various values of $\theta$, both bargaining models yield the same outcome. Their results resemble Carruth and Oswald (1987).
Thus, wage rigidity is prevalent in some circumstances only, but not in others. The incorporation of seniority considerations does not strengthen the weak rigidity results. If there is a trend decline in the foreign price of the union's output only, then Grossman (1984) shows in a monopoly union model, governed by majority rule, the long-run wage will be rigid only in special cases, for example, if the firm's production function is Cobb-Douglas. When the union utility function comprises of the real wage solely as an argument, then Oswald (1993), demonstrates that in an efficient bargaining framework, with no uncertainty, the wage is rigid only under special cases, for example, if the firm's production technology is constant elasticity. If there is ex ante uncertainty about the price of the output, Oswald (1986b) reports that wage rigidity is present, conditional on a special relation, occurring between the firm's relative risk aversion, the elasticity of labour demand and labour's share of the revenue, specifically, $\zeta = (1 - a)\varepsilon$, where, $\zeta =$ firm's relative risk aversion, $a =$ labour's share of revenue, and $\varepsilon =$ elasticity of demand. These three results imply wage rigidity is rather a lottery. Thus, the conclusion is that wage rigidity is not a general and robust implication of IOMs.

The issue of nominal wage rigidity has been investigated by Gottfries (1992) in an IOM model. He finds from his numerical experiments that the gain from indexation is less than 0.1 per cent of wage, i.e., it is small. This implies that nominal wage rigidity may be present in IOMs. But it must be noted, as is common in the literature, this relies on the specific functional form used. Since evidence from most OECD countries is that job creation and destruction arise in conjunction with each other in all stages of business cycles' uncertainty should be incorporated into his model. Laseen (2003) does just this: i.e., he analyses the question of wage rigidity, incorporating firm-specific uncertainty. He finds the gain from indexation is notable, specifically, the inclusion of uncertainty, to the Gottfries (1992), model increased the gain from 0 to 1.5 per cent of the wage. His result appears more plausible, in view of the fact, that, for example, most studies show that, most unemployment experiences, can be explained by uncertainty, see Davis, Haltiwanger and Schuh (1997). See Table 2.9 for a summary of the most recent developments of IOMs.

Next, I turn to the more important question of asymmetric adjustment of wages as in,

---

6On the point about uncertainty being omitted from Gottfries's (1992) model, Leslie (1992) demonstrates that IOT's treatment of uncertainty is unsystematic and would therefore benefit from an integration with implicit contract theory.
## TABLE 2.9
MORE RECENT DEVELOPMENTS OF INSIDER-OUTSIDER MODELS

<table>
<thead>
<tr>
<th>Study</th>
<th>Bargaining Structure/Utility Function</th>
<th>Results/Criticisms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shakot and Sutton 1984</td>
<td>Rubinstein model</td>
<td>Firm structures the bargaining process, to be most advantageous to the firm. There exists an unrealistic asymmetry between the bargaining position of the firm and the insider. If agreement has not been reached within a certain time T, the firm substitutes the insider as a bargaining partner for the outsider.</td>
</tr>
<tr>
<td>Carruth 1987</td>
<td>A utilitarian utility function; aggregate sum of members utility levels maximised</td>
<td>As product prices (p) rises, wages (w) rise simultaneously, until n = m. Further rises in p are translated into higher wages, depriving outsiders of employment, i.e., n is fixed. The increments in wages continue until a certain point and w becomes rigid again. Thus, wage rigidity occurs when n ≠ m.</td>
</tr>
<tr>
<td>Oswald 1987</td>
<td>EBM</td>
<td>Both w and n are rigid over a range of p when n = m.</td>
</tr>
<tr>
<td>Huizinga and Schiantarelli 1988</td>
<td>EBM union objective is maximised contingent to the firm’s total profit constraint. If members are unemployed, employed members redistribute their wages, until the marginal utilities of both types of workers are the same.</td>
<td>Their results of the two models are identical for a variety of values of θ and resemble the Carruth and Oswald 1986b outcome.</td>
</tr>
<tr>
<td>Black and Buckley 1989</td>
<td>EBM</td>
<td>With the union governed by majority voting, the long-run wage will be rigid only in special cases, for example, if the firm’s production technology is Cobb-Douglas.</td>
</tr>
<tr>
<td>Holden 1990</td>
<td>MUM</td>
<td>The firm’s production is constant elasticity. Gains from indexation are less than 0.1 per cent of wage. This is reliant on the specific functional form utilised.</td>
</tr>
<tr>
<td>Miaouli 1990</td>
<td>MUM</td>
<td>In the absence of uncertainty about the price of output, wage rigidity is present, contingent on a special relationship occurring, between the firm’s relative risk aversion, the elasticity of labour demand and labour’s share of the revenue.</td>
</tr>
<tr>
<td>Fitzenberger and Franz 1999</td>
<td>Aspects of IOM integrated with theoretical consideration with respect to an optimal degree of centralisation of wage-bargaining</td>
<td>Wages are set to retain employment of insiders at all times in the future. If unemployed outsiders’ interests are taken into consideration, then employment converges towards its steady-state level of full employment.</td>
</tr>
<tr>
<td>Jones and McKenna 1989</td>
<td>Incorporates the IO distinction into the static MUM and finds this unsatisfactory. Hence, revives the MUM</td>
<td>Employment performance is better, when unions give precedence to employment vis-a-vis wages and show a long-run orientation of wages. Imposing unemployment to take precedence over wages, wages have to be rigid at some phase to sustain employment, so that n is at least equal to m. When n &gt; m, the union accords more weight to current employed outsiders and if it values future membership.</td>
</tr>
<tr>
<td>Oswald 1993</td>
<td>Union utility function with the real wage solely as an argument, in an EBM</td>
<td>In the absence of uncertainty about the price of output, wage rigidity is present, contingent on a special relationship occurring, between the firm’s relative risk aversion, the elasticity of labour demand and labour’s share of the revenue.</td>
</tr>
<tr>
<td>Oswald 1986b</td>
<td>-</td>
<td>If there is ex ante uncertainty about the price of output, wage rigidity is present, contingent on a special relationship occurring, between the firm’s relative risk aversion, the elasticity of labour demand and labour’s share of the revenue.</td>
</tr>
<tr>
<td>Gottfries 1992</td>
<td>Insiders maximise their wages contingent on employment of all insiders. Wage of the outsiders is suppressed.</td>
<td>Gains from indexation are less than 0.1 per cent of wage. Since job creation and destruction occurs simultaneously, uncertainty should be incorporated in his model. The gain from indexation increased enormously from 0 to 1.5 per cent of the wage. Small cost of indexation is insufficient to support an equilibrium with a rigid nominal wage.</td>
</tr>
<tr>
<td>Laseen 2003</td>
<td>Impact of firm-specific shocks incorporated into state contingent wage contracts model</td>
<td>Their results of the two models are identical for a variety of values of θ and resemble the Carruth and Oswald 1986b outcome.</td>
</tr>
</tbody>
</table>

for example, LS (1988c, chapter 9). This refers to wages exhibiting downward rigidity and upward flexibility in IOMs. In the strong versions of IOMs, insiders will want higher wages provided there are no layoffs; showing no interest in expanding employment. McDonald (1989) shows wages are asymmetric. A similar result is demonstrated by Begg (1988), in a dynamic overlapping generations model. All these studies use the monopoly union bargaining framework; LS (1988c) demonstrates the presence of asymmetries in a right-to-manage model. Huizinga and Shiantarelli (1992) show asymmetries emerge using an efficient bargain model. The use of the seniority system may strengthen this result. For example, Turnbull (1988) shows that in the presence of increase in demand, insiders want this translated into higher wages, but when demand falls, unions governed by majority and seniority rules ensure that
the impact of the reduction in demand is absorbed by contraction in employment, with wages remaining rigid. This result is confirmed by Prachowny (1987), McDonald (1989) and Kaufman and Martinez-Vazquez (1990). See Table 2.10.

### TABLE 2.10

<table>
<thead>
<tr>
<th>Study</th>
<th>Bargaining Structure/Utility Function</th>
<th>Results/Main Criticisms</th>
</tr>
</thead>
<tbody>
<tr>
<td>LS RMM</td>
<td>MUM, EBM, MUM</td>
<td>Wages adjust asymmetrically, contingent on an optimal upper bound on wages</td>
</tr>
<tr>
<td>McDonald and</td>
<td>MUM</td>
<td>Asymmetric wage adjustments</td>
</tr>
<tr>
<td>Solow 1981</td>
<td>EBM</td>
<td>Wage adjustments are asymmetric</td>
</tr>
<tr>
<td>Begg 1988</td>
<td>Union governed by seniority rule</td>
<td>More potent asymmetric adjustment of wages. More upwardly flexible, for example, when demand is favourable and more contraction of employment during adverse demand</td>
</tr>
<tr>
<td>Huizinga and</td>
<td>MUM with union governed by seniority rule</td>
<td>Asymmetric adjustment of wages. Favourable shocks to productivity, for example, are translated into higher wages and the impact of the reduction in demand is absorbed by contraction in employment with wages rigid</td>
</tr>
<tr>
<td>Schiantarelli 1988</td>
<td>RTM with union governed by seniority rule</td>
<td>Asymmetric adjustment of wages; flexible upward during peaks and rigid downwards during troughs</td>
</tr>
<tr>
<td>Prachowny 1987</td>
<td>MUM, EBM and Median voter model</td>
<td>All three models exhibited asymmetric behaviour post demand shocks. This is explicitly propounded in the median voter model</td>
</tr>
<tr>
<td>McDonald and</td>
<td>MUM with plant specific unions</td>
<td>Asymmetric adjustment of wages; flexible upward during peaks and rigid downwards during troughs</td>
</tr>
<tr>
<td>Kaufman and</td>
<td>MUM, EBM and</td>
<td>All three models exhibited asymmetric behaviour post demand shocks. This is explicitly propounded in the median voter model</td>
</tr>
<tr>
<td>Martinez-</td>
<td>Median voter model</td>
<td></td>
</tr>
<tr>
<td>Vazquez 1990</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

However, this result is not entirely general and may not hold under various scenarios, namely: the presence of negotiations over wages; when wages set are determined by bargaining over wages, limit price, by aggressive underbidding by outsiders, differences in productivity and training costs between insiders and outsiders, as shown in Layard (1990), McDonald (1991b), Vetter and Andersen (1994), Gottfries and Sjostrom (2000) respectively. A simple demonstration of the first point is in Layard (1990), who notes that, in the absence of large shocks, it is advantageous for the median voter to seek the highest feasible wage, irrespective of the state of the product demand. The firm, on the other hand, will want to pay the lowest wage possible. The common method of resolving this incentive incompatibility is through bargaining, where the relative strength of the bargainers will be taken into account, amongst other related factors, to determine the actual wage. Thus, it is wrong to assume that unions will increase wages in a boom and accept layoffs in a trough; instead, they will be attempting to maximise the wage each period. McDonald (1991b), using a monopoly union model, demonstrates that it is the limit price (i.e., if goods are priced in excess of this price level foreign competitors will absorb all the firm’s sales) which determines the wages set. Thus, it
s wrong to consider that in the presence of adverse unfavourable shock, wages will rise and vice versa, as in LS (1988c) for example. Instead they will fall, if the limit price dictates this. Indeed it will fall, since adverse shocks imply prices will be lower, and hence the wages.

Vetter and Andersen (1994) show using a two-period model, that it is outsiders who set the limit on the wages insiders demand, and insiders are also constrained from restricting employment opportunities to outsiders. This is because the higher the wages set, the more aggressively outsiders will underbid current insiders to gain insider status, since the loss to an outsider if permanently an outsider, is immense, rendering their incentive to underbid insiders very strong. As a consequence, it becomes very difficult for insiders to protect their employment. This result is reinforced by Andersen and Vetter (1995), where it is shown that the outsiders do not want to underbid, as they are hampered by their expectations of becoming insiders in the future. Thus the last two results show that insiders' wages and reservation of their employment are kept in check by outsiders. This, makes it incorrect to consider that insiders boost wages in a boom and accept reductions in employment in a rough. Gottfries and Sjostrom (2000) show that it is differences in productivity and training costs between insiders and outsiders that determine the insider and outsider wages. Hence, the unions do not increase wages in an upturn and accept layoffs in a downturn; wages are determined by both the agents productivity differentials.

The occurrence of asymmetric wage adjustment in IOMs is sensitive to the assumptions about the form of the bargain, the unions' power to negotiate wages, union goals, outsiders' power to influence wages, and the productivity and training cost differentials between insiders and outsiders. See Table 2.11 summarising the irrelevance of the asymmetric adjustment in O Models.

A related question is of employment adjustment and unemployment persistence. Are shocks to employment persistent in IOMs? A simplified version of the monopoly union model would indicate they are. Fundamentally, the argument is as follows: assume the union sets wages so that \( E_n = E_m \), where \( E \) is the expectations operator, which is equal to the last period's employment level. The value of shocks is only revealed after the wage is set. Then an adverse unfavourable shock will contract employment now, and thus membership next period. The new reduced membership will disregard some of the existing members next period, and demand higher wages at their colleagues' expense. In the absence of additional
TABLE 2.11  
STUDIES ON THE IRRELEVANCE OF THE ASYMMETRIC ADJUSTMENT IN INSIDER-OUTSIDER MODELS

<table>
<thead>
<tr>
<th>Study</th>
<th>Bargaining Structure/Utility Function</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Layard 1990</td>
<td>RTM with layoffs by seniority</td>
<td>There is no asymmetric adjustment of wages. Workers will demand the highest feasible wage with the firm’s objectives as the constraint. Limit pricing and increasing returns to scale nature of producer’s technology dictates the wages set</td>
</tr>
<tr>
<td>McDonald 1991b</td>
<td>MUM</td>
<td>Outsiders constrain the high wage demands of the insiders and also their restriction of employment opportunities to outsiders, since higher wages spur outsiders to underbid more vehemently. In the presence of youth unemployment on account of seniority rule, young outsiders do not want to underbid, because of their expectations of becoming insiders in the future.</td>
</tr>
<tr>
<td>Vetter and Andersen 1994</td>
<td>Two period IOM with turnover costs</td>
<td>Outsiders constrain the high wage demands of the insiders and also their restriction of employment opportunities to outsiders, since higher wages spur outsiders to underbid more vehemently. In the presence of youth unemployment on account of seniority rule, young outsiders do not want to underbid, because of their expectations of becoming insiders in the future.</td>
</tr>
<tr>
<td>Gottfries and Slostrom 2000</td>
<td>IOM</td>
<td>Wage differentials between insiders and outsiders are attributed to productivity and training costs differentials</td>
</tr>
</tbody>
</table>

TABLE 2.12  
STUDIES ON EMPLOYMENT ADJUSTMENT AND UNEMPLOYMENT PERSISTENCE

<table>
<thead>
<tr>
<th>Study</th>
<th>Data Source</th>
<th>Testing Method</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>A: Empirical Study</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blanchard and Summers 1986</td>
<td>OECD data and Grubb 1984-1984</td>
<td>Wage, employment and employment processes equations estimated for the UK, France, Germany and the US</td>
<td>Employment follows a random walk with a positive or negative drift conditional on the size or the variety of parameters used.</td>
</tr>
<tr>
<td>Burda 1990</td>
<td></td>
<td>Multi: Results as above</td>
<td></td>
</tr>
<tr>
<td>Gottfries and Horn 1987</td>
<td>MUM</td>
<td>Low employment in the current period leads to higher wages in the following period.</td>
<td></td>
</tr>
<tr>
<td>McDonald 1989</td>
<td>Multi: Results as above</td>
<td>Union precludes the increase in employment by averting the entry of new firms. Asymmetric wage adjustments, whereby, following an adverse shock, wages remain unchanged and employment contracts, which lead to employment persistence, due to the wage setting behaviour of the incumbent workers.</td>
<td></td>
</tr>
<tr>
<td>Drazen and Gottfries 1990</td>
<td>Dynamic seniority model</td>
<td>Unemployment persistence prevalent depending on the assumption of the form of the seniority rule.</td>
<td></td>
</tr>
</tbody>
</table>

The criticisms of these results are as follows: first, even the use of the monopoly union model, does not necessarily show that higher membership is tantamount to lower wage de-
and, if the union's indifference curve in $w - n$ space, is downward sloping until $n = m$, and horizontal after this point. The utilitarian union is interested in achieving higher wages, providing all its members are employed, as shown in Blanchflower et al. (1990). Indeed, nominal wages will only be set in such a manner, so that all members are employed at all times in the future, as observed by Miaouli (1990).

Second, after a shock, and the prevalence of persistency, there may be multiple equilibria; with a high employment equilibrium initially and then a low equilibrium after that, in which the system remains stuck. McCausland (1998) shows that after an adverse technological shock, the system moves from a high to a low equilibrium, due to the cubic cost and profit functions, and the system remains stuck in this state.

Third, persistency may not necessarily hold, if the union must negotiate over the wage with the firm. The implication of the Layard (1990) argument is that employment returns to its initial level following a one-period shock, since the union's utility does not alter in accordance with employment changes, (see McDonald, 1991a). If one assumed that bargaining power hanges with employment, then there could be serial correlation in employment changes. If this was the case, then this could give rise to negative serial correlation.

Fourth, persistency may not arise if the wages set are determined by limit price. The McDonald (1991b) argument implies that employment increases after a favourable shock, but will not remain stuck at that level, since employment does not move with the aggregate demand, but it moves with aggregate demand as in the conventional Keynesian relation.

Fifth, persistency may not be prevalent if the wage set is not sufficiently high to induce outsiders to underbid. The Vetter and Andersen (1994) argument implies that employment will return to its original level after a one-period shock, since insiders will not set their wage sufficiently high to induce outsiders to bid for their post, i.e., employment does not change with wages, but it moves with the wage-setting behaviour of the insiders, which in turns affects the outsiders' behaviour.

Sixth, persistency may not occur, if the wage determined is a reflection of productivity differentials between insiders and entrants. The Gottfries and Sjostrom (2000) argument implies that employment will return to its initial level after a one-period shock, since productivity and training differentials between the insider and the entrant will not change, when employment changes.
It is useful to note some additional points. First, shocks can be present, but in a fundamentally asymmetric fashion; see for example, Kidd and Oswald (1987), Lockwood and Manning (1987) and Huizinga and Schiantarelli (1992). The first two studies show this utilising the intertemporal monopoly union model within a partial equilibrium framework and assumes exogenous reservation level of utility Huizinga and Schiantarelli utilise the efficient argain model within a general equilibrium framework, endogenising the level of utility. All three studies find that employment falls instantaneously in troughs, but in Huizinga et al. his is attained through quits as well; but only gradually adjusts to its status quo in booms.

Second, while shocks to employment may be persistent, the magnitude of the initial effect is smaller than it would have been in a competitive market, see Ball (1990). Studies critiquing the employment adjustment and unemployment persistence outcome are summarised in Table 2.13.

<table>
<thead>
<tr>
<th>Study</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blanchflower</td>
<td>Even in the MUM, it is not unequivocally true that higher membership is tantamount to lower wage demands if the union’s indifference curve is downward sloping until where n = m and horizontal after this point</td>
</tr>
<tr>
<td>Oswald and Garrett</td>
<td>Nominal wage will only be set in such a manner, so that all members are employed at all times in the future</td>
</tr>
<tr>
<td>Huizinga and Schiantarelli</td>
<td>After an adverse technological shock, the system moves from a high equilibrium to a low, due to the cubic cost and profit functions, and the system remains stuck in this state</td>
</tr>
<tr>
<td>McCausland</td>
<td>Employment returns to its initial level following a one-period shock, since the unions’ utility does not alter in accordance with employment changes</td>
</tr>
<tr>
<td>Layard</td>
<td>Employment increases after a favourable shock, will remain stuck at that level, since employment does not move with the aggregate demand, but it moves with aggregate demand in the conventional Keynesian relation</td>
</tr>
<tr>
<td>McDonald</td>
<td>Employment will return to its original level after a one-period shock, since insiders will not set their wages sufficiently</td>
</tr>
<tr>
<td>Vetter</td>
<td>Employment will return to its initial level after a one-period shock, since productivity and training differentials between the insider and entrant will not change when employment changes</td>
</tr>
<tr>
<td>Andersen</td>
<td>Employment will return to its initial level after a one-period shock, since productivity and training differentials between the insider and entrant will not change when employment changes</td>
</tr>
<tr>
<td>Gottfries</td>
<td>Employment will return to its original level after a one-period shock, since insiders will not set their wages sufficiently</td>
</tr>
<tr>
<td>Andersen</td>
<td>Employment will return to its initial level after a one-period shock, since productivity and training differentials between the insider and entrant will not change when employment changes</td>
</tr>
<tr>
<td>Lockwood</td>
<td>Employment will return to its initial level after a one-period shock, since productivity and training differentials between the insider and entrant will not change when employment changes</td>
</tr>
<tr>
<td>Manning</td>
<td>Employment will return to its initial level after a one-period shock, since productivity and training differentials between the insider and entrant will not change when employment changes</td>
</tr>
<tr>
<td>Huizinga</td>
<td>Employment will return to its initial level after a one-period shock, since productivity and training differentials between the insider and entrant will not change when employment changes</td>
</tr>
<tr>
<td>Schiantarelli</td>
<td>Employment will return to its initial level after a one-period shock, since productivity and training differentials between the insider and entrant will not change when employment changes</td>
</tr>
<tr>
<td>Ball</td>
<td>Employment will return to its initial level after a one-period shock, since productivity and training differentials between the insider and entrant will not change when employment changes</td>
</tr>
</tbody>
</table>

However, the overall argument about employment persistency is not completely general not robust, and may degenerate if a non-myopic firm hoards labour to counteract the power of the insider, as in Vetter and Andersen (1994). In addition, the arguments in Layard...
1990), McDonald (1991b), Gottfries and Sjostrom (2000), all suggest that the employment persistence argument breaks down after a shock. Thus, persistence arising in IOMs is rather sensitive to assumptions about the form of the model, i.e., it is rather model-specific.

A general implication of IOMs is that wages are a convex combination of insider and outsider factors. The most simple exposition of this point is in Blanchflower et al. (1990): assume wages are determined using the right-to-manage framework. If the union is risk-neutral and is indifferent to employment, then utility is \( U = w \). Then the negotiated wage is a solution to the following Nash bargaining problem.

\[
\max_{w} : (w - b)\theta(\pi - \pi^*)^{1-\theta} \\
\text{s. t. } \pi_n = 0
\]

The foc is:

\[
\frac{\theta}{w - b} + \frac{(1 - \theta)\pi_w}{\pi - \pi^*} = 0
\]

Rearrangement of this equation yields

\[
w = b + \frac{\theta}{1 - \theta} \left\{ \frac{(\pi - \pi^*)}{\pi} \right\}
\]

Similar results are found in Carruth and Oswald (1989a) and Beckerman and Jenkinson 1990). In the latter case, the union is also interested in employment.

More general wage equations are found in Nickell and Kong (1992), Nickell and Wadhwan (1990), Holmlund and Zetterberg (1991), Brunello and Wadhwan (1989) and Dolado and Lentolila (1993). See Table 2.14 which summarises studies on wage equations.

A general criticism of all the studies reviewed is that bargaining over severance pay is

<table>
<thead>
<tr>
<th>Study</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blanchflower, Oswald and Garrett 1990</td>
<td>Wages are a convex combination of insider and outsider forces</td>
</tr>
<tr>
<td>Carruth and Oswald 1989a</td>
<td>As above</td>
</tr>
<tr>
<td>Beckerman and Jenkinson 1990</td>
<td>Union is interested in wage and employment</td>
</tr>
<tr>
<td>Nickell and Kong 1992</td>
<td>More general wage equation incorporates the state of the aggregate labour market</td>
</tr>
<tr>
<td>Nickell and Wadhwan 1990</td>
<td>General wage equation, which includes external factors and lagged dependent variable</td>
</tr>
<tr>
<td>Holmlund and Zetterberg 1991</td>
<td>Wage equations which include capturing the degree of centralisation</td>
</tr>
<tr>
<td>Brunello and Wadhwan 1989</td>
<td>Wage equations which include wage aspirations and nominal inertia.</td>
</tr>
<tr>
<td>Dolado and Lentolila 1993</td>
<td>Wage equations incorporating permanent membership, labour productivity, the ratio of temporary to total employment in the firm and lagged dependent variable</td>
</tr>
</tbody>
</table>
An important general implication of Blanchflower, Oswald and Garrett (1990) is that of the main internal factors is the firm's performance. Some of the internal factors are considered in, for example, Nickell and Wadhwani (1990), Dolado and Bentolila (1993). The earlier studies have not taken into account the future performance of the firm influencing age setting, since the environment is of a non-stationary nature and empirical observation suggests the bargainers are forward-looking. Coles and Wright (1998) find this is the case, sing a monetary model. It is this factor, i.e., the future performance of the firm, that the esis is devoted to analysing empirically in chapter 3 and theoretically in chapter 5, pursuing e consequences of forward-looking and rational behaviour in the bargaining process.

All the above authors unfortunately omit to take this into account, including Dolado and entolila (1993), Nickell and Wadhwani (1990), and Blanchflower, Oswald and Garrett (1990). They consider steady-state analysis of a firm's future financial performance; that bargaining etween agents are in non-stationary environments. Therefore, agents' behaviour must be orward-looking, so it is important to take into account the future financial performance of e firm. Studies in the past have made no attempts to accord explicit prominence to factors at affect the future performance of the firm. Prior to undertaking that I summarise the terature on the empirical tests on the IO models in the next section.

2.5. EMPIRICAL TESTS OF INSIDER-OUTSIDER MODELS: LITERATURE REVIEW

he theoretical review discussion has shown that there are abundant theoretical results and ropositions in the IOT, and many of these have been extensively tested empirically. Five ections have been given particular attention, particularly the last question below.

1. Are unions/incumbent workers mainly interested in increasing wages?
2. Do shocks generate unemployment persistence, and if so, why?
3. Are wage adjustments asymmetric (i.e., rigid downwards and upwards flexible)?
4. Do wages depend on 'insider-outsider' factors, such as a firm's level of productivity id profits?
(5) Does unemployment have a negative impact on wage settlements?

There are a wide variety of answers to these questions, and I review the main results below. Indeed, one source of variation is the degree of aggregation used in the studies; tests have been conducted using economy-wide, industry-wide, firm-level or individual level data. For each question, the answers found by different authors are discussed in accordance to the decreasing levels of aggregation. My aim is to assess how these results match with the theoretical results. Generally, the aim is to evaluate if the implications and predictions (posed in questions above, since they have received empirical attention), are empirically robust to ranges in approach in the use of datasets, specifications, in the style of methodology and so like, and other modifications.

5.1. Are Unions/Incumbent Workers Mainly Interested in Increasing Wages?

Here are a great deal of problems estimating the parameters of a union utility function, to assess if the unions are mainly interested in seeking higher wages. This leads one to question the validity of the use of aggregate data in examining this issue. The common problems of aggregation suggests that any attempt at seeking the answer to this question, would require totally implausible assumptions, so much so that to do so would negate the effort expended seeking an answer to this question.

However, Hersoug, Kjaer and Rodseth (1986), Pencavel (1985, 1989) and Pehkonen (1990) nbody estimates. Yamane (1998) provides evidence using Japanese data. Hersoug, Kjaer and Rodseth use Norwegian data and an union utility function closely resembling the CES. He estimates of the parameter lack precision. Pencavel (1989) uses an extension of the one Geary utility function using aggregate UK data. He finds estimates of the parameter reflecting IO considerations are close to 1, which implies outsiders are fully accounted for in the utility function, which implies that the unemployment rate is embodied in their union utility function. He also finds the estimates of the coefficient of relative risk aversion (CRRA) zero, suggesting they are highly risk-averse to changes in real wages. Pencavel (1985) and Pehkonen (1990) examine the manufacturing sector in Sweden and Finland respectively. In pencavel, the estimate of CRRA is 0.35, Pehkonen finds the usual estimate of the several estimates is considerably lower. The latter estimates the parameter of a monopoly union model, and find that workers are risk-averse to wage changes. The restrictions with regard to
The use of monopoly union model are invalidated by the data. Yamane (1998) using aggregate Japanese data, finds, that unions have a strong preference for employment stability. See Table 2.15.

### Table 2.15

<table>
<thead>
<tr>
<th>Study</th>
<th>Data Source</th>
<th>Testing Method</th>
<th>Results/Criticisms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hersoug, Kjer and Rodseth 1986</td>
<td>Norwegian data from the manufacturing sector, obtained from various sources, including wage rates from Norwegian Federation of Employees and various data from National Accounts; 1962-1978, 1980</td>
<td>Studies Using Aggregate Level Data</td>
<td>Estimates of the union utility function resembling the CES estimated</td>
</tr>
<tr>
<td>Pencavel 1989</td>
<td>UK annual data; 1953-1979</td>
<td>Equation (7) estimated</td>
<td>CRRA to change in employment approximately equal to 0. Outsiders are fully accounted for in the utility function, which implies unemployment rate is embodied in their utility function Restrictions with regard to the MUM are invalidated by the data</td>
</tr>
<tr>
<td>Pencavel 1985</td>
<td>Swedish quarterly mining and manufacturing sector data; 1968.1-1982.4</td>
<td>Current and lagged wage equation estimated by IV and structural parameters for real wages, employment and labour force estimated by three stage least squares Estimation of the first order condition for rational union behaviour based on Stone-Geary functional form and reduced form wage and employment equations are also estimated Variations in employment estimated</td>
<td>Evidence of Stone-Geary utility function. The long-run real wage elasticity of employment is approximately -0.35. Workers are risk-averse to wage changes</td>
</tr>
<tr>
<td>Pekkonen 1990</td>
<td>Annual Finnish data on manufacturing and mining; 1960-1987</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yamane 1998</td>
<td>Quarterly data on the number of non-agricultural employees from the management and Coordination Agency from their Labour Force Survey: Japan; 1983-1992</td>
<td>Studies Using Industry Data</td>
<td>Unions have a strong preference for employment stability</td>
</tr>
<tr>
<td>Carruth and Oswald 1985</td>
<td>UK mining industry; 1950-1980</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doiron 1995</td>
<td>British Columbian data on the International Woodworkers of America and the wood products industry; 1964-1984</td>
<td>Studies Using Industry Data</td>
<td>Unions are risk averse and CRRA estimated to be 0.8-1.2 IOM is consistently rejected and some positive weight is given to all levels of employment. The weight the union places on employment is negatively related to the level of employment</td>
</tr>
<tr>
<td>Pencavel 1984a, 1984b, 1986</td>
<td>Typographical union; 1946-1966</td>
<td>Studies Using Firm Level Data</td>
<td>No general estimate due to considerable variation in them Estimates particularly for the risk aversion parameter lack precision The estimate of the importance attached to employment and wages in the CES utility function fluctuated in accordance to the approach used Consistent confirmation of the union preferences for employment. Their preferences for employment is stronger than that of the US unions</td>
</tr>
<tr>
<td>Svejnar 1995</td>
<td>12 large US firms; between 1950s and late 1970s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doiron 1992</td>
<td>British Columbian data on the firms from the International Woodworkers of America; 1963-1983</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yamane 1998</td>
<td>1147 firms listed of which 775 are non manufacturing employees, on the first and second sections of the Tokyo, Osaka and Nagoya Stock Exchanges from Japan Development Bank Corporate Finance Databank</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Carruth and Oswald (1985) use industry data for the UK to estimate parameters. Doiron (1995) also uses industry-level data to examine union preferences generally. Carruth and Oswald (1985) find unions are risk-averse and CRRA is estimated to be 0.8 – 1.2. Doiron (1995), using data on the International Woodworkers of America and the wood products
industry in British Columbia, Canada, finds that the IOM is consistently rejected in support of models in which some positive weight is given to all levels of employment. However, she also finds that the weight the union places on employment is negatively related to the level of employment. This result appears rather contradictory. Her last finding is in favour of the IOMs.

Studies using firm-level data to estimate union utility parameters include Pencavel (1984a, 1984b), Svejner (1986) and Doiron (1992). Yamane (1998) also uses firm-level data, and examines union preferences generally. Pencavel examines the International Typographical Union; using a Stone-Geary utility function, he was unable to find a general estimate, as the estimates varied considerably. Using data on twelve large U.S. firms, Svejner estimates both the CRRA and the measure of the workers' bargaining strength. His estimates lack precision and in some cases this may be due to the small data set and simplifying assumptions he uses, and exogenising variables, which are explicitly endogenous. He also ignores the possibility, indicated by Manning (1987), that the bargaining strength of the union over wages is not the same as its bargaining strength over employment.

Doiron (1992) also estimates the measure of the bargaining strength of the workers, using a maximum likelihood method for a four-equation system, for different values of the firm's bargaining strength. The estimates of the importance attached to employment and wages in the CES union utility function fluctuated in accordance to the approach used, i.e., they were sensitive to the approach used. Consistent confirmation of the union preferences for employment in Japanese firms is demonstrated in Yamane (1998), where he finds that their preferences for employment are stronger than US unions.

Overall, from the small (four) precise results we have, the evidence is naturally inconclusive. But there is support for unions to be interested in employment. As we saw and noted, we do not have sufficient results to say this affirmatively. With regard to most of the studies, we saw it was problematic to provide useful interpretation of union power. One must note two additional points in this regard. The problems of using aggregate data suggest, that the results produced from using it will be highly implausible or lack any precision in most cases, particularly for the UK, where bargaining is conducted in a relatively decentralised manner. Second, these results are often dependent on using the monopoly union model. This implies that the union indifference curve, in \( w - n \) space, is tangental to the labour demand curve.
However, if agents bargain over wages, then the union indifference curve is not generally tangential to the labour demand curve, but flatter. Thus, the use of the monopoly union model biases estimates, providing the distorted view that workers are more interested in employment (Oswald, 1989). (See Table 2.16.) In fact, using survey evidence, Clark and Oswald (1993) find that the union leaders prefer a 5 per cent wage increase, as opposed to increase in employment, (see Table 2.17). However, Japanese unions have a stronger preference for employment stability than U.S. unions, as found in Yamane (1998); which implies that they are more interested in employment than wages. Doiron (1995) shows that the utility derived from wage increases is higher if there is a corresponding increase in employment in Canadian wood industry unions, although the weight the union places on increased employment declines with the level of employment. This then implies that the unions would rather opt for a 5 per cent increase in wages than an equivalent increase in employment, which conforms with Clark and Oswald’s (1993) findings.

<table>
<thead>
<tr>
<th>TABLE 2.16</th>
<th>STUDY CRITICIZING THE MONOPOLY UNION MODEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study</td>
<td>Results</td>
</tr>
<tr>
<td>Oswald 1989</td>
<td>MUM distorts the estimates of the union utility function by providing the view that workers are more interested in employment</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TABLE 2.17</th>
<th>STUDY ON UNIONS STRONGLY PREFERING WAGES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study</td>
<td>Data Source</td>
</tr>
<tr>
<td>Clark and</td>
<td>Survey of UK Trade Union leaders'</td>
</tr>
<tr>
<td>Oswald 1993</td>
<td>perceptions about their own union's</td>
</tr>
<tr>
<td></td>
<td>preferences</td>
</tr>
</tbody>
</table>

2.5.2. Do Shocks Generate Unemployment Persistence?

Studies examining unemployment persistence, using aggregate data, include Blanchard and Summers (1986), Alogoskoufis and Manning (1987, 1988), Brunello (1990b), Mulvey (1997) and Yamane (1998). Fundamentally, these tests entail examining non-stationarity or a unit root in the unemployment series. Blanchard and Summers demonstrate that the presence of unemployment persistence is more prevalent in the UK, France and West Germany as opposed to the U.S.. But Alogoskoufis and Manning (1987a) report that these results are sensitive to the specifications of the model. When they incorporated a squared-time trend,
All four countries, including Japan, exhibit almost the same degree of persistence. Despite attempting to explain the reason for this persistence in their estimates of coefficients they were unable to obtain a general result (Alogoskoufis and Manning, 1988a). Ball (1990), finds that there is no correlation between the estimates of coefficients for persistence and the level of unionisation amongst European countries.

Brunello (1990b) conducted some formal unit root tests, using Dickey Fuller statistics, to find evidence and support for the null hypothesis that unemployment in both the UK and Japan exhibits unit root. Yamane (1998) confirms the invalidity of insider power being the cause of persistence in unemployment in Japanese data. However, Lever and van Werkhooven (1996) find no evidence of the influence of insider power causing unemployment persistence in the 68 three-digit industries in Dutch manufacturing. Mulvey (1997) using UK data for both motor vehicle and electrical engineering industries for the period from 1952 – 1985, also finds no support for the impact of insider power on the persistence of unemployment in these industries. Graafland and Lever (1996), estimating a wage equation following Nickell and Yadhwani (1990), cast doubts on the influence of insiders being the reason for unemployment persistence, in 18 sectors in the Dutch market sector for the period from 1967 to 1990. They found the estimates for the influence of the change in sectoral employment on sectoral wage determination are insignificant and of the wrong sign, which they interpret as insider effect unlikely to have an effect on unemployment persistence.

Risager (1992) demonstrates that neither the current nor the lagged unemployment, or the change in current or the lagged rate of unemployment, have an impact on real wages, by testing the hypothesis that the wage is a negative function of past employment. He also finds that the coefficient of the lagged employment, is positive for skilled men, whereas the wage equation for unskilled men has a stable and highly significant negative coefficient on the lagged employment variable, implying that insider power causes persistence in unemployment. Yamane (1998) finds in Japanese firm data that there is no evidence in support of the fact that insider power causes unemployment persistence. See Table 2.18 for a summary of the studies examining whether shocks generate unemployment persistence.

There are two criticisms to note here with respect to studies using unit root tests based on Dickey-Fuller tests. The first criticism is that studies based on time-series analyses of
TABLE 2.18
STUDIES ON WHETHER SHOCKS GENERATE UNEMPLOYMENT PERSISTENCE

<table>
<thead>
<tr>
<th>Study</th>
<th>Data Source</th>
<th>Testing Method</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blanchard and Summers 1986 (henceforth BS, 1986)</td>
<td>OECD databank and Grubb 1984</td>
<td>Wage, employment and unemployment processes equations estimated for the UK, France, Germany and the US. Fundamentally the tests sought non-stationary or a unit root in the unemployment series</td>
<td>Unemployment persistence is more prevalent in the UK, France and West Germany as opposed to the US</td>
</tr>
<tr>
<td>Alogoskoufis and Manning 1987</td>
<td>Annual unemployment data from France, Germany, UK, US and Japan and various other sources, including OECD, IMF, International Financial Statistics; 1951-1986</td>
<td>Incorporate a square time trend to the BS &amp; S 1986</td>
<td>The results of BS 1986 are sensitive to the specifications of the model</td>
</tr>
<tr>
<td>Alogoskoufis and Manning 1988a</td>
<td>Unemployment data on countries including France, Germany, US, Japan and other European and Scandinavian countries; 1952-1985</td>
<td>Estimated to obtain a reason for the unemployment persistence coefficients</td>
<td>Unsuccessful in attaining a general result for the unemployment persistence coefficients</td>
</tr>
<tr>
<td>Ball 1990</td>
<td>From G. Bertola</td>
<td>Persistence of unemployment and variance of the innovation of the unemployment equation estimated</td>
<td>No correlation between the estimates of persistence coefficients and the level of unionisation</td>
</tr>
<tr>
<td>Brunello 1990b</td>
<td>OECD Economic Outlook no. 44 December 1988. OECD Historical Statistics</td>
<td>Conducts formal unit root tests using Augmented Dickey-Fuller Tests Variation in employment tested</td>
<td>Evidence for the null hypothesis that unemployment in both the UK and Japan exhibits unit root</td>
</tr>
<tr>
<td>Yamane 1998</td>
<td>Quarterly data on the number of non-agricultural employees from the Management and Coordination Agency: from their Labour Force Survey: Japan; 1983-1992</td>
<td></td>
<td>Evidence of the invalidity of insider power causing the cause of persistence in unemployment</td>
</tr>
<tr>
<td>Lever and van Beveren 1996</td>
<td>Panel of annual observations for 68 Dutch manufacturing industries; 1974-1986</td>
<td>Wage equations estimated by GMM</td>
<td>No evidence of the influence of insider power causing unemployment persistence</td>
</tr>
<tr>
<td>Mulvey 1997</td>
<td>UK data on the electrical engineering and motor vehicles and various other data, including OECD Main Economic Indicators; 1952-1985</td>
<td>Log of wage estimated by two stage least squares</td>
<td>No support of the impact of insider power on the persistence of unemployment</td>
</tr>
<tr>
<td>Graafland and Lever 1996</td>
<td>18 sectors in the Dutch market; 1967-1990</td>
<td>Wage equation estimated by GMM</td>
<td>Doubts the influence of insiders, being the reason for unemployment persistence</td>
</tr>
<tr>
<td>Yamane 1998</td>
<td>1147 firms of which 775 are manufacturing and 372 are nonmanufacturing firms listed on the first and second sections of the Tokyo, Osaka and Nagoya Stock Exchanges from Japan Development Bank Corporate Finance Databank; 1978-1992</td>
<td>IOM is tested with respect to the impact of union behaviour on the variability of employment</td>
<td>The coefficient of the impact of union variable is negligible and statistically insignificant</td>
</tr>
<tr>
<td>Risager 1992</td>
<td>Danish data on firms in the manufacturing and construction sectors affiliated to the Danish Employers Federation; 1951-1987</td>
<td>Wage equations estimated to examine if wage is a function of past employment. Estimation is by Generalised Instrument Variable Estimation method</td>
<td>The current nor the lagged unemployment rate has an impact on wages. The coefficient of the lagged employment is positive for skilled men. Whilst, the wage equation for the unskilled has a stable and highly significant negative coefficient on the lagged employment variable, implying that insider power causes persistence in unemployment</td>
</tr>
</tbody>
</table>

unemployment persistence data do not explicitly identify the reasons underlying the persistence in the model, as the studies have made clear, with the exception of Yamane (1998). A second criticism is that Brunello's (1990b) study based on Dickey-Fuller tests may not be valid when the time-series under investigation is affected by a structural break (Perron,
Overall, the evidence is not in favour of persistence of unemployment shocks arising from the influence of insider factors. Also, when there are problems interpreting some of the results, because of tests being based on a unit root in unemployment, it makes deciphering which of the labour market explanations accounts for unemployment persistence difficult.

2.5.3. Are Wage Adjustments Asymmetric?

Evidence on this question is rather scant, however, a few studies have demonstrated some indications of the presence of asymmetric wage adjustments. Andersen and Hylleberg (1993), and Jansson (1995), for example, find that shocks have an impact on wages (see Table 2.19). Andersen and Hylleberg (1993) use the quarterly data from the Danish manufacturing sector for the period from 1974.1 – 1991.4, to estimate a bivariate error-correction model (Johansen and Engle-Granger two-step procedures) of wage and employment formation, to show that both unanticipated and anticipated shocks have an impact on wages; but the impact of unanticipated shocks has more impact on employment than on wages.

Jansson (1995) using quarterly data from Swedish private manufacturing sector for the period from 1965.1 – 1991.4, and the same testing strategy, confirm the significant influence of both unanticipated and anticipated shocks on wages; only unanticipated shocks have an impact on employment. One must note that the demerit of using aggregate level data for these types of studies, is that there is a chance that some information may be lost in the aggregation. In addition, the results obtained from these tests, in common with other studies, are immensely reliant on the chosen strategy.

For the U.S., Bell and Freeman (1985) find that wages are strongly correlated to value productivity per worker, particularly for industries with higher-than-average value productivity per worker than for industries with lower than average. This could be interpreted as wages exhibiting more flexibility upwards and more rigidity downwards.

adjustments, since wages are more responsive to insider effects in peaks and in expanding industries, as opposed to troughs and declining industries. Grosfeld and Nivet (1999), using data on 173 large Polish manufacturing firms for a period of seven years, find that wages adjust asymmetrically to productivity changes. Brunello and Wadhani (1989) using data on 157 manufacturing firms for the period from 1977 – 87 and utilizing four different types of dummy variables, find that the asymmetric behaviour of wages are mixed, as they seem to be dependent to a large extent on the dummy variables used. With Japanese firm-level data, they found that in two cases wages appeared to be more responsive to insider effects in a boom and in two cases in a trough. In UK firms wages were more responsive to insider effects in troughs in three of the four cases examined.

Blanchflower (1991) using data on 5,300 employees in the UK from the British Social Attitude Survey for the period from 1983 – 86 and 1989, estimating individual wage equations, finds that wages adjust asymmetrically. Specifically, in firms which expected expansion in employment, wages also increased by 8 percent, but wages did not fall notably when employment was expected to contract, i.e., wages were more rigid in the presence of negative demand shocks. In another study for the US, Holzer and Montgomery (1993), using a survey of 3,400 firms for the period from 1980 – 82 to estimate wage and employment-growth equations, find wages are very inflexible compared to employment. They also found that the wages were rigid downwards in both non-unionised firms and unionised firms, but both types of firms exhibited more upward flexibility. In addition, they also found wages adjust highly asymmetrically to sales growth, i.e., invariably wages increased when sales rose, but when sales fell, wages did not fall. See Table 2.19 for a summary of the studies in asymmetric wage adjustments. Blanchflower, Oswald and Garrett (1990) using the Workplace Industrial Relations Survey of 1984 (WIRS II), also find limited evidence that a contraction in employment leads to an increase in wages in the future. Christofides and Oswald (1988), using Canadian contract data, found no support for this wage flexibility effect in response to contraction in employment.

Briefly, the issue of whether wages are more variable upwards than downwards, either as a reward for contracting employment or for other factors, has not been resolved by the empirical
## TABLE 2.19
### STUDIES ON ASYMMETRIC WAGE ADJUSTMENTS

<table>
<thead>
<tr>
<th>Study</th>
<th>Data Source</th>
<th>Testing Method</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andersen and Hylleberg, 1993</td>
<td>Quarterly data from the manufacturing sector, drawn from Danmarks Statistik; Denmark; 1974.1-1991.4</td>
<td>Studies Using Aggregate Level Data: Estimation of a Bivariate wage-employment error-correction model (Johansen and Engle-Granger two steps procedures)</td>
<td>Both anticipated and unanticipated shocks have an impact on employment. Only unanticipated shocks have an impact on employment.</td>
</tr>
<tr>
<td>Jansson, 1995</td>
<td>Quarterly data from private manufacturing sector; Sweden; 1965.1-1991.4</td>
<td>Studies Using Time Series Data: Estimation of a bivariate wage-employment error correction model (Johansen and Engle-Granger two step procedures)</td>
<td>Both anticipated and unanticipated shocks have an impact on wages. But only unanticipated shocks have an impact on employment.</td>
</tr>
<tr>
<td>Bell and Freeman, 1985</td>
<td>US data on 53 industries 1970-1992, 1970-1980</td>
<td>Studies Using Industry Level Data: Wage productivity equations re-estimated; the sample firms divided into two groups (productivity growth) of above and below average growth. Wage equations estimated by the one-step robust GMM</td>
<td>Wages are strongly associated to value productivity per worker in the US, particularly in industries with higher than average value productivity per worker as opposed to industries with below average of the same. Wages are more flexible upwards than downwards. Wages adjust asymmetrically. Wages are more responsive to insider effects in peaks and in expanding industries as opposed to troughs and declining industries.</td>
</tr>
<tr>
<td>Johansen, 1996</td>
<td>Norwegian data on 117 industries; 1966-1987</td>
<td>Studies Using Firm Level Data: A dummy variable Dd used (-1, when expected of wages. Wages are more rigid downwards than upwards</td>
<td>Evidence of asymmetric adjustment of wages. Wages are more rigid downwards than upwards.</td>
</tr>
<tr>
<td>Grosfeld and Nivet, 1999</td>
<td>173 large Polish manufacturing firms. Most of the data was drawn for the state-owned firms Zasrfronmadnanzke until 1991 and thereafter from Zycie Gospodarcze; 1988-1994</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brunello and Wadhwani, 1989</td>
<td>Annual panel of 157 Japanese manufacturing firms and aggregate UK data for manufacturing; 1977-1987</td>
<td>Studies Using Firm Level Data: Four different kinds of dummies utilised, which were interacted with the insider effects, to evaluate the extent to which these responses are asymmetric</td>
<td>Asymmetric behaviour of wages are mixed, as they seem to be dependent on the dummy variables used to a large extent. With Japanese firm-level data, they found that in two cases, wages are more responsive to insider effects during peaks, in the other two cases, the reverse is true. In the UK firms wages were, more responsive to insider effects to troughs in the three of the four cases examined. Wages adjust highly asymmetrically in response to sales growth; (wages are more variable upward than downward. Wages are considerably less variable than employment.)</td>
</tr>
<tr>
<td>Holzer and Montgomery, 1993</td>
<td>US survey data from the Employers Opportunity Pilot Project, on 3400 US firms on 28 labour markets, 1980, 1982</td>
<td>Studies Using Employee Level Data: Reduced form wage and employment equations estimated</td>
<td>Evidence of asymmetric wage adjustments. Specifically, in firms which expected expansion in employment, wages also increased by 8 per cent, but wages did not fall notably when employment was expected to contract, that is wages are more rigid in the presence of negative demand shocks. No evidence of the upward wage flexibility effect in the future, in response to contraction in employment.</td>
</tr>
<tr>
<td>Blanchflower, Oswald and Garrett, 1990</td>
<td>UK survey data from the British Social Attitudes Survey of 5300 employees; 1983-1986, 1989 (which includes Northern Ireland data)</td>
<td>Studies Using Firm Level Cross Section Data: Logarithmic wage equations for unskilled, semi-skilled and skilled worker estimated</td>
<td>Limited evidence of a contraction in employment leads to an increase in wages, in the future.</td>
</tr>
</tbody>
</table>

Evidence. Overall, the evidence for employment persistence is very thin and inconclusive. It is unclear if anything can be inferred from these results. As the theoretical review made clear, other labour market models can also lead to symmetric wage adjustment (i.e., wage...
rigidity) and no persistence in employment shocks, which is applicable to some of the results based on unit root tests for persistence in unemployment. But with regards to persistence in unemployment shocks, the overall evidence is in favour of insider power not being the cause of persistence in unemployment as noted.

2.5.4. Do Wages Depend on 'Insider' Factors, such as a Firm's Level of Productivity and Profits?

Possibly the most robust implication of IOMs, is that wages should be determined, at least partly, by insider factors; that is, factors specific to the firm7, which arises from the firm's own financial performance (or industry, when the level of disaggregation is at this level). Some studies have used aggregate level data to examine if this is the case, including: Dreze and Bean (1990), Carruth and Oswald (1987, 1989a), Christofides and Oswald (1992), Rowlatt (1987), Carruth and Schnabel (1993), Prachowny (1987), and Holden (1989). See Table 2.20. Dreze and Bean (1990), using data for ten countries including Austria, Belgium and the UK, and utilising a macroeconomic framework, find that productivity gains are highly correlated to wages. Carruth and Oswald (1987, 1989a) and Rowlatt (1987) using UK data estimate the quarterly average of the Department of Employment monthly survey based series of manufacturing earnings. Rowlatt finds that profits have an impact on wages. Christofides and Oswald (1992) demonstrate that the real wage is an increasing function of past profitability in the industry.

Carruth and Oswald (1989a) find the elasticity of wages with respect to profits per-employee is approximately 0.05. Carruth and Schnabel (1993) using German data for contract wages, also find that in the long-run contract wages are associated with productivity (with unit elasticity). Prachowny (1987), estimates a conventional Phillips curve, with an aggregate measure of Tobin's q included as an additional variable, as a proxy for economic rent. The coefficient of q was positive and significant. He inferred this to be evidence for the importance of insider factors. In addition, he also regarded the results to imply the importance of seniority systems in layoffs. The deficiency of his result is that insider factors are important

---

7 This implies, of course, to rent sharing factors that are specific and internal to the firm which incumbent workers, irrespective of their union affiliation can capture. To confirm as noted at the outset of the chapter, insiders here and throughout the thesis refers to both union and non-union members in the spirit of Lindbeck and Snower (1988c) in contrast to Sanfey (1995), where insiders are considered to be union members only.
in non-unionised settings, where seniority rules are less likely to be important. In addition. Blanchflower and Oswald (1994) find the concept of the Phillips Curve inherently incorrect. However, Holden (1989) finds that the ratio of gross product to wages has no effect on wage drift in the manufacturing sector in Norway (wage drift is one of the main ways of determining wages in Norway).

### TABLE 2.20

<table>
<thead>
<tr>
<th>Study</th>
<th>Data Source</th>
<th>Testing Method</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dreze and Bean</td>
<td>Aggregate data on 10 countries; 1960-1985</td>
<td>Wage equations which provide the elasticity of the real product wages with respect to average labour productivity are estimated.</td>
<td>In Europe productivity gains are swiftly transferred into wages.</td>
</tr>
<tr>
<td>Carruth and Oswald</td>
<td>Annual data from the manufacturing sector drawn mainly from Layard and Nickell (1986) for a variety of variables, including real product wage and consumption earnings; 1954-1963</td>
<td>Real product wage rate and consumption earnings for manufacturing industries in the UK estimated by IV</td>
<td>Aggregate profits have a direct impact on both equations.</td>
</tr>
<tr>
<td>Carruth and Oswald</td>
<td>Annual data mainly sourced from Layard and Nickell (1986). Profit data from the Appropriations of the UK manufacturing sector’s earnings; 1960a’-1980a’s</td>
<td>Real product wage equation estimated by IV</td>
<td>Elasticity of wages with respect to profits per employee of approximately 0.05</td>
</tr>
<tr>
<td>Rowlatt</td>
<td>Quarterly average of the Department of Employment monthly survey based on 595 contracts with respect to manufacturing sector’s earnings; 1978.1-1984.4</td>
<td>Manufacturing earnings equations estimated with GLS</td>
<td>Lagged profitability has a significant impact on wages.</td>
</tr>
<tr>
<td>Christofides and Oswald</td>
<td>Labour Canada drawn from contracts agreed in the manufacturing industries; 1960a’-1980a’s</td>
<td>Real wage equations estimated by GLS and IV-GLS based on 595 contracts</td>
<td>Real wage is an increasing function of past profitability in the industry.</td>
</tr>
<tr>
<td>Carruth and Schnabel</td>
<td>German data for contract wages from various sources, including the Monthly Report of the Deutche Bundesbank; 1965-1989</td>
<td>Wage Equation estimated by utilising cointegration techniques, namely, Engel and Granger two-step procedure</td>
<td>In the long-run German nominal wages are influenced by prices and productivity (both with unit elasticity). The positive and significant ‘q’ variable envisions a demonstration of the importance of insider factors. He considers this to be a reflection of the relevance of seniority rules in layoffs. But insider factors are also important in largely non-union settings where layoffs by seniority are less prevalent. The ratio of gross product to wages has no impact on wage drift in the manufacturing sector in Norway.</td>
</tr>
<tr>
<td>Prachowny</td>
<td>Annual US data, from the Appendix B of the Economic Report of the President, on non agricultural industries; 1957-1983</td>
<td>Rate of increase of nominal wage estimated to examine the Phillips curve with an aggregate measure of Tobin’s ‘q’ incorporated to represent economic rent</td>
<td></td>
</tr>
<tr>
<td>Holden</td>
<td>Annual Norwegian data on the manufacturing sector; 1963-1986</td>
<td>Nominal wage increases in percentage equation estimated.</td>
<td></td>
</tr>
</tbody>
</table>

U.K. industries. Freeman (1986), Pugel (1980), and Bell and Freeman (1985) investigate U.S. industries. Lever and van Werkhooven (1996) and Graafland and Lever (1996) analyse the Dutch industries, whereas Holden (1989) and Johansen (1996, 1999) study Norwegian industries, the latter, 117 of these. See Table 2.21. The general conclusions are as follows.

First, both insider and outsider factors matter in wage formation. It is interesting to note that Holmlund and Zetterberg (1991) find that sectoral productivity changes, and also price changes have the most impact on wages in the US economy; they conclude that rent-sharing is a distinctive aspect of wage determination. Pugel (1980) shows that profits are a significant determinant of wages, but the significance declines sharply when an index for schooling is incorporated in the specification.

Profits are also significant in the UK data set examined by Beckerman and Jenkinson (1990), they estimated the long-run elasticity of wages to profit per worker to be 0.044. Long-run profits are the main long-run determinant of Norwegian industries data set analysed by Johansen (1996) from the period 1966 – 1987. He finds the full sample estimate indicates a long-run insider weight of approximately 0.2. Johansen (1999) also confirms that there is a significant permanent relation between industry profitability and industry wages from the period 1962 – 1991. The estimated long-run weight is in excess of 0.2 and stable both over time and across countries. It should be noted that in both the Johansens' studies, no control for the skill mix was included, thereby rendering the insider influences on wage-setting to be overstated. This criticism may be applicable to other studies as well.

Graafland and Lever (1996) also find that value added price and output per worker are a significant determinant of wages in the 18 sectors in Holland; with the relative weight for such internal factors being 0.14. Holden (1989) finds that the ratio of the gross product to wages has only a small positive effect on wage drift. Nickell and Kong (1992) and Lever and van Werkhooven (1996) find that the degree of monopoly in the product market is an important determinant of wages. The former finds this in the 25 years of annual data for 14 two-digit industries they analysed, and the latter finds product market power has a significantly positive influence on the wage rate in the 68 industries they analysed: with the internal factor weight of 0.12. Holmlund and Zetterberg (1991) and Nickell and Kong (1992) find some limited evidence that their estimate of a general 'insider' coefficient, \( \lambda \) is positively correlated across industries with union power. However, evidence in Sanfey (1995a) demonstrates the reverse
conclusion for the US: he finds wages appear to be less influenced by insider effects in heavily unionised industries.

As with the results for industry data, firm or individual data appear to contradict both classical competitive models of wage determination and pure IOMs; both insider and outsider

<table>
<thead>
<tr>
<th>Study</th>
<th>Data Source</th>
<th>Testing Method</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coe</td>
<td>OECD sectoral base data on 14 OECD countries and 196 manufacturing and service industries: 1963-1986</td>
<td>Growth of real product wage equations estimated for both the manufacturing and service sectors</td>
<td>Insider factors matter in wage formation. Aggregate consumer prices and output prices have an important influence on wages. Sectoral productivity and price changes, have the most important impact on wages in the US economy. They conclude that rent-sharing is a distinctive aspect of wage determination.</td>
</tr>
<tr>
<td>Holmlund and Zetterberg</td>
<td>Panel data from various sources on industries of 5 countries: Sweden, Norway, Finland, Germany and the United States: 1960s' to mid 1980s'</td>
<td>Log-linear wage equations estimated with industry/time dummies</td>
<td></td>
</tr>
<tr>
<td>Pissarides and Moghadam</td>
<td>Quarterly data with respect to various industries: with respect to manufacturing and service sectors for both the manufacturing and service sectors: 1963-1986 and 1963-1984.4</td>
<td>Relative hourly earnings are estimated for all 4 countries</td>
<td>Insider factors are important in all four countries at varying levels of importance.</td>
</tr>
<tr>
<td>Carruth, Oswald and Findlay</td>
<td>UK annual data on 2 industries: coal mining; 1950-1980 and Steel; 1949-1979</td>
<td>Reduced form wage and employment equations estimated</td>
<td>Wages are correlated with insider variables.</td>
</tr>
<tr>
<td>Nickell and Kong</td>
<td>UK data on 14 pooled production industries from various sources, including real labour cost from Employment Gazette; 1961-1986</td>
<td>Both unrestricted and tightly specified wage equations estimated for each industry</td>
<td>Wages are influenced by insider factors namely, the degree of monopoly power in the product market. Some limited evidence of insider power being enhanced by the presence of unions across industries.</td>
</tr>
</tbody>
</table>


Nickell and Wadhwani's (1990) model is an influential, and may even be regarded as a seminal model, in empirical labour economics for a variety of reasons, including the extensive and comprehensive dataset they have used, their estimation model, method of testing and so
forth. Indeed, a number of studies have followed the study in their own empirical modelling. It would be useful, to consider their study.

Nickell and Wadhwani (1990) use firm data for 219 firms, using EXTAT and DATASTREAM for the period from 1972 – 82. The firms are fairly large in terms of employment, average employment in 1982 was 6,046. They also used questionnaire responses from Personnel Managers of 75 selected firms to gain information about unionisation. Their empirical model is as follows (the model is in logs):

$$w = \mu_0 + (1 - \mu)w_{-1} + \mu\{\lambda[(p + y - n)^e + \alpha_1\beta + \alpha_2l] + (1 - \lambda)(\bar{w} - \gamma_2b) + \alpha_3\Delta n^e$$

where \(p + y - n\) is the firm's revenue per head, plus the value of sales, divided by employment, \(w\) is the wage, \(\Delta n^e\) is the hysteresis term, \(\bar{w}\) is aggregate wage, \(l\) is the liquidity/cash flow terms includes, the firm's debt-equity ratio, the minimum lending rate and the deposit/liability ratio, \(\beta\) is the measure of union power, \(\lambda\) is the insider weight, \(b\) is the benefit replacement ratio, i.e., unemployed benefit level ratio to the expected level of net earnings, \(w_{-1}\) is lagged wages, \(\bar{w}\) is the aggregate UK wage, \(p\) is the output price, \(y - n\) is the output per head. As revenue per head and employment change refer to expectations, they then replaced them with actual values. Their method of estimation is GMM, due to Arellano and Bond (1991). They estimate a fixed effects equation, which has firm-specific constant and separate dummies for each of the nine years they covered.

They found, first, wages were positively correlated to product price and productivity terms, and these factors are strongly correlated to the firm's financial position. Second, the total outsider effect of unemployment is strong and well determined at the aggregate level. Third, wages were negatively correlated to interest. Fourth, the firm's liquidity effects are not insignificant at all and indeed, they find a strong correlation between wages and interest rate. In addition, when the real rate is incorporated, it shows no impact. Thus, a liquidity rate as opposed to aggregate demand interpretation appears appropriate. They also provide weak favourable evidence on the role of lagged employment on wages. Furthermore, when the aggregate variables are replaced by time dummies, those results which stay relevant are
**TABLE 2.22**

**DO ‘INSIDER FACTORS’ HAVE AN IMPACT ON WAGES?**

*Studies Using Firm Level Data*

<table>
<thead>
<tr>
<th>Study</th>
<th>Data Source</th>
<th>Testing Method</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nickell and Wadhwan 1989</td>
<td>219 UK firms; 1974-1982</td>
<td>Wage equation estimated</td>
<td>Insider factors, such as rise in productivity, have a positive impact on wages.</td>
</tr>
<tr>
<td>Nickell and Wadhwan 1990</td>
<td>219 UK manufacturing firms, obtained from integrating the DATASTREAM on-line service; 1972-1982</td>
<td>Wage equation in conjunction with union coverage interactions estimated</td>
<td>Insider effects, including financial variables, have an important influence on wage determination.</td>
</tr>
<tr>
<td>Scaramozzino 1991</td>
<td>The basic data is drawn from a panel of 215 UK manufacturing firms derived from amalgamating the DATASTREAM on-line service with the EXTAT data tape; 1974-1982</td>
<td>Wage equation estimated</td>
<td>Evidence of the important impact of insider forces, particularly those emanating from profits per employee, on wage determination.</td>
</tr>
<tr>
<td>Nickell, Vainiomaki and Wadhwan 1992, (henceforth, NVW)</td>
<td>Unbalanced panel of 614 UK manufacturing firms. The data is obtained by amalgamating the DATASTREAM on-line service with the EXTAT data tape. The data constitute a continuous series for each company which has a minimum of six observations; 1975-1996</td>
<td>Basic wage equation in conjunction with two sets of variations of the basic wage equation estimated. First, with the firm size interactions. Second, incorporates a restricted sample of companies who responded to NVW union questionnaire</td>
<td>Firm-specific factors, including product market power, have a positive effect on wages. Their inability to control for the skill composition of the workforce detracts from the reliability of these results.</td>
</tr>
<tr>
<td>Hildreth and Oswald 1997</td>
<td>Unbalanced panel of 329 firms obtained from EXTAT database; 1981-1990. In addition, another balanced panel of 58 establishments collated in a survey by Hildreth was also utilised; 1980-1986</td>
<td>GMM IV estimation of the wage equation on both the panel of 329 companies and 58 establishments</td>
<td>Product market power has a positive effect on wages, which is more pronounced in large firms, irrespective of the union status. Long-run variations in wages are correlated with earlier variations in the measure of profitability. The long-run elasticity of company wages and establishment wages with respect to profit per employee is slightly less than 0.02 and 0.04 elasticity.</td>
</tr>
<tr>
<td>Brunel and Wadhwan 1989</td>
<td>157 Japanese extremely large manufacturing companies drawn from the Japan Development Bank tape; 1971-1986; 1964-1969</td>
<td>Wage equations estimated by GMM (AB, 1988)</td>
<td>The elasticity of wages with respect to sales per worker is 0.33 and 0.1 in Japan and the UK, respectively, suggesting insider effects are more important in Japan than in the UK, but less so in small firms in both economies.</td>
</tr>
<tr>
<td>Dolada and Bentolila 1993</td>
<td>Panel data on 1667 non-energy private mainly large manufacturing firms, drawn from the database of the Balance Sheet Survey at the Bank of Spain; 1985-1988</td>
<td>Wage equation estimated by GMM (AB, 1991)</td>
<td>Liquidity and market power variables are found to have a marginally significant impact on wages. The insider weight of firm-specific factors is ≤0.10 per cent. Innovations are found to be a good approximation to economic rents. Firms undertaking process and product innovations pay higher wages.</td>
</tr>
<tr>
<td>Martinez-Roz 2001</td>
<td>Encuestas sobre Estrategias Empresariales (ESSE) survey data on 2188 Spanish manufacturing companies; 1990-1994</td>
<td>Panel data techniques utilised to control unobserved heterogeneity. Estimation method by Arellano and Bond (1995) employed. Wage equations for 1991-1994, two versions of the wage equations estimated; one with firms increasing and the other with firms decreasing productivity</td>
<td>The insider weight of firm-specific factors is ≤0.10 per cent. Innovations are found to be a good approximation to economic rents. Firms undertaking process and product innovations pay higher wages.</td>
</tr>
<tr>
<td>Grosfolds and Nivet 1999</td>
<td>173 Polish large manufacturing firms; 1998-1994</td>
<td>Wage equations estimated by GMM (AB, 1991)</td>
<td>The insider weight of firm-specific factors is ≤0.10 per cent. Innovations are found to be a good approximation to economic rents. Firms undertaking process and product innovations pay higher wages.</td>
</tr>
<tr>
<td>Lee 1999</td>
<td>Firm level panel data of 681 SOEs’ derived from a matched dataset from two surveys</td>
<td>Wage equation estimated by seemingly unrelated regression technique (SUR)</td>
<td>Evidence of insider power in China, manifested in the prevalence of rent-sharing activities. Wage setting of unskilled men are affected by insider forces. Their results were inconclusive as to whether insider effects have an impact on the wages of skilled men.</td>
</tr>
<tr>
<td>Risager 1992</td>
<td>Firms affiliated to the Danish Employers’ Federation; 1951-1987</td>
<td>Wage reaction functions estimated for skilled and unskilled men by the Generalised IV Estimation Method Log of wage equation based on NW (1990) estimated by GMM</td>
<td>Demonstrate a small and insignificant insider effect. The estimated insider weight is 0.07.</td>
</tr>
<tr>
<td>Forslund 1994</td>
<td>Swedish data on 128 firms, derived from an annual survey conducted by the Federation of</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Their main result is that both external and the firm's degree of financial prosperity determines the wage rate and that insider factors have a significant influence on wage determination. They also find that wages become rigid when there is an anticipated fall in demand.

Their investigation is distinct: the weakness of their model is that the bargainers are in a non-stationary environment, and as the behaviour of the agents is forward-looking, it is important to incorporate additional forward-looking variables, such as P/E ratio, net income to sales ratio and so forth, to reflect these important aspects of bargaining. The importance of such an incorporation will be noted later in my succeeding chapters.

Nickell and Wadhwani (1988) also found financial variables are important in determining wages in the data for 219 UK manufacturing firm over the period from 1974 – 82; in fact, noninclusion of these variable renders the coefficient on the level of the wage to be insignificant. Indeed, they conclude that one of the main reason for the rise in wages is due to the improvements in the financial health of the firm, for example, improved liquidity and gearing and accompanied falling of interest rates have led to firms conceding to higher wage demands. Dolado and Bentolila (1993) confirm that though liquidity variables in the 1,167 large manufacturing firms in Spain were significant, they were only marginally so. The overall estimated insider weight is approximately 0.11. Scaramozzino (1991) also finds that profits are a significant influence on wages in 215 UK manufacturing firms from 1974 – 1982.

Risager (1992) finds that output price has an influence on wages, in the Danish data. Grosfeld and Nivet (1999) finds that wages in State Owned Enterprises (SOEs) are positively and significantly influenced by productivity changes, but only in an upward direction in the Polish data. Lee (1999) finds that insider forces are important determinant of wages in the 769 SOEs over the period from 1980 – 1994. This is manifested in the prevalent rent-sharing activities. Martinez-Roz (2001) confirms the importance of rent-sharing on wages, in firms in

<table>
<thead>
<tr>
<th>Study</th>
<th>Data Source</th>
<th>Testing Method</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swedish Industries</td>
<td>1984-1988</td>
<td>and IV method. The main difference is that in Forslund (1994) the union objective function is with respect to wage income and the destination of a union member who does not find a regular job pursues a labour market programme</td>
<td>However, it should be noted that, these results are highly sensitive/ways in accordance to the estimation method chosen</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Study</th>
<th>Data Source</th>
<th>Testing Method</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nickell and Wadhwani</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1988)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grosfeld and Nivet</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1999)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lee</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1999)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Martinez-Roz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2001)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
the manufacturing sector in Spain. Here the rent arises from innovation activities, particularly when both product and process innovation is undertaken simultaneously. Nickell, Vainiomaki and Wadhwani (1992) find that product market power has a positive influence on wages in the 814 manufacturing firms over the period 1975 – 1986. However, the lack of control for the skill mix detracts from the reliability of these results. Forslund (1994) finds insider forces to have a small and insignificant influence on wages in the 128 firms for the period from 1984 – 1988. The estimated insider weight is 0.07. However, it should be noted that his results are highly sensitive to the estimation method chosen.

Blanchflower and Oswald (1988), Blanchflower, Oswald and Garrett (1990) and Stewart (1990) examine the survey data set WIRS 84/II (noted above), to provide evidence of insider power in wage setting. Blanchflower and Oswald (1988) show that firm-specific variables are important determinants of pay; although their paper does not embody any econometric estimations. Blanchflower, Oswald and Garrett (1990) also show that insider variables such as firm performance are important influences on wages of skilled workers in both the unionised and non-unionised sectors, than it is for unskilled workers, particularly if they are non-unionised. Stewart (1990) demonstrates that the union wage mark up is positively and significantly correlated to product market power.

FM (2000a) uses the 1998 WERS to provide evidence of the impact of insider power in wage formation. They find that changes in product demand has an influence on wages in the private sector, and the bargained settlements are lower than non-bargained ones. Blanchflower (1991) also confirms the influence of insider power using the data from British Social Attitudes Survey to show that workers in more prosperous larger firms appropriate more rent.

Gregory, Lobban and Thomson (1985, 1986, 1987) use the data from Confederation of British Industry's (CBI) Databank to provide evidence of insider power in wage determination. These studies conclude that profitability and productivity and financial strength were two of the main determinants of pay. See Table 2.23, which provides a summary of the studies, using UK British/UK survey data.

For the US, several studies have used the extensive Current Population Survey (CPS) data source, for example, Dickens and Katz, 1987; Krueger and Summers, 1987, 1988; Katz and Summers, 1989. The general conclusion is that wage differentials across industries can-
not be fully explained by skill or compensating differentials. See Table 2.24. Dickens and Katz conduct the following two-step procedure: first, estimate wages on individual characteristics, geographic dummies and three-digit dummies on industry characteristics, such as profitability, concentration and the like. An interesting result is that the coefficients on the profit variables

<table>
<thead>
<tr>
<th>Study</th>
<th>Data Source</th>
<th>Testing Method</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blanchflower and Oswald 1988</td>
<td>British Survey data from the 1984 WIRS, which have 25 or more employees</td>
<td>Statistics to show the factors which have an impact on the level of wage in the most recent settlement</td>
<td>Evidence of insider power in wage setting</td>
</tr>
<tr>
<td>Blanchflower, Oswald and Garrett 1990</td>
<td>British Survey data from the 1984 WIRS, covering all manufacturing and the service sectors in both the public and service sectors and union and nonunion establishments. A sample of 2019 establishments were utilised</td>
<td>Three logarithmic weekly wage equations with respect to the unskilled, skilled and unskilled workers estimated. Per skill categories, two equations are reported, one with the (natural logarithm of the) county unemployment rate variable, and the other with the (natural logarithm of the) county average weekly wage rate as the external variables. One equation with the total sample; second equation with the unionised private sector subsample and the third equation with the non-unionised private sector subsample are estimated</td>
<td>Insider variables such as firm performance and market competitiveness are important influences of wages of skilled workers in both the unionised and nonunionised sectors, but not for unskilled workers, particularly if they are nonunionised. The firm’s financial performance has a positive and significant impact on wages in most of the semi-skilled and skilled market power</td>
</tr>
<tr>
<td>Stewart 1990</td>
<td>1984 WIRS data on private sector establishments, employing semi-skilled manual workers and also provide sufficient information on the wage and the control variables and have also answered sufficiently the question on the number of competitors faced by the establishment in the market for its products and services</td>
<td>Log linear wage equations are estimated by maximum likelihood estimator, with controls including the size of the ownership, establishment facing competition and establishments with market power</td>
<td>Union wage markup is positively and significantly correlated to product market power</td>
</tr>
<tr>
<td>Forth and Millward 2000a</td>
<td>WERS 1998 UK data of workplaces with 10 or more employees from all sectors, with the exception of agriculture and coal mining; August 1977 to July 1988</td>
<td>Wage settlements for the largest occupational group (excluding managers) estimated by OLS</td>
<td>Evidence of the impact of insider power in wage formation. Improving product demand induces higher wage payments in the private sector. Bargained settlements are lower than non-bargained ones</td>
</tr>
<tr>
<td>Blanchflower 1991</td>
<td>UK data on 5,300 employees collated through questionnaire from the five pooled British Social Attitudes Survey; 1983-1986 and 1989</td>
<td>Natural logarithm of annual earnings equation estimated</td>
<td>Workers in more prosperous larger firms appropriate for more rent</td>
</tr>
<tr>
<td>Gregory, Lobban and Thomson 1985</td>
<td>Approximately 1,200 manufacturing industries, encompassing approximately 2,000 settlement groups and 600,000 employees from the Confederation of British Industry (CBI, henceforth); 1979-1984</td>
<td>Analysed wage settlement equation to ascertain the factors that have an impact on wage determination</td>
<td>Profitability had an important impact on wages for the high settlers</td>
</tr>
<tr>
<td>Gregory, Lobban and Thomson 1986</td>
<td>1319 UK establishments from the CBI Pay Databank; 1979-1984</td>
<td>Examined factors that have an impact on wage determination, by bargaining structure</td>
<td>Firms who have product market power are awarding higher pay rises to fairly well-established and relatively secure employees in the labour market. Insider power is important in wage determination. Profitability plays an important role in pay determination, consistently</td>
</tr>
<tr>
<td>Gregory, Lobban and Thomson 1987</td>
<td>UK CBI Pay Databank Survey of Pay Settlements. The data comprises of a series of five sequential annual surveys of a sample of settlement groups</td>
<td>Joint Generalised Least Squares estimates for each year’s cross-section in a four year equation system is estimated by Zellner’s method on 848 observations, or the factors, which have an impact on pay settlements, 1980-1984</td>
<td></td>
</tr>
</tbody>
</table>
### Table 2.24

<table>
<thead>
<tr>
<th>Study</th>
<th>Data Source</th>
<th>Testing Method</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dickens and Katz 1987</td>
<td>US data from Current Population Survey (CPS, henceforth). The sample comprises of private sector, non-agricultural employees, 16 years of age or older with complete data on either hourly wages or normal hours of work per week; 1983-1985</td>
<td>Wage equations, are estimated in a two step procedure. In the first step, wages are estimated on individual characteristics, geographic dummies and three-digit industry dummies. In the second step, the coefficients of the three-digit industry dummies are estimated on industry characteristics such as profitability, concentration ratio and so forth</td>
<td>The coefficients of the profits variables are mostly significant for nonunion workers, but are usually insignificant for union workers. There were substantial wage differences across firms. The upper bound on the importance of industry effects is that they account for 30 per cent of the wage dispersion. Establishment size and high capital intensity had a positive impact on wages</td>
</tr>
<tr>
<td>Krueger and Summers 1987</td>
<td>US data from 1984 CPS, The sample comprises of full and part-time privately employed non-agricultural workers 16 years old or older.</td>
<td>Industry wage differentials estimated on wages and without labour quality controls estimated</td>
<td>Higher wage industries lure high quality workers. Evidence of wage structure is relatively stable over considerably long time and the ranking of different industries are remarkably similar across countries. Workers of the same quality are paid different wages at different firms. Wage distribution in the US, tends to be countercyclical, in the short run. The dispersion of wages across industries is immense, that is, workers in high wage industries have substantially higher wages than workers in low wage industries. The dispersion of wages across noncompetitive rents is consistent with the competitive labour market theories.</td>
</tr>
<tr>
<td>Katz and Summers 1989</td>
<td>US cross sectional and longitudinal data on individuals collated by the Bureau of the Census for the May 1974, 1979 and 1984 CPS and the University of Michigan’s Quality of Employment Survey (QES)</td>
<td>A number of standard cross-section wage equations estimated to investigate the importance of industry affiliation in accounting for relative wages, with controls for human capital, demographic background and so forth.</td>
<td>There are significant interindustry wage differentials on account of rents sharing that is inconsistent with the competitive labour market theories.</td>
</tr>
<tr>
<td>Vroman 1984</td>
<td>US data from the US Labour Department’s Current Wage Developments (henceforth, CWD) comprising of 2,774 very large collective bargaining situations; 1957 to 1980</td>
<td>Influences of union wage contract settlements in manufacturing estimated</td>
<td>Profits have a significant impact on wages</td>
</tr>
<tr>
<td>Blanchflower, Oswald and Sanfey 1996</td>
<td>US March CPS data on 200,000 individuals for the manufacturing sector, from 1984-1985 was combined with annual profit data for four digit manufacturing industries Productivity Database; 1984-1985. The earnings data are drawn from the 1984-1986 CPS. Individuals were asked to report the earnings in the preceding year</td>
<td>Wage equations estimated</td>
<td>Wages are a reflection of past profitability. But when the firms prosperity increases one of the gains are appropriated by the workers. The elasticity of pay with respect to profit per employee is 0.008. Lagged prices generally had a negative impact on wages</td>
</tr>
<tr>
<td>Mitchell 1978</td>
<td>Two data source utilised. The first, is a six data series drawn from the U.S. Bureau of Labour Statistics CWD; 1960-1976. The second are data on large union agreements pertaining to changes in pay rates for selected units in the manufacturing, mining and transport industries</td>
<td>Wage changes estimated in annual equations vis-a-vis, year to year per cent changes in CPI (P) and the reciprocal of the unemployment rate (U⁻¹). Two forms of unemployment rate are estimated: specifically, the official rate and the weighted Perry rate. The latter adjusts for changes in the composition of the labour force that have had an impact on the relationship between</td>
<td>Wages are a reflection of past profitability. But when the firms prosperity increases one of the gains are appropriated by the workers. The elasticity of pay with respect to profit per employee is 0.008. Lagged prices generally had a negative impact on wages</td>
</tr>
</tbody>
</table>
TABLE 2.24 (CONTINUED)

<table>
<thead>
<tr>
<th>Study</th>
<th>Data Source</th>
<th>Testing Method</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hamermesh</td>
<td>Wage and profit data drawn from bargaining situations in twelve manufacturing</td>
<td>observed unemployment and the &quot;tightness&quot; or &quot;looseness&quot; of the labour</td>
<td>Four wage equations estimated. Two with and two without the linear</td>
</tr>
<tr>
<td>1970</td>
<td>four in public utilities. Wage rate and cost of living allowances are derived</td>
<td>approximations to the non-linear wage cost-of-living relationship. Two</td>
<td>approximations to the non-linear wage cost-of-living relationship. Two</td>
</tr>
<tr>
<td></td>
<td>from the Bureau of Labour Statistics series of wage chronologies and their</td>
<td>wage equations estimated. Two with and two without the linear</td>
<td>wage equations estimated. Two with and two without the linear</td>
</tr>
<tr>
<td></td>
<td>continuations are found in CWD. Profit rate data are computed using post tax</td>
<td>approximations to the non-linear wage cost-of-living relationship. Two</td>
<td>approximations to the non-linear wage cost-of-living relationship. Two</td>
</tr>
<tr>
<td></td>
<td>profits as the numerator and the net tangible assets as the denominator.</td>
<td>wage equations estimated. Two with and two without the linear</td>
<td>wage equations estimated. Two with and two without the linear</td>
</tr>
<tr>
<td></td>
<td>Data for the former are from Mood's Industrial Manual and profits data</td>
<td>approximations to the non-linear wage cost-of-living relationship. Two</td>
<td>approximations to the non-linear wage cost-of-living relationship. Two</td>
</tr>
<tr>
<td></td>
<td>are from Standard and Poor's Cooperation Records 1948-1967, 1948-1961 and</td>
<td>wage equations estimated. Two with and two without the linear</td>
<td>wage equations estimated. Two with and two without the linear</td>
</tr>
<tr>
<td></td>
<td>1962-1967.</td>
<td>wage equations estimated. Two with and two without the linear</td>
<td>wage equations estimated. Two with and two without the linear</td>
</tr>
<tr>
<td>Currie and</td>
<td>Large panel dataset of US labour contracts from CWD Contract tape sources</td>
<td>Firm specific determinants of the logarithm of the average expected real wage</td>
<td>Profits have a negative and insignificant impact on the wage. This could be</td>
</tr>
<tr>
<td>McConnell 1992</td>
<td>from the Bureau of Labour Statistics. With respect to almost half the</td>
<td>estimated</td>
<td>attributes to their use of accounting profit, which has</td>
</tr>
<tr>
<td></td>
<td>contracts, the wage levels were obtained from an independent contract</td>
<td></td>
<td>semblance to economic profit or the size of the rent. Sales have an</td>
</tr>
<tr>
<td></td>
<td>listing published by the Bureau of National Affairs. For the remainder of</td>
<td></td>
<td>important effect on wages. Their estimates indicate that at the average</td>
</tr>
<tr>
<td></td>
<td>the contracts annual hourly earnings for the appropriate 4 digit Standard</td>
<td></td>
<td>level of sales a 10 per cent increase in sales per employee enhances the</td>
</tr>
<tr>
<td></td>
<td>Industrial Classification category are drawn from Employment and Earnings</td>
<td></td>
<td>real wages by 1 per cent</td>
</tr>
<tr>
<td></td>
<td>as the base wage level. Accounting information is drawn from Standard and</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>and Poors' Industrial CompuStat. The wage equation is estimated using data</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>derived from approximately 1300 US contracts settled, pertaining to 28</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rates of change of wages Bureau equation estimated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sparks and</td>
<td>Data from the Canadian Department of Labour, and mainly drawn from the</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wilton 1971</td>
<td>Dominion Bureau of Statistics, which documents source of profit data from</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>the Department of National Revenue Taxation Division, Taxation Statistics</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Part Two. Pooled sample of time series observations with respect to 14</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Canadian manufacturing industries. Data on industrial contracts utilised.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Profits were designated as a per cent of assets. Profits data and total</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>assets by industry were derived from the Department of National Revenue</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Taxation Statistics Part Two. Canadian data on 395 labour</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>contracts from labour Canada. Annual data on net profits and equity were</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>drawn from Corporation Financial Statistics (Statistics Canada 61-207), 1978-</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1984.4.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Log of the difference of the real wage equations estimated by Generalised</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Least and IV-GLS. Mainly one equation is estimated without the incorporation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>of industry prices and with the incorporation of industry prices</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
are generally positive and significant for non-union workers but are generally insignificant for union workers. Vroman (1984) demonstrates the influence of profit on wages, and Blanchflower, Oswald and Sanfey (1996), which combines CPS data on individuals with four-digit profit data for the manufacturing sector only, finds the estimated elasticity of wages to profits per employee to be 0.08. However, profit is not an infallible influence on wages in the US; Mitchell (1978) shows, using contract data from the BLS publication Current Wage Developments, that lagged prices generally had negative coefficients in wage equations. Hamermesh (1970) also casts doubts on the importance of profits in the US. Currie and McConnell (1992) confirms that profits had a negative impact on wages.

Using Canadian contract data, Sparks and Wilton (1971) show that profits have a highly significant influence on wage equations. Christofides and Oswald (1992) confirms that profits have a significant effect in Canadian wage determination; the long-run elasticity of wages is less than 0.01. Since the percentage change in profit is massive, this could amount to a great deal. In addition, studies have also shown that industry prices also have an important positive impact on wages, as we have seen in the studies using industry data. Card (1988) using Canadian contract data, shows that wages are positively correlated to industry product prices and profitability. Table 2.24 provides a summary of the studies on the effect of 'insider factors' on wages, using US survey level/Canadian contract data.

2.5.5. Does Unemployment have a Negative Effect on Wage Settlements?

Another most robust implication of insider-outsider models is that wages are shaped at least partially by external factors, that is, factors that are not specific to the firm or industry (when the level of disaggregation is at this level), including notably, unemployment rate/level, cost
of living, the prevailing wage rate in the firm/industry, the external pay structure and the replacement ratio, which has an impact on the expected cost of job loss and other general factors that have an impact on the incumbent workers' expected alternative income. Some studies have used aggregate data to verify this: examination for the UK includes Carruth and Oswald (1987, 1989a) and Rowlatt (1987). These studies find that aggregate unemployment, i.e., specifically, both the change in unemployment and its level, has an impact on wages in the UK. This is corroborated by Christofides and Oswald (1992) who also find the level of unemployment in the employers region has a negative impact on wages in Canada.

Unemployment in the outside labour market acts to subdue workers' bargaining power.

Carruth and Schnabel (1993) also find, using cointegration regressions, that long-run W. German wages are influenced by unemployment. Holden (1989) estimates a wage equation, in which the variable vacancy rate captures labour market pressures. He finds the vacancy rate is significant, with the inclusion of unemployment rate. Thus he demonstrates that labour market pressures are positively related to wage drift. Dreze and Bean (1990) find that the effect of unemployment on wages is generally weak. See Table 2.25 for a summary of the studies showing the impact of unemployment on wage settlements using aggregate level data.

We now turn to studies showing importance of outside factors using industry data. Most of which are in the affirmative include Coe (1990), Graafland and Lever (1996), Carruth, Oswald and Findlay (1986), Lever and van Werkhooven (1996), Johansen (1999), Beckerman and Jenkinson (1990), Nickell and Kong (1992), Johansen (1996) and Holden (1989). See Table 2.26. Coe (1990) finds the impact of unemployment is less important when analysing 14 countries individually but not when estimating pooled data for groups of countries. He also finds aggregate labour market conditions, proxied by the unemployment rate, does not have an impact on industry wages. But the examination of pooled data for groups of countries, demonstrates that it has an important influence on the level of wages. Graafland and Lever (1996) find sectoral wages are strongly influenced by the macrowage rate and the impact of the unemployment rate is minimal. Further estimation of the three groups of industrial sectors and service sectors, shows unemployment has a negative correlation or has no effect on wages in the Dutch industrial sector. They also find unemployment has a negative influence on wages in also the service sectors. The unemployment effects are more pronounced in the service sectors, as opposed to the industrial sectors.
TABLE 2.25
DOES UNEMPLOYMENT HAVE A NEGATIVE IMPACT ON WAGE SETTLEMENTS?
Studies Using Aggregate Level Data

<table>
<thead>
<tr>
<th>Study</th>
<th>Data Source</th>
<th>Testing Method</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carruth and Oswald 1987</td>
<td>Annual data from the manufacturing sector drawn mainly from Layard and Nickell (1986), with respect to a variety of variables including the real product wage, real consumption earnings and the labour force</td>
<td>Real product wage rate and consumption earnings for manufacturing in the UK estimated by IV</td>
<td>Aggregate unemployment that is specifically, both the changes in unemployment and its level, has an impact on wages in the UK</td>
</tr>
<tr>
<td>Carruth and Oswald 1989a</td>
<td>Annual data mainly drawn from Layard and Nickell (1986). Profit data from the Appropriations Account of Industrial and Commercial Companies, 1956-1983</td>
<td>Real product wage equation by IV</td>
<td>Aggregate unemployment has an effect on wages</td>
</tr>
<tr>
<td>Rowlatt 1987</td>
<td>Quarterly average of the Department of Employment monthly survey based manufacturing sector’s earnings; 1960's - 1980's</td>
<td>Change in average wages in manufacturing equations estimated</td>
<td>Evidence of both the change in and the level of unemployment has an impact on wages</td>
</tr>
<tr>
<td>Christofides and Oswald 1992</td>
<td>Canadian contract data from Labour Canada on various Canadian private uncontrolled industries. Other data they also utilised including the ratio of average weekly benefits to average weekly earnings from Unemployment Insurance Statistics (Statistics Canada 73-2025). Data on average weekly earnings on industrial composite (Cansim M1433-493) were utilized; 1978.1 to 1984.4</td>
<td>Real wage equations estimated by GLS and IV-GLS based on 595 contracts</td>
<td>Regional unemployment rate has a negative and significant impact on wages. The unemployment elasticity of real wage is about -0.08 and this is found to be stable, and consistent, when experimenting with a wide range of specifications</td>
</tr>
<tr>
<td>Carruth and Schnabel 1993</td>
<td>Various sources, including index of hourly contract wages from the Monthly Report of the Deutsche Bundesbank, various issues; unemployment rate drawn from Bundesanstalt für Arbeit, Statistisches Bundesamt and Carruth and Schnabel's calculation; 1965-1989</td>
<td>Wage equation estimated by cointegration regressions techniques</td>
<td>Long run equilibrium unemployment dampens the union’s bargaining. In the short run it is changes in unemployment which leads to wage reductions</td>
</tr>
<tr>
<td>Holden 1989</td>
<td>Annual Norwegian data on the manufacturing sector from various sources, including ILO standard, i.e., AKU data and OECD Main economic indicators which provide the vacancy rate, obtained dividing vacancies by the labour force</td>
<td>Nominal wage increases in percentages estimated by OLS and IV regression, where the variable vacancy rate captures labour market pressures</td>
<td>Labour market pressures as captured by the vacancy rate is positively related to wage drift. Vacancy rate is significant with the inclusion of the unemployment rate in the equation</td>
</tr>
<tr>
<td>Dreze and Bean 1990</td>
<td>Aggregate data on 10 countries; 1960-1985</td>
<td>The derivatives of the rate of growth of real wages with respect to the rate of unemployment estimated</td>
<td>The effect of unemployment on wages is generally weak</td>
</tr>
</tbody>
</table>

Carruth, Oswald and Findlay (1986) interpret the significance of unemployment benefit and unemployment in employment equations, as a cause for rejection of the seniority/flat indifference curve union utility, although this is not a strong test; incorporation of these variables is congruent with some specifications of the seniority model. They also find aggregate unemployment has a significant and negative impact on miner’s wages. A 10 per cent increase in the alternative wage leads to a 6 per cent increase in steelworkers wages. Lever and van Werkhooven (1996), find that the effect of unemployment and change of short term unemployment has a stronger effect on wages in some of the sectors. They find the weight of the external factors to be 0.88. Johansen (1999) also find wages are significantly affected by aggregate unemployment. The estimated long-run insider weight ranged from 0.19 to 0.222, whereas, the estimated long-run unemployment coefficient ranges from 0.040 to 0.050. Beckerman and Jenkinson (1990), using pooled two-digit industry data, find that industry unemployment has a positive effect on wages in the UK, they infer this to be in support of the hysteresis/membership interpretation. Nickell and Kong (1992) find that when two-digit
<table>
<thead>
<tr>
<th>Study</th>
<th>Data Source</th>
<th>Testing Method</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coe 1990</td>
<td>OECD sectoral base data on 14 OECD countries and 196 manufacturing and service industries, 1963-1986</td>
<td>Wage equations estimated for the manufacturing and service sectors on all 14 countries. Also wage equations for the pooled time-series cross-country data estimated</td>
<td>Aggregate labour market conditions proxied by the unemployment rate do not have an important impact on industry wages. But the examination of pooled data for groups of countries demonstrates that it has an important influence on the level of wages. Evidence of external factors having an important sectoral impact on wages, in the 18 Dutch market sector.</td>
</tr>
<tr>
<td>Graafland and Lever 1996</td>
<td>Dutch pooled cross-sectional time-series annual data, drawn from the Central Planning Bureau which are based on the National Accounts of the Central Bureau of Statistics in Netherlands; 1967-1990</td>
<td>Wage equations are estimated by GMM, AB (1991)</td>
<td>Estimation for industrial and service sectors independently reveals that there are distinct differences in wage determination. In the industrial sector the macrowage has a strong impact on wages. They suggest it indicates a weak insider power. This is not necessarily so. See my theoretical and empirical chapters. They also then find unemployment has no impact on wages which they attribute to powerful insider effects. With respect to the service sector, they demonstrate, that their wages are determined in the light of the macrowage</td>
</tr>
<tr>
<td>Carruth, Oswald and Findlay 1986</td>
<td>UK annual data from various sources, including Unemployment Benefit data from Social Security Statistics average wage rate data from Monthly Digest of Statistics, Unemployment data from Economic Trends, Annual Supplement (1983 edition) and Income Tax data from Economic Trends, Annual Supplement (1983 edition) and Income Tax data from Economic Trends Annual Supplement and data on 2 industries: coal mining; 1960-80 and steel; 1949-79</td>
<td>Wage equations estimated for both industries for the respective periods by OLS, using the Hendry and Grba package, GIVE</td>
<td>In the mining industry, both the comparative wage and unemployment benefit has unit elasticity. Aggregate unemployment has a significant and negative impact on the miner’s wage. A 10 per cent increase in the wage paid elsewhere leads to a 6 per cent increase in steelworker’s wage. Unemployment benefit has a strong negative impact on wages in the steel industry, which is startling. Lagged unemployment has scant influence on the level of real wages in both industries</td>
</tr>
<tr>
<td>Lever and van Werkhooven 1996</td>
<td>Dutch panel of annual observations for 68 3-digit industries, with 10 or more employees; 1974-1986</td>
<td>Wage equation without and with the concentration ratio variable for 68, 36 industries and large and small firms separately, estimated by GMM (AB, 1991)</td>
<td>Evidence of the weight of external factors to be 0.88, with respect to the 68 industries. The effect of unemployment, change of short-term unemployment and taxes is more powerful in the 36 industries as opposed to, in all 68 industries. The unemployment benefit ratio has a positive influence on wages in small firms and a negative effect on wages in the large firms</td>
</tr>
<tr>
<td>Johansen 1999</td>
<td>Panel of annual time series data from the National Account Statistics, for 117 Norwegian industries; 1967-1991 and 1970-1991</td>
<td>Change in wage costs per hour estimated by GMM (AB, 1991) to eliminate industry fixed effects with respect to the full and subsample</td>
<td>Aggregate unemployment has a significant impact on industry wages. In the full sample, unemployment has a negative impact on wages. An increased unemployment ratio from 1 to 2 per cent induces a long-run decrease in wages by 2.3 per cent. The predominant determinant of industry wages is the outside wage both in the short and the long-run. In the full sample, in the short -run, impact is 0.87 and the long-run elasticity is 0.77 Unemployment has a negative influence on wages. Vacancy rate has a positive and significant impact on wages. Increases in the payroll tax rate has a negative influence on wage drift. Relative wages has a negative and significant effect on wage drift, which is significant at the 10 per cent level. This is attributed to the operation of the error correction mechanism, that is, if the relative wage in an industry is lower relative to the average value over the estimation period, then this raises the wage drift in the industry Industry unemployment has a positive impact on wages in the UK, they attribute this to the hysteresis/</td>
</tr>
</tbody>
</table>
industries are analysed separately, this effect is only prevalent in a minority of industries. Johansen (1996) finds industry wages are significantly influenced by unemployment. Holden (1989) finds that unemployment has a negative influence on wages.

In congruence with the results pertaining to industry data, firm or individual data (which we pursue below) appear to contradict both classical competitive models of wage determination and pure IOMs. Outsider factors also appear to be important in conjunction with insider factors, as noted earlier. Nickell and Wadhwani (1990), one of the seminal empirical studies in empirical IOT as noted above, found aggregate unemployment exerts downward pressure on wages. Other studies that have examined the importance of outside factors in wage determination using firm-level data include: Grosfeld and Nivet (1999), Brunello and Wadhwani (1989), Risager (1992), Forslund (1994), Dolado and Bentolila (1993), Nickell, Vainiomaki and Wadhwani (1992) and Nickell and Wadhwani (1988). See Table 2.27 for a summary of these studies, which show the impact of unemployment on wage settlements. Grosfeld and Nivet (1999) find unemployment has no affect in privatised and corporatised firms, but has a significant downward impact on wages in SOEs. Brunello and Wadhwani (1989) find that there is no substantial difference in wages to variations in unemployment in large Japanese and UK firms. Risager (1992) finds that current or lagged unemployment does not have a

<table>
<thead>
<tr>
<th>Study</th>
<th>Data Source</th>
<th>Testing Method</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nickell and Kong 1992</td>
<td>UK data on 14 production industries; Other data sources include UK male unemployment rate, mid year, from Layard and Nickell (1986); industry unemployment rate, for male and female; mid year from Employment Gazette. Average aggregate hourly wages, male, October figures from Layard and Nickell (1986); Tax rate on labour paid by employers, drawn from Layard and Nickell (1980); 1961 - 1986</td>
<td>Wage equations estimated by GMM (AB, 1991). The model is first-differenced to eliminate the individual fixed effects</td>
<td>Unemployment has a significant impact on industry wages. The Norwegian wage curve is highly non-linear and tends to be flat for moderate levels of unemployment. The principal long-run determinant and the short-run determinant of industry wages, is the outside wage. Both the short and long-run elasticities are in excess of 0.8. Payroll taxes are wholly borne by labour</td>
</tr>
<tr>
<td>Johansen 1996</td>
<td>Panel of annual time-series data from the National Account Statistics, for 117 Norwegian industries including mining, manufacturing, and some private services</td>
<td>of relative wage movements on wages in an individual industry is captured by the variable $(W - W_{t-1})$, where $W$ is the wage, $W_t$ is the nominal wage in industry $i$ and $t$ is the time subscript Unrestricted and tightly specified form of the wage equation estimated for each industry. The association between union power, insider and aggregate unemployment effects from both the equations are also examined</td>
<td>membership effects. Aggregate unemployment has a negative influence on industry wages. Relative wages have an important impact on industry wages Overall, unemployment has a positive impact on few of the industries in the unrestricted wage equation. Prevailing aggregate labour market conditions also have an important influence on wages</td>
</tr>
</tbody>
</table>
direct impact on wages. This also applies to the current or lagged rate of change of unemployment. Forslund (1994) found that aggregate unemployment did not influence wages. His result is rather imprecise and unreasonable, due to the small number of time periods and low degree of variability in the variables during his sample period. Dolado and Bentolila (1993) find that aggregate labour market variables have a strong and significant impact on wages, in particular the Spanish unemployment rate, which he found had a negative (−0.928) and significant (5.60) impact on wages. Nickell, Vainiomaki and Wadhwani (1992) find that the external labour market captured by the unemployment terms have an important impact on company wages. Nickell and Wadhwani (1988) also find that both aggregate and industry unemployment exerts downward pressure on pay.

In conjunction with the importance of external factors on wages, in studies using UK/British survey data, Blanchflower and Oswald (1988) also find that external pressures also have an impact on wage settlements. Blanchflower, Oswald and Garrett (1990) also confirm the importance of external pressures. In fact, they demonstrates that pay moves with factors such as unemployment and the going rate of pay in the firm's vicinity.

Blanchflower (1991) uses the data from British Social Attitudes Survey, to show unemployment in the individual's region lowers pay with an average elasticity of −0.1. In addition, wage is influenced more by changes in the unemployment rate in the non-union as opposed to the union sector.

Gregory, Lobban and Thomson (1985) (henceforth, GLT) find the risk of redundancy exerts a downward pressure on pay settlements. They also found other external factors having an important impact on wages, specifically, intracompany comparisons, attained an almost constant rating. But the importance of each of the other external focus of comparison, that is with the industry, locality, nationally and with national agreement, declined sharply in 1980, with only minimal improvements post 1980. GLT (1986) also find that marginal employers are severely restricting pay increases to those employees who are subject to the threat of redundancy. Thus external factors, notably the redundancy rate, has a negative impact on pay. GLT (1987) find that accelerating unemployment, its duration and the risk of redundancy, has a minimal negative impact on wages over the period 1981/82 – 1983/84. However they find that the risk of redundancy played an important role in exerting
TABLE 2.27
DOES UNEMPLOYMENT HAVE A NEGATIVE IMPACT ON WAGE SETTLEMENTS?

<table>
<thead>
<tr>
<th>Study</th>
<th>Data Source</th>
<th>Testing Method</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grosfeld and Nivet</td>
<td>Finnish and Polish manufacturing firms, 1998-1994</td>
<td>Wage equations estimated: some for the period pre 1990, prior to the change in ownership of large industrial firms and the others following the transformation of ownership of these firms post 1990</td>
<td>Unemployment and other labour market conditions had a downward impact on wages in SOEs. When firms with high and low productivity were estimated separately between 1991-1994, only wages in firms in the latter category were repressed by regional unemployment.</td>
</tr>
<tr>
<td>Brunello and Wadhwani</td>
<td>157 large Japanese manufacturing companies, Japan Development Bank tape; which is from the financial accounts of large corporations listed principally on the First Section of the Tokyo Stock Exchange, UK data is derived from the Census of Production on wages, employment and value added by firm size on the manufacturing sector; 1971-1986 and 1994-1998</td>
<td>Wage equations estimated at firm-level and Japanese wage equations by the size of firm estimated by GMM (AB, 1988)</td>
<td>There is not an enormous difference in the responsiveness of wages to unemployment in large UK and Japanese firms. In both these countries wages in small firms are more responsive to unemployment than they are in large firms. BW attribute the variability of aggregate wages in Japan to the abundance of small firms vis-a-vis OECD countries. The long-run elasticity with respect to an increase in outside wage is lower. Whilst the long-run elasticity of the wage with respect to unemployment ranges from -0.07 to -0.15 in Japan and is approximately -0.1 in the UK; and they are statistically insignificant for Japan. Both the current and lagged unemployment rates are highly insignificant in both the wage reaction equations for skilled and unskilled men. The current and the lagged rate of change in unemployment, also does not have any impact on wages. Aggregate labour market variables have a strong and significant impact on wages. Outside opportunities in particular, with respect to wages, have more impact in sectors with lower productivity growth. Conditions in the external labour market as captured by the unemployment terms have a very important impact on company wages, but the effect is diminished for firms with a high degree of market power.</td>
</tr>
<tr>
<td>Risager</td>
<td>Firms affiliated to the Danish Employers Federation which comprises of the firms, in the manufacturing and construction of change in sector; 1951-1987</td>
<td>Wage reaction function estimated for skilled and unskilled men by the Generalised Instrument Variable Estimation method</td>
<td>Basic wage equation estimated, in conjunction with two sets of variations of the basic wage equation estimated. First, with firm size interactions. Second, incorporates a restricted sample of companies who responded to NVW's union questionnaire.</td>
</tr>
<tr>
<td>Dolado and Bentolilla</td>
<td>Panel data on 1667, non-energy private chiefly large manufacturing firms drawn from the database of the Balance Sheet Survey at the Bank of Spain; 1985-1988</td>
<td>Wage equation estimated by GMM (AB, 1991)</td>
<td>Basic wage equation estimated in conjunction with union coverage interactions.</td>
</tr>
<tr>
<td>Nickell and Wadhwani</td>
<td>219 UK firms, 1974-1992</td>
<td>Basic wage equation estimated in conjunction with union coverage interactions.</td>
<td>Unemployment represses wages. Aggregate unemployment and industry-wide unemployment has a negative impact on wages. Outside factors, especially the state of the labour market as captured by aggregate unemployment has an important impact on pay.</td>
</tr>
<tr>
<td>Nickell and Wadhwani</td>
<td>219 fairly large UK manufacturing companies derived from integrating the EXSTAT data tape with the DATASTREAM on-line</td>
<td>Basic wage equation estimated in conjunction with union coverage interactions.</td>
<td>Basic wage equation estimated in conjunction with union coverage interactions.</td>
</tr>
</tbody>
</table>
a significant and negative impact on pay in 1980/81, when the rates of plant closures and redundancy were exceptionally rife. They also find intracompany comparisons have a systematic impact on pay. See Table 2.28, which summarises the effect of unemployment on wage settlements in studies using UK/British survey level data.

As for the importance of outsider factors in studies, using US survey/Canadian contract data, Dickens and Katz (1987) estimate the influence of industry unemployment on wages was highly unreliable, as it was sensitive to small variations in the specification. Krueger and Summers (1988) show that industry variables have a large impact on relative wages. From the finding of inter-industry wage differentials, they infer that firms are less inclined to adjust wages in the presence of prevailing unemployment. Vroman (1984) demonstrates that unemployment has a positive and significant impact on wages.

Blanchflower, Oswald and Sanfey (1996) obtain a mixture of results for the influence of unemployment on pay in the variety of log earnings equations they estimated. In the hourly and annual log earnings equation estimated, the unemployment elasticity of pay is negative. But in the equation on the logarithm of the average level of hourly earnings in each industry for each year, the long-run unemployment elasticity is ill-defined.

Mitchell (1978) also obtained a mixture of results with respect to the impact of unemployment on pay. In the annual wage adjustment equation for manufacturing he found wage setting is not highly influenced by short-run unemployment changes. But using the unions contract data, he showed that unemployment has an important effect on short but not long-term contracts. He also demonstrates that wage adjustments inter-industries are highly intercorrelated. Hamermesh (1970) affirms unemployment has a significant impact on wages in the US.

Currie and McConnell (1992) finds that the higher aggregate unemployment is, the lower is the bargained wage. Industry wage also plays an important role in influencing real wage. Using Canadian contract data, Sparks and Wilton (1971) show that unemployment has a highly significant impact on wage determination. Christofides and Oswald (1992) confirm
the significance of unemployment in Canadian wage determination. Regional unemployment has a negative and significant impact on pay. The unemployment elasticity of pay is approximately $-0.08$. In terms of the bargaining process, unemployment in the outside labour market depresses pay. Card (1988), using contract data, finds regional unemployment rates have a negative influence on wages. Furthermore, increases in alternative wages, have a positive impact on wages. See Table 2.29 for a summary of the studies showing the effect of unemployment on wages, using US survey/Canadian contract data.

Overall, the evidence is that unemployment does have an influence on wages; this conforms with the insider-outsider hypothesis. The reason for this, is that $w$ is inseparable and non-linear in $t$ and bargainers have nonconstant discount rates.

Although the proposition that wages are a convex combination of insider and outsider factors seem to have empirical support, Manning (1993) has casts some doubts on their validity, since he argues that majority of these tests are either not identified, or if they are, they are identified only by exclusion restrictions. See Table 2.30.

Thus, the econometric evidence noted above, that variables like productivity and profits influence wages are dubious, since in a majority of cases (for example, if the firm’s production function is Cobb Douglas) a positive correlation between these variables would exist on the labour demand curve. However, in reply one could argue that the use of lagged variables obviates this problem. Thus, the wage equations may be identified using lagged variables, and indeed, it is lagged profits that have a strong influence on wages, as noted in the above studies. In addition, both Blanchflower, Oswald and Sanfey (1996), as noted, and Hildreth and Oswald (1997) show that total profits in a wage equation are positive and significant, which defies the labour demand curve interpretation. See Table 2.31.

Irrespective of what is the best way of modelling empirical tests of insider effects, the body of evidence appears to clearly imply that, they are a prominent wage determinant.
**Table 2.28: Does Unemployment Have a Negative Impact on Wage Settlements?**

<table>
<thead>
<tr>
<th>Study</th>
<th>Data Source</th>
<th>Testing Method</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blanchflower and Oswald</td>
<td>British WIRS1984 data on 1,267 private sector establishments with equal or greater than 25 employees; 1981 and 1984</td>
<td>Empirical evidence presenting the results which constitute, the factors which influence the level of pay in the most recent settlement</td>
<td>External pressures have an influence on pay.</td>
</tr>
<tr>
<td>Garrett 1988</td>
<td>British survey data of WIRS II (1984) covering all manufacturing and service sectors in both public and private sectors. A sample of 2019 establishments were utilized. Two external variables were also incorporated to the WIRS2 data, specifically county unemployment rates and county wage rates derived from the Department of Employment. These provide disaggregated data across 85 British counties</td>
<td>Three logarithmic wage equations are estimated. One equation with the total sample, second equation with the unionised private sector and the third equation, with the non-unionised private sector. Two equations are estimated per three of the skill groups. One with the county unemployment rate and the other with the county average weekly wage rate as the external variable</td>
<td>External pressures have an important impact on pay in the unskilled sector. The unemployment elasticity of wages is about -0.14. The external wage elasticity is approximately equal to 0.7. The external wage rates and unemployment levels have a significant impact on skilled, semi-skilled and unskilled workers wages. The elasticities of both these external pressures are largest in the unskilled sector. In the unskilled unionised sector, the external wage has a coefficient of 0.49 as opposed to 0.92 in the non-union sector. Workers who expect to be redundant earn 9 per cent less than their counterparts. Workers in the non-union sector who expect plant closure, earn 15 per cent less. Unemployment detracts more by changes in unemployment rate in the non-union than in the union sector. High unemployment in the vicinity contributed to the highest union mark up in the 1980s.</td>
</tr>
<tr>
<td>Blanchflower 1991</td>
<td>UK data on 5300 employees collated through questionnaires from the five pooled British Social Attitudes Surveys. Regional unemployment is the unemployment in the Standard Region drawn from the various issues of Employment Gazette. Regional wage, which is the weekly earnings of male workers in the Standard Region is derived from Regional Trends, various issues. Psychological data based on the series of surveys pertaining to expected redundancy are approximately equal to 1.250 manufacturing industries encompassing 2,000 settlement groups and 600,000 employees from the Confederation of British Industries (CBI, henceforth).</td>
<td>Natural logarithm of natural earnings equations estimated</td>
<td>Evidence of the risk of redundancy exerting a downward pressure on pay settlements. They also found other external factors having an important impact on wage, specifically, comparisons within intracompany attained a constant rating, but the importance of each external focus of comparison with the industry, locality, nationally and with national agreements, declined sharply in 1980, with only minimal improvements post 1980.</td>
</tr>
<tr>
<td>Gregory, Lobban and Thomson 1985</td>
<td>CBI Pay Databank Survey of Pay Settlements. The data comprises of a series of five sequential annual surveys of a sample of 250 settlement groups; 1979/80-1983/84</td>
<td>Analysed wage settlement equation to ascertain the factors that have an impact on wage determination</td>
<td>Unemployment, its duration and the risk of redundancy has a minimal negative impact on wages over the period 1979/80-1983/84. Although, they naturally, find that the risk of redundancy played a significant role in exerting a significant negative impact on pay in 1980/81. They also find intracompany comparisons has a systematic impact on wage settlements.</td>
</tr>
</tbody>
</table>
and from 1983 to approximately estimated in a two-step of the impact of Katz Dickens US data from the UPS Wage equations are The estimates REL=1.01.

M em loyer in the contract. is incorporated in the regression in ratio form. For example, an industry with wages S per cent in excess of the normal has a equal to 1985. The sample f procedure. In the first step, indust C7 987 comprises o private sector, ývages are estimated on 0yment unemp

uREL is ciýn_iiwted by dividing the base earnings by average hourly earnings for the non-agricultural sector in the year preceding the relevant year, using estimated. In the second equation,

Sanfey from 1964-1985 was in the relevant year, using estimated. In the second equation, changes in the wage equation estimated. In the first step, wages are estimated on industry characteristics, such as, profitability, concentration ratio and so forth

The logarithm of the average level of hourly earnings in each industry in the relevant year, using cell means estimated. Annual log earnings equations, using cell means reestimated. A third set of equations of hourly log earnings with industry dummies from First-Stage Regressions are estimated. A fourth set of equations of annual log earnings equations for US manufacturing utilising cell means are estimated. A fifth set of equations of hourly log earnings by union status estimated

The industry unemployment elasticity of wage is -0.13 in the logarithm of worker's weekly and hourly earnings estimated. In the second equation, the long-run unemployment elasticity of wage is ill-defined. In the annual earnings equation, the long-run profit elasticity of wage is approximately equal to 0.06. In the third set of equations, the unemployment elasticity of wage is ill-defined. In the fourth equations, the set of long-run unemployment elasticity of wage in the low-union sectors is also ill-defined. In the fifth set of equations, the unemployment elasticity of wages are -0.05 and -0.03, in the second-stage regressions and cell means respectively.

At 1 per cent official unemployment increases, a 1 percentage point increase in the unemployment rate, depresses the non-union wage rate by 0.4 percentage point. Variations in short-run unemployment has only a small impact on wage-setting. First-year adjustments in both the major and minor unions display the same sensitivity to unemployment as the nonunion sector. It is inferred from the file of data on large collective bargaining situations; 1 7-- 1990

TABLE 2.29

<table>
<thead>
<tr>
<th>Study</th>
<th>Data Source</th>
<th>Testing Method</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dickens and Katz 1987</td>
<td>US data from the CPS from 1983 to approximately estimated in a two-step of the impact of Katz</td>
<td>Wage equations are estimated in a two-step procedure. In the first step, wages are estimated on individual characteristics, geographic dummies and three-digit industry dummies. In the second step, the coefficients of the three-digit industry dummies are estimated on industry characteristics, such as, profitability, concentration ratio and so forth</td>
<td>The estimates of the impact of industry employment on wages was highly unreliable as it was sensitive to small variations in the specification</td>
</tr>
<tr>
<td>Kraeger and Summers 1988</td>
<td>US cross sectional data on individuals collected by the Bureau of the Census for the US and the University of Michigan's Quality of Employment Survey (QES, henceforth)</td>
<td>A number of cross-section wage equation estimated to investigate the importance of industry affiliation in accounting for relative wages, with controls for human capital demographic background and so forth</td>
<td>Industry variables have a large impact on relative wages. For example, wage earnings of an average employee in the mining industry are 24 per cent higher than the average employee in all industries, after controlling for human capital and demographic background. Thus, relative wages play a fairly important role in wage determination within industry. It is inferred from the finding of large interindustry wage differentials, that profits may be relatively insensitive to wages over a wide range. Thereby, rendering firms less inclined to adjust wages in the presence of prevailing unemployment</td>
</tr>
<tr>
<td>Vroman 1984</td>
<td>US large-scale longitudinal micro database from the US Labour Department's Current Wage Developments comprising of 2274 very large collective bargaining situations; 1974-1985</td>
<td>Influences of union wage contract settlements in manufacturing estimated</td>
<td>Unemployment had a positive and significant impact on wages</td>
</tr>
<tr>
<td>Blanchflower, Oswald and Sanfey 1996</td>
<td>US March CPS data on 200,000 individuals, for average level of hourly earnings in each industry in the relevant year, using cell means estimated. A third set of equations of hourly log earnings with industry dummies from First-Stage Regressions are estimated. A fourth set of equations of annual log earnings equations for US manufacturing utilising cell means are estimated. A fifth set of equations of hourly log earnings by union status estimated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mitchell 1978</td>
<td>Two data sources utilised. The first is a six data series drawn from the US Bureau of Labour Statistics; 1960-1976. The second is a file of large union agreements pertaining to changes in pay rates for selected unionised manufacturing and transport industries</td>
<td>Wage changes estimated in annual equation vis-a-vis the year-to-year per cent changes in the CPI and the reciprocal of the unemployment rate (1-u). Two forms of unemployment rate are estimated; specifically, the official rate and the weighted Perry rate. The latter adjusts for changes in the composition of the labour force that have had an impact on the relationship between observed unemployment and the &quot;tightness&quot; or</td>
<td>The industry unemployment elasticity of wage is -0.13 in the logarithm of worker's weekly and hourly earnings estimated. In the second equation, the long-run unemployment elasticity of wage is ill-defined. In the annual earnings equation, the long-run profit elasticity of wage is approximately equal to 0.06. In the third set of equations, the unemployment elasticity of wage is ill-defined. In the fourth equations, the set of long-run unemployment elasticity of wage in the low-union sectors is also ill-defined. In the fifth set of equations, the unemployment elasticity of wages are -0.05 and -0.03, in the second-stage regressions and cell means respectively. At 1 per cent official unemployment increases, a 1 percentage point increase in the unemployment rate, depresses the non-union wage rate by 0.4 percentage point. Variations in short-run unemployment has only a small impact on wage-setting. First-year adjustments in both the major and minor unions display the same sensitivity to unemployment as the nonunion sector. It is inferred from the file of data on large collective bargaining situations; 1 7-- 1990</td>
</tr>
</tbody>
</table>

*REL is computed by dividing the base earnings by average hourly earnings for the non-agricultural sector in the year preceding the effective date of the contract. Then this ratio was normalised by dividing it by its mean value for all contracts pertaining to the same employer in the contract. REL is incorporated in the regression in ratio form. For example, an industry with wages 1 per cent in excess of the normal has a REL=1.01.
<table>
<thead>
<tr>
<th>Study</th>
<th>Data Source</th>
<th>Testing Method</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hamermesh 1970</td>
<td>Wage and profit data drawn from bargaining situations in twelve manufacturing and four in public utilities. Wage rates data are derived from the Bureau of Labour Statistics. The unemployment rate is the CPS seasonally adjusted civilian unemployment rate for the month when the new wage is settled. Period of analyses are from 1948-1967 for the whole period and from 1948-1961 and 1962-1967 separately.</td>
<td>Negotiated wage change at annual rate are estimated incorporating the inverse of the unemployment rate. The non-linear form of the unemployment variable is included as in A. W. Phillips (1958). The specific form of the variable is indicated in Perry (1966). Estimation method is by the least squares. To curb serial dependence amongst the residuals, caused by the heterogeneity in the size of the wage settlement negotiated he reestimates all equations with a set of dummy variables for all the firms, with the exception of one and tests if the vector of coefficients is significantly different from zero. First set of equations estimated from 1948-1967. Equation reestimated with a set of firm dummy variables, utilizing 135 contracts bargained between 1948 and 1961 subsequently for 45 contracts bargained between 1962-1967. Third set of equations examined to compare the impact of wages during 1962-1967, unemployment vis-a-vis to that observed in 1948-1961.</td>
<td>Unemployment rate has a significant impact on wages.</td>
</tr>
<tr>
<td>Currie and McConnell 1992</td>
<td>Large panel dataset of US labour contracts from CWD. Contract tape derived from the Bureau of Labour Statistics. With respect to almost half the contracts, the wage levels were obtained from an independent contract listing published by the Bureau of National Affairs. For the remainder of the contracts, annual hourly earnings for the appropriate 4-digit Standard Industrial Classification category are drawn from Employment and Earnings as the base wage level. The wage equation is estimated using data derived from approximately equal to 1300 US contracts bargained. These cover 26 different 2-digit SIC industries; 1970-1981.</td>
<td>Firm-specific determinants of the logarithm of the average expected real wage estimated by Two Stage Least Squares (TSLS)</td>
<td>Industry level wage has an important impact on the real wage. The higher the aggregate unemployment, the more depressed the bargained wages are. For instance, their estimates indicate an increase in the unemployment rate by 10 per cent lowers bargained wage by approximately equal to 1.5 per cent.</td>
</tr>
<tr>
<td>Sparks and Wilton 1971</td>
<td>All wage settlements data from the Canadian Department of Labour and data for the remainder of the variables were mainly drawn from the published Dominion Bureau of Statistics documents. Sources of profit and total assets data industry, were derived from the Department of National Revenue Taxation</td>
<td>Rate of change of wages equation estimated</td>
<td>Unemployment has a highly significant impact on wage determination. With respect to the interactions effects of unemployment with price changes, the evidence suggests for instance, at three per cent unemployment the ratio of change of prices has minimal impact on wage changes, whilst the influence</td>
</tr>
</tbody>
</table>
**TABLE 2.29**

<table>
<thead>
<tr>
<th>Study</th>
<th>Data Source</th>
<th>Testing Method</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Christofides and Oswald 1992</td>
<td>Canadian data on 595 labour contracts from Labour Canada. Regional unemployment data is, also derived from the Labour Canada tape. The national unemployment rate is drawn from Cansim (D767611). Detailed province/SIC information on average weekly earnings deflated by the CPI, is a proxy for outside wage rate are obtained from Cansim (M8007-M8727); 1978.1-1984.4.</td>
<td>Log of the real difference in real wage equations estimated mainly without incorporating industry prices. Regressions with the industry prices substitutes year dummies with a constant. Estimation method is by Generalised Least Squares and IV-GLS.</td>
<td>of this variable, is notable at higher rates of unemployment. Incorporation of industry effects the relative base rate variable to be significant. Unemployment in the outside labour market depresses pay. Unemployment in the employer's region has a negative and significant impact on wages. The outside wage in the vicinity and with the same SIC category; generally, has a positive and significant impact on pay. The outside wage has a positive coefficient of approximately 0.06 and the general statistical significance is at 5 per cent level. Replacing the full set of time dummies by a constant, yields almost identical results. When industry price is incorporated, regional unemployment retains the negative and significant impact on pay. National Canadian unemployment rate also has a negative and significant influence on real wage. The national unemployment elasticity of the real wage is approximately equal to -0.08. But simultaneous inclusion of the regional unemployment with industry prices as explanatory variable renders national unemployment to be insignificant.</td>
</tr>
<tr>
<td>Card 1968</td>
<td>Labour contracts data from the Canadian manufacturing sector. December 1965, Labour Canada's Wage Tape on wage rates and other provisions with respect to 1467 contracts and 298 bargaining pair pertaining to 500 or more employees. Average weekly earnings in all manufacturing from January 1961 to March 1963 drawn from Cansim D1518, from the 1983 University Base Tape (December 1983 Release). From April 1983 to June 1985 data was derived from Cansim L5607 from the various issues of the Bank of Canada Review. Data from April 1983 onwards are multiplied by 1.040 to take account of the revision in the establishment survey. Unemployment rates were seasonally adjusted. Rates for January 1966-1963 were derived from the 1983 Cansim University Base Tape. Rates from December 1963-December 1985 were drawn from the Bank of Canada Review, November 1986. The following were utilized: Quebec-Canada D76847; Ontario-Canada D76848; British Columbia-Canada D76923; remainder of the provinces-Canada D767611 (national rate); 1966-1983.</td>
<td>Determinants of the expected average real wages estimated. Specifically, first difference of expected average real wage rate equation estimated, in conjunction with all explanatory variables incorporated also as first difference form. To alleviate the first order error component from the observations from a given bargaining pair, the estimation method is by two step procedure. This eliminates the residual correlation between consecutive contracts for a bargaining pair, it is claimed.</td>
<td>Regional unemployment rates have a negative impact on wages. Increases in alternative wage has a positive influence on wages. It is claimed, these estimates are robust to other specifications.</td>
</tr>
</tbody>
</table>

---

**TABLE 2.30**

<table>
<thead>
<tr>
<th>Study</th>
<th>Data Source</th>
<th>Testing Method</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manning 1993</td>
<td>UK annual wage setting data. The 52 times weekly earnings data for full time male manual workers in all industries and services is drawn from the Department of Employment Gazette, British Labour Statistics Yearbook 1969-76, BLS Historical Abstract 1948-1960. Male unemployment data obtained from Department of Employment Retail price index data derived from Economic Trends; 1956-1987.</td>
<td>Unemployment and real consumer wage growth equations estimated with real consumer wage growth as a regressor in the former. Estimation is by IV method.</td>
<td>Majority of the econometric tests noted above are invalid, since they are not identified or if they are, they are identified only by arbitrary exclusion restrictions. Thus, most econometric evidence noted in the studies above, that variables such as productivity and profits influence wages are dubious, since in a majority of cases (for example, if the firm's production function is Cobb-Douglas) a positive correlation between these variables would exist on the labour demand curve. However, in reply one could argue that the use of lagged variable obviates this problem. Thus, the wage equations may be identified using lagged variables, and indeed, it is lagged profits that have a strong influence on wages.</td>
</tr>
</tbody>
</table>
### TABLE 2.31

<table>
<thead>
<tr>
<th>Study</th>
<th>Data Source</th>
<th>Testing Method</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blanchflower, Oswald and Sanfey 1996</td>
<td>US data on manufacturing industry, pertaining to approximately equal to 200,000 full-time, full-year workers, drawn from the March tapes of the CPS. Earnings data are drawn from 1965-1986 CPS. Profit data is derived from NBER’s Productivity Database constructed by Gray (1989). The database comprises of 450 four-digit manufacturing industries utilising the 1972 SIC definitions; 1984-1985</td>
<td>The logarithm of the average level of hourly earnings equation in each industry in the relevant year, using cells means estimated. Annual log earnings equations using cell means reestimated.</td>
<td>Total profits are positive and significant. Which is in defiance of the labour demand curve interpretation.</td>
</tr>
<tr>
<td>Hildreth and Oswald 1997</td>
<td>Annual data on unbalanced panel of 329 firms derived from an EXTAP database on company accounts pertaining to both manufacturing and nonmanufacturing industry. Which comprises of 38 firms reporting information from 1983-1990. 209 firms from 1982-1990 and 28 firms providing information from the period 1981-1990. With respect to the establishment panel, annual observations on 100 establishments were collated in a survey by Hildreth. It focuses in the West Midlands region of the UK. Dataset compiled by utilising three types of survey techniques interviews; contact with local industrial organisations which yielded an incomplete database on manufacturing industry in the region, a postal and telephone survey was also conducted. Ultimately 58 plants are utilised for their analysis, due to reasons including anomalies in the data; 1980-1986</td>
<td>Wage equations estimated by OLS with respect to first, the panel of 329 companies and second, with respect to a panel of 58 establishments</td>
<td>Total profits are positive and significant in both the wage equations pertaining to companies and establishments. This violates/ nullifies the labour demand interpretation.</td>
</tr>
</tbody>
</table>

### 2.6. CONCLUSIONS

We have reviewed all the main theories of wage of wage determination, with special attention being focused on IO theories. In essence, they are all species of the rent-sharing theories.

Only, if there is rent to be shared, will firms pay higher wages. This is a phenomenon which EWT omits to take into account, in conjunction with agents being fully rational, as a consequence of forward-behaviour. These are the prime deficiencies of EWT.

I have abstracted from the situation\(^8\) to form an empirical and theoretical model in terms of which to develop the empirical and theoretical analyses in the context of IOT. Indeed, the main wage determination theories have also made no attempt to show the consequences of forward-looking behaviour of agents, nor have any studies in the applied labour literature, established forward-looking behavior. Furthermore, recruitment and retention is of fundamental and chief importance in labour turnover theories. Empirical studies in the past have examined recruitment and retention as a part of a general enquiry on wage determination. But these examinations have made no attempt to investigate the importance of recruitment and retention in wage-bargaining in detail. Since the review focuses on IOT, I also reviewed the seminal contributions and early developments of IOT.

IOT, as developed by many authors, is an important contribution to our understanding of how wages are determined. I have reviewed the main contributions and the main conclusions

\(^8\)That is, the development of these phenomenon in EWT.
are as follows. First, several implications of some IOMs are not robust to variations in the model's specification. For example, the implication of asymmetric adjustment in wages and persistence in unemployment is not necessarily valid. However, the implication of insider and outsider factors influencing wages is robust: this is strongly supported by both theory and empirical evidence, which suggests that insider forces, that is, forces emanating from within the firm, are a prominent determinant of wages. This conclusion applies to all corporate entities, irrespective of whether the workers in these entities are unionised or not.

One point that emerged from the body of evidence is that unemployment has a negative impact on wages; this is in line with both the efficiency wage hypothesis and insider-outsider hypothesis and also Blanchflower and Oswald's (1994) wage curve. Since from the efficiency wage hypothesis, we know that unemployment is a disciplinary device (see Shapiro and Stiglitz, 1984); workers exert greater effort as to avoid being laid off, particularly since higher wages are also paid for the exertion of greater effort. This results in greater productivity, which in turn leads to greater rents that the workers can appropriate from the firm, due to insider power, as propounded in the insider view of wage determination. But higher unemployment depresses the wages insiders can demand. This confirms my casual observation that EWT is informally a special case of IOT. From the review (evidence), the most striking determinant of wages appeared to be the firm's financial variables as shown by a body of studies, for example, Wadhwani (1987), Nickell and Wadhwani (1988, 1990), Blanchflower Oswald and Garrett (1990), Scaramozzino (1991), and Dolado and Bentolila (1993). As for the importance of the implication for the impact of outside factors in wage determination, unemployment, overall, has a negative impact on wages as noted.

**Research Question**

I recapitulate and state the main goals of this thesis:

1. A concise statement of the question that my thesis tackles.

2. Justification, by direct reference to the above literature review, that my question is previously unanswered.

3. Discussion of why it is worthwhile to answer this question.

I will discuss each of these items in turn.

With respect to item 1, when rational agents with foresight bargain in an ongoing rela-
tionship, it is natural for each agent to consider all the utility (both present and future), of the respective players. The worker would want to take account of rents available for sharing, both now and in the future, as noted above. For example, if the future financial performance of the firm is favourable, higher wages will be sought. Obversely, if the future financial performance is unfavourable, workers will lower their wage demands and may even take a pay cut. For example, the crew of United American Airlines\textsuperscript{9} accepted a pay cut to avert bankruptcy for three months. There is also a body of formal evidence to suggest this: for example, Nickell and Quintini (2003). First, I empirically investigate to establish whether bargainers care about the future. I then, naturally, pursue the consequences of this behaviour, with the added ingredient of full rationality. In the interim, I also establish the inherently fundamental phenomenon of the importance of recruitment and retention of workers in wage-bargaining in detail.

Item 2 above, is largely covered in the main text above, where I have analysed what I have presented above and pointed the weaknesses of the past literature, I also state now that my task is to develop an empirical and theoretical model assuming that the terms of trade will be a differential function of time, since bargainers bargain with foresight, and are fully rational. For example, the distinct explanation put forward by LS is inherently static as noted above. In the past authors have made no endeavour to characterize the behaviour of the terms of trade as a function of time in an ongoing relationship as noted above. In addition, in the interim my task is to develop an empirical model to establish the importance of recruitment and retention in detail. There has been no attempt to accomplish this in the past. This thesis will develop an empirical model establishing forward-looking behaviour and a theoretical model pursuing the consequences of this behaviour, and a further empirical model establishing the importance of recruitment and retention as a major bargaining concern; to prove why this problem is crucially important and should not be neglected. In the labour market I have already shown above each class of previous approaches fails (that is, for example, with respect to pursuing the consequences of forward-looking behaviour, all studies of wage determination focus on steady-state wages and if out-of-steady-state dynamics are discussed at all, again steady-state wages are imposed).

In the last item, I will point out why taking into account bargainers are forward-looking

\textsuperscript{9}See Financial Times, 28/4/04.
is highly useful and can be applied to any economic area. It is worthwhile to answer these crucially important questions, otherwise there will be a void in our understanding of wage determination. If these important aspect of bargaining in particular are precluded, then the existing theory is deficient and the predictions derived from it are distorted.

By including all the essential aspects of the bargaining process, we can then provide a wholesome perspective of wage determination. Both my empirical studies have confirmed this fact.

As I have noted above, as with all the theoretical studies all the empirical studies have made no attempt to regard the game in its entirety, by seeking first, theoretically, to show what it is worth for each agent to have the opportunity to engage in the game, taking into account, not just utilities and endowments, available for bargaining today, at time t, but also at time t + 1. Of course, it follows that no empirical verification has been made of this important dimension of bargaining, which has been ignored in the past, as has the consequences of this forward-looking behaviour. But even more fundamentally, given that recruitment and retention of workers is paramount to any firm/organisation and indeed is a indispensable concern in wage-bargaining, no endeavours have been made to establish this in detail empirically.

This thesis is devoted to analysing both empirically the forward-looking behaviour in wage-bargaining and theoretically the consequences of this behaviour of agents, and investigating the importance of recruitment and retention of workers as a major bargaining concern in detail (with some degree of forward-looking effects\textsuperscript{10}) for which no attempts have been made as far as I can ascertain. Since the game is played by forward-looking and fully rational agents in a dynamic environment, with recruitment and retention of workers an important wage determinant, it is crucially important to incorporate these features into the game, either jointly or independently. So it is clearly, of immense interest to investigate the forward-looking behaviour of agents and this I undertake in the next chapter.

---

\textsuperscript{10}Given the dataset I have at my disposal currently. With DATASTREAM on-line, for example, I would expect to establish full forward looking effects. I will leave this for my immediate future research.
CHAPTER 3

DOES FORWARD-LOOKING BEHAVIOUR MATTER IN WAGE DETERMINATION?

3.1. INTRODUCTION

A dynamic wage-bargaining situation involves a firm and a worker, or workers representatives such as, a union, who have the opportunity to collaborate for their mutual benefit in multiple ways. In the case considered in this chapter, bargainers will want to bargain not just about what is available today, at time $t$, but also in the future at $t + 1$. No action will be taken by either bargainer without taking into account what is available for bargaining from the other party.

The economic situations between firms and workers are regarded as bargaining problems which two agents solve to their mutual satisfaction. This economic situation has occurred in one form or another for centuries, irrespective of the presence of the unions. It is the purpose of the chapter to provide an empirical verification of this problem. This is a classical applied wage determination situation, as treated by Nickell and Wadhwani (1990) (NW henceforth), Blanchflower, Oswald and Garrett (1990) and others, which permits the identification of this typical wage-bargaining situation in a steady-state.

In general terms, I idealise the bargaining situation and hence the empirical formulation, by assuming that the two agents are fully rational, maximise an intertemporal utility function, and are forward-looking. They accurately compare their desires for the future, they are equally skilled in dynamic bargaining, and each has full knowledge of the extent of the future preferences of the other.

In order to provide an empirical treatment of the wage-bargaining situation, I abstract from the situation to form an empirical model which enables us to develop the analysis.

---

11 Other authors include Slichter (1950) who was the first to show that there is a positive correlation between 'the firm's ability to pay' and wages, in contrast to the predictions of the competitive theory. This was confirmed by Dickens and Katz (1987), Krueger and Summers (1987, 1988), Katz and Summers (1989), and Blanchflower, Oswald and Sanfey (1990) using US time series data. Using European data, Blanchflower and Oswald (1990), Beckerman and Jenkinson (1990), Carruth and Oswald (1989a), Christofides and Oswald (1992), Holmlund and Zetterberg (1991), Denny and Machin (1991), Hildreth and Oswald (1997) and Nickell and Wadhwani (1990) reach similar conclusions.
In estimating my wage-bargaining model, I employ a regression equation, which reflects the main determinants of wage-bargaining. That is, I incorporate into the empirical model, the desire of each forward-looking agent to maximise his dynamic gain, specifically from the future financial performance of the firm, in bargaining. In addition, I also incorporate other gains emanating from within the firm, and other external factors, such as unemployment, which are beyond both agents' control.

How do the agents seek their goals? Is it determined individually, collectively or by other means? Whenever workers are in employment, they would have to be paid the appropriate wage and it does not matter whether they seek this collectively or individually. Unionisation is not necessary to increase wages, see for instance, Card (2001), who found that despite sharp shifts in union membership, the structure of union wage effects was about the same in the mid-1990s as it was in the mid-1980s. This was confirmed by a number of studies, for example, Hoxby (1996) and Menezes-Filho (1997), which show that wage increases reflect the desire of managers to share the profits of the firm with workers and are predisposed against unions. It follows that unions are not required to reach a satisfactory conclusion. Unions of course, enhance the bargaining power of workers in a modern setup, but they are not necessary, and there is a considerable body of evidence which suggests this (Lindbeck and Snower, 1988c; Brown, Ingram and Wadsworth, 2004). It has also been suggested that employer and workplace characteristics generally have a greater effect on pay than union bargaining (see Forth and Millward, 2000b, (FM (2000b), henceforth)).

Wage-bargaining is still very important, but the means of facilitating it have altered. That is, unions do not play as significant a role in wage-bargaining as they did up the decline in union power around to early 1980s. The real wage growth over the last 21 years does not indicate that there has been a decline in the rate of wage growth, to coincide with the decline of the unions, in contrast to when union strength was at its peak prior to the Thatcher era (Gray, Ingram and Rickman, 2004). But the money wage may have risen more slowly, preventing inflation (i.e., cost-push inflation may have decreased). This again suggests that unions are not important for effective wage-bargaining.

Policy prominence with regard to industrial relations has declined, but this does not imply that wage-bargaining has altered irrespective of the form it takes. Indeed, there is evidence to suggest that 89 per cent of establishments (with employees in excess of 10) that had an
annual settlement also have a review of pay (FM, 2000b). In the non-union sector, most employees have an annual pay review (Ingram, Wadsworth and Brown, 1999; Brown, Ingram and Wadsworth, 2004). Indeed, it is the same in other countries. For example, Japan\textsuperscript{12} has an annual review called the Japanese Shinto, analysed in Barnichon, Olivei and Tenreyro (2005).

Theories such as efficiency wage theory and insider-outsider theory do not need unions for the workers to receive wage increases. Of course in the IOT, unions only enhance the power of the workers within the firm, as noted above. It should also be noted that wage increases are more prevalent in the private sector where there is a lower degree of unionisation, than in public sectors, with a higher degree of unionisation, and where work conditions are also considerably better.

The point of mentioning how workers attain their goals in wage-bargaining is to confirm that evidence suggests that unions are not necessary to achieve goals in wage-bargaining. Given that wage-bargaining is important irrespective of the shape or form it takes, what are the factors that agents take into account when bargaining in a dynamic game, that is, an ongoing relationship? The manner in which wages are determined also has macroeconomic implications, since it provides an explanation as to what is available for sharing, and how it is being shared, which clearly has an impact on unemployment. Agents would be interested in obtaining utilities from the current set of utilities that are being bargained over, but they will also be bargaining, more importantly, over the future set of utilities. Typically, all theories of wage determination, including union models, adopt a static bargaining framework. In the IOT, for example, insiders exert greater influence in the wage-bargaining process than outsiders and the unemployed. But that theory makes no attempt to seek a solution to a bargaining game, where the relationship is ongoing. Consequently, extant econometric studies have followed suit in terms of conducting empirical analysis using steady-state wages.

It is my view that forward-looking behaviour is important, which naturally has serious implications for the behaviour of the macroeconomy. Indeed, Anderton, Barrell and In’t Veld (1993), assuming forward-looking behaviour in wage formation in the context of credibility of policy commitment, discuss its role and its implication for monetary union. But the analysis there makes no attempt to assess the importance of forward-looking behaviour in the context of a single economy, not withstanding the role it plays in wage determination.

\textsuperscript{12}Japan is randomly chosen for illustration purposes.
I will be examining empirically the relevance of forward-looking behaviour in the determination of wages in a relationship which is ongoing, in the context of the theoretical model developed in a later chapter. The general concept is the following and will be explained partly by illustration.

Suppose the future financial performance, as implied by the current state of the market, is favourable. If wage-bargaining is static there will not be any anticipation, that is, a state of expectation which may involve the certainty of some contingencies and various probabilities of other contingencies. Consequently, the wage bargained (and indeed wage settlements) will not be a reflection of the firm's future financial performance. If agents are forward-looking, they would clearly bargain with foresight and not bargain myopically, without taking into account their bargaining partner's expected endowments in the future irrespective of whether it is favourable or adverse. Thus, they will demand wages in accordance with the future financial performance of the firm, for example, in a favourable state of the market.

When forward-looking behaviour is important there will be a tendency for a favourable future financial performance to be captured in the form of a higher wage share as the workers appropriate the anticipated/expected surplus rent. Similar remarks apply to any other expectations pertaining to the firm's future financial performance. The tendency will be for wages to increase, translating the favourable future financial performance into a wage increase and an adverse future financial performance into a paycut or freeze (see chapter 4, for example, for preliminary evidence of this). The variables that would capture the forward-looking aspect of the bargainers' behaviour in wage determination are the future financial performance variables.

If the future financial performance of the firm has an important influence in the determination of wages, then this has macroeconomic implications, as alluded to earlier. For example, if the firm's favourable future financial performance increases current wage settlements, then employment in that firm will increase further. An important policy implication is that wage (and price) inflation ensues because of agents anticipating future profitability.

Therefore, this chapter focuses on several issues. First, the main objective is to investigate whether the future financial performance of the firm has an important influence on wages. It is clear from my theoretical chapter, that this reconciles with the fully rational behaviour of agents in a game where the solution is sub-game perfect. In addition, there is a body of
evidence to suggest that price-setting is forward-looking and not myopic (see for example, Martin, 1999; Price, 1992) where price-setters are shown to be rational and forward-looking agents. Moreover, Moghadam and Wren-Lewis (1994) have shown that wage-setters do anticipate future movements in prices. They accomplish this by first proposing that agents form rational predictions about future price movements and second, that they use simple rules-of-thumb based on past price movements. They show that agents form rational expectations with respect to inflation when setting nominal wage contracts.

Second, how important are insider factors in the determination of wages? It is clear both from the theoretical and empirical evidence that insider factors are prevalent. It has been found by a wide variety of studies that a firm's financial performance is an important determinant of pay. Managers report that it is the financial performance of the firm, which includes profitability, that is the important determinant of pay (Gregory, Lobban and Thomson, 1985; or Blanchflower and Oswald, 1988).

A third issue which is of some interest is the question of what actually determines insider power. We examine a variety of determinants, including the relevance and/or the extent of unionisation. Another issue I investigate is the importance of external labour market conditions on wage-bargaining, that is, the importance of outside factors in shaping pay. If these are irrelevant, then this is in support of the pure insider-outsider model of Blanchard and Summers (1986).

Before I undertake to investigate the determinants of wage settlements, it is useful to first consider the factors that are relevant to wage determination. Thus, the plan of the chapter is as follows: In Section 3.2, I briefly consider the factors that have an impact on wage determination. In Section 3.3, I provide a brief discussion of my empirical specification. In Section 3.4 I discuss the data, the processes underlying wage determination and the results. The final section concludes.

3.2. FACTORS THAT HAVE AN IMPACT ON WAGE DETERMINATION

The main theories of wage determination which have informed empirical studies over the years have been provided in the earlier literature review chapter. The discussion there provides an indication of the variables used in my empirical specification, in the light of my comments
of the importance of incorporating of forward-looking behaviour in the bargaining process. Special attention is focused on IOT.

The extant theoretical determinants of wages, reviewed in the earlier literature review chapter, appear to focus more on predicting wage levels rather than pay adjustments, which accrue to reflect the change in circumstances that have occurred since the previous pay was determined. So it would be useful to provide a brief discussion of the variables that would be present in a satisfactory empirical specification. It should be noted at the outset, that the studies I refer to are based on wage levels, whereas my study uses wage increases (settlements) as the dependent variable, so this may produce slightly different results.

Many other variables have been found to affect wage determination. Naturally, special attention will be focused on forward-looking effects in wage determination.

First, there is ample evidence in the union literature, to show that union recognition is correlated with higher wages. Blanchflower (1991) finds that the union wage gap in the UK is 10 per cent, Stewart (1990) also finds the mean union pay differential to be 8 to 10 per cent. However, other more recent studies have found that union status is less important in pay determination (Brown, Ingram and Wadsworth, 2004). In addition, there is currently, a body of evidence to show that there has been a decline in collective representation with regards to pay, and that individual bargaining has increased. This should be unsurprising, given the industrial relations changes since the Thatcher era, although employee-employer disputes at individual level have not received a great deal of attention vis-à-vis collective disputes (Knight and Latreille, 2000a). They do suggest that unresolved disputes are taken to Employment Tribunals.

Indeed, pay is negotiated through consultation, independent individual contracts and workers conduct on-the-job search and take up higher offers. With respect to the former, this also implies that workers also bargain individually through employee representatives (Drinkwater and Ingram, 2002). There is a marked movement towards greater individualism with respect to the employment relation (Kelly, 1998). Moreover, with the Employment Relations Act 1999, which curtails the qualifying period for unfair dismissal to one year and raises the compensation payments to £50,000, there has been a rapid increase in tribunal cases (Knight and Latreille, 2000a). Greater individualism is also reflected in the remarkable increase in individual Advisory, Conciliation and Arbitration Service cases.
The demise of the union voice is also suggested by Bryson and Gomez (2003). This has been echoed by, for example, Machin (2000, 2003), Disney, Gosling and Machin (1995), Millward, Bryson and Forth (2000) and Charlwood (2001). In addition, in widespread recognition of the declining numbers of employees covered by collective bargaining, an EU Directive on Information and Consultation has been passed, which will cover the majority of the workforce by 2008 (Gospel and Wilman, 2002)\textsuperscript{13}. Thus, it would be of interest to examine particularly if employee coverage by collective bargaining plays a role in wage determination and to what extent. So another issue I will be investigating is the importance of union coverage in wage determination.

Second, there is a body of evidence to suggest that an improvement in the firm's financial performance will induce insiders to appropriate the excess rent. Blanchflower, Oswald and Sanfey (1996) show that an increase in profits leads to an increase in wages. According to IOT, the establishment's financial performance could also have an important influence on wages (see for example, FM, 2000a). If the profits of the firm have risen, for example, this will be reflected in higher wages. In addition, changes in labour productivity will also have an impact on wages. Likewise, future financial performance of the firm may also have an impact on wages. For example, if the product market is improving, this could lead to higher wage settlements. Hence, the better the financial performance, the higher is the bargained wage, since greater excess surplus rent accrues from more favourable financial performance.

Third, following from the above (and also my theoretical analysis in my theoretical chapter, which deals with the dynamic aspect of the above variable, given agents who are rational and have foresight, firms pay wages in accordance to their future financial performance, irrespective of whether it is adverse or favourable. For example, firms whose future performance is better will pay higher wages and vice versa. Similarly, the workers will also depress their wage demands, in accordance to the future financial performance when it is adverse or the firm has performed less well. These explanations are intimately related to the concept of recruitment and retention of workers, for example, the more prosperous the firm, the greater the importance of recruitment and retention of labour. However, due to data constraints, it was only possible to show this in a static sense.

\textsuperscript{13}I shall abstract from whether individual disruption arose as a consequence of cost-cutting strategies in expressing discontent. See Knight and Latreille (2000b) and Tremlett and Banerji (1994) for an initial investigation on this front.
It follows that workers will want to be employed by firms who pay higher wages and incumbent workers will also want to retain their employment with the firm. The converse is also true. This does not imply that employment is purely supply determined. Wages are correlated with firm size, since it is larger firms that make higher profits. Indeed, higher wages are paid to retain and recruit workers, as alluded to above. These are in congruence with all rent-sharing theories, for example IOT, which is the main focus of this chapter. This of course, implies that the higher the wage, the greater the firm size and vice versa. There is again a body of evidence which suggests that the wage is positively correlated to firm size (examples include Katz and Summers, 1989; Krueger and Summers, 1988; Burdett and Mortensen, 1998).

There is clear evidence that bargaining in accordance with future financial performance, that is, the empirical phenomenon of bargainers exhibiting forward-looking behaviour, exists. For example, declining firm performances positively correlate with zero settlements (see Ingram, Rickman and Wadsworth, 2003). Indeed, pay rise figures collated by the Incomes Data Services (IDS), show that average pay rises awarded in January 2002 were below the prevailing rate of inflation. Our first and foremost objective, then, is to attempt to pin down these impacts with some precision.

Like FM (2000a), I will be examining pay adjustments. But unlike FM (2000a), I will be focusing on the influence of insider power in wage determination in a dynamic environment. Hence, I will consider the variables that could capture the dual impact of insider forces and forward-looking effects in wage determination. But empirical studies developed from any of the above theories do not make attempts to show that wages will be a function of time, that is, the future financial performance of the firm. There is a body of evidence that suggests that this phenomenon is prevalent. For example, a number of studies (e.g., Nickell and Quintini (2003) and Smith (2000)), have shown that workers accept pay-cuts, when the firm is close to bankruptcy (see Henle, 1973; Brown, Ingram and Wadsworth, 2004), where it was found that downward wage flexibility is pervasive. This suggests that wage-bargaining reflects the future performance of the firm, irrespective of whether it is favourable or adverse.

---

14See The Times 2/3/02.
15The notion of workers taking paycuts is known as concession bargaining (see Carruth and Oswald, 1989a).
16When the union leader was asked, the reason for conceding to pay cuts, his response was that 'there is only one way, you can push him (the firm, that is) out of business' (Carruth and Oswald, 1989a). Recently, stewards of American Airlines accepted a paycut to avert bankruptcy of the firm for four months (Financial Times 26/3/03).
In terms of bargaining, LS (1988c) and earlier studies, both theoretical and empirical, have only used a static Nash bargaining framework. Indeed, in economics generally, the static Nash framework is used. For example, Shi (1995), Trejos and Wright (1995) and Rubinstein (1982) focus their analyses on steady states, and even if dynamics are discussed, the Nash axiomatic bargaining solution is imposed. This is tantamount to assuming that the agents are myopic. This is the case in Christofides and Oswald (1992), where they find that the real wage is an increasing function of the level of past profits. But the analyses there make no endeavour to show that agents are highly rational agents, who bargain with foresight and are forward-looking. My model, in contrast gives rise to a different type of equilibrium. In other words, the bargainers consider the future bargains, irrespective of whether the firm is in an adverse or favourable position. For example, if the firm is going to be bankrupt in a few year's time, the insider will dampen his wage demands and if the firm will be in a favourable financial position, insiders will demand higher wages. The firm will meet the workers' demand, since there is immediate trade equilibrium (see my Theorem 1 in Chapter 5, for more details), on account of factors such as turnover costs of the insiders, in accordance with LS, where the IOT is analysed in a static sense, in contrast to the analysis of the IOT in this study, which is in a dynamic sense.

NW's empirical results from their IOM, which are derived from several empirical specifications using a comprehensive and extensive data set, indicate that:

(i) insiders have an important influence on wage determination,
(ii) there is some persistency in employment, with both wage demands and offers by firms,
(iii) wages are more rigid downwards than upwards,
(iv) outsiders have an impact in wage determination.

However, the empirical analysis developed by NW (1990) makes no attempt to incorporate the fact that the bargained wages are a reflection of the near future financial performance of the firm. I do take into account the fact that each bargainer can costlessly take account of the future performance of the firm. This is an important extension for the following reason. In the NW result, all bargainers exert greater power in increasing wages, in a static sense. However, some workers may not be in a position to increase their wages, notwithstanding the fact that some firms will be unable to meet the demand for higher wages due to the adverse financial performance of the firm. This occurs even if at time t, the firm is performing well financially,
since at $t + 1$, for example, the firm may be in difficult circumstances, financially. If any worker were permitted to deviate from the steady-state result, and could bargain the wage in accordance with the financial strength of the firm in the future and if the financial strength is favourable, he or she would bargain for the highest possible wage, thereby extracting the maximum feasible rent from the firm. NW rule this out, by assumption, since workers are not ever permitted to bargain in accordance with the near future financial performance of the firm. But this is an unappealing feature of their model. In particular, it suggests that allowing for the forward-looking and rational behaviour of agents would lead to a very different type of result.

In this chapter, workers are permitted to take into account the near future performance of the firm when bargaining at any time. Like NW, it is consistent with the four stylised facts described above. Unlike NW, it also implies that workers bargaining with firms expected to be in a financially favourable position in the near future will demand and receive higher wages and vice versa. However, it is also shown that the result of my investigation converges to their result in the limit as $t \to \infty$ or $r_f = r_w$, where $r$ is the discount rate and the subscripts $f$ and $w$ pertain to firms and workers respectively as in Chapter 5. NW's assumption that wages cannot be a reflection of the near future performance of the firm does not alter the qualitative nature of the result in this limiting case.

Fourth, there is some evidence to suggest that where there are many competitors, product markets will be more competitive and firms will strive to lower costs. This is consistent with the findings in Guadalupe (2003), where it is shown that product and service market competition have a positive correlation with returns to skill. Increases in skill enhance cost reduction, which in turn induces firms which are more sensitive to curtailing costs, in the face of increasing competition, to pay higher wages to these skilled workers, vis-à-vis low skilled workers. Thus, wage increases will only be justified if there is a corresponding increase in productivity, for example as shown in NW (1990). In addition, there is also evidence that suggests variance of rent appropriation by insiders, is in accordance with the establishment's competitive product market conditions and the degree of product market power (Stewart, 1990). If I incorporate this factor into our models, I will find that bargained wages will be higher, the greater the concentration of output on one product or service. The firm's product market power, on account of its output concentrated in a single product or service, has a
positive impact on wages, indicating insider forces at play.

Fifth, if insider power is prevalent, then vacancies are likely to be filled internally. When firms recruit internally it lends support to the 'insider-outsider' theory in a sense. Since the firms have already invested in search costs and so forth on these workers, it would be more cost-effective to hire from within the organisation.

Sixth, there is considerable evidence to suggest that foreign ownership pays higher wages (see for example, FM, 2000b). If I incorporate this factor into our model, I find that foreign ownership lead to higher wages.

Seventh, bargained wages will also be expected to be higher in the private sector, since insider forces are more likely to prevail in the private sector, given union membership. Theories of wage determination generally assume a profit-maximising employer, irrespective of whether they are in competitive or imperfectly competitive labour markets. This is not applicable to the public sector since the government ultimately determines pay in this sector, and its objectives may not be to maximise profits. Hence, it is widely acknowledged that insiders cannot fully exert their market power in the bargaining process with the government, particularly since the demise of strong union power.

Eighth, bargained wages are also a reflection of the external factors which have an impact on the firm’s ability to recruit, retain and motivate. The fewer are vacancies, the lower the bargained wage is expected to be, since the exertion of worker power, particularly insider power, is limited, due to the fact that the chances of being laid off are greater at any given wage. There is ample evidence to suggest this (see for example, Blanchflower and Oswald, 1994). Similarly, the higher the number of unemployed workers, the lower are the bargained wages, since the probability of being substituted by an unemployed worker are greater at any given wage. Since IOT is an offshoot of EWT, the same reasoning is applicable to IOT, but not of course the strong version of IOT, as mentioned in Chapter 2. There is a considerable body of evidence to suggest this, (see for example, Ericksson and Gottfries, 2002). Dolado and Bentolila (1993) using 1,167 manufacturing private firms over the period 1983–8, found the Spanish natural unemployment rate had a negative (−0.928) and significant (5.60) impact on wages. Blanchflower and Oswald (1994) also show theoretically that a wage curve is prevalent, i.e., there is a negative correlation between unemployment and wages across
regions. Moreover, they also found this holding the level of regional productivity constant\textsuperscript{17}. Thus, I investigate the relevance of these outside factors to the wages of the employed.

These considerations which take into account a dynamic environment in wage-bargaining, will enable us to provide a more satisfactory empirical formulation, which I undertake next.

### 3.3. EMPIRICAL SPECIFICATION

In the IOT a theory of wage determination is developed, which incorporates as a special case the static wage determination problem, as is the case with all wage determination theories where the steady-state Nash solution is used. But the theory there, and indeed all other wage determination theories, ignores the forward-looking aspect of wage determination, that is, what it is worth to each agent to have the opportunity to engage in the ongoing game. In the light of this, I use the theoretical model of my succeeding theoretical chapter, where I explicitly show that agents are fully rational and have foresight and show the consequences of forward-looking behaviour. Naturally, the agents' behaviour plays an important role in the bargaining process and, as a consequence, the outcome. It is my view that statistical estimation of wage determination must focus on the depiction of the bargainers' behaviour, since it cannot be satisfactorily be represented in a wage equation derived from the static Nash bargaining solution. Only following such an analysis can one proceed to formulate a model of wage determination encompassing additional factors such as forward-looking variables in the context of insider or rent-sharing factors accruing from either agent and so forth.

As implied above, the forthcoming empirical analysis is devoted to this viewpoint. The behaviour of agents is incorporated in the estimation of wage equations. In particular, the wage will be a function of insider factors, including the firm's financial performance, the state of the market for the firm's products, market concentration, firm size, union recognition and unemployment. Since I am handling firm-level data, it is clearly necessary to control for the proportion of vacancies filled within the organisation and the ownership of the firm. The former may reveal the relevance of insider power and in the latter, foreign ownership may contribute to higher earnings as opposed to insider power having any effect. We do this by including the appropriate variables in the wage equations.

\textsuperscript{17}A multitude of other studies echo similar results, across a wide range of countries (see for example, Montgomery, 1994).
Following the NW analysis\(^{18}\), I formulate the following empirical specification,

\[ w_i = \beta_0 + \beta_1 p_i + \beta_2 r_i + \beta_3 c_i + \beta_4 m_i + \beta_5 u_i + X_i \delta + \varepsilon_i \]

where \( w_i \) is the wage settlement in establishment \( i \); \( p \) is the financial performance of the establishment; \( r \) is the union coverage, \( c \) are the market concentration/competition variables; \( m \) is the state of the market for the firm's product; \( u \) is the unemployment variable and \( X \) a vector of other controls. The \( \beta \)'s and \( \delta \) are the parameters to be estimated and \( \varepsilon_i \) is the error term.

It is the variable \( m \) which is a novel feature of this model, vis-à-vis earlier studies. This variable is used to determine whether forward-looking behaviour matters in determining wages. Using the data on the percentage change in wages, the manner in which wages are bargained, I am able to show the determinants of wages. Such a formulation, which uses explanatory variables, including the behaviour of agents with foresight, is in contrast to previous studies.

\[ \]

3.4. DATA AND METHODS

Although preferable, it was infeasible to apply variables such as stock market valuation variables to reflect the impact of the future financial performance on wages to our empirical work, since I found no measures in our chosen dataset and I cannot match in any data, as workplaces cannot be identified. Prior to choosing the illuminating Workplace Employee Relations Survey of 1998 (Department of Trade and Industry, 1999), (WERS98 henceforth\(^{19}\)), I conducted a cost-benefit assessment of using the various datasets, to investigate the relevance of forward-looking behaviour in the determination of wages in the UK. The WERS98 dataset is comprehensive, large, and nationally representative, since it is a random sample of all firms with ten or more employees. However, in common with most datasets of this type, there are several potential problems with the data, specifically, managers not responding to all the questions in a group and some firms who do not respond at all. In addition, as I have alluded

\(^{18}\)In addition, more importantly, my analysis in my succeeding chapter 5 where I show there is immediate trade equilibrium when \( t < \infty \) and when \( r_f \neq r_w \).

\(^{19}\)Funded jointly by the Department of Trade and Industry, the Economic and Social Research Council, the Advisory, Conciliation and Arbitration Service and Policy Studies Institute (from funds provided by the Leverhulme Trust). The datasets are available from the Data Archive, University of Essex.
to before, there is a potential problem with respect to the forward-looking variable, due to this variable exhibiting some form of measurement error. Also it is possible that this variable is endogenous, since respondents take into account the bargained wage when forming their assessment of future profitability. Nevertheless, overall, it is preferable to its counterpart the CBI Pay Settlements Databank, since it has a better range of control variables.

WERS data contain a considerable amount of information based on the perception of managers and there may be considerable heterogeneity across firms in how they perceive their economic performance. Whilst there may be heterogeneity across firms on how they measure economic performance, the traditional aggregate indicators were outperformed by the disaggregate indicators such as our data anticipating movements in both manufacturing output and sectoral output growth (see Mitchell, Smith and Weale, 2002). In addition, disaggregate indicators of economic activities, of both manufacturing and sectoral output growth, both in-sample and out-of-sample, yield more precise early estimates than conventional aggregate indicators (see Mitchell, Smith and Weale, 2004). Furthermore, disaggregate forecasts based on data such as ours also exceed the performance of conventional forecasts with respect to anticipating movements in manufacturing output growth on an in-sample basis (see Mitchell, Smith and Weale, 2005).

Aggregate data have been found to be a source of problems (Wolfson 1993). Although WERS does not provide information on the timing of the settlement, this is obtainable from Income Data Services. Indeed, WERS98 has been extensively used for a wide range of analyses, including the examination of the effect of employee involvement on financial performance (see for example, Addison and Belfield, 2000). Other authors using the WERS98 dataset in conjunction with WIRS3, specifically, McNabb and Whitfield (2000a) have analysed the reasons for marked differences in the relationships between the single and joint participation variables and financial performance.

WERS98 data have also been used to show the following: bargaining arrangements have little influence on financial performance (see Bryson and Wilkinson, 2001). Second, bargaining levels generally had little impact on workplace performance (ibid.). Third, bargaining coverage had no correlation with workplace financial performance (ibid.). Fourth, while, management attitudes to unions and union membership were not correlated with workplace financial performance, they were correlated with the employee relations climate (ibid.). Union
decline is due to the age of the workplace, as opposed to the age of the worker (see Machin, 2000). Using linked employer-employee WERS98 data, it is found that higher wages for unionised workers are a reflection of the individual’s earning capacity, such as individual characteristics, the type of employment and the workplace employed in (see Bryson, 2002). WERS98 data have also been used to show that although foreign establishments pay 13 per cent higher than domestic establishments, this differential vanishes when the skill structure within establishments is controlled for (see Te Velde, 2002). Utilising WERS98 data it is shown that employee voice is undeveloped in a majority of the workplaces (see Rainbird, Sutherland, Edwards, Holly and Munro, (2003)20.

Overall, the WERS data are well equipped to provide both fulfilling and satisfying answers to our question. In addition, I also obtained certain restricted data from the Department of Trade and Industry to conduct my analysis. These facilitated the investigation of the importance of external factors in wage determination.

We now investigate the importance of insiders and forward-looking and rational behaviour in the bargaining process on wage setting, using the WERS98. The settlements mostly took place between early 1997 to early 1998. As mentioned previously, WERS98 is a nationally representative survey. Using appropriate weighting to compensate for the complex sampling design, the survey results can be generalised with confidence to the population of firms in the UK employing 10 or more employees, covering all sectors (with the exception of agriculture and coal-mining), including both private and publicly owned firms. These 340,000 or so firms employed approximately 18.6 million employees, that is, 82 per cent of employees in the UK.

We use the data from the primary element of the 1998 survey, the management interview, which is conducted face-to-face with the firm’s most senior manager accountable for personnel or employee relations. Interviews were conducted with 2,191 firms between October 1997 and June 1998, with a 80.4 per cent success rate. The majority of the questions related to the organisation as a whole. However, for topics such as wage determination where wages were likely to be dispersed intrafirm, there was more focused questioning in up to nine occupational

---

20To further indicate the robustness of the WERS98 data, I provide a few illustrations of the wide range of studies it has been utilised in, including Mumford and Smith (2003); Gray (2002); Ramsey, Scholarions and Harley (2000); Budd and Mumford (2004); Budd and Mumford (2003); Perotin and Robinson (2000); Harley (2001); Machin (2000); Knight and Latreille (2000a); Bryson (2002); Litwin (2000); (Adams, 2001); McNabb and Whitfield (2000b); Brown, Deakin, Nash and Oxenbridge (2000); Kedz. Davis, Lain, Strebler, Rick, Bates, Cumminghs, Meoer, Anxo, Gineste, Trinczek and Pamer (2003).

It should be noted that the studies above are by no means an exhaustive list of analyses using WERS98, as indicated at the outset. For a more complete list, see Millward, Woodland, Bryson, Forth and Kirby (2004).
groups, which are the Major Groups of the 1992 Standard Occupational Classification. In such cases, the survey sought even greater detail by focussing on the arrangements for the largest occupational group (henceforth, LOG), with the exception of the managers.

The WERS98 management interview included a wide range of questions about the most recent wage settlement for the LOG at the firm. Data on the size of the most recent wage settlement was obtained by asking the manager: ‘the average percentage change in basic pay [for employees in the LOG] from the last review or settlement’. The response rate was very high (95 per cent). Responses were aggregated around integer or half integer values. But the degree of aggregation is only slightly greater than that in the Income Data Services’ published records on wage settlement over a similar period. This is to be expected, as establishments belonging to the same organisation, if they have had the same LOG and if wage setting was at the organisation level, will report the same wage settlement.

The managers were then asked the following questions: how does the percentage change in basic pay compare with the average increase for other groups, both within and outside the workplace; specific factors that had an impact on the size of the settlement; the agents involved in determining the wage settlement; and the nature of the agents’ involvement in determining pay. These questions provide us with information about the wage increases across the groups in the UK; the specific factors that were crucial in influencing the size of the wage settlement; and whether it was senior level management or unions who were responsible for negotiating a rise in wages. Additional questions in the management interview provide us with information about the establishment’s performance; financial performance; future financial performance or the manager’s assessment of the current state of the market (for the main product or service)/value of sales over the last 12 months.

The insider variables tested, in addition to ones mentioned above, will include the following: concentration of output or service on one or more different products or services, which will have a positive impact on wages. If the output of the firm is concentrated on one output or service, higher wage settlements are more likely to prevail. If concentration of output or service is on different products or services, the impact on wages are expected to be lower. The degree of competition in the market will also have an influence on wages. The greater the degree of competition, the lower the pay settlements are expected to be.

The external variables tested include: the average vacancy rate by travel-to-work area
which refers to the number of job centre vacancies divided by the labour force in the travel-to-work area) and total unemployment rate by travel-to-work area. This is because a typical worker would tend to work within the travel-to-work area and similarly a typical vacant job would be more likely to be filled by a worker within that area. Both unemployment and vacancies are likely to have a negative impact on wages, as discussed previously.

It would also be useful to incorporate other controls, specifically, the proportion of all employees covered by collective bargaining, changes in the circumstances of the firm, including the change in the percentage of vacancies within the past 12 months filled by employees within the organisation, the change in the flexibility to transfer employees from one task to another, the change in the degree of employee control over managerial decision-making and change in ownership, the change in the proportion of pay pertaining to performance and the change in ownership. My statistical modelling of the size of wage settlements was estimated using the survey estimation procedures in STATA8 (StataCorp, 2003). These procedures utilize a robust variance estimator and take into account, when calculating point estimates and standard errors, the complex sample structure of the WERS98. The method of estimation will be Ordinary Least Squares. The definitions of the independent variables used in the regressions are given in Appendix I.

### 3.5. THE PROCESSES UNDERLYING WAGE DETERMINATION

Various questions were asked of the management respondents about the processes of wage determination in the LOG at each firm. In 67 per cent of the firms, the LOG comprised of the majority of the employees (FM, 2000a). In private sector manufacturing, the craft, killed, and the operative and assembly workers dominate, whereas in private sector services, the identity of the LOG is difficult to discern. Sales and clerical and secretarial workers were common, but did not dominate the sector. As noted in FM (2000a), the wage determination arrangements are similar for employees that constitute the LOG across the workplaces in the I.K.

*How frequent are the pay reviews?*

Frequent pay reviews naturally provide opportunities for the bargainers to set wages according to the prevailing circumstances. Most establishments, in fact 89 per cent of the
sample, reviewed their wages annually. There may be several reasons for this, including the appropriation of rent by incumbent workers arising from an improvement in the firm's financial performance, for example.

*What are the determinants of the wage settlement?*

WERS98 asks the management respondent precisely which specific factors influenced the wage settlement of the LOG. Three specific factors were cited as having an upward influence on pay, namely good workplace or organisation performance, the cost of living and industrial action. Similarly, three factors were also considered to have a downward influence on wages. These were the cost of living, poor organisation performance and the risk of redundancies.

Good or poor organisational performance had influenced 75 per cent of the wage settlements in the LOG in the private sector, whereas this was true of only 33 per cent of the wage settlements in the public sector. Table 3.1 provides statistics of the organisations' perception of the impact of these factors on wages. The percentages in Table 3.1 facilitates the comparison between the influences.

<table>
<thead>
<tr>
<th>TABLE 3.1</th>
<th>FACTORS INFLUENCING WAGES (IN PERCENTAGES)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Upward Influence</td>
</tr>
<tr>
<td></td>
<td>Good Establishment Performance</td>
</tr>
<tr>
<td>Very important</td>
<td>36</td>
</tr>
<tr>
<td>Fairly important</td>
<td>27</td>
</tr>
<tr>
<td>Not important</td>
<td>37</td>
</tr>
<tr>
<td>N</td>
<td>2108</td>
</tr>
</tbody>
</table>

The statistics indicate that 36 per cent of organisations perceive good workplace performance to have a very important upward impact on wages, as opposed to 27 per cent who consider good establishment performance to have fairly important upward influence on wages, while 37 per cent view good establishment performance as not an important influence on pay. With respect to the cost of living, 45 per cent of the organisations consider it to have a very important upward influence on wages. With regard to the industrial action threatened or taken, 93 per cent view industrial action threatened or taken, not to have an important influence on pay. This is expected due to the decline in union power. 83 per cent of the firms do not regard the risk of redundancies as having an important downward impact on pay. Although they are only perceptions, I may then want to investigate them further, if it is the insider power which is causing this result.
The size of the wage settlements

Prior to discussing the size of annual settlements, it should be noted that some establishments had no increase in wages and some have had a pay-cut. The main reason for the former is that the recent performance of the firm did not warrant it. Other reasons include the provision of performance-related pay. The annual settlements are generally clustered around 3 per cent. The mean, median and the standard deviation of the wage settlements for all establishments, future financial variables and the establishment financial performance are depicted in Table 3.2. Establishment performance constituted a common cause for the dispersion in wage settlements.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean</th>
<th>Median</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size of the wage settlements for the LOG:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In all sectors</td>
<td>3.57</td>
<td>3.0</td>
<td>2.0</td>
</tr>
<tr>
<td>When the market is growing</td>
<td>3.76</td>
<td>3.3</td>
<td>2.05</td>
</tr>
<tr>
<td>When the market is mature</td>
<td>3.52</td>
<td>3.1</td>
<td>1.62</td>
</tr>
<tr>
<td>When the market is declining</td>
<td>3.50</td>
<td>3.0</td>
<td>2.08</td>
</tr>
<tr>
<td>When the market is turbulent</td>
<td>3.55</td>
<td>3.0</td>
<td>2.06</td>
</tr>
<tr>
<td>When the assessment of the workplace is a lot better than average</td>
<td>3.73</td>
<td>3.0</td>
<td>2.10</td>
</tr>
<tr>
<td>When the assessment of the workplace is better than average</td>
<td>3.67</td>
<td>3.2</td>
<td>1.92</td>
</tr>
<tr>
<td>When the assessment of the workplace is about average for industry</td>
<td>3.58</td>
<td>3.0</td>
<td>2.17</td>
</tr>
<tr>
<td>When the assessment of the workplace is below and a lot below average</td>
<td>3.03</td>
<td>3.0</td>
<td>1.87</td>
</tr>
</tbody>
</table>

The dispersion of wage settlements when the market is growing, mature, declining and turbulent are also shown in Table 3.2. When the market is growing, the wage settlements are still clustered around 3 per cent, but there is an increase in settlements within the range from 4.5 to 5.5 per cent, compared to the wage settlements for all sectors (not shown in the table). This indicates that firms where the market for product or services is growing, were being awarded greater pay rises, depending on the extent of the growth. In addition, the mean of the settlements when the market is growing is distinctly high, showing that when the financial performance is expected to improve, wage settlements are higher. As mentioned earlier, there is a potential problem, with respect to this variable exhibiting some form of measurement error and also it is possible that this variable is endogenous, since respondents take into account the bargained wage when forming their assessment of future profitability. When the market is declining, wage settlements were lower in the 4.5 and 5.5 per cent range (not shown in Table 3.2). Similarly, a larger number of firms had wage settlements in the range 3.5 and 4.5 per cent when the market is mature, and less so when the market is turbulent and declining. This suggests that wage settlements are higher, the more favourable the future state of the market (not shown in Table 3.2).
The dispersion of the wage settlements, when the assessment of the workplace financial performance is, a lot better than, better than, about average, and below or a lot below average, are also displayed in Table 3.2. When the performance is a lot better than average, wage settlements were concentrated between the range 2 and 6 per cent, whilst when the performance is better than average, wage increases were clustered around a range of 1 per cent to 5.5 per cent (not shown in Table 3.2). The pattern is similar when the performance is about average (not shown in Table 3.2). However, with respect to below and lot below average performance, the pay settlements are lower, and concentrated around the range 1 and 5 per cent (not shown in Table 3.2), implying that the assessment of the financial performance is higher when the wage settlements are correspondingly higher.

There were large variations between bargained and non-bargained settlements in the private sector. The average was 4.1 per cent for non-bargained settlements and 3.3 per cent, when negotiated with the trade union, see FM (2000a).

**Uniformity of wage settlements within and across firms**

WERS98 asked managers how the wage settlement compared with wages both within the firm and also across firms. Within firms, managers were asked how the wage settlement of the employees in the LOG compared with the managers’ wage settlement. WERS98 also suggested that comparability played an important role in both bargained and non-bargained wage setting. In the majority of cases the average increase in wages for both the managerial and non-managerial employees was similar. This was more pronounced when most employees were covered by collective bargaining.

**Agents involved in pay determination**

WERS98 contains data relating to the agents involved in determining the wage and the extent of their influence. In most cases, the consultation with higher level managers was high; however, the final decision on the size of the settlement rests with the workplace managers.

Table 3.4 presents the descriptive statistics for the explanatory variables used in the econometric models\(^2^1\). As can be seen from the statistics, Table 3.3 illustrates that a high percentage of establishments considered that their financial performance was good. For example, 7 per cent of establishments viewed their performance as below average (includes a lot

\(^{21}\) They relate to the sample used in the most general model (5).
below), less than 32 per cent assessed their financial performance as about average, whereas in excess of 43 per cent considered their workplaces to be above average, and 18 per cent a lot above average.

Similarly, as can been seen from Table 3.3, a high percentage of establishments considered that their future financial performance (current state of the market) would be good. For example, 7 per cent of establishments perceived the current state of the market as declining, 17 per cent considered the current state of the market to be turbulent, whilst 51 per cent assessed the current state of the market to be growing, and 25 per cent that the market was mature.

In addition, a high percentage of establishments consider that a high proportion of employees are not covered by collective bargaining. For example, 16 per cent of establishments reported that all their employees were covered by collective bargaining, 9 per cent assessed that most employees were covered by collective bargaining, whereas 57 per cent consider none of their employees to be covered by collective bargaining, whilst 11 cent reported almost all their employees to be covered by collective bargaining and 7 per cent as some or few of their employees to be covered by collective bargaining.

Moreover, a high percentage of establishments stated that their size was 50 – 199 employees. For example, 8 per cent of establishments reported the size of their establishment was between 10 to 24 employees, 13 per cent 25 – 49 employees and a further 19 per cent 50 – 99 employees and a similar percentage between 100 – 199 employees, whereas 27 per cent stated that their workplace size was comprised of 200 to 499 employees and 14 per cent as 500 or more employees.

Furthermore, a high percentage of establishments considered that there were many competitors for their main product or service. For example, 63 per cent of establishments considered there were many competitors for their main product or service, whilst 33 per cent assessed there were few competitors for their main product or service and 4 per cent reported there to be none.
### TABLE 3.3
SUMMARY STATISTICS FOR EXPLANATORY VARIABLES IN THE WERS98a

<table>
<thead>
<tr>
<th>Variables</th>
<th>N</th>
<th>Mean (S. D.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Establishments financial performance:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lot better than average</td>
<td>860</td>
<td>0.18 (0.35)</td>
</tr>
<tr>
<td>Better than average</td>
<td>860</td>
<td>0.43 (0.50)</td>
</tr>
<tr>
<td>About average for industry</td>
<td>860</td>
<td>0.32 (0.47)</td>
</tr>
<tr>
<td>Below and Lot below average</td>
<td>860</td>
<td>0.07 (0.26)</td>
</tr>
<tr>
<td>Future financial performance (the current state of the market):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market is growing</td>
<td>860</td>
<td>0.51 (0.50)</td>
</tr>
<tr>
<td>Market is mature</td>
<td>860</td>
<td>0.25 (0.43)</td>
</tr>
<tr>
<td>Market is declining</td>
<td>860</td>
<td>0.07 (0.25)</td>
</tr>
<tr>
<td>Market is turbulent</td>
<td>860</td>
<td>0.17 (0.37)</td>
</tr>
<tr>
<td>Proportion of all employees covered by collective bargaining:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All (100%)</td>
<td>860</td>
<td>0.16 (0.37)</td>
</tr>
<tr>
<td>Almost all (80-99%)</td>
<td>860</td>
<td>0.11 (0.31)</td>
</tr>
<tr>
<td>Most</td>
<td>860</td>
<td>0.09 (0.26)</td>
</tr>
<tr>
<td>Some or few (below 60%)</td>
<td>860</td>
<td>0.07 (0.26)</td>
</tr>
<tr>
<td>None (0%)</td>
<td>860</td>
<td>0.57 (0.50)</td>
</tr>
<tr>
<td>Size of Establishment:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 to 24 employees</td>
<td>860</td>
<td>0.08 (0.28)</td>
</tr>
<tr>
<td>25 to 49 employees</td>
<td>860</td>
<td>0.13 (0.34)</td>
</tr>
<tr>
<td>50 to 99 employees</td>
<td>860</td>
<td>0.19 (0.39)</td>
</tr>
<tr>
<td>100 to 199 employees</td>
<td>860</td>
<td>0.19 (0.39)</td>
</tr>
<tr>
<td>200 to 499 employees</td>
<td>860</td>
<td>0.27 (0.41)</td>
</tr>
<tr>
<td>500 or more employees</td>
<td>860</td>
<td>0.14 (0.35)</td>
</tr>
<tr>
<td>Competitors for the Main Product or Service:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>860</td>
<td>0.04 (0.20)</td>
</tr>
<tr>
<td>Few</td>
<td>860</td>
<td>0.33 (0.47)</td>
</tr>
<tr>
<td>Many</td>
<td>860</td>
<td>0.63 (0.48)</td>
</tr>
<tr>
<td>Output concentrated on one or several different Product(s) or Services:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single product or service</td>
<td>860</td>
<td>0.38 (0.49)</td>
</tr>
<tr>
<td>Different products or services</td>
<td>860</td>
<td>0.62 (0.49)</td>
</tr>
<tr>
<td>Percentage of vacancies in the past 12 months filled by employees within the organisation:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All (100%)</td>
<td>860</td>
<td>0.02 (0.15)</td>
</tr>
<tr>
<td>Almost all (80-99%)</td>
<td>860</td>
<td>0.05 (0.23)</td>
</tr>
<tr>
<td>Most (60-79%)</td>
<td>860</td>
<td>0.09 (0.29)</td>
</tr>
<tr>
<td>Around half (40-59%)</td>
<td>860</td>
<td>0.16 (0.37)</td>
</tr>
<tr>
<td>Some (20-39%)</td>
<td>860</td>
<td>0.24 (0.42)</td>
</tr>
<tr>
<td>Just a few (1-19%)</td>
<td>860</td>
<td>0.44 (0.50)</td>
</tr>
<tr>
<td>Ownership of the workplace:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UK owned/controlled</td>
<td>860</td>
<td>0.76 (0.43)</td>
</tr>
<tr>
<td>Predominantly UK-owned (in excess of 51%)</td>
<td>860</td>
<td>0.06 (0.24)</td>
</tr>
<tr>
<td>50/50 UK and foreign ownership</td>
<td>860</td>
<td>0.01 (0.11)</td>
</tr>
<tr>
<td>Predominantly foreign owned (in excess of 51%)</td>
<td>860</td>
<td>0.05 (0.22)</td>
</tr>
<tr>
<td>Foreign owned/controlled</td>
<td>860</td>
<td>0.12 (0.33)</td>
</tr>
<tr>
<td>Banded average vacancy rate by travel-to-work area:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-0.80</td>
<td>860</td>
<td>0.23 (0.42)</td>
</tr>
<tr>
<td>0.8-1</td>
<td>860</td>
<td>0.33 (0.47)</td>
</tr>
<tr>
<td>1-1.30</td>
<td>860</td>
<td>0.22 (0.41)</td>
</tr>
<tr>
<td>Over 1.30</td>
<td>860</td>
<td>0.22 (0.42)</td>
</tr>
<tr>
<td>Banded total unemployment rate by travel-to-work area:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-3%</td>
<td>860</td>
<td>0.22 (0.41)</td>
</tr>
<tr>
<td>3-5%</td>
<td>860</td>
<td>0.30 (0.47)</td>
</tr>
<tr>
<td>5-7%</td>
<td>860</td>
<td>0.35 (0.48)</td>
</tr>
<tr>
<td>Over 7%</td>
<td>860</td>
<td>0.13 (0.34)</td>
</tr>
</tbody>
</table>

*Standard deviations are given in parentheses.

### 3.6. ESTIMATION AND RESULTS

Several empirical studies (for example, NW (1990) and FM (2000b)) and the theories mentioned earlier, augmented by my theoretical chapter, have informed my empirical study. My empirical analysis is a natural complement to my theoretical analysis in chapter 5. I have estimated five different models, due to different response rates for each variable and the need to focus on separate influences. Various specifications are set out in columns (1) to (5) of Table 3.4. The dependent variable is the average percentage change in basic wage for the
LOG, excluding managers from the last review (in 1998). The independent variables of the baseline specification (1) are union coverage, establishment size and the assessment of the financial performance. The importance of these variables on pay was assessed in both the private and public sectors.

First, the impact of the proportion of employees covered by collective bargaining can be examined for all establishments (private and public) using model (1). The following points are worth noting with respect to model (1)'s estimates. The influence of union non-coverage is strong and well determined and is highly significant. This accords with current evidence cited in the earlier section. Second, establishment size had a negative but insignificant influence on wages, with the exception of the establishment comprising the smaller firm size of 10 to 24 employees, where the impact is positive but insignificant. Third, the impact of establishment financial performance is strong, with strong well-determined positive coefficients. Fourth, private sector-other (non PLCs) have a positive and a significant influence on wages. In line with expectations, the impact of the public sector on wages is negative and strongly significant in models (1) and (2). These are strong and well determined in both models, since insiders cannot fully exert their market power in the bargaining process with the government, particularly since the demise of strong union power over the last two decades.

We must incorporate market and output concentration variables as well as other factors which I have identified earlier, which could provide bargaining strength to the insiders and thus have an impact on wages. In the light of this, in specification (2) the number of competitors for the main product or service, and output concentration on one or several different product(s) or service(s) are included. The impact of there being no competitors for the main product or service is positive but insignificant.

In model (3) I have included some control variables, specifically, the effect of the percentage of vacancies in the past 12 months filled by employees within the organisation and the ownership of the workplace.

In model (4), I include the current state of the market as a variable, which would provide us information about the future financial performance. It should be noted that there are many missing observations in the case of this variable, since it does not apply to public sector organisations. In addition, as mentioned earlier, one should note that this variable exhibits some form of measurement error and it is possible that the variable is endogenous,
since respondents take into account bargained wage when forming their assessment of future profitability. This was the only variable in the WERS98 dataset that measures the future financial performance.

In model (5), I included the external variables, which indicate the relevance of these outside factors to the wages of the employed. Specifically, these variables are the banded average vacancy rate by travel-to-work area and the banded total unemployment rate by travel-to-work area. With respect to the banded average vacancy rate by travel-to-work area, I have amalgamated the banded average vacancy rates into four categories: 0 – 0.80, 0.80 – 1, 1 – 1.30 and 1.30 – 1.60+. With regard to the banded total unemployment rate by travel-to-work area, I have amalgamated total unemployment rates into four categories: less than 3 per cent, 3 – 5, 5 – 7 and over 7 per cent.

The principal findings from Table 3.4 are as follows: First, firms with several competitors have significantly higher wage settlements. This effect is well determined in all our equations, and it takes its highest value in our final regression (5). In models (4) and (5) it can be seen that when competition is high for the product or service, this has strong and well-determined impact on wage settlements; in the case of models (1) and (2) positive and significant at the 5 per cent level. This is consistent with the findings in Guadalupe (2003) and other studies, and conforms to expectations. Clearly, the larger the distribution of these variables, the greater will be its impact on wages, as I would expect.

Second, the favourable future financial performance variable is also positive and significant. This implies that bargainers do consider and take into account the future financial performance of the firm when negotiating pay. Similarly, consistent with our expectations, when a market is mature and has reached its peak, the impact would be positive, but less powerful. However, this influence is insignificant. Likewise, when a market is declining, the impact on pay is also less powerful, unsurprisingly, as insiders would dampen their wage demands. But this variable, although positive and stronger than it is for mature markets, is also insignificant.

Third, establishment financial performance is found to have a positive and significant influence on wage settlements at the 5 per cent level of significance in all five models. The strength of the financial performance is positively correlated to pay. This conforms to the results of several studies, for example NW (1990) found own price and productivity to be
ell determined. Blanchflower, Oswald and Garrett (1990) also find wages are positively related to the establishment’s financial performance; and further, Blanchflower and Oswald (1988) also find that wages are influenced by the firm’s financial prosperity.

Fourth, the firm size effects are not strong in any of the five models.

The concentration of output on a single product or service effects has a positive impact on wages in all four equations and its importance increases with the addition of the ownership and proportion of vacancies filled internally, the future financial performance of the firm variables, and the banded average vacancy rate by travel-to-work area and the banded total unemployment rate by travel-to-work area. This is consistent with the results obtained in Stewart (1990), who showed that workers in establishments with product market power were able to appropriate rent from their firms. However, the coefficients are not significant at the per cent level.

The influence of the percentage of vacancies that have been filled by employees from within the organisation over the last 12 months are in most cases positive, except where the impact of the percentage of vacancies in the past 12 months filled by employees within the organisation is between 60 – 70 per cent, where it consistently appears as having a negative, but not significant, effect on pay in models (3) and (5). However, these variables are not significant.

UK-owned firms have a positive influence on pay settlements, with the impact increasing with the inclusion of the financial performance and external variables in models (4) and (5), but not significant influence on pay. This positive impact is greater in firms which are 50 per cent UK and foreign owned in models (3), (4) and (5), and approaching significance at the 7 per cent level in the latter model. The effect on wages is still positive and slightly lower when the establishments are predominantly foreign owned. However, all of these positive influences are insignificant, with the exception of semi foreign/UK in model (5), where it is approaching significance. The results of the positive ownership effects are consistent with M (2000b) and Te Velde (2002), where the latter suggests that there is evidence for a wage premium in foreign owned firms, but this vanishes when controlling for skill level.

Finally, the inclusion of the external variables of unemployment and vacancies in equation showed that these variables had a negative impact on wages. Travel-to-work areas where unemployment is between 5 and 7 per cent had a negative and well determined influence on
wage settlements, whilst although negative, establishments located in areas of high unemployment did not experience significantly lower wage settlements. Thus, the results of the external variables conform to expectations and is consistent with evidence in earlier studies of total unemployment rate by travel-to-work area having a significant effect on wages.

However, vacancies are not significant, but again establishments located in areas with a lower vacancies rate have a negative impact on wage settlements. The statistical non significance of vacancies is consistent with the insider-outsider theory. According to the assumptions of IOT, there will be persistent unemployment, since by the fundamental assumption of the IOT the insiders bargain, exerting their market power to enhance wages on account of turnover costs, and this is attained at the expense of the outsiders or unemployed workers. In sum, all this by implication means the impact of vacancies is minimal, primarily due to turnover costs, which according to IOT is non-transferable in its entirety to its employees in the form of wage reduction.

Unemployment appears to have a negative and significant impact on wages in the middle band rate, but is not significant in other bands. This is consistent to expectations, and also conforms to most of the earlier studies, where the relationship between wage and unemployment is well established in the literature, over time and intra and across countries. This finding has also been corroborated by Blanchflower and Oswald using British wage curves from the General Household Survey for the period from 1973 – 1980 and 1981 – 1990, that unemployment elasticity to pay is robust. In addition, Blanchflower and Oswald (1989, 1990), Blanchflower and Freeman (1992, 1993) and Lee and Pesaran (1993) also echo the downward sloping wage curves.

Furthermore, when additional changes in the circumstances of the firm over the five years variable are included: namely, the impact on pay; the flexibility to move employees from one task to another; the proportion of pay for non-managerial employees which is related to measures of performance; and the amount of employee influence over managerial decision-making, and the other variables under this category (equation (3) and then incorporated with equation (4)), those of the above results which remain relevant are much the same. However, the future financial performance variable is consistently well determined and is stronger (with a $t$ statistic of 2.44). These results can be obtained from the author upon request.

We did not find that the union coverage set of variables had a positive impact on wages
in any of our equations. Instead I find that no union coverage had a well determined and

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>2.73 (10.4)</td>
<td>2.25 (8.4)</td>
<td>2.07 (5.0)</td>
<td>1.90 (4.4)</td>
<td>2.45 (5.2)</td>
</tr>
<tr>
<td>Proportion of employees covered by collective bargaining</td>
<td>0.08 (0.5)</td>
<td>0.07 (0.4)</td>
<td>0.13 (0.7)</td>
<td>0.04 (0.2)</td>
<td>0.04 (0.2)</td>
</tr>
<tr>
<td>All (100%)</td>
<td>0.13 (0.9)</td>
<td>0.19 (1.2)</td>
<td>0.32 (1.6)</td>
<td>0.24 (1.2)</td>
<td>0.25 (1.2)</td>
</tr>
<tr>
<td>Almost all (80-99%)</td>
<td>0.32 (1.7)</td>
<td>0.38 (1.7)</td>
<td>0.50 (1.8)</td>
<td>0.42 (1.5)</td>
<td>0.41 (1.4)</td>
</tr>
<tr>
<td>None (0%)</td>
<td>0.75 (4.5)</td>
<td>0.78 (4.8)</td>
<td>0.92 (5.6)</td>
<td>0.82 (4.8)</td>
<td>0.85 (4.8)</td>
</tr>
<tr>
<td>Establishments financial Performance</td>
<td>0.71 (3.5)</td>
<td>0.85 (4.3)</td>
<td>0.76 (2.7)</td>
<td>0.69 (2.4)</td>
<td>0.64 (2.3)</td>
</tr>
<tr>
<td>Lot better than average</td>
<td>0.68 (3.8)</td>
<td>0.83 (5.0)</td>
<td>0.66 (3.1)</td>
<td>0.61 (2.8)</td>
<td>0.54 (2.6)</td>
</tr>
<tr>
<td>Better than average</td>
<td>0.62 (3.3)</td>
<td>0.71 (4.2)</td>
<td>0.58 (2.5)</td>
<td>0.58 (2.5)</td>
<td>0.48 (2.2)</td>
</tr>
<tr>
<td>About average for industry</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Size of establishment</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>10 to 24 employees</td>
<td>0.10 (0.4)</td>
<td>0.30 (1.1)</td>
<td>0.71 (1.5)</td>
<td>0.66 (1.4)</td>
<td>0.60 (1.3)</td>
</tr>
<tr>
<td>50 to 99 employees</td>
<td>-0.16 (-0.9)</td>
<td>-0.03 (-0.2)</td>
<td>0.14 (0.6)</td>
<td>0.10 (0.4)</td>
<td>0.09 (0.4)</td>
</tr>
<tr>
<td>100 to 199 employees</td>
<td>-0.06 (-0.3)</td>
<td>0.13 (0.7)</td>
<td>0.18 (0.7)</td>
<td>0.13 (0.5)</td>
<td>0.17 (0.6)</td>
</tr>
<tr>
<td>200 to 499 employees</td>
<td>-0.13 (-0.8)</td>
<td>0.04 (0.2)</td>
<td>0.10 (0.4)</td>
<td>0.06 (0.2)</td>
<td>0.07 (0.3)</td>
</tr>
<tr>
<td>500 or more employees</td>
<td>-0.06 (-0.4)</td>
<td>0.03 (0.2)</td>
<td>0.23 (0.9)</td>
<td>0.21 (0.9)</td>
<td>0.26 (1.0)</td>
</tr>
<tr>
<td>Competitors for the main product or service</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>None</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Many</td>
<td>0.21 (2.0)</td>
<td>0.30 (2.1)</td>
<td>0.32 (2.3)</td>
<td>0.32 (2.3)</td>
<td>0.35 (2.4)</td>
</tr>
<tr>
<td>Output concentration on one or several different product(s) or service(s)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Single product or service</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Percentage of vacancies in the past 12 months filled by employees within the organisation</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>All (100%)</td>
<td>-</td>
<td>0.01 (0.0)</td>
<td>0.01 (0.0)</td>
<td>0.06 (0.2)</td>
<td>0.06 (0.2)</td>
</tr>
<tr>
<td>Most (60-70%)</td>
<td>-</td>
<td>-</td>
<td>-0.12 (-0.4)</td>
<td>0.12 (-0.4)</td>
<td>-0.14 (-0.5)</td>
</tr>
<tr>
<td>Around half (40-50%)</td>
<td>-</td>
<td>0.14 (0.6)</td>
<td>0.12 (0.5)</td>
<td>0.10 (0.4)</td>
<td>0.10 (0.4)</td>
</tr>
<tr>
<td>Some (20-30%)</td>
<td>-</td>
<td>0.24 (1.1)</td>
<td>0.21 (1.0)</td>
<td>0.18 (0.8)</td>
<td>0.18 (0.8)</td>
</tr>
<tr>
<td>Just a few (1-19%)</td>
<td>-</td>
<td>0.10 (0.5)</td>
<td>0.08 (0.4)</td>
<td>0.06 (0.3)</td>
<td>0.06 (0.3)</td>
</tr>
<tr>
<td>Ownership of the workplace:</td>
<td>-</td>
<td>-</td>
<td>-0.03 (0.2)</td>
<td>0.06 (0.4)</td>
<td>0.09 (0.5)</td>
</tr>
<tr>
<td>UK owned/controlled</td>
<td>-</td>
<td>-</td>
<td>-0.14 (-0.4)</td>
<td>-0.14 (-0.4)</td>
<td>-0.09 (-0.3)</td>
</tr>
<tr>
<td>Predominantly UK-owned (&gt; 51%)</td>
<td>-</td>
<td>-</td>
<td>0.96 (1.4)</td>
<td>0.97 (1.5)</td>
<td>1.06 (1.6)</td>
</tr>
<tr>
<td>Predominantly foreign owned (&lt; 51%)</td>
<td>-</td>
<td>-</td>
<td>0.53 (1.3)</td>
<td>0.52 (1.3)</td>
<td>0.58 (1.5)</td>
</tr>
<tr>
<td>Future financial performance of the firm (the current state of the market)*:</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Market is growing</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Market is mature</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Market is declining</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Banded Average Vacancy Rate by Travel-to-work Area:</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>0-0.80</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>0.80-1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1.30-2.6</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Banded Total Unemployment Rate by Travel-to-work Area:</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3-5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5-7</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Over 7%</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Status of the organisation</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Private sector-other</td>
<td>0.36 (2.1)</td>
<td>0.37 (2.8)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Public sector</td>
<td>-0.55 (-4.6)</td>
<td>-0.40 (-4.2)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>N</td>
<td>1776</td>
<td>1351</td>
<td>861</td>
<td>860</td>
<td>860</td>
</tr>
<tr>
<td>R²</td>
<td>0.08</td>
<td>0.09</td>
<td>0.06</td>
<td>0.07</td>
<td>0.08</td>
</tr>
<tr>
<td>F</td>
<td>15.33 (0.000)</td>
<td>10.55 (0.000)</td>
<td>2.61 (0.000)</td>
<td>2.67 (0.000)</td>
<td>2.25 (0.000)</td>
</tr>
</tbody>
</table>

* t ratios in parentheses

1 The omitted categories in each variable group are as follows:
- Proportion of employees covered by collective bargaining: Most (60-70%)
- Establishments financial performance: Below and a Lot below average
- Output concentration on one or several different product(s) or service(s): Differentiated products or services
- Percentage of vacancies in the past 12 months filled by employees within the organisation: Almost all (80-99%)
- Ownership of the workplace: Foreign owned/controlled firms.
- Future financial performance of the firm (the current state of the market): Market is turbulent
- Boarded average vacancy rate by travel-to-work area: Over 1.30
- Banded total unemployment rate by travel-to-work area: 0 - 3%
- Status of the organisation: Private sector company - plc

2 Model [2] estimated with the following additional variables: unemployment rate by government office region;
- Average vacancy rate over course of fieldwork by government office region, yielded the coefficients
  -0.70 (-1.0) and -0.11 (-0.3) respectively. t ratios are in parentheses.
- We have also conducted further estimations with just the union coverage variables as the explanatory variable and found similar results to this.
- A wide variety of experiments conducted with the other forward-looking variable, the expected value of sales, consistently had a positive coefficient of about 0.34 and a t ratio of greater than 3. But inclusion of this variable, slightly lowers the t ratio of our forward-looking variable, the growing market variable.
strong impact on wage settlements in all five of the equations estimated here, but also showed up to be consistently well determined on the additional experiments, mentioned above. This is not entirely surprising, given changes in the industrial relations climate compared to previous decades.

3.7 CONCLUSIONS

The results here establish that bargainers are forward-looking and rational, that is, they care about the future, bearing in mind the caveats to our conclusion. This is in contrast to past studies which have neglected to establish this fundamental and inherent behaviour of bargainers in the bargaining process. This study has endeavoured to explain the determinants of wages in a representative sample of firms in the UK with greater than or equal to ten employees, with the exception of coal mining and agriculture, including both private and publicly owned establishments. We have investigated wage determination at the establishment level focusing special attention on the impact of the future financial performance. The key variables were found to be the future and current financial performance variables, the absence of collective bargaining, having many competitors for the main product or service, and to some extent local unemployment. The following are the important results attained.

(i) The future financial performance, as captured by the growing markets variable, has a significant influence on pay determination. In addition, the future financial performance, as captured by the establishment financial performance variable, has a significant impact on wage determination.

(ii) Determinants of insider power, such as the number of competitors for the main product or services, have a significant influence on wage determination.

(iii) The non coverage of employees by collective bargaining has a positive and significant impact on pay.

(iv) External variables, such as a high level of unemployment, have a negative impact on wages. The impact of the local unemployment on wages is in most cases is insignificant, whilst the impact of unemployment in general, in most cases is significant or approaching significance. This is corroborated by a multitude of wage-curve evidences in Blanchflower and Oswald (1994) both spatially and over time.
The empirical determination of wage negotiations in this study (if we accept it is true) should facilitate the explanation of wage movements satisfactorily, using such additional factors as the manner in which wages are bargained, the standard insider factors and so forth. The results of this study (again, if we accept it is true) have important implications for policy, since the manner in which wages are determined has implications for employment, that is, as to whether workers want to be employed in the firm given the form of wage determination. This is specifically, as stated at the beginning, since employment will only expand in firms where the future financial performance of the firm is improving, and not in firms where it is declining. This is because more workers are more likely to want to retain their employment and be employed in firms that have a favourable future financial performance relative to those in firms with an adverse future financial performance, by virtue of the fact that pay is higher in the former and not the latter firms.

Encouraging mobility from failing to successful firms is an attractive option. Moreover, retraining subsidies could be provided to specific firms for the workers where the future financial performance is adverse, to provide firm-specific skills training or for workers to follow nationally recognised qualifications, granted by institutions independent of the recipients, that is, the firms. An alternative example would be through tax concessions to stimulate product or service demand (see for example Snower, 1995 with respect to product demand). A further example, would be properly targeted and well-designed Active labour market policies (ALMP), which augment the matching process between unemployed workers and vacant jobs, and if it entails job subsidisation, will aid job creation (see for example, Pissarides, 1999). In addition, reduction in payroll tax also enhances recruitment directly (see for example, Dreze and Malinvaud, 1994). All these policy recommendations are viable on the grounds of equity considerations. As I have clearly mentioned above, if this entails job subsidisation, it will help create jobs. Also, a more important policy implication is the wage (and price) inflation that ensues on account of agents anticipating future profitability.

To recapitulate, using the WERS98 dataset, I have found that firms that are prospering financially pay higher wages than firms that are not performing so well financially (of course, bearing in mind the caveats). It would be interesting to amalgamate both employer and employee WERS98 datasets, and consider whether large firms pay higher wages, as noted in my theoretical chapter, using these data sets. This is on my future research agenda.
Although illuminating, the WERS98 does not permit the incorporation of the more preferable stock market valuation variables, such as (PE) ratio, to show the impact of future financial performance on wages. Second, the dataset is not derived from published accounts of publicly quoted companies, as with a dataset like DATASTREAM on-line. As a consequence, it is not clear how accurate the information about the process of wage determination is. Thus, for example, there will be considerable heterogeneity across firms in how they perceive the level of economic activity. Second, there are several potential problems in the data, specifically, managers not responding to all the questions in a group and few firms who do not respond at all. Nevertheless, it is preferable to other survey datasets, particularly on account of the data being well-structured with a better range of control variables as noted earlier. Overall, its attractive features far outweigh the general drawbacks, as demonstrated by its wide use in a number of analyses. However, again we need to bear in mind the caveats I have alluded to earlier, in particular with respect to the forward-looking variable, for the purposes of this study.

In this chapter, I have established empirically that in an ongoing game, firms and workers care about the future and bargain in accordance to the future financial performance of the firm, again bearing in mind the caveats I have mentioned earlier. The, first is the potential problem of using a variable which exhibits some form of measurement error. If this is in fact present, it may cause the regressor to be correlated with the disturbance term. Second, it is possible that the market growth variable may be endogenous, since respondents take into account the bargained wage when forming their assessment of future profitability. This implies we are not certain to what extent the market growth variable has an impact on the wage settlement. One reason why firms want to pay higher wages in this ongoing game (and the concept ongoing is critical here), is because they want to prolong the relationship between workers and firm (that is, to retain) and form new firm-worker relationships (that is, recruit more workers) to maximise profits. This could be attributed largely to the fact that the majority of employment involves utilising some element of human/firm-specific human capital in the production process. Hence, workers are of a fundamental and crucial importance to a firm. Therefore, I next examine the importance of recruitment and retention of workers in wage determination, using a dataset with a time element to it; namely, the Confederation of British Industries dataset. This I undertake in the next chapter.
CHAPTER 4

AN ANALYSIS OF THE IMPORTANCE OF
RECRUITMENT AND RETENTION OF
LABOUR IN UK WAGE SETTLEMENTS

4.1. INTRODUCTION

Labour is an essential factor of production, without which a firm cannot be a viable ongoing concern. Nor can workers survive satisfactorily on an ongoing basis, if their sole means of income is through employment. Wages offered and accepted by workers in a match will reflect this. In addition, the wage also reflects the payment required to hire new matches (workers), since both firms and workers are interested in an ongoing relationship. Research on labour economics, both theoretical and empirical traditionally only considers pay determination in a stationary environment. However, the game between firms and workers occurs within a non-stationary environment, with the relationship between these two agents ongoing. My earlier empirical chapter has taken account of this important phenomenon, thereby establishing that agents in such an environment will be forward-looking.

The succeeding theoretical chapter pursues the consequences of this behaviour. Thus, workers with firms with a favourable future financial performance will be paid higher wages, and vice versa. Thus, in terms of firm size and wage dispersion, firms with a favourable financial position will encourage the retention and recruitment of more workers. Hence, those firms that have better financial performance will be paying higher wages, as well as having a large number of employees, and will also crucially consider the need to recruit and retain labour as an important factor in exerting upward pressure on wage settlements (henceforth RRF).

The underlying reason for the payment of higher wages is to prevent labour turnover, which is very costly for firms. It is equally costly for workers in employment to re-search (that is, seek) for and re-match with, another employer. With respect to firms, these turnover costs mainly pertain to hiring and firing costs and with respect to workers it is the loss of continuity of service with a given firm, and its repercussions, one of which I noted above. Almost all non-competitive theories, including turnover theories, EWT and IOT, have expounded the
importance of firm's attempts to curtail labour turnover. Special attention will be focused on IOT\textsuperscript{22}. In the IOT workers are paid higher wages to curb turnover costs. If workers did not retain their employment in the firm, the firm incurs further recruitment costs in replacing these workers. Further details of these costs were provided in chapter 2.

The nature of the WERS dataset, exploited in Chapter 3, permitted the verification of the behaviour of the bargainers, since the dataset has a better range of well-structured explanatory variables compared to the CBI dataset utilised in this chapter. However, the WERS data is cross-section data and does not permit an in-depth analysis of the influence of wage settlements over time, across regions and so forth. In order to get a handle on the performance of the firm, the WERS98 dataset was preferable; this I analysed in Chapter 3. I have used the market growth variable as an indication of future financial performance variable, as the question clearly/effectively asks the respondents whether the current state of the market for the main product or service is growing, as mentioned earlier. However, one needs to note two potential problems of using this proxy (as mentioned in Chapter 3). First, the potential problem of using a variable which exhibits some form of measurement error. Second, it is possible that the market growth variable is endogenous, since respondents take into account the bargained wage when forming their assessment of future profitability. This implies, that we are not certain to what extent the market growth variable has an impact on the wage settlement.

Given that value of output, volume of output and value added per person employed, are modes of measuring output used mainly by certain types of industries, it would be reasonable to use these variables to proxy for the extent of insider power in these industries. It is well known that insider power are greatest where the rents to be shared are the greatest. Preliminary analysis by the author has shown that the most appropriate method of measuring most service sector output, such as professional and scientific services and business services, is by the value of output per person employed. The ONS has informed the author (indeed, their statistics show) that these industries have one of, if not the highest gross domestic product (GDP) in the UK, of course, CBI data does not indicate this. In addition, I have also used the size of the bargaining group as a proxy for an indication of the firm size. There are two caveats to note here: first, all employees of an establishment may not join a bargaining group.

\textsuperscript{22}In addition, IOT is an offshoot of EWT as noted in chapter 2.
Second, some establishments may have more than one bargaining group. These caveats may lead to underestimation of the firm size.

Although the CBI dataset may lack information, such as financial information, overall the CBI dataset does permit us to develop and establish an analysis of the influence of wage settlements over time, including an in-depth/detailed analysis of the RRF. The CBI dataset allows us to explore the influences of wage settlements adequately and satisfactorily as does the WERS dataset. However, it should be noted that there may be some limitations with respect to the choice of explanatory variables, as alluded to above. So, the dataset is fairly well equipped to provide reasonably satisfactory answers to our question, bearing in mind the possible data limitations.

The price settled, that is, the terms of trade in chapter 5, implicitly incorporates factors such as the importance of the RRF to firms and the workers' desire to retain and new workers desire to gain employment in the firm, since by definition the wage bargained is monopolistically priced, that is, the wage that each agent is indifferent to. Thus, in this chapter I will investigate the influences of wage determination in general, but focus special attention on the RRF, since it is labour turnover costs that sustains IOT. This, exemplifies the importance of recruitment and retention as a major negotiation consideration exerting upward pressure in wage settlements, using a unique illuminating and previously unexploited longitudinal dataset. The latter is the primary goal of the chapter.

As alluded to above, my theoretical analysis in chapter 5 encompasses the following findings (see Theorem 1); wages are determined monopolistically as noted. That is, both agents are indifferent to the price agreed. In setting this price, primal factors such as the importance of recruitment and retention of labour will be accorded major consideration. Both parties are accurately aware of the pivotal role played by the importance of recruitment and retention of workers. Second, bargained wages will be a function of the future financial performance of the firm. I have established this empirically in an earlier chapter.

I now investigate the importance of recruitment and retention of labour as a major bargaining consideration. Successful/prosperous establishments pay higher wages to recruit and retain workers. Similarly, more workers would want to be employed and want to be retained in successful/prosperous firms.

If recruitment and retention is important in wage-bargaining and prosperous firms pay
high wages to recruit and retain workers this could have serious macroeconomic implications for the behaviour of the economy. For example, if recruitment and retention activities occur in more prosperous establishments and regions, then there will be agglomeration effects and increasing amount of workers would want to be employed and want to retain their employment in these prosperous establishments. Equally these prosperous establishments would pay higher wages to lure workers and retain more workers at the expense of the other less prosperous or deprived regions of the economy.

We are therefore interested in a variety of issues. First, is recruitment and retention of labour a major consideration in wage settlements? Anecdotal evidence suggests that managers view the need to improve the ability to recruit and retain labour as important determinants of pay settlements. For example, the prevalence of ascending pay scales is a manifestation of the importance of the RRF to firms. Equally, the importance of workers to be employed and to retain their employment in these firms, is also propounded in the EWT. Indeed, in some EWTs (Salop, 1979; Shapiro and Stiglitz, 1984) it is suggested that higher wages are paid to reduce quits. This has been developed further by LS (1988c) in insider-outsider theory, in which higher wages are paid on account of turnover costs. Other theoretical and empirical studies have also found turnover is an important determinant of higher wages (see for example, Martin, 1999). Gregory, Lobban and Thomson (1987), using CBI data, suggested that recruitment or retention effects are fairly important, as part of a general enquiry on wage determinants. But no attempt has been made to analyse in detail how important this factor is in wage determination.

My main purpose is to attempt to pin down the importance of recruitment and retention effect with some precision. A second issue of some interest is the question of what actually determines the need to enhance the ability to retain and recruit labour, as a factor exerting upward pressure on the level of settlement. Here I am interested in investigating a variety of characteristics of establishments, with an emphasis on industries, regions and bargaining groups, which consider the RRF as very important in exerting upward pressure on wage settlements. Therefore, the main purpose of this analysis is to complement my empirical analysis in chapter 3, which is applied to the IOT. This will provide an indication of the characteristics of establishments that who are most likely to consider the need to recruit and retain labour as a very important factor in exerting upward pressure on wage settlements,
and identify those establishments where insider factors may be greatest, given the importance of turnover costs in this theory. I accomplish the former and the latter over a very long dimension, identifying this need and where insider power may be greatest with bargaining groups, industries, regions, which previous studies have been bereft of.

The outline of the chapter is as follows. In Section 4.2, I discuss characteristics of those establishments likely to consider the RRF to be a very important factor in wage settlements. Section 4.3 discuss our data. Section 4.4 provides preliminary data analysis pertaining to influences on wage settlements in general. Section 4.5 empirically models the importance of RRF. Section 4.6 discuss the results. Section 4.7 concludes.

4.2. CHARACTERISTICS OF THOSE ESTABLISHMENTS LIKELY TO CONSIDER RETENTION AND RECRUITMENT A VERY IMPORTANT FACTOR IN WAGE SETTLEMENTS

I make it clear at the outset, as I have alluded to earlier, since I have investigated in Chapter 3 the importance of forward-looking behaviour in the context of the IOT, I now examine the relevance of IOT by looking at the importance of recruitment and retention, given that turnover costs sustains the IOT. This will be undertaken in a static sense with less than ideal/preferred variables, due to data limitations.

I will first discuss the characteristics of establishments who we might expect likely to consider the RRF to be a very important factor in exerting upward pressure in wage settlements. As noted earlier, by prosperity I mean that profitability of establishments that is of prime importance, as these are the establishments where insider power is greatest. That is, more prosperous/profitable establishments, such as computing services, are more likely to consider the RRF is a very important negotiation consideration. Prior to discussing further characteristics, it would be useful to set out a simple framework of analysis within which to examine the characteristics of the establishments most likely to consider the RRF is important (that is, where insiders are more likely to have power) prior to embarking on the econometric analysis. I also state at the outset, that I would have preferred a wider range of more suitable variables, but due to data limitations this is not possible.

The decision to consider RRF to be very important can be represented within a prosperity/profitability of the firm framework, which goes along with the IOT hypothesis. In the
IOT insiders have the greatest power where the financial prosperity/profitability of the firm is highest. It follows that recruitment and retention of the appropriate workers is an activity undertaken in accordance to the prosperity of the firm, in which costs are borne by establishments in return for a steady stream of rewards (including productivity gains) accruing over time. So, establishments have more to lose, the greater their profitability. This is in the spirit of the IOT and indeed, goes along with the hypothesis of the IOT. Examples of rewards include the benefits of having an economic mass (Rice and Venables, 2004), and contribution to the agglomeration effects, such as face-to-face contact (see for example, Stroper and Venables, 2003).

The prosperity/profitability of the firm model, which goes along with the IOT hypothesis, as mentioned earlier, is used to explain the properties/characteristics of the establishments which consider the RRF to be very important. First, establishments in all industries are more likely to consider recruitment and retention of labour as an important bargaining consideration; this is consistent with the hypothesis of the IOT. The importance of recruitment and retention of labour as a major bargaining consideration tends to be greater in industries that are more prosperous/profitable, since this is where insiders have the greatest power on account of higher turnover costs. In addition, these industries should also reap the greatest potential returns from the human capital investment in labour because they are in a better position to take advantage of the benefits flowing from the hiring or retention of the worker. By better position I mean features such as deeply seated agglomeration effects, including higher innovativeness, strong local knowledge networks and spill-overs. Moreover, proximity to direct and intermediate markets, well established connections with traditional markets and the new markets, also enables these industries to be in a better position to take immense advantage of the benefits accruing from hiring/retention of workers. Furthermore, these establishments may have a strong first-mover advantage, which vastly increases their return. In the case of the South East, this relates to the first-mover advantage in information and communications technology. So, the benefits of recruitment and retention will far outweigh the costs. There is a body of evidence which suggests that industries with the benefits mentioned above are prosperous/profitable\textsuperscript{23}, with of course, gradation of prosperity/profitability both intra and inter industries (see for example, Martin, Miller and Mayes, 2003). All the above

\textsuperscript{23}The list is by no means exhaustive.
corroborates with the hypothesis of the IOT.

Second, spillover effects to the regions, emanating from factors such as agglomeration effects, contributes to a region's prosperity. The factors determining a region's prosperity include GDP, earnings and unemployment. In regions with lower unemployment, GDP and earnings, insiders are more likely to be important. With respect to unemployment the rents to be shared are likely to be lower in areas of high unemployment. This corroborates with IOT, EWT and a body of evidence suggesting a negative impact of unemployment on wages and factors such as the RRF, which is a major bargaining consideration. Having said this, even in prosperous regions there will be relatively deprived areas, where firms are less likely to be successful in recruiting labour, since the potential workers' reservation wages are low.

Of course, there are other characteristics that render a region prosperous. For instance, workers would also want to be employed in the prosperous region. Some workers would want an attractive environment and rural areas for quality of life reasons (see Bolton and Chalkley, 1989). Key managers, professional and scientific/technical staff, have been attracted to East Anglia due to its attractive environment.

In addition, regions in southern England are preferred as opposed to other regions, due to its historic and industrial structure. The attraction of highly qualified professionals to climatically favourable regions for quality-of-life reasons is of major importance in understanding current regional dynamics (Keeble, 1991), and indeed, two-thirds of those questioned report that it was the region's perceived attractiveness as a residential place which swayed them to locate in East Anglia (Keeble and Gould, 1985).

As alluded to earlier, the key locational influences overlap with each other, for example, in the existence in particular areas of southern England of significant local concentrations of scientific research activity (this includes the ancient Universities of Cambridge and Oxford and government research laboratories). The majority of these are located in the South East and the provision of capital to firms in southern England by London (Martin, 1992).

I will extremely briefly note the salient features of the degrees of prosperity in each region of the UK covered in this analysis in turn, so as to deepen our understanding of the extent/reason for the importance of the RRF in that region, which underpins my theory portrayed in chapter 5. There is a positive relationship between prosperity and wages, as

---

25 My discussion will be constrained to the periods of this analysis.
expounded in Theorem 1 of chapter 5. My theory is also applicable to the insider-outsider theory, which is investigated in this chapter. Quantitative evidence on comparative regional economic performance is in Table A4.1 – A4.4 in the Appendix. Quantitative evidence on comparative industrial economic performance is in Table A4.5 – A4.6 in the Appendix. I will first focus on the quantitative evidence during the period of my analysis. I will then supplement it briefly with some remarks on the characterisations of regions, which may assist in highlighting the cause of, or provide some background to, some of the differences in economic performances between regions and industries.

Table A4.1 shows unemployment is generally the lowest in the South East for the duration of my period of analysis. East Anglia and the South West regions have the second lowest unemployment during the period of my analysis. East Midlands’ unemployment generally tends to be high. Scotland, Wales and the North generally have the highest unemployment rates during the sample period. Unemployment in the North West region is also relatively high, while unemployment in Yorkshire and the West Midlands is around the UK average. In accordance with the IOT, insiders are less likely to be important in high unemployment regions, whilst insiders will be important in low/lower unemployment regions. Therefore, RRF is unlikely to be important in regions with high unemployment, but is likely to be important in regions of low unemployment.

Table A4.2 shows GDP of the regions. This is provided in Table A4.2. With the base of UK = 100 for the whole of UK, the South East consistently has the highest GDP throughout the period from 1979 to 1996. Consistent data was unavailable for the last year of my analysis. East Anglia also has a relatively high GDP, indeed it has the second highest GDP of the regions analysed and Scotland has fared relatively well in terms of GDP. South West, Yorkshire and Humber and the East Midlands also have a relatively high GDP. The North West and North have comparatively low GDP amongst the UK regions, while Wales has consistently the lowest GDP in the UK throughout the duration of the analysis. All these suggests that insiders are likely to be important in regions like the South East, where GDP is high/the highest. This is because there are more rents available for sharing, insiders would want a share of it, as indicated by IOT. Therefore, RRF is likely to be more important in regions with high GDP and conversely, not so in regions with low/lower GDP, such as Wales.
Another indicator of regional economic performance is earnings. This is given in Table A4.3. The pattern of earnings differentials are very similar to GDP, with the South East having consistently the highest earnings for the duration of my period of analysis. The South West, East Anglia and North West have relatively high earnings during the 18 years of my analysis. Comparatively high earnings are seen in Scotland and the West Midlands. Yorkshire and the North, have relatively lower average earnings, while Wales and the North have consistently the lowest average earnings for the duration of my analysis. In regions where earnings are high, insiders and therefore turnover costs, are more likely to be important. This implies RRF is more likely to be important in these regions. Conversely, in regions with very low earnings, RRF is unlikely to be very important.

A final indicator of regional economic performance is vacancies. This is given in Table A4.4. Although the differentials are not so large, again the South East tends to have the highest vacancy rates for most of the period of analysis, followed by East Anglia and the South West. According to IOT, insiders are likely to be important in these regions, as are turnover costs. This implies again that RRF is likely to be important in these regions.

I now consider the quantitative evidence on comparative industrial economic performance provided in Table A4.5. Employment is a good indicator of industrial economic performance. In the interests of maintaining consistency for the whole span of the analysis and with the regions discussed above, I have categorised some of the industries into groups, in accordance with the availability of statistics.

First, employment growth has been highest in distributive trades and leisure, insurance, banking, finance and business, and scientific and professional services of the groups of industries or industries I analysed. Employment in the miscellaneous services, including motor distribution, in aggregate has increased steadily from 1979/80 to 1989/90 with the exception of 1990/91 and 1991/92, when there was a fall in employment in all industries in Table A4.5. From 1993/94 employment in this industry rose steadily again, and suggests insiders/turnover costs are likely to be important in these industries, and implies RRF is likely to be important in these industries.

In contrast, in manufacturing there has been a steady decline in employment during the period of our analysis, with the exception of 1996/7 when there was a very slight increase. Employment in the construction industry has largely declined, except from 1984/85 to 1987/88,
and then fluctuated for a few years and steadily decreased from 1990/91 to 1996/97. On the whole, employment in this industry has been relatively low. Furthermore, employment in transport and communication has been relatively low throughout the span of my analysis. Therefore, neither insiders nor RRF is likely to be very important in this industry. Overall, in industries where employment is high, insiders/turnover costs are and therefore, RRF is likely to be important. Conversely, in industries where employment is low, turnover costs and RRF is unlikely to be important, in accordance with IOT.

Another important indicator of industrial economic performance is GDP per head. This is given in Table A4.6. Again, in the interests of maintaining consistency for the whole span of the analysis and with the regions discussed above, I follow the same categorisation of industries into groups for employment in accordance to the statistics available. GDP growth per head in the groups of industries analysed has been highest in insurance, banking, finance, business activities, professional and scientific services, distributive trades, leisure, repair, transport, communications, and miscellaneous services including motor distribution. Insurance, banking, finance, scientific and professional services had a slightly lower GDP per head in 1990, and in Construction the GDP was slightly lower in 1983. This suggests insider/turnover costs are likely to important in these industries. Overall, in industries where GDP per head is increasing, so are insiders/turnover costs and therefore, RRF is likely to be important. Conversely, in industries where GDP per head is low, so are turnover costs and RRF is unlikely to be important, in accordance with IOT.

Since some of the characteristics of the region were noted earlier I will note only the most pertinent characteristics. The South East is considered to be an engine of growth, the benefits of which are relayed to other regions. In addition, the South East facilitates more face to face contacts, as noted above (see for example, Stroper and Venables, 2003), which is an essential ingredient for progress and advancement of an establishment's workforce (ibid.), due to its economic and social diversity. Indeed, it also encourages creativity due to the openness of the networks and the liberating force of anonymity (see Florida, 2002). So heavily populated cities, such as London, derive their agglomerate force from the classical network agglomeration efficiencies and power and influence (for example, government headquarters, trade associations and international agencies (Hall, 1998; Scott, 2001).

Vibrant regions are not devoid of difficulties, particularly that of recruitment, and reten-
tion of labour difficulties. These difficulties lead to firms offering higher wages to attract and retain their workforce. London, for example, suffers from severe labour shortages, particularly in engineering (Brown and Walsh, 1991). In addition, growth in the 1990s, particularly in business and banking services, concentrated in central London, exacerbated recruitment difficulties with respect to professional staff (ibid.). This will intensify the need to improve the ability to recruit and retain labour.

Furthermore, the continued polarisation of well-paid employees and those in low paid jobs notwithstanding the unemployed, exacerbates social segregation within the region (Townroe and Martin, 1992). This has led to labour shortages in key sectors, such as construction, repair and new technology occupations, such as business and professional services, banking and finance. In conjunction with the housing shortage (Bover, Muellbauer, and Murphy, 1989) this intensifies the need to improve ability to recruit and retain labour as a very important factor in exerting upward pressure in wage settlements.

East Anglia has grown the fastest in terms of output, employment and population (Townroe and Martin, 1992). Due to the pressures of growth, East Anglia also experienced acute labour shortages, poor infrastructure as in the South East, which inhibits growth (see CBI 2003).

The South West is more prosperous in terms of most indicators of economic performance, such as GDP per head (Townroe and Martin, 1992). It is ranked third, in terms of prosperity in the UK (ibid.). The manufacturing sector in the region exceeded the rest of the UK, since most of the manufacturing is in the sectors of aerospace/defence contracting and other high technology industries (ibid.). In addition, the region also exceeded the rest of the UK in agriculture and private services (ibid.). Due to its strength in high technology, business, professional, scientific services, insurance, banking and finance industries, the South West is relatively prosperous (ibid.).

The diverse nature of the economic base and strong manufacturing sector, with large numbers of small to medium sized firms, implies that East Midlands is one of the most resilient in the UK, in relative terms (ibid.). A large percent of its GDP, which is one of the highest in the UK, emanates from manufacturing industries such as textiles, clothing and tourism (ibid.). Its counterpart, the West Midlands is also prosperous, on account of its striking economic revival from the catastrophic economic collapse, which has contributed
favourably to the wider business revival in this region (Martin, 1992). Birmingham is a major provincial centre for corporate finance and associated services (see Smith, 1991).

Yorkshire and Humberside are also relatively prosperous, due to its expanding service sector, post severe rationalisation and comprehensive restructuring (ibid.). In contrast, the North West, on account of its large and relatively independent sectors in chemicals, aerospace and electrical engineering including computers, employing a variety of skilled workers, is only fairly prosperous (ibid.). The North is less prosperous, due to the adverse impact of the recession in the early 1980s, from which it has made a modest recovery. Similarly, Wales is also only fairly prosperous. This is because although there have been improvements in productivity post transfer to service employment, overall it has particular problems recovering from de-industrialisation.

To recapitulate, the characteristics of a region which render the need-to-improve ability to be a very important factor in exerting upward pressure in wage settlement are regions which are endowed with faster growing industries relative to others. For example, the South East's growth rate is attributed to this factor. But there are other reasons apart from industry mix which determine a region's economic performance. One of these factors is the entrepreneurial activity, since firm creation rate is higher in the South, particularly if the proximity to London is higher, than in the North. The South East and its surrounding regions have built-in advantages for firm creation, which is less evident in the North (Storey and Johnson, 1988).

In addition, the RRF is likely to be very important with a quality workforce. For example, the South East is unique in attracting a disproportionate share of highly skilled and highly educated workers. In addition, the South East enjoys from a virtuous circle where highly skilled workers want to be employed in highly skilled jobs.

According to IOT, see for example, LS (1988c), outsider labour market conditions are relevant to wage-bargaining. There is a considerable body of evidence which suggests that there is a negative relationship between unemployment and wages, for example, Blanchflower and Oswald (1994). Insiders/turnover costs are unlikely to be important in high unemployment regions for a number of reasons, including that proposed by LS. This implies RRF is unlikely to be important. The northern regions have been losing managerial control due to acquisitions by firms located in the South East, which is the chief location of head offices.
Moreover, although there has been a major inflow of branch plants into regions of high un-employment, for example, the North, this does not enhance the need to recruit and retain labour as a major bargaining consideration for two main reasons. First, the branch plants are more susceptible to recessions and company reorganisations than independent plants, since the predators' allegiances are questionable, due to incentive incompatibility problems. Second, branch plants generate fewer spin-offs than independent firms and concentrate on lower level tasks such as processing (Harris, 1988).

Another important determinant of the need to improve the ability to retain and recruit labour as a very important factor in exerting upward pressure in wage determination is the education and skill level of the bargaining groups in establishments. There is a body of evidence which suggests the skill composition of the workers is pertinent in determining wages. Skilled workers are paid more. Reasons for this include their marginal product of labour is higher and the beneficial spillover effects on less skilled workers. Most of the skilled bargaining groups are concentrated in the South East, where the majority of the high technology industries and other services, notably, professional and scientific services and leisure are located. The pattern of demand for skills has changed significantly during the 1990s. The main growth bargaining groups are managers, supervisors (administrators), professional occupations and technical bargaining groups. High technology industries are more likely to have these bargaining groups and since these industries are the most prosperous, this reinforces recruitment and retention as a very important bargaining consideration.

Given the growth in service industries and the decline in the manufacturing sector, the need to improve the ability to recruit and retain labour as a major bargaining consideration will be higher for supervisors, managers, professional/technical and also for support staff, such as clerical staff.

There is a considerable body of evidence which suggests that methods of measuring performance can have an impact on the performance of an organisation, and indeed measurement systems are implemented to attain a number of objectives, see for example, Mannion and Goddard (2002). Further, it has been found that the mode of measuring performance yields efficiencies, including cost savings for the establishment concerned (Stevens, 2005). This suggests that modes of measuring performance can achieve efficiencies and a number of desirable objectives, which ultimately improve organisational success. This indicates that there are
likely to be higher rents to be shared in these industries and may thus lead to greater degrees of insider power. By implication, the RRF is also likely to be important in these industries.

The size of the bargaining group is likely to be a very important determinant of the need to improve the ability to recruit and retain labour as a very important pressure in wage settlements. This is because larger firms pay higher wages and thus are likely to have lower turnover rates (Salop, 1979) and the size of bargaining group is a proxy for firm size (Ingram et al.). Furthermore, since these establishments are more likely to be content with the number of workers, the need to improve the ability to recruit and retain labour is not likely to be such a strong bargaining consideration. In smaller bargaining groups, the need to improve the ability to recruit and retain labour is thus likely to be a major bargaining consideration. There are a number of reasons for this. Due to the continual expansion of industries, such as high technology industries nationwide, establishments need to provide incentives to encourage recruitment and retention of labour. Moreover, the high-technology industries, from the author's preliminary investigation\textsuperscript{26}, are relatively smaller, but growing.

4.3. DATA

The empirical analysis of the importance of recruitment and retention as a major bargaining consideration is based on a pooled cross-sectional time-series survey data on establishments collected by the Confederation of British Industry's (CBI) Pay Databank survey. The CBI dataset is designed to provide a continuous picture of the level of wage settlements and associated details over time. The dataset covers the period from August 1979 to July 1997. I matched these data with unemployment statistics from the Office of National Statistics. The dataset is the longest source of disaggregated establishment level data, which provides information on wage settlement increases and the factors that influence it. The survey collects information on various factors influencing pay\textsuperscript{27}. The Databank consists of a structured

\textsuperscript{26}Available from the author upon request.

\textsuperscript{27}To indicate the robustness of the data, and to illustrate that it has been used in a wide range of analysis, I refer to a few examples of the studies in which it was utilised. Several authors examine wage determination in general, including Gregory, Lobban and Thomson (1985) to assess the general perspective of wage settlements. Gregory, Lobban and Thomson (1986) also use CBI data to incorporate the structure of bargaining and assess its relationship to pay settlement. The pattern, outcome of pay settlements and wage bargaining in general was assessed by Ingram (1991a); and Ingram (1991b) analyse average settlement.

In addition, CBI data has been utilized for a wide variety of aspects of wages including the investigation of the patterns of persistence in UK private manufacturing settlements in Ingram, Wadsworth and Brown (1996). Ingram (1995) examines the association between pay and productivity. Ingram (1991c) also assesses
sample of establishments stratified by industry, region, bargaining groups of varying skills and sizes, and a variety of financial variables. The dataset incorporates a wide range of questions on the establishments' perceptions of the importance of the RRF as a major bargaining consideration. The dataset also comprises details of the main characteristics of the establishments. Furthermore, the dataset also provides information on the factors that determine the percentage increase in pay and evaluates the main characteristics of the establishment's perceptions of the need to improve the RRF as a factor for exerting upward pressures on pay. Moreover, the dataset also contains details of the main characteristics of the establishments over varying economic cycles and the accompanying reactions of the establishments are captured over the 18 years. This, enables a clear assessment of the importance of the establishments need to enhance the ability to recruit and retain as a factor exerting upward pressure on wage settlements. In addition to surveying the perceptions of establishments' of one region, the questionnaires are sent to all the UK regions, to all industries and bargaining groups within each establishment.

The varying economic climate and the accompanying reactions of the establishments are captured over the 18 years, as noted, which permits a clear assessment of the factors that encourage or enable firms to recruit and retain workers, and its consequent impact on firm size. Second, the sample period encompasses varying business climate, with periods of recession and booms over the 18 years and their impact on issues such as factors influencing wage settlements, specifically, whether the establishments considered the need to recruit and retain as a very important factor in exerting an upward pressure on the level of the settlement and the resulting firm size.

There are a number of merits of using pooled cross-sectional time-series data for econometric estimation:

Pooled cross-sectional time-series data can be used to identify changes occurring in a sequential fashion, such as high rates of redundancies during the year 1980/81, shortage of skills and labour shortages in general. This produces more effective data analysis, providing in-depth reasons as to the cause of the occurrence of such events. Second, it enables us to the extent of systematic change at the workplace, following high growth rate in manufacturing industry.

Other studies that utilise CBI data include Brown and Walsh (1991); Metcalf, Wadsworth and Ingram (1993); Ingram, Metcalf, Wadsworth (2001) Drinkwater and Ingram (2003); and Ingram, Rickman and Wadsworth (2003) for their analysis on bargaining power and concessions in Britain over 1979-2000. Furthermore, Gray, Ingram and Rickman (2004), analyse patterns of wage claims, investigate the characteristics of the groups who settle for a zero increase in their basic wage and assess the impact of inflation on settlement.
analyse and make inferences of the dynamics of change, from the bargainers’ perspective, in a continuous fashion. It also allows us to analyse the factors that influence important aspects of employment, wage determination, and recruitment and retention of employees, all of which are crucial to the establishment. Fourth, the availability of multiple observations for a given establishment or at a given time permits us to identify the model accurately. For example, forecasts of manufacturing output using CBI survey data in general is shown to be more accurate than aggregate indicators. For instance, as a disaggregate indicator of manufacturing output growth, it provides a more accurate early estimate of output growth than traditional indicators, see Mitchell, Smith and Weale (2004).

Each year, information is collected from a selection of manufacturing workplaces, which are chosen according to the number of employees, in order to provide a more representative sample. The CBI dataset covers private manufacturing industry, and from 1987 private services. Each establishment is asked to provide information on up to three settlement groups, whose wages are settled, in part, at a local level in conjunction with information on other details pertaining to the settlement and some information on the characteristics of the group submitting the information. Initially, the firm is asked to provide details pertaining to the largest occupational group (LOG), comprising of both a manual and staff group, where feasible. The mean number of responses is 2 groups for every establishment. The annual response rate is approximately 65 per cent. A member of the management bargaining team directly involved with the settlement process completes the questionnaire.

The dataset comprises approximately 1,500 observations per year. Since its inclusion in 1987, the service sector data has constituted one third of the settlement groups, but since the groups are typically larger, they cover approximately two-thirds of all employees in the sample. In addition to determining the rate of increase in wages as a result of the settlement, and any non-wage dimension of the settlement, the CBI dataset provides information on calendar year, month and duration of every settlement. Most settlements occur annually, see Table 4.1. This information is amalgamated into periods comprising a 12 months ‘settlement year’, which traditionally commences in August. The longitudinal nature of the data implies that the same settlement group is pursued over time to ascertain the impact of the need to enhance the ability to recruit/retain employees as a negotiation consideration on the level of wage settlements, amongst an extensive list of other potential pressures influencing the wage
settlement process. The continuity of the data also permits the examination of whether agents are forward-looking, specifically, if agents who have good expectation of future productivity will consider the RRF to be an important wage determinant.

Wage settlement data are preferable to the measured growth in earnings. This is because although the number of settlements coming into effect varies widely between different months of the year, in a pattern which itself appears to oscillate, settlement data alleviate the problem of distortion to the time-series of earnings changes which is implied by the fluctuating numbers receiving pay settlements in any period. Furthermore, by quantifying the settlement outcome directly, the settlement separates the formalised element or wage growth from any influence of the changing incidence of overtime or an unanticipated pay contingent on output.

Moreover, settlement data do not necessitate a plethora of changes in order to render the data amenable for econometric analysis, unlike the major obstacles such as the combination of varying contract lengths and staged increases (occasionally in the form of partial indexation to future changes in a price index) which have confronted other authors, such as Christofides, Swindinsky and Wilton (1980a and 1980b), Sparks and Wilton (1971), Ridell (1979) and Taylor (1983). As noted, Table 4.1 shows that in excess of 90 per cent of the settlements recorded in the Databank have been for precisely 12 months, with both shorter and longer settlements mainly reflecting exceptional changes to the annual settlement data. In addition, although the data are pooled, they do not suffer from pooling effects of the type expounded in Akerlof and Main (1980). That is, for example, for each same sample point some characteristic is measured precisely up to a specified level, but no record is made if the characteristic exceeds that boundary. The CBI Databank is devoid of such a normalisation.

<table>
<thead>
<tr>
<th>TABLE 4.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>SETTLEMENT DURATIONS: 1979-2000</td>
</tr>
<tr>
<td>Percentage of Settlements Lasting 12 months</td>
</tr>
<tr>
<td>1979-80</td>
</tr>
<tr>
<td>1984-85</td>
</tr>
<tr>
<td>1989-90</td>
</tr>
<tr>
<td>1994-95</td>
</tr>
<tr>
<td>1997-98</td>
</tr>
<tr>
<td>1999-00</td>
</tr>
</tbody>
</table>

The question which is of relevance to this chapter is one which asks establishments the factor which they think influenced the level of their settlement/award and which has exerted an upward pressure on the level of the settlement. In particular, how important is the need to improve the ability to recruit/retain labour in exerting an upward pressure on the level
of the settlement. The precise questions asked in the CBI Survey are shown in the Data Appendix.

Details are also collected on other factors which potentially exert pressure on the level of wage settlements, including the effect of high/improving profits, high/improving level of orders, good labour productivity performance, the threat of industrial action and industrial action taken. The factors listed in the questionnaire are grouped into upward and downward pressures. Most of the upward and downward pressures are the reverse of each other. The establishments decide independently and unilaterally on the quantity of factors to cite and the level of importance to attach to them. The options for the level of importance were 'very important', 'fairly important' and 'not important/relevant'. The full list of factors provided in the questionnaire and the percentage of respondents citing each factor as 'very' in each of the 18 years is shown in Table 4.3. The pattern of responses over the 18 years indicates that respondents are selective in their approach when choosing the answers to these questions.

While the responses are perceptions of managers, rendering them subjective and qualitative, the responses are mainly by CBI members. They thus have an incentive to relay accurate information to the CBI so that the organisation can assist them indirectly through the government. Second, the questionnaire format permits some measure of influences, such as the perceived risk of redundancy, bearing in mind its impact on pay. Some other variables, such as establishment-level profits, are in principle observable but in practice may be imperfectly so. The format of the questionnaire permits respondents to report on the measure they consider pertinent.

To summarise, the data takes the form of a series of eighteen sequential annual surveys of a sample of settlement groups, providing the opportunity for a comprehensive pooled cross-sectional time-series econometric analysis. Thus, the CBI's Pay Databank provides a continuous and more reliable account of the factors affecting the need to recruit/retain workers, and those exerting pressures on wage settlements for 18 continuous years.

4.4. PRELIMINARY DATA ANALYSIS OF THE INFLUENCES ON WAGE SETTLEMENTS

The questionnaire asks respondents the amount the settlement will increase or decrease earnings, including bonus, merit payment and so forth, if made part of the settlement of a typical
employee over the 12 months and to choose from an array of factors influencing pay.

Annual nominal and real wage settlement increases from 1979 to 1997 are shown in Figure 4.1. I will first discuss the nominal wage settlements and then how the descriptive analysis is affected by considering real wage settlements. Nominal wage settlement increases are highest in 1979/80. While there have been fluctuations in wage increases since, settlements have not reached the 1979/80 level since then. Real wage increases were have been lowest around 1982 and the real wage increase occured in 1988/89. It is worth noting that when real wage increase is are at its lowest, nominal wage increase is at one of its highest point, for example, during 1981/82. The percentage of nominal and real settlements within each percentage point for the four economic cycles (1979/80 to 1982/83; 1983/84 to 1988/89; 1989/90 to 1992/93 and 1993/94 to 1996/97) are shown in Figures 4.2a–4.5b. This permits identification of the nature of the wage settlements over time and the percentage of firms settling for the percentage point increase. Figure 4.2a shows that most of the nominal wage increases are clustered in the 4 – 8 percentage point range in economic cycle 1, although there is a marked dispersion in wage settlements, while the real wage increases are clustered around the 2.5 percentage point range in economic cycle 1. Nominal settlements are high during the earlier years around 1979/80, since this was a period of high inflation. In cycle 2, nominal wage increases are clustered around the 6 percentage point, while real wage increases are clustered around the 2.5 percentage point. Bearing in mind this was a boom period, considerably more establishments settle at these nominal rates, due to increased firm creation, than was the case in economic cycle 1. This is consistent with expectations, since there were an exceptional amount of establishment closures in cycle 1. In cycle 3, there is a more uniform distribution of nominal wage settlements, while real wage settlements are clustered around 1.3 percentage points as shown in Figure 4.4b.

Again in cycle 4 most of the nominal wage increases are clustered around the 3 per cent level rate, as can be seen from Figure 4.5a. The lower nominal settlement rate is attributed to the government’s concerted effort at sustaining the inflation rate. Again, there are far more establishments in operation, due to the creation of firms and foreign direct investment, since this is again a period of recovery. The real wage settlements are clustered around the 0.8 per cent level rate, as can be seen from Figure 4.5b. This is expected as this is predominantly a period of low inflation.
Figure 4.1. – Annual Nominal and Real Wage Settlement Increases, 1979/80 – 96/97

Figure 4.2a. – Annual Nominal Wage Settlements in Economic Cycle 1: 1979/80 – 1982/83
Figure 4.2b. Annual Real Wage Settlements in Economic Cycle 1: 1979/80 – 1982/83

Figure 4.3a. Annual Nominal Wage Settlements in Economic Cycle 2: 1983/84 – 1988/89
The summary statistics of the increase in nominal and real wage settlements are shown in Table 4.2. The mean of the nominal settlements during the inflationary period of 1979 – 80 was highest at 16.2 per cent, but since then there has been a steady decline in the mean of the nominal percentage settlements, with successive governments attempting to curb inflation. From the initial high level of 16.2 per cent in 1979 – 80, nominal settlements fell sharply from July 1980 until December 1980, when they were about 8.5 per cent. The average level of nominal pay increases fell steadily again to about 5 per cent in the mid 1980s. Subsequently, the average settlements rose progressively from 5 per cent to about 9 per cent in the early 1990s. The mean of the real wage settlements was at its lowest following the period of high inflation of 1979 – 80. The low real wage settlements increased steadily until 1983 – 84. After this period, real wage settlements fluctuated.

The data shows a clear cyclical variation in general, which is reflected in the choice of the factors deemed to exert an upward or downward pressure on both wage settlements.
Figure 4.4a. – Annual Nominal Wage Settlements in Economic Cycle 3: 1989/90 – 1992/93

Figure 4.4b. – Annual Real Wage Settlements in Economic Cycle 3: 1989/90 – 1992/93
Moreover, Table 4.2 also shows the percentage of establishments settling at zero increase in settlements. Zero settlements were highest during the general recessionary period of the early 1990s, peaking in 1992–93, and were lowest in 1988/89. From 1989/90 to 1992/93, there was
a marked increase in zero settlements. The highest was in 1992 – 93, when there were 19.7 per cent of zero settlements, after rising steadily from 1989/90 from a rate of 1.1 per cent at the beginning of the recession. In the boom period from 1993/94 to 1996/97, the percentage of zero settlements dropped from 8.1 per cent in 1993/94 to 6.2 per cent in 1996/97.

There is a negative correlation between the average increase in nominal wage settlements and zero settlements, which reflects the economic cycles.

<table>
<thead>
<tr>
<th>Year</th>
<th>Nominal Mean</th>
<th>Real Mean</th>
<th>Nominal Zero settlements (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1979-80</td>
<td>16.2 (4.2)</td>
<td>-2.7 (4.5)</td>
<td>0.9</td>
</tr>
<tr>
<td>1980-81</td>
<td>9.0 (3.1)</td>
<td>-4.1 (3.0)</td>
<td>1.0</td>
</tr>
<tr>
<td>1981-82</td>
<td>7.0 (2.5)</td>
<td>-3.6 (2.8)</td>
<td>3.0</td>
</tr>
<tr>
<td>1982-83</td>
<td>6.0 (2.2)</td>
<td>0.3 (2.4)</td>
<td>5.1</td>
</tr>
<tr>
<td>1983-84</td>
<td>6.0 (2.0)</td>
<td>1.0 (2.0)</td>
<td>1.6</td>
</tr>
<tr>
<td>1984-85</td>
<td>6.5 (1.7)</td>
<td>0.6 (1.9)</td>
<td>0.4</td>
</tr>
<tr>
<td>1985-86</td>
<td>6.1 (1.7)</td>
<td>1.9 (2.2)</td>
<td>1.6</td>
</tr>
<tr>
<td>1986-87</td>
<td>5.2 (1.6)</td>
<td>1.3 (1.6)</td>
<td>3.0</td>
</tr>
<tr>
<td>1987-88</td>
<td>6.1 (1.9)</td>
<td>2.1 (1.9)</td>
<td>1.0</td>
</tr>
<tr>
<td>1988-89</td>
<td>7.6 (2.1)</td>
<td>0.0 (2.0)</td>
<td>0.3</td>
</tr>
<tr>
<td>1989-90</td>
<td>8.7 (2.4)</td>
<td>0.0 (2.5)</td>
<td>1.1</td>
</tr>
<tr>
<td>1990-91</td>
<td>7.3 (3.1)</td>
<td>-0.5 (2.9)</td>
<td>8.3</td>
</tr>
<tr>
<td>1991-92</td>
<td>4.3 (2.2)</td>
<td>0.2 (2.2)</td>
<td>11.7</td>
</tr>
<tr>
<td>1992-93</td>
<td>2.7 (1.9)</td>
<td>0.9 (1.9)</td>
<td>19.7</td>
</tr>
<tr>
<td>1993-94</td>
<td>2.8 (1.6)</td>
<td>0.3 (1.6)</td>
<td>8.1</td>
</tr>
<tr>
<td>1994-95</td>
<td>3.4 (1.9)</td>
<td>0.2 (2.0)</td>
<td>7.5</td>
</tr>
<tr>
<td>1995-96</td>
<td>3.5 (1.6)</td>
<td>0.8 (1.7)</td>
<td>6.2</td>
</tr>
<tr>
<td>1996-97</td>
<td>3.3 (1.5)</td>
<td>0.6 (1.6)</td>
<td>6.2</td>
</tr>
</tbody>
</table>

*Standard deviations are in parentheses.

We now turn to analysing the factors that influence nominal wage settlements, focusing particularly on the need to improve the ability to recruit/retain labour as a very important factor in the upward pressure on the level of settlements from 1979 – 1997.

One of the main elements in the Databank is the reporting of the managers’ perceptions of the relative importance of various factors which have an impact on wage-bargaining. The factor ratings reflect the measure of the mean level of perception among the managers of the importance of each factor. The ratings are given by a member of the negotiating team, who is knowledgeable and who is responsible precisely for interpreting and balancing the various factors that have an impact on the settlement process.

The factors listed in the questionnaire are grouped into upwards, downwards and 'other' factors, which comprises comparability factors. For our purposes, we will focus on the former two factors. Most of the upwards and downwards factors are the converse of each other. Table 4.3 provides, for each factor, the proportion of bargaining groups citing a ‘very important’ rating over the 18 years.
The table is interesting for both the relative importance attached to the different factors and for changes in these factors over the different cycles. The economic cycle has an impact on the frequency with which the perceived pressures are cited by the employers. Both upward and downward pressures had an impact on the size of the wage change and are more important during the periods 1979/80 – 1982/83 and 1988/89 – 1989/90, a recessionary and an expansionary period, respectively. Pressure from the need to recruit or retain workers fell dramatically in 1980/81. It declined in this recessionary period and recovered from the boom period of 1983/84, and has been steadily increasing until 1989/97. The need to improve the ability to recruit and retain more workers was highest during the latter period and lowest during most of the former period.

The cost of living factor was strong initially; indeed it had the highest rating, both absolutely and relative to other factors. But with the diminishing rate of inflation this rating declined. Indeed, cost of living does not have an important impact on wages during periods of low inflation, see Hamermesh (1970). This is confirmed by Ingram, Wadsworth and Brown (1999), where it was found that the cost of living did not have a noticeable effect on settlements.

In order to provide an empirical treatment of the importance of the need to recruit and retain labour as a bargaining consideration, in the context of rent-sharing theories, I shall abstract from the situation to give an economic analysis in terms of which to develop the econometric model which appears in the next section.

The upward pressures of profits, initially of very limited influence in the recessionary period from 1979/80 – 1982/83, was equally of limited importance in the next recessionary period from 1989/90 – 1992/93. In economic cycles 1 and 3 the establishments were also more concerned about remaining a viable concern, but particularly so in the former economic cycle. The business climate, such as relatively poor levels of education, training and infrastructure (CBI, 2003), may also contribute to the weak impact of this factor. The adverse impact of this factor is felt more potently during a recessionary period, whilst the pressure from the ability to pass on wage increases in prices has been weak for the entire period. The pressure from industrial action, taken or threatened, was perceived to be of very little significance. Overall, this is expected since the Thatcher era, when the unions’ power were severely curtailed. The pressure for good labour productivity has been fairly important throughout the span of this
analysis. The pressure of high or imposing level of orders has only fairly limited importance.

Most of the principal downward pressures have been consistently highly rated, rising to a peak in the second half of 1980/81, after which these pressures declined but did not restore to the levels seen in 1980/81. Throughout most of the period, the downward factors receive the highest ratings, even higher than the cost-of-living ratings. The product market pressures from profit and prices have consistently outweighed the risk of redundancy as a downward pressure on settlements. The risk of redundancy pressure has also an opposite impact to the RRF pressures, since when one is high, the other is low, and vice versa. For example, risk of redundancy was highest in 1980/81; that was also precisely when the RRF was of least importance.

The pressures which the bargainers considered to have influenced the settlement are systematically related to the level of wage increase settled. High settlers are systematically less affected by the three principal downward pressures: low profits, inability to pass prices and the risk of redundancy. In addition, they have been strongly influenced by upward pressures, particularly high profits and the need to recruit or retain labour. Low settlers demonstrate almost precisely the reverse pattern, and they are strongly influenced by the downward pressures (Gregory, Lobban and Thomson, 1985).

Overall, the economic cycles dictate the impact of each factor on wage settlements. Moreover, among upward pressures during the latter periods such as from 1994/95 to 1996/97, it is the recruitment and retention factors, that have shown a steady rise outweighing the upward pressure of profits, which is the most important, with the exception of the cost of living. For reasons stated above, the cost of living is no longer considered a particularly important influence on wage settlements, due to inflation not being important.

Further dimensions of the nominal settlement pattern are reported in Table A4.7, which shows the regional and industrial influences on the percentage of respondents citing retention and recruitment factor 'very important' in exerting pressure on the level of wage settlements.

The RRF is particularly very important from around 1987/88 to 1989/90 in retailing and distribution, insurance, banking and finance, business and professional services. The RRF is also particularly very important in most manufacturing industries during this period. Similarly, the RRF is also particularly, very important during these periods in most regions,
<table>
<thead>
<tr>
<th>Factors exerting an Upward pressure on level of wage Settlements</th>
<th>70-72</th>
<th>73-74</th>
<th>75-76</th>
<th>77-78</th>
<th>79-80</th>
<th>81-82</th>
<th>83-84</th>
<th>85-86</th>
<th>87-88</th>
<th>89-90</th>
<th>91-92</th>
<th>93-94</th>
<th>95-96</th>
<th>97-98</th>
</tr>
</thead>
<tbody>
<tr>
<td>High or improving establishment/company profits</td>
<td>11</td>
<td>11</td>
<td>16</td>
<td>19</td>
<td>21</td>
<td>23</td>
<td>20</td>
<td>20</td>
<td>24</td>
<td>19</td>
<td>12</td>
<td>10</td>
<td>12</td>
<td>18</td>
</tr>
<tr>
<td>Management able to pass on substantial part of pay increases in prices</td>
<td>6</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>A need to improve ability to recruit/retain labour</td>
<td>22</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>9</td>
<td>12</td>
<td>13</td>
<td>13</td>
<td>27</td>
<td>33</td>
<td>33</td>
<td>17</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>Cost of living increases</td>
<td>60</td>
<td>48</td>
<td>45</td>
<td>37</td>
<td>40</td>
<td>45</td>
<td>31</td>
<td>26</td>
<td>23</td>
<td>58</td>
<td>67</td>
<td>50</td>
<td>29</td>
<td>19</td>
</tr>
<tr>
<td>Industrial action threatened</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Industrial action taken</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>High or improving level of orders</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>8</td>
<td>11</td>
<td>13</td>
<td>10</td>
<td>6</td>
<td>6</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>Good labour productivity performance</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>14</td>
<td>14</td>
<td>18</td>
<td>15</td>
<td>14</td>
<td>13</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Factors exerting downward pressure on level of pay settlements</td>
<td>45</td>
<td>62</td>
<td>60</td>
<td>53</td>
<td>46</td>
<td>41</td>
<td>27</td>
<td>26</td>
<td>19</td>
<td>18</td>
<td>26</td>
<td>45</td>
<td>49</td>
<td>43</td>
</tr>
<tr>
<td>Low or deteriorating establishment/company Profits</td>
<td>38</td>
<td>56</td>
<td>52</td>
<td>52</td>
<td>51</td>
<td>43</td>
<td>41</td>
<td>42</td>
<td>34</td>
<td>34</td>
<td>43</td>
<td>48</td>
<td>48</td>
<td>41</td>
</tr>
<tr>
<td>Management unable to pass on a substantial part of pay increase in prices</td>
<td>20</td>
<td>43</td>
<td>35</td>
<td>27</td>
<td>21</td>
<td>18</td>
<td>15</td>
<td>16</td>
<td>10</td>
<td>9</td>
<td>11</td>
<td>28</td>
<td>29</td>
<td>23</td>
</tr>
<tr>
<td>Risk of redundancy if large pay</td>
<td>2</td>
<td>-</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Development of employee involvement policies</td>
<td>2</td>
<td>-</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Low or deteriorating level of orders</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>14</td>
<td>13</td>
<td>9</td>
<td>8</td>
<td>15</td>
<td>34</td>
<td>34</td>
<td>29</td>
<td>14</td>
</tr>
<tr>
<td>Poor labour productivity performance</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>33</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>5</td>
</tr>
</tbody>
</table>

a Available from 1985-6.

b Not available in 1980-1.
but more so in the South East, with East Anglia a close second.

Figure 4.6 traces the average level of the RRF as a very important factor in exerting an upward pressure on nominal wage settlement, average nominal and real wage settlements and unemployment rates over the 18 year period. It is worth noting, for example, from 1983/84 to 1989/90 the upward pressure from the need to improve the ability to recruit/retain labour was higher than the previous years, since the mid 1980s to 1990 reflected the general recovery of the economy. There appears to be a similarity in the movement of the RRF being very important and the average nominal wage increase, and a negative correlation between both of these and unemployment. For example, in and around March 1990 both the average increase in the nominal wage settlement and the RRF being very important was at its highest, whilst unemployment was at one of its lowest rates.

Post 1990, the average of the RRF declines progressively and the lowest average of the RRF is in 1993 – 1994. The average increase in nominal settlement was also at its lowest in 1992 – 1994. During the recessionary period between 1980/81 and 1982/83, unemployment was high, whilst the importance of the RRF was relatively low, which is consistent with expectations. Between 1988/89 and 1990/91 the importance of the RRF is very high, whilst unemployment is low, thus highlighting the increasing need for labour, in the growing service sector of banking, insurance, finance, business, professional and scientific services, in conjunction with the fact there were acute skill shortages, especially in engineering, and labour shortages generally. Again during the period from 1994/95 – 96/97, the RRF became increasingly important, whilst unemployment was steadily falling. This, highlights the fact that during upswings the RRF is very important, whilst unemployment is steadily falling.

With respect to real wage increases there appears to be a similarity in the movement of the average unemployment rate and the average real wage increase, and a negative correlation between the RRF and the latter and also with the mean of the increase in nominal wage settlements. For example, in and around March 1990 both the average increase in real wage settlement and the unemployment rate were at their lowest, whilst there is a lag of the RRF after real wage increases and also the mean of the increase in nominal wage settlements is at one of its highest rates. In the early 1980s the real wages were high compared to nominal wages, since it was a blip period due to high inflation. In addition, during this period the nominal wages matches the RRF. Post 1990, the real wage settlements does not show a
marked increase at all, in fact, they only increased slightly. This is unsurprising, due to the period from around 1991 – 1997 being one of low inflation generally.

Table 4.4 provides the summary statistics of the importance of the recruitment and retention of labour as a major bargaining consideration in the UK over 18 continuous years from 1979/80 to 1996/97. In particular it shows the percentage of establishments reporting that the need to improve the ability to recruit/retain labour as a very, fairly, and not important factor in exerting upward pressure in wage settlements. It can be seen from the table that there are some clear differences in the responses given by establishments for each year. It shows that this influence exerted a great deal of upward pressure in 1989/90 and 1990/91 and as we have seen from Figure 4.1 the nominal settlements were also high in this period. Insider influences are important in this period.

We will consider all three types of responders in turn. With respect to the establishments who considered the RRF is important: the average nominal settlement in 1979 – 80 was the highest during our period of analysis for all three categories. Overall the statistics are similar for establishments who responded the RRF is very, fairly and not important, although the average of the latter two categories are slightly lower each year. It is worth noting that the average nominal wage settlements for each category are lower over time generally; this is attributed to successive governments attempts to reduce inflation. But for the establishments who have reported the RRF is not important, the average nominal settlements for every year is considerably lower. For instance, in 1987/88 the average was 6.8 percent for establishments who consider the RRF is very important, but for establishments who consider the RRF is fairly and not important it is 6.1 and 5.7 respectively. In 1990/91 for establishments who reported the RRF is very important, the average is 8.5 percent, whereas the average for establishments who reported the RRF is not important is 6.5. The findings for 1990/91 are in line with the acute skill shortage during the period when the RRF was high. The results of 1987/88 also conform with acute skill shortages at the time in some engineering companies. It was approximately this time, in 1989, for example, British Airways were awarding 15 per cent increase in wages, to attract qualified engineering staff and to curb turnover rates which increased from 2 to 12 per cent in a year, as reported in Brown and Walsh (1991). In 1992 – 93 and 1993 – 94, the nominal wage settlements were less than 4 per cent for establishments who consider the RRF is very important, for establishments who consider the RRF is fairly
important the figure was less than 3.5 per cent and for establishments who consider the RRF is not important, the figure was less than 3 per cent.

![Figure 4.6. Average Nominal and Real Wage Settlement Increases, Recruitment/Retention as a Very Important Factor and Unemployment Rates: 1979/80 – 1996/97](image)

**TABLE 4.4**

**DESCRIPTIVE STATISTICS FOR THE IMPORTANCE OF THE RECRUITMENT/RETENTION OF LABOUR IN EXERTING UPWARD PRESSURE ON THE LEVEL OF SETTLEMENTS AND AVERAGE WAGE SETTLEMENTS: 1979/80-1996/97**

<table>
<thead>
<tr>
<th>Year</th>
<th>N</th>
<th>Mean</th>
<th>N</th>
<th>Mean</th>
<th>N</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>1979-80</td>
<td>208</td>
<td>16.4</td>
<td>277</td>
<td>16.9</td>
<td>444</td>
<td>15.6</td>
</tr>
<tr>
<td>1980-81</td>
<td>99</td>
<td>10.0</td>
<td>266</td>
<td>9.6</td>
<td>992</td>
<td>8.7</td>
</tr>
<tr>
<td>1981-82</td>
<td>84</td>
<td>7.9</td>
<td>249</td>
<td>7.5</td>
<td>1097</td>
<td>6.8</td>
</tr>
<tr>
<td>1982-83</td>
<td>69</td>
<td>7.0</td>
<td>239</td>
<td>6.1</td>
<td>1000</td>
<td>5.6</td>
</tr>
<tr>
<td>1983-84</td>
<td>127</td>
<td>6.6</td>
<td>322</td>
<td>6.4</td>
<td>912</td>
<td>5.8</td>
</tr>
<tr>
<td>1984-85</td>
<td>155</td>
<td>7.1</td>
<td>328</td>
<td>6.6</td>
<td>767</td>
<td>6.3</td>
</tr>
<tr>
<td>1985-86</td>
<td>147</td>
<td>6.6</td>
<td>296</td>
<td>6.4</td>
<td>713</td>
<td>5.9</td>
</tr>
<tr>
<td>1986-87</td>
<td>158</td>
<td>5.6</td>
<td>307</td>
<td>5.4</td>
<td>709</td>
<td>5.1</td>
</tr>
<tr>
<td>1987-88</td>
<td>336</td>
<td>6.8</td>
<td>364</td>
<td>6.1</td>
<td>568</td>
<td>5.7</td>
</tr>
<tr>
<td>1988-89</td>
<td>391</td>
<td>8.2</td>
<td>395</td>
<td>7.5</td>
<td>398</td>
<td>7.0</td>
</tr>
<tr>
<td>1989-90</td>
<td>476</td>
<td>9.1</td>
<td>486</td>
<td>8.8</td>
<td>505</td>
<td>8.1</td>
</tr>
<tr>
<td>1990-91</td>
<td>243</td>
<td>8.5</td>
<td>440</td>
<td>8.1</td>
<td>741</td>
<td>6.5</td>
</tr>
<tr>
<td>1991-92</td>
<td>174</td>
<td>5.6</td>
<td>401</td>
<td>4.9</td>
<td>1027</td>
<td>3.9</td>
</tr>
<tr>
<td>1992-93</td>
<td>159</td>
<td>3.7</td>
<td>375</td>
<td>3.4</td>
<td>1128</td>
<td>2.3</td>
</tr>
<tr>
<td>1993-94</td>
<td>213</td>
<td>3.7</td>
<td>452</td>
<td>3.0</td>
<td>1008</td>
<td>2.5</td>
</tr>
<tr>
<td>1994-95</td>
<td>285</td>
<td>4.2</td>
<td>519</td>
<td>3.5</td>
<td>822</td>
<td>3.0</td>
</tr>
<tr>
<td>1995-96</td>
<td>349</td>
<td>4.1</td>
<td>532</td>
<td>3.7</td>
<td>868</td>
<td>3.2</td>
</tr>
<tr>
<td>1996-97b</td>
<td>357</td>
<td>3.9</td>
<td>445</td>
<td>3.4</td>
<td>598</td>
<td>2.9</td>
</tr>
</tbody>
</table>

*Standard deviations are in parentheses.
*Unavailable from 1997-98.

My earlier chapter 3 has empirically established agents are forward-looking. Figure 4.7
depicts the average expected productivity increase throughout the 10 years. It is worth noting that the mean of the expected productivity was at its lowest points in 1995/96 and Figure 4.6 also shows that the mean of the increase in nominal wage settlements in 1994/95 was low and was also at one of its lowest in 1995/96. This, reinforces my empirical results in chapter 3 and my theoretical analysis in chapter 5, that wages bargained will be a reflection of the future financial performance. That is, since the expected productivity was expected to be low in 1995/96, the wage was also correspondingly low. Another example is that when expected productivity was at its highest in 1990/91, the mean of the increase in nominal wage settlement was at its highest in 1989/90. As expected, both the expected productivity increase/decrease has been fluctuating just as the mean of the nominal wage settlements. The crucial point to note is that there is a correlation between these two factors.

Table 4.5 shows the establishments expectations’ of productivity in the next 12 months,

Figure 4.7.- Expectation of productivity to increase or decrease in the next 12 months with average nominal wage settlements. The table also shows nominal settlements from expected productivity levels of 0 – 5, and greater than or equal to 10 per cent respectively. It is worth noting that the number of establishments expecting 0 – 5 per cent increases in productivity is very high from 1987 to 1991. This is due to more establishments in operation and productivity growth was around 0 to 5 per cent for majority of the establishments. From

---

28 Due to data constraints it is only available for these years.
the recessionary period from around 1990/91 to 1992/93 these 0 to 5 per cent increase in

<table>
<thead>
<tr>
<th>Year</th>
<th>N</th>
<th>Mean*</th>
<th>N</th>
<th>Mean*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1987/88</td>
<td>299</td>
<td>6.1 (1.4)</td>
<td>124</td>
<td>7.4 (2.7)</td>
</tr>
<tr>
<td>1988/89</td>
<td>271</td>
<td>7.2 (2.0)</td>
<td>120</td>
<td>7.5 (1.5)</td>
</tr>
<tr>
<td>1989/90</td>
<td>327</td>
<td>8.6 (1.9)</td>
<td>162</td>
<td>9.7 (3.7)</td>
</tr>
<tr>
<td>1990/91</td>
<td>255</td>
<td>7.1 (2.3)</td>
<td>110</td>
<td>7.2 (2.8)</td>
</tr>
<tr>
<td>1991/92</td>
<td>329</td>
<td>4.7 (1.6)</td>
<td>154</td>
<td>4.8 (3.0)</td>
</tr>
<tr>
<td>1992/93</td>
<td>340</td>
<td>2.9 (1.4)</td>
<td>151</td>
<td>4.7 (2.6)</td>
</tr>
<tr>
<td>1993/94</td>
<td>383</td>
<td>3.0 (1.2)</td>
<td>123</td>
<td>5.6 (2.0)</td>
</tr>
<tr>
<td>1994/95</td>
<td>363</td>
<td>3.7 (1.5)</td>
<td>141</td>
<td>3.7 (2.8)</td>
</tr>
<tr>
<td>1995/96</td>
<td>372</td>
<td>3.5 (1.0)</td>
<td>124</td>
<td>4.1 (2.1)</td>
</tr>
<tr>
<td>1996/97</td>
<td>311</td>
<td>3.1 (1.1)</td>
<td>108</td>
<td>3.3 (2.0)</td>
</tr>
</tbody>
</table>

*Unavailable until 1987.
*I have provided the average expected productivity rate (i.e., authors own calculations), for observations involving the first, second and third frequency, annually.
*Standard deviations are given in parentheses.

expected productivity have been declining since there have been considerable numbers of redundancies, which occurred around 1990/91 to 1993. As can be seen from Table 4.5, nominal wage settlements for those establishments with 0 to 5 per cent productivity expectations increased steadily in the recovery period from 1993/94 to 1995/96.

We can see a similar pattern of nominal wage settlements for establishments with an increase in expected productivity of greater than or equal to 10 per cent. But, as can be seen, the sample size is considerably smaller. Nonetheless, average nominal wage settlement increases were higher in this category, with the exception of 1994/95 when they were equal. This again shows the importance of expected productivity levels (a forward-looking variable) on nominal wage settlements.

Figure 4.7 confirms that expected productivity has been fluctuating from 1987, although it has generally been on an upward trend. However, expected productivity did dip towards the end of 1996. The general trend may be attributed to the economy recovering from the recessionary period and labour shortages.

The CBI dataset currently provides 18 years of data enlightening wage negotiations at the bargaining group level and the influence of recruitment and retention as a major negotiation consideration. The period from 1979 – 1997, incorporating four economic cycles, is an especially interesting period to study, not just for the period, but for its colourful nature. First, the country went through a major recession, when some regions of the UK underwent major transformation, particularly the traditional manufacturing regions such as the North
East, the North and Wales. The other recession, in economic cycle 3, mainly affected the service sectors. The period also has two boom periods, which clearly had different and very favourable impacts on the whole, and on the need to recruit and retain labour as a major bargaining consideration. More prosperous establishments are more likely to consider the need to recruit and retain labour as a major negotiation consideration. Hence, it follows that more successful establishments pay higher wages and are larger. There is a body of evidence which suggests that large firms pay higher wages, see for example Krueger and Summers (1988).

4.5. MODELLING THE IMPORTANCE OF THE RECRUITMENT AND RETENTION OF LABOUR

Establishments are presented with a scale that requires them to state which of the categories best describes their perception of RRF; this renders the observed dependent variable to be categorical and ordered. Therefore an ordered probit model is estimated, which has been in wide use as a framework for analysing such responses. The ordered response model was first developed by Aitchison and Silvey (1957). McKelvey and Zavoina (1975) wrote the computer program NPROBIT based on the Newton-Raphson iteration method which facilitated the production of their output.

The ordered probit model of the importance of the need to improve the ability to recruit/retain labour as a factor in exerting upward pressure on wage settlements (conditional on explanatory variables \(x\)) can be derived from a latent variable model. The observed categorical dependent variable is related to an establishment's underlying importance of the RRF as follows:

\[ y_i^* = x_i \beta + \varepsilon_i \sim N(0,1) \] (1)

where \(y_i^*\) is an unobserved variable indicating an establishment's perception of the RRF. It is assumed that \(\varepsilon_i\) is normally and identically distributed. Since \(y_i^*\) is only observed ordinally, the scale of the \(y_i^*\) is then normalised by fixing the variance of \(\varepsilon_i\). The establishments have their own perceptions, which depend on certain measurable factors \(x_i\) which are the explanatory variables comprising of a set of establishment characteristics, and its associated
vector of coefficients $\beta$, which is $K \times 1$ and certain unobservable factors $\varepsilon$. The latent dependent variable is associated to the establishment’s underlying RRF as follows, which we do observe:

$$
\begin{align*}
y_i &= 1 \text{ if } y_i^* \leq \mu_1 \\
y_i &= 2 \text{ if } \mu_1 < y_i^* \leq \mu_2 \\
y_i &= 3 \text{ if } \mu_2 < y_i^* \leq \mu_3
\end{align*}
$$

(2)

where the $\mu$’s are unknown parameters to be estimated with $\beta$. We then have the following implied probabilities:

$$
\begin{align*}
\text{Prob}(y_i = 1|x_i) &= P\{y_i^* \leq \mu_1|x_i\} = \Phi(-x_i^*\beta) \\
\text{Prob}(y_i = 2|x_i) &= P\{y_i^* \geq \mu_2|x_i\} = \Phi(\mu_2 - x_i^*\beta) - \Phi(-x_i^*\beta) \\
\text{Prob}(y_i = 3|x_i) &= 1 - \Phi(\mu_2 - x_i^*\beta)
\end{align*}
$$

(3)

where $\Phi$ is the cumulative standard normal distribution.

For all the probabilities in (2) to be positive, we must have

$$
\mu_1 < \mu_2 < \mu_3
$$

(4)

The interpretation of the $\beta$ coefficients is in terms of the latent variable model (for example, a positive $\beta$ implies that the corresponding variable increases the importance of an establishment’s need to improve the ability to recruit/retain labour as a factor exerting an upward pressure on level of settlement), or in terms of its effect on the respective probabilities. For instance, if in the above model, $\beta_k$ is positive, this implies that the latent variable $y_i^*$ increases if $x_{ik}$ increases. Then, the probability that $y_i = 3$ will increase, whereas $y_i = 1$ will decrease. The probability that $y_i = 2$ may increase or decrease.

Maximum likelihood methods are used to obtain estimators of the population parameters of the model. Since the log likelihood function is a function of $\beta_k$ and the $\mu$’s, we have to locate a maximum to the log likelihood function, subject to the constraint in equation (4). We then solve this constrained maximisation problem and then obtain the partial derivatives.
of the log likelihood function with respect to the unknown parameters in conjunction with
the matrix of second partials. To obtain the Maximum Likelihood Estimator, the equation of
the first partial derivatives are then set to zero and solved for the unknowns as in McKelvey
and Zavoina (1975).

To ensure that the solution is a maximum, the matrix of second partials evaluated at the
solution point should be negative definite. It has been shown by Pratt (1981) in the case
of a simple probit model that this is the case. The equations generated by the first partial
derivative are non-linear, which implies they cannot be solved by the standard methods
for simultaneous linear equations. But an iterative method of solution, the Newton Raphson
method is used. We use Stata 8, which uses the Newton Raphson algorithm to iterate towards
a root of the first partial derivative and the matrix of second partials. Pratt (1981) has
shown that the Newton-Raphson method will converge to a global maximum. The resulting
estimates of μ's and β's are consistent, asymptotically efficient and their asymptotic sampling
distribution known.

The equation generated by the first partial derivative is then solved iteratively, using the
Newton-Raphson method. The parameters μ and β are estimated by maximum likelihood,
which maximises the joint probability of obtaining the observed values. The convergence of
the iterative procedure has consistently converged rapidly, with convergence taking about
five iterations for the models estimated in this chapter.

Marginal effects are interpreted as a change in the probability that the RRF being very
important equals a given level, per unit change in independent variable, conditional on other
covariates. So, for the above probabilities in (3), the marginal effects of changes in the
explanatory variables are, as in Greene, for example

\[
\frac{\partial \text{Prob}(y = 1|x_i) }{\partial x_{ik}} = \Phi(-x'_i \beta) \beta
\]

\[
\frac{\partial \text{Prob}(y = 2|x_i) }{\partial x_{ik}} = \Phi(-x'_i \beta) - \Phi(\mu_1 - x'_i \beta) \beta
\]

\[
\frac{\partial \text{Prob}(y = 3|x_i) }{\partial x_{ik}} = \Phi(\mu_2 - x'_i \beta) \beta
\]

Prior to analysing the results it is useful to examine the descriptive statistics for the explana-
tory variables used in the econometric models. Table 4.6 reports the descriptive statistics for
Specifications 1 and 2. Two different specifications are estimated because some variables are not available in all years. As can be seen from the statistics, Table 4.6 illustrates that a wide range of industries are represented in my analysis.

In terms of regional variation, Table 4.6 illustrates that a high percentage of establishments are from the South East. For example, around a quarter of the establishments are located in the South East. Establishments from other regions of the UK are also fairly well represented. The bargaining group has been included to capture whether establishments with a specific type or specific types of bargaining group consider the RRF is very important. The expected productivity variable has been included to capture forward-looking effects to show that recruitment/retention will follow the pay increase pattern and to generally gain a deeper understanding of the characteristics of those who consider the RRF as an important factor. This investigates whether firms are more likely to undertake more recruitment/retention activity, if expected productivity is higher in the near future.

It is natural to consider the size of the firm, because the importance of turnover costs in the IOT suggests recruitment and retention activity is likely to be important to firms of most sizes29, if financial viability permits. If we incorporate this factor into our model, then most bargaining group size are more likely to consider RRF to be important. Since there is not a satisfactory variable for firm size in the dataset, bargaining group size is used as a proxy for the size of the establishment. There is a correlation between firm size and the size of bargaining unit, and it is a reasonable proxy for firm size. This was inferred to be the case in Ingram, Metcalf and Wadsworth (1993).

Acceptance by employees of the introduction of a new technology as part of the settlement has been included, because of possible capital-labour complementarities or substitution. Alternatively, the RRF may be lower if there is capital substitution. If the firm is fairly prosperous, then such acceptance should reflect the importance of the RRF. Similarly, the method the establishment uses to measure performance is included to gain further insight into the importance that recruiting/retaining has on exerting upward pressure on wage settlements. For example, the method of measuring performance by the value of output per person employed is utilised mainly by business and scientific services30. The mean of these dummy variables do not naturally sum to one by the conventional method.

29 Given that Lindbeck and Snower (1988c) stress that workers can bargain individually as mentioned earlier.
30 Preliminary analysis by the author on CBI dataset has confirmed this. Details available upon request.
TABLE 4.6
DESCRIPTIVE STATISTICS FOR EXPLANATORY VARIABLES IN THE CBI PAY DATABASE

<table>
<thead>
<tr>
<th>Variable</th>
<th>Specification 1</th>
<th>Specification 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sector</strong></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Food, Drink and Tobacco</td>
<td>0.086 (0.28)</td>
<td>0.071 (0.26)</td>
</tr>
<tr>
<td>Chemicals and Allied</td>
<td>0.139 (0.35)</td>
<td>0.136 (0.34)</td>
</tr>
<tr>
<td>Metal Manufacturing</td>
<td>0.061 (0.24)</td>
<td>0.053 (0.22)</td>
</tr>
<tr>
<td>Mechanical Engineering</td>
<td>0.258 (0.14)</td>
<td>0.227 (0.42)</td>
</tr>
<tr>
<td>Instrument, Electrical, Shipbuilding and Marine Engineering</td>
<td>0.122 (0.33)</td>
<td>0.116 (0.32)</td>
</tr>
<tr>
<td>Textiles, Leather, Leather Goods, Fur, Clothing and Footwear</td>
<td>0.060 (0.24)</td>
<td>0.051 (0.22)</td>
</tr>
<tr>
<td>Bricks, Pottery, Glass, Cement, Timber and Furniture</td>
<td>0.041 (0.20)</td>
<td>0.035 (0.18)</td>
</tr>
<tr>
<td>Paper, Printer and Publishing</td>
<td>0.057 (0.23)</td>
<td>0.050 (0.22)</td>
</tr>
<tr>
<td>Construction</td>
<td>0.004 (0.06)</td>
<td>0.000 (0.07)</td>
</tr>
<tr>
<td>Transport and Communication</td>
<td>0.022 (0.15)</td>
<td>0.035 (0.18)</td>
</tr>
<tr>
<td>Distributive Trades</td>
<td>0.036 (0.19)</td>
<td>0.060 (0.24)</td>
</tr>
<tr>
<td>Insurance, Banking and Finance</td>
<td>0.031 (0.17)</td>
<td>0.053 (0.22)</td>
</tr>
<tr>
<td>Business, Professional</td>
<td>0.067 (0.25)</td>
<td>0.092 (0.29)</td>
</tr>
<tr>
<td>Leisure</td>
<td>0.006 (0.08)</td>
<td>0.009 (0.10)</td>
</tr>
<tr>
<td>Miscellaneous Services, Inc. Motor Distribution</td>
<td>0.005 (0.07)</td>
<td>0.007 (0.09)</td>
</tr>
<tr>
<td><strong>Region</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scotland</td>
<td>0.114 (0.32)</td>
<td>0.116 (0.32)</td>
</tr>
<tr>
<td>North</td>
<td>0.062 (0.24)</td>
<td>0.067 (0.25)</td>
</tr>
<tr>
<td>Yorkshire</td>
<td>0.092 (0.29)</td>
<td>0.086 (0.28)</td>
</tr>
<tr>
<td>East Midlands</td>
<td>0.072 (0.26)</td>
<td>0.065 (0.25)</td>
</tr>
<tr>
<td>East Anglia</td>
<td>0.040 (0.20)</td>
<td>0.046 (0.21)</td>
</tr>
<tr>
<td>South East</td>
<td>0.253 (0.43)</td>
<td>0.273 (0.45)</td>
</tr>
<tr>
<td>South West</td>
<td>0.079 (0.27)</td>
<td>0.083 (0.28)</td>
</tr>
<tr>
<td>West Midlands</td>
<td>0.109 (0.31)</td>
<td>0.100 (0.30)</td>
</tr>
<tr>
<td>North West</td>
<td>0.122 (0.33)</td>
<td>0.111 (0.31)</td>
</tr>
<tr>
<td>Wales</td>
<td>0.057 (0.23)</td>
<td>0.054 (0.23)</td>
</tr>
<tr>
<td><strong>Bargaining Group</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unskilled Manuals</td>
<td>0.423 (0.49)</td>
<td>0.435 (0.50)</td>
</tr>
<tr>
<td>Semiskilled Manuals</td>
<td>0.255 (0.44)</td>
<td>0.253 (0.43)</td>
</tr>
<tr>
<td>Skilled Manuals</td>
<td>0.166 (0.37)</td>
<td>0.154 (0.36)</td>
</tr>
<tr>
<td>Supervisors</td>
<td>0.136 (0.34)</td>
<td>0.137 (0.34)</td>
</tr>
<tr>
<td>Clerical, Professional and Technical staff</td>
<td>0.016 (0.13)</td>
<td>0.021 (0.14)</td>
</tr>
<tr>
<td><strong>Financial Variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expected Productivity</td>
<td>-</td>
<td>2.510 (4.83)</td>
</tr>
<tr>
<td>Acceptance by employees the introduction of New Technology as part of the settlement</td>
<td>-</td>
<td>0.040 (0.20)</td>
</tr>
<tr>
<td><strong>Methods of Measuring Performance</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Value of Output per person employed</td>
<td>-</td>
<td>0.18 (0.38)</td>
</tr>
<tr>
<td>Volume of Output per person employed</td>
<td>-</td>
<td>0.22 (0.41)</td>
</tr>
<tr>
<td>Value added per person employed</td>
<td>-</td>
<td>0.13 (0.33)</td>
</tr>
<tr>
<td>Unit Labour Costs</td>
<td>-</td>
<td>0.30 (0.46)</td>
</tr>
<tr>
<td>None</td>
<td>-</td>
<td>0.12 (0.32)</td>
</tr>
<tr>
<td>Other</td>
<td>-</td>
<td>0.12 (0.32)</td>
</tr>
<tr>
<td><strong>Size of Bargaining Group</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 25 workers</td>
<td>-</td>
<td>0.178 (0.38)</td>
</tr>
<tr>
<td>26-50</td>
<td>-</td>
<td>0.144 (0.35)</td>
</tr>
<tr>
<td>51-100</td>
<td>-</td>
<td>0.172 (0.38)</td>
</tr>
<tr>
<td>101-200</td>
<td>-</td>
<td>0.174 (0.38)</td>
</tr>
<tr>
<td>201-500</td>
<td>-</td>
<td>0.160 (0.37)</td>
</tr>
<tr>
<td>501+</td>
<td>-</td>
<td>0.173 (0.38)</td>
</tr>
<tr>
<td><strong>Year</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1979/80</td>
<td>0.037 (0.19)</td>
<td>-</td>
</tr>
<tr>
<td>1980/81</td>
<td>0.054 (0.23)</td>
<td>-</td>
</tr>
<tr>
<td>1981/82</td>
<td>0.057 (0.23)</td>
<td>-</td>
</tr>
<tr>
<td>1982/83</td>
<td>0.052 (0.22)</td>
<td>-</td>
</tr>
<tr>
<td>1983/84</td>
<td>0.054 (0.23)</td>
<td>-</td>
</tr>
<tr>
<td>1984/85</td>
<td>0.050 (0.22)</td>
<td>-</td>
</tr>
<tr>
<td>1985/86</td>
<td>0.046 (0.21)</td>
<td>-</td>
</tr>
<tr>
<td>1986/87</td>
<td>0.047 (0.21)</td>
<td>-</td>
</tr>
<tr>
<td>1987/88</td>
<td>0.051 (0.22)</td>
<td>0.122 (0.33)</td>
</tr>
<tr>
<td>1988/89</td>
<td>0.047 (0.21)</td>
<td>0.115 (0.32)</td>
</tr>
<tr>
<td>1989/90</td>
<td>0.059 (0.23)</td>
<td>0.143 (0.35)</td>
</tr>
<tr>
<td>1990/91</td>
<td>0.057 (0.23)</td>
<td>0.139 (0.35)</td>
</tr>
<tr>
<td>1991/92</td>
<td>0.064 (0.24)</td>
<td>0.156 (0.36)</td>
</tr>
<tr>
<td>1992/93</td>
<td>0.066 (0.25)</td>
<td>0.162 (0.37)</td>
</tr>
<tr>
<td>1993/94</td>
<td>0.067 (0.25)</td>
<td>0.163 (0.37)</td>
</tr>
<tr>
<td>1994/95</td>
<td>0.065 (0.25)</td>
<td>-</td>
</tr>
<tr>
<td>1995/96</td>
<td>0.070 (0.25)</td>
<td>-</td>
</tr>
<tr>
<td>1996/97</td>
<td>0.050 (0.23)</td>
<td>-</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25030</td>
<td></td>
<td>10254</td>
</tr>
</tbody>
</table>

aStandard deviations are in parentheses.
bThe sample size in Specification 1 relates to the most basic specification.
cThe sample size in Specification 2 relates to the general specification.
dThe excluded category for the measures of performance variable refers to establishments using no or other performance measures. Establishments were able to select multiple responses for forms of performance measure used.
4.6. RESULTS

Table 4.7 reports the results of estimating (1) for the entire sample of establishments from 1979/80 to 1996/97, for specification 1 (1982/3 is the reference year). Specification 2 is estimated for 1987/88 to 1996/97 (1992/3 is the reference year). Prior to discussing the results it would be useful to mention the fundamentals of the output. The table reports coefficients from each ordered probit model and the marginal effect for establishments that reported the RRF as very important in wage settlements. The z-ratios are the ratios of the estimated coefficients to their respective estimated standard errors. The z-ratios are (asymptotically) distributed at $N(0,1)$ under the null hypothesis that the associated coefficients are zero. The value of $L_1$ is the maximised log-likelihood. Since the hypothesis that all the slopes in the specification are zero is also of interest, I have computed the log-likelihood with only a constant term, $ln L_0 = -11046.98$, also shown in Table 4.7. The $Chi^2$ value rejects the null hypothesis. The pseudo $R_2$ is McFadden's (1973) Likelihood ratio index.

The coefficients associated with the geographical, industrial, bargaining groups and other variables generally have the expected sign. For example, the most prosperous sectors, such as banking, insurance and finance, and business and professional services, establishments from the South East and supervisory bargaining groups consider the RRF as very important. In addition, the RRF is considered very important in the leisure industry and has the highest marginal effect amongst the sectors. With respect to bargaining groups it should be noted that if there are multiple responses from establishments when indicating the number of bargaining groups in their establishment, the CBI unilaterally selects one. In terms of regional differences, having many thriving businesses, has consistently been shown to be positive and have a significant effect on the importance of the RRF, such as in the South East with its thriving computing industry, for example. With respect to the South East, for example, existing literature on regional development in the UK strongly suggests that the South East has many features which characterise an economy developing with intensified division of labour, which are less evident for instance, in the industrial heartland region of northern England which helps to maintain its prosperity vis-a-vis other regions, for example, by being competitive (see Athreye and Keeble, 2002). Establishments in the West Midlands, which has traditionally had an equally vibrant manufacturing base, also highly significantly consider the need for the ability to recruit and retain as a very important factor in exerting upward
154

TABLE 4.7
ORDERED PROBIT RESULTS OF THE NEED TO IMPROVE ABILITY TO RECRUIT/RETAIN
LABOUR
AS A FACTOR EXERTING AN UPWARD PRESSURE ON LEVEL OF WAGE SETTLEMENTS'
Dependent variable: RRF

Independent Variableb
Industry
Chemicals and Allied
Metal manufacturing
Mechanical engineering
Instrument, Electrical, Shipbuilding
and Marine Engineering
Textiles leather leather goods,
I
fur, clothing aný Footwear
Bricks, Pottery, Glass, Cement,
Timber, Furniture
Paper, Printing, Publishing
Construction
Transport and Communication
Distributive
Trades
Insurance, Banking and Finance
Business, Professional and Scientific Services
Leisure
Miscellaneous Services Inc. Motor
Distribution
Size of Bargaining
Group
< 25 workers
H-50
51-100
101-200
201-500
BarX inin L Grouf
Un illed
anua s
Skilled Manuals
Supervisors
Clerical, Professional/Technical
and Managerial Staff
Financial -Variables
Expected Productivity
Value of Output per person employed
Volume of Output per person employed
Value added per person employed
Unit Labour costs
Introduction
of New Technology
Region
North

Yorkshire
East Midlands
East Anglia
South East
South West
West Midlands
North West
Wales
Year
1979/80
1980/81
1981/82
1983/84
1984/85
1985/86
1986/87
1987/88
1988/89
1989/90
1990/91
1991/92
1992/93
1993/94
1994/95
1995/96
1996/97
N
Log L

Specification (1)
1979/80-1996/97
Estimate
Marginal

0.118
0.153
0.409
0.548

12.28ý
2.40
8.80
10.96)

0.022
0.014
0.074
0.127

Effect

12.70)
1.39ý
9.27
11.96)

Specification
2)
1987/88-1996ý97
Marginal
Estimate

0.1 6ý8 2 061
:
0.149ý 1 46
0.358 ý4.72
0.506 6.21

0.023
0.005
0.073
0.110

Effect

11.521
0.28
4.84
5.88

0.259 ( 4.28)

0.062 (5.54)

0.223 (2.27)

0.065 (3.14)

0.004 ( 0.06)

(-1.38)
-0.014
0 0 23 (225 ý

(-0.21)
-0.025

(-1.27)
-0.024

0 112
0: 45 9
0 0 78
:6
00 4
0.683
0.834
0.842
0.228

( 1 79 ý
:0
3 1
10.94
10.12 ý
10.53
15.04
7.28 ý
1.56

0: 125
0 024
:
0 165
0.171
0.213
0.248
0.039

-

-

-

-

0.042 11.58 ý
0.064 1.80
0.417 13.28 )
0.191 2.69)

0.005 11.16 ý
0.012 2.09
0.105 15.25)
0.048 3.17)

-

031
56 1
0: 0 11 0.23

0 230
0: 204
0.470
0.142
0.242
0.154
0.021

3: 49
( 1 74
6
1 10)
.
19.73)
14.47)
6.70 ý
1.

( 457
3:44
( 12.24)
12.841
5.32
3.37
0.36

0
0:007
0 087
:0
0 66
0.116
0.030
0.060
0.037
0.023

23 1

02
.8
(8 36
:
553
(14.80)
13.341
6.65
4.57
2.35

0.265 (13.02)
0.023( l. 88)
(-0.04)
-0.000
0.073 5 141
0.120 7:61
0.123 7.50
0.136 8.20
0.267 14.161
0.373 19.47
0.355
355 19.30
0: 1 10.20
0.171
0 0 77 5.48J
0:046 3.55
0.100 6.90
0.178 10.86)
0.201 12-03ý
0.278 14.84

0:0 39 ( 1 99 )

0 144
00 8
.1
O 148
ý570
0
0.885
0.799
0.979
0.315

( 1 44)
:
0 74
1,28
6,23
9.39
9.27
6.66
1.62

03 2
0 0 67
0: 166
0.244
0.208
0.339
0.092

086
0:
292
7ý06
891
9.11
7.21
1.94

0.234
0.29 1
0.241
0.110
0.095

4.12
5.02
4.37
1.97
1.71

0 05 5
:
006 3
0.051
0.034
0.025

4 51
t
48
4 30
3.02
2.22

0.764 11.90 1
0.042 0.77
0.471 9.90
0.234 2.39

0.012 11.64 ý
0.016 1.59
0.127 10.2 i)
0.049 1.98)

0.004 ( 1.42)
0.196 ( 4.98)
(-1.58)
-0.062
ý
0.03 3 0
.71
0.06 5ý 0.13
0.081 1.06

0.001 ý2.16ý
0.063 7.11
(-2.24)
-0.016
0.031 ý3.24 ý
0.001 0.16
0.018 1.18

081 ( 0 9 5
0: 190 2:5 1

012
0

0 449
0:301
0 536
0: 213
0.437
0.295
0.134

(574 )
3:45
9,09
2,80
6.21
4.23
1.49

Wald chi2

0.911 11.88)
0.137 1 701
:
0.038 0 46
0.296 3.79
0.463 6.05
0.489 6.29
0.533 6.94
0.936 12.96)
1.157 16.00ý
8
1.120 15.81)
0 598 8 04)
:
030 2 3:98
0.210 2.731
0.379 5.10
0.598 8.20
0.715 9.97
0.929 12.7 i)
25030
-9742.38
(2294.84)

Prob > chi2
Pseudo R2
Log Lo computed with only a constant term

0.0000

0.0000

0.1181
98
-11046 .

0.1296

(073 )

0:029 1ý94
031 8 ( 7 051
0: 100 4:88
0 124 9 601
:
.
0 036 2.32
0.099 5.94
0.082 5.30
0.066 3.53
-

-

0 730
:9
0 61
0.914
0.397
0.093

12.011
15.83
15.86
6.47J
1.47

0.164 (2.70)

0 210
:3
0 16
0.292
0.122
0.030
0.050

12.681
18.29
18.28
8.60ý
2.47
(4.14)

10254
02
-4387.
(1116. 18)

Oz-statistics in parentheses.
(1): Food, Drink and Tobacco; semi-skilled manuals bargaining
bReference Categories: For Specification
bargaining
Tobacco;
Drink
(2):
Food,
Specification
For
semi-skilled
manuals
1982/83.
and
Scotland and
bargaining group with > 500 workers; No or other performance measure; Scotland; 1992/3.

group;
group;


pressure in wage settlement. Since the 1980s, the West Midlands has also received foreign direct investment from Japan, coupled with long-term cooperation between customers and suppliers to lower costs, and make quality improvements and enhanced efficiency (Okamura, 1997). This has improved the financial performance of these firms in the Midlands, and is likely to have contributed to the RRF being very important.

Prior to discussing other results, we must bear in mind that the regional and time dummy variables included in our regression capture other factors such as spatial differences in unemployment and demand. Indeed, the year dummies will pick up a plethora of influences, such as the inter-industry variation in financial performance, general establishment strength, labour demand and supply (through the implicit unemployment rates), market conditions and other bargaining factors. Evidence of this is demonstrated by the fact that the RRF is important in regions with financially prosperous establishments such as the South East, West Midlands, East Anglia, North West and South West. Therefore, I did not add a separate unemployment variable in Table 4.7 in Specifications 1 and 2. Since we have regions over time, doing so will give rise to collinearity of the unemployment variable with the regions. (Although I will do so later in Table 4.8.)

Regions such as East Anglia have experienced protracted spells of relatively successful structural changes and growth over the whole period of our analyses (see Keeble, 1998), thereby rendering the RRF very important. It is worth noting the following for the reduction in significance of the RRF in the North, Yorkshire and Wales. The recession is fundamentally a manufacturing phenomenon and most of the manufacturing activities were focused in the North. Thus, manufacturing employment fell by 10 percentage points more in the North than in the South. In addition, as the UK economy began to recover from 1983 onwards, the accentuated disparity in regional trends did not lessen. Manufacturing employment in the northern England and Wales progressively declined until 1986 and then recovered very slightly. Coupled with other reasons, such as the high rates of direct taxation in the 1980s, this produced a negative multiplier effect, which curbs the spending of the ordinary wage earners and a reduction in employment in the industries which produce the goods and services, he would have purchased from and so forth. Of course, it also applies to regions where these industries are located. The magnitude of the burden varies amongst individuals, for example,

31 I shall abstract from referring to future financial performance in this chapter, due to data constraints (i.e., unavailability).
a typical wage earners spending power was drastically curtailed. This, coupled with the inequality of dispersion of pre-tax pay during the 1980s, particularly affecting less prosperous areas such as the North, Yorkshire and Wales, contributed to the negative multiplier effect. which conforms to our finding with respect to these regions.

It is also found that all industries are positively associated, with the RRF being a very important bargaining consideration, with the exception of the bricks, pottery, glass, cement, timber and furniture industry, relative to the excluded category of food, drink and tobacco. Of course, the importance of the RRF in exerting an upward pressure on wages varies in accordance to the prosperity of the industries.

I now provide some measures of prosperity for each industry or group of industries, when measures of prosperity are unavailable on a historically consistent basis. This is given in Table A4.5–A4.6. GDP is consistently the highest in the distributive trades and or leisure industries as can be seen in Table A4.6. Second, the transport and communication industry has the next consistently highest GDP. Third, the construction industry has a relatively high GDP. Fourth, business, professional, scientific services and miscellaneous services including motor distribution have a comparatively and consistently high GDP. Fifth, insurance, banking and finance also have a comparatively and consistently high GDP. Similarly, the manufacturing industries generally have a fairly high GDP.

Another measure of industrial prosperity is the employment in each or a group of industries as dictated by the availability of consistent historical statistics as mentioned earlier. First, the distributive trade and leisure has the highest employment amongst the industries we had consistent statistics for. Second, insurance, banking and finance have the second highest level of employment amongst the industries in my analysis, for which we have the consistent statistics. Third, employment in the manufacturing sector as a whole, is relatively high, as can be seen in Table A4.5. Fourth, the construction industry also has a comparatively high employment level. Fifth, business, professional, scientific services and miscellaneous services, including motor distribution, has a relatively high employment level. Sixth, the construction industry also has a fairly high employment level.

In the light of the quantitative evidence, it is clear for example, that the banking, finance, insurance, business, professional, scientific services, distributive trade and the leisure industry are likely to consider the RRF to be very important. This is in congruence to expectations.
for example, computing services have had the fastest GDP growth rate (see ONS 2003). Second, the high significance of the RRF in the distributive trades is due to the heavy demand for consumer goods, particularly during protracted periods of low interest rates within this period. This has promoted the retailing industries immensely, which is consistent to expectations. It is the insurance, banking, finance and business industry that actually has the highest very important RRF. Third, the RRF is also relatively important in sectors which have traditionally suffered from skill shortages, such as mechanical, instrument and electrical engineering. Fourth, the construction industries also consider the RRF to be somewhat important but to a lesser degree, than for example, business and professional services.

The RRF is significantly more important for supervisors, but also for clerical, professional/technical and managerial bargaining groups, relative to semi-skilled manual workers. The importance of the RRF is highest for the supervisory bargaining group. There are no significant differences between the skilled and unskilled manual bargaining group and semi-skilled manuals32.

The importance of the RRF has varied considerably over time, even after controlling for other factors as shown by the significant year dummies. Our common perception would be that the importance of the RRF will be highest in boom years, and lowest in periods of recession. This has been borne out by these results, even when I include controls for the above characteristics. Indeed, all the year dummies corroborate well with the figures in Table 4.4 and overall figures in Table 4.6. The RRF is very important and highly significant for all the years except years 1980/81 relative to 1981/82, when it is positively associated with very important RRF. This is expected, since the economy was experiencing one of the worst recessions ever experienced. It is worth noting that the coefficients for 1988/89 and 1989/90 are very strong and well determined. This conforms to expectations since the economy was booming at the end of the 1980s. Similarly, the coefficients at the end of the period (1994/5 – 1996/7) are also strong and well determined. In the former two years, they were particularly very strong, and the RRF rating was at the highest (see Table 4.4). This corresponds to a period when the UK economy had recovered after the recession of the early 1980s. The RRF was also very important but not significant, during 1980/81 and 1981/82. The reduction in the strengths during these years was naturally, primarily due to the de-

32 In the analysis I conducted, including the semi-skilled manuals, which is available on request.
industrialisation which commenced from the mid-1970s, particularly affecting the North and Yorkshire (Townroe and Martin, 1992), coupled with the unprecedented level of the recession at this time. Output fell by 15 per cent and employment by about 19 per cent (see Fothergill and Guy, 1990). Towards the end of the decade unemployment fell but a dearth of skilled labour was the main constraint on growth. This strengthens the insider power on account of turnover costs.

The following pertains to all our specifications. Upward RRF pressures in the 1980s generally, are due to the disinvestment in skills, in traditional industries, such as mechanical engineering and electrical engineering. On account of this an exceptionally high number of workers of the UK workforce in comparison to our overseas competitors has been left jobless or untrained. In addition, the UK's record in education and training vis-à-vis overseas standards was poor and deteriorating during the 1980s, for example. GDP devoted to education fell from 5.5 per cent in 1980 to 4.7 per cent in 1987, relative to countries such as the US and Denmark, which devoted 6.5 and 7.9 per cent of their GDP respectively. Furthermore, decreasing number of 16 to 18 year olds undertake full-time education in the UK than in any other advanced country. For example, in 1988, only 35 per cent did so, as opposed to 66 per cent in France, 79 percent in the US and 77 per cent in Japan. Moreover, only 38 per cent of the British industrial workforce received skilled vocational training, compared with 67 per cent, 79 per cent and 80 per cent in West Germany, Italy and France respectively (Miliband, 1990).

Throughout the 1980s official youth-training policy underwent constant change. Official expenditures were mainly directed at job creation, rather than independently validated training. This neglect of formal education as a basis for training and training itself, explains why skills shortages have become a major constraint upon economic growth (Steedman and Wagner, 1987). All this also explains the reason why the RRF upward pressures rose.

Indeed, difficulties with recruitment and retention have become important bargaining considerations at the end of the 1980s, when the RRF being very important as an upward pressure in settlement was the highest (see Table 4.4). Skill shortages were becoming increasingly severe (OECD, 1989), and was a major contributor towards wage inflation between 1987 and 1989 (Sentance and Williams, 1989). In addition, CBI data show that there has been a marked increase in the proportion of establishments reporting problems with recruiting
specific types of skilled labour, which rose from 55 per cent in 1986 to 70 percent in 1989 (CBI, 1989). This conforms to the RRF being very important as an upward pressure and being the highest in this period (see Table 4.4). The gravity of the skill shortage, particularly, during the end of the 1980s, as noted, increased the importance of the RRF. For instance, 28 per cent of the establishments’ growth were constrained by skill shortages, according to the CBI Industrial Trends Survey. This aligns with our RRF statistics in Table 4.4. The above periods in the 1980s were also when insider power was at its peak.

In/around 1988/89, the percentage of respondents citing the determinant 'good labour productivity performance' as a 'very important' exerting upward pressure on wages rose, as shown in Table 4.3. This is attributed to the acute skill shortage, particularly in the South East, where, for example, property prices and the general inertia experienced nationwide, impedes labour mobility, thereby enhancing the importance of the RRF as a very important bargaining consideration. The regional property price differential in the South-East, which had been 25 per cent in excess of the national average in 1981, increased to 53 per cent in excess of the national average (Cambridge Econometrics, 1990; Hamnett, 1998). The severe labour shortages, have led to financial and business service sectors attracting applicants with very attractive remuneration packages, particularly in the aftermath of the deregulation of the financial markets. These remuneration packages have been subject to frequent adjustments, both in terms of quantity and quality to attract applicants or a specific type of applicant.

Regional imbalances in pay were most noticeable in the South East and these imbalances could not be alleviated by attractively packaged wage supplements. For instance, the Alliance and Leicester Building Society was unable to provide an efficacious package: despite raising London allowances by 37 per cent in 1987, turnover rates in London were still twice as high as the rest of the UK as reported in Brown and Walsh (1991). Another explanation which dislocates the effective operation of labour markets in the 1980s is the incentives to owner-occupation, particularly, the tax relief for mortgages which increased the portfolio returns compared to other assets and caused a ‘mobility trap’ in the South-East (Bover, Muellbauer and Murphy, 1989). All this increases the importance of the RRF as a very important negotiation consideration. Generally, there is a negative correlation between good labour

33Pencavel (1994) attributes this to high housing costs in the UK viz-a-viz the US. Henley (1998) finds home-owners are averse to mobility under changing labour market conditions.
productivity performance pressure and RRF (see Table 4.3).34

In order to further examine the impact of unemployment in Specifications 1 and 2, coefficients on the measures of regional unemployment are reported in Table 4.8. This shows the impact of local labour market variables on the RRF. Three models are shown with respect to Specifications 1 and 2. Inclusion of the regional unemployment measure in Specification 1 (as expected it does cause multicollinearity with the regional and year dummies) shows unemployment to have a negative and significant effect on the RRF, as expected. This corroborates with a body of evidence, including for example, Blanchflower and Oswald (1994). Excluding the regional dummies from Specification (1) also shows the unemployment measure is negative and significant. Similarly, exclusion of time dummies also shows unemployment to have a negative and significant impact on RRF. Regressions estimated using Specification 2 reported in Table 4.8 also show unemployment to have a negative and significant impact on RRF, again aligning to expectations. Furthermore, excluding regional dummies and the time dummies separately from Specification 2, also showed unemployment to have a strong negative and significant impact on RRF as expected.

Overall, with respect to the marginal effects of the establishments who reported the need to recruit and retain labour is a ‘very’ and ‘fairly’35 important factor in exerting upward pressure on the level of wage settlements for specification 1, are similar. There is a dichotomy between respondents who report the need to recruit and retain as a ‘very’, ‘fairly’ and ‘not’ important in exerting upward pressure on the level of wage settlements’. 

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Same sample, measures of regional unemployment, regional dummies and time dummies included</td>
<td>-.07 (-9.44)</td>
<td>-.10 (-6.48)</td>
</tr>
<tr>
<td>Same sample, measures of regional unemployment, time dummies included, no regional dummies</td>
<td>-.08 (-14.40)</td>
<td>-.09 (-10.61)</td>
</tr>
<tr>
<td>Same sample, measures of regional unemployment, regional unemployment, regional dummies included, no time dummies</td>
<td>-.11 (-23.0)</td>
<td>-.16 (-20.11)</td>
</tr>
</tbody>
</table>

a z-statistics in parentheses
b The reference categories are as in Table 4.7 with respect to the corresponding specifications for all three experiments.

34 To confirm robustness of these results, I conducted further investigations. A brief report is presented below. The coefficient of the introduction of new technology variable without the control for the size of the bargaining unit is 0.12 with a z-statistic of 2.46 and the coefficient of the introduction of the new technology variable with controls for the size of the bargaining unit is 2.82. The number of observations for the former model is 20257 and 20255 for the latter. There are few overall differences between these two models and specification 1.

35 Details available on request.
Additional specifications were estimated to shed further light on other characteristics affecting the importance of the RRF. It is infeasible to include these results with Specification 1 in Table 4.7, due to some of these variables not being present in the data until 1987/88. Hence, I include additional variables in Specification 2, specifically the acceptance by employees of the introduction of new technology, size of the bargaining groups, expected productivity over the next 12 months and the establishments’ mode of measuring performance. These are included since it is natural to consider that the manner in which establishments measure performance, expected productivity, differing new technological accumulation and the size of the bargaining groups have an impact on the RRF being very important. For example, firms would report the RRF to be very important if specific skill types enhance the financial performance of the firm and vice versa. Firms would recruit and retain more workers, if introduction of the new technology accumulation enhances the financial performance of the firm, and vice versa.

Second, the future expected productivity or financial performance in general, is likely to have an impact on the firm’s recruitment and retention activity, on account of the rents available for sharing. If the expected productivity is higher, we find the RRF is higher. However, we should also note the potential endogeneity between future expected productivity and the RRF. Third, more prosperous firms have a large workforce, see for example, Burdett and Mortensen (1998), and will consider the RRF to be very important, and vice versa. Besides the establishment size being an important institution, which reflects the prosperity of the firm, for our purpose it is an important dimension of the importance of the RRF, since my explanation of the size-importance of the RRF differential is based on my theoretical analysis in my succeeding chapter, that results from more prosperous establishments being attracted by more workers and more workers wanting to retain employment in these firms. The more prosperous firms would want to recruit and retain more workers. The opposite is also true for both these cases, as stated earlier in both my empirical and succeeding theoretical chapters.

These results are presented in the same table\textsuperscript{36}. Note I only report the differences between

\textsuperscript{36}Further investigations on the skill groups, showed that the impact of the professional and technical and managerial group have a powerful impact on the likelihood of establishments reporting RRF is very important relative to unskilled groups. The coefficients and their respective significance levels are as follows: For professional and technical workers the coefficients are 0.152 (4.52) and for managerial workers the coefficients are 0.146 (4.42). This corroborates with expectations, since increasing number of establishments are relying on the workers technical, professional knowledge and skilled managerial guidance. For example, most indus-
this Specification 1 and Specification 2, and this strategy will be followed throughout the chapter. The significance level of most of the coefficients in Specification 2 has been reduced. This can be attributed to the smaller sample size, than the full sample used in specification 1. In terms of the results from Specification 2, the following points are of interest and worth noting.

The most interesting marginal effects relate to the financial variables. Although a unit increase in expected productivity only increases the probability of the establishment reporting that the RRF exerts a very important influence, the significance of this variable has increased. The marginal effect on the expected productivity variable is significant at the 5 per cent level. However, as mentioned earlier, one should also note that future productivity is potentially endogenous, since firms which use the wage to recruit and retain staff employ high quality workers and hence have higher productivity, or at least firms expect it. Thus data of a longer duration and well-structured variables may be required to rule out the endogeneity and capture the strong and powerful forward-looking effects of this variable. Second, establishments who have introduced new technology are 2 percentage points more likely to report that the need to improve ability to recruit/retain is a very important factor in exerting an upward pressure on wage settlements. There is a body of evidence to suggest that establishments which utilise new technology, for example, in business services, as expounded in Townroe and Martin (1992), are the most prosperous establishments in the UK. This has been confirmed by all our investigations. But again this variable is not significant.

Third, firm size is an important indicator of the firm’s performance level as noted. The marginal effects of all sizes of the bargaining groups are positive and significant as expected. The estimates suggest that the bargaining group with less than or equal to 25 workers are 6 percentage points more likely, the bargaining group with 26 – 50, 51 – 100, 6 and 5 percentage points respectively, and 101 – 200 and 201 – 500 workers, are 3 percentage points more likely to report the need to improve the ability to recruit/retain a very important factor in exerting an upward pressure on wage settlements relative to the establishments whose size of bargaining group is greater than 500. The significance level is slightly lower in a bargaining group size
tries in the banking, finance and business centre, in London and East Anglia. Indeed, nationwide there is a tendency, where feasible for establishments to be increasingly reliant on these skill groups. I have not reported the estimates of all the other skill groups, due to some collinearity with the bargaining group. Similarly, I had also investigated the influence of unions with specification 2, but there was some collinearity with the size of the bargaining group. In addition, I also examined the impact of unemployment, but as alluded to earlier, there was some collinearity with regions.
greater than 200, since the evidence is that old manufacturing firms, such as the aerospace
and defence industries in the South West are no longer important. There is no longer a dire
need to recruit and retain in these firms. In a sense, these establishments are content with
their recruitment and retention activity. That is, higher/efficiency wages do not need to be
paid to reduce quits and increase hires, since manufacturing on the whole throughout the UK
is in decline and the incumbent workers are content with their employment in these firms, due
to most of the lucrative industries in the UK which pay higher wages are mainly in business
and banking or other similar services, so the skills of the workers in these establishments
are no longer as marketable as they once were, prior to the influx of the highly skilled
service industries. In smaller bargaining units, that is with less than or equal to 100 workers,
establishments report a more significant desire/need to recruit and retain workers, as for
example the small prosperous establishments in East Anglia and the diverse small prosperous
establishments in the East Midlands (see Townroe and Martin 1992).

Fourth, the estimates suggest that establishments whose method of measuring perfor-
mance is through value of output per person employed, are 6 percentage points more likely,
and establishments whose method of measuring performance is value added per person em-
ployed, are 3 percentage points more likely, to report the need to improve the ability to
recruit/retain a very important factor in exerting an upward pressure on wage settlements
relative to the establishments who use no or other performance measures. The effect of the
former is very powerful relative to establishments using no or other performance measures.
This is the most frequently used mode of performance by professional and scientific services,
specifically, 310 establishments use this method of measuring performance. Moreover, the
estimates suggest that establishments whose method of measuring performance is through
volume of output per person employed are 2 percentage points less likely to report the need
to improve the ability to recruit/retain a very important factor in exerting an upward pres-
sure on wage settlements relative to the establishments who use no or other performance
measures. This mode of measuring of performance is largely employed by manufacturing
industries, such as motor manufacturing, and chemical industries. In the former, 179 estab-
ishments and in the latter, 133 establishments use this method of measuring performance

37 These are derived from preliminary data analysis conducted by the author.
in decline. Furthermore, a unit increase in labour costs only increases the probability of the establishment reporting that the RRF exerts a very important influence.

Fifth, the estimates suggest that the supervisors' bargaining group is 13 percentage points more likely, bargaining groups of clerical, professional/technical and managerial staff, skilled manual and unskilled manuals are, 5, 2 and 1 percentage points respectively more likely, to report the need to improve the ability to recruit/retain as a very important factor in exerting an upward pressure on wage settlements38.

In addition, with respect to the marginal effects of the explanatory variables on the probability of an establishment reporting that the need to recruit and retain labour is a fairly important factor in exerting upward pressure on wage settlements for specification 239, the estimates again are considerably lower than the estimates for the marginal effects of establishments who considered the need to recruit and retain labour as a very important factor in exerting upward pressure on wages settlements, as with specification 1. With respect to the marginal effects of the explanatory variables on the probability of an establishment reporting that the need to recruit and retain labour is not important in exerting upward pressure on wage settlements40, are similar to specification 1. The estimates suggest a negative likelihood, with the exception of the building industry and volume of output per person employed, with the need to improve ability to recruit and retain labour as a very important factor in exerting upward pressure on wages, as expected.

For robustness, I also computed the average of the marginal effects (see Bartus, 2003), with respect to every establishment who reported the need to recruit and retain labour as either, very, fairly important, and not important factor in exerting upward pressure in the level of settlements for both specification 1 and 2. These are shown in Tables A4.8. The results are fairly similar to the results of the average of the marginal effects for the average observations reported in Tables 4.7, except that the significance levels are slightly lower.

Overall, there is again a dichotomy of those respondents who report the need to recruit and retain labour as a 'very', 'fairly' and 'not' important factor in exerting upward pressure in the level of settlements for specifications 1 and 2.

Analysing economic cycles for our specification (1), which is for the whole sample, reported

---

38 All results in Table 4.7 are robust to a wide range of specifications, which the author conducted. Details available upon request from the author.
39 Details available from the author.
40 Details available from the author.
in Table 4.9, enables us to gain a deeper understanding of the changes that have occurred within these disaggregated timescales and their varying impact on the need to improve the ability to retain and recruit labour as a very important factor exerting upward pressure on settlements. It should be noted that since some of the variables, including expected productivity and the other financial variables in specification 2, are only available from 1987/88, it is infeasible to incorporate these variables, as it will not permit us to undertake comparative analysis with the earlier years preceding 1987/88.

It is important to analyse the RRF in different periods, since we can then focus particular attention to sub-periods. For example, it is shown in Table 4.7 that the importance of the RRF varies considerably with the economic cycle. Table 4.9 reports the ordered probit estimates of the importance of the RRF in exerting an upward pressure on wages for the four periods. The first period, 1979/80 – 1982/83 is a recessionary period, whilst the second period, 1983/84 – 1988/89 is a boom period. Similarly, the 1989/90 – 1992/93 corresponds to a recession and 1993/94 – 1996/97 a period of recovery.

Model (1) displays estimates from economic cycle 1. During cycle 1, the economy experienced one of the most adverse recessions it had experienced for many years. The South East and East Anglia were the only regions where establishments reported that the RRF had an important significant influence relative to Scotland. With respect to East Anglia, the relatively rapid growth rates compared to the rest of the UK, brought East Anglia through the recession with its underlying dynamic structural conditions unimpaired, thereby sustaining the prominence of insider power and simultaneously the significance of the RRF.

The regions which are less likely to consider the RRF is very important, for example, the North, had suffered a catastrophic impact. This is due to closures of steelworks, shipyards, engineering plants, the job-displacing capital investment undertaken in the Teeside chemical industry, coupled with the mass exodus of multinationals, and the reductions in the coal mining industry. In the East Midlands, the recession spurred massive restructuring of the region's industrial base, resulting in substantial job losses in the engineering textiles and mining industries. Wales also experienced specific difficulties surmounting the aftermath of the recession. This is in conformity with our results in Table 4.7. Naturally, this render insider powers less prominent and indeed, dampened the insider effects and consequently the importance of the RRF. While positive coefficients are also associated with the South West,
West Midlands, and the North West, insider effects are not strong and hence, nor is the significance of the RRF. With respect to the South West, this is due to most manufacturing employment being in the aerospace/defence contracting sectors and other high technology establishments (examples of high technology industries are Plessey and Hewlett Packard). In addition, their agricultural, manufacturing and private services output was the highest in the UK. In West Midlands this is due to its cyclical dynamism, which emanates from the diverse but interlinked metal-based manufacturing sectors.

In this period, there is no information on the CBI database on service sector establishments, which is unfortunate given that the recession was mainly manufacturing based (a large decline in manufacturing industries, and high interest rates). Relative to the food, drink and tobacco industry, establishments in the mechanical, instrumental, and electrical engineering industries were the only manufacturing industries to report a significantly more important influence of the RRF in this period. Two of the other industries showed a lower influence of the RRF. This shows the severe effect that the recession had on the labour markets in many Northern areas. The lower but positive association with the textiles and clothing industry is due to the buoyant East Midlands with its diverse and fairly robust industrial base.

In common with the estimates in Table 4.7, the supervisory bargaining group is more likely to report that the RRF had an important effect on wage pressure.

Model (2) displays the estimates for economic cycle 2. The RRF is significantly important in the South East and East Anglia again, but it is positive relative to Scotland in all regions and these differences are significant with the exception of the North, Yorkshire and Wales, which show recovery. With respect to the North, our results corroborate with the experience of the North during this period, where there was a wave of closures in the coal mining industry. In East Anglia, by 1988 the pressures of growth lead to increasing labour shortages, thus rendering the RRF to be significantly important, as noted, due to enhanced insider power. In the East Midlands there has been increased growth in the service sector. The region has a stronger small business sector than its counterpart the North, which explains the powerful impact on the RRF, as being very important in East Midlands, second only to the South East. The very powerful impact of the RRF, being very important, in the West Midlands is attributed to the pronounced economic revival. The main cause of the recovery is due to the favourable restructuring of its manufacturing sector, which generates
in excess of one-third of the GDP. The region's metal and engineering group has altered its product and market strategies. There has also been marked growth in overseas investments. All these imply insider effects are intact and the RRF is significant. Amongst the positive associations, the impact of the RRF being very important in Yorkshire is due to its upturn, as evidenced by the demand for office spaces exceeding supply in major cities. The cities of Leeds, Bradford and Sheffield have been at the forefront of the revival. With the additional industries included, these service industries have a significantly higher RRF than the food, drink and tobacco industry, with the exception of the building, transport and communication and miscellaneous services, but the same applies to some of the other manufacturing industries. Only positive associations pertain to transport and communications industry, since a good proportion of these industries were owned/regulated by the government during the years of our investigation, as noted in an earlier chapter 3 and hence, there are divergence in objectives between the public and private sector and also the significance of the RRF. Again, the only significant bargaining group is the supervisors.

Model (3) depicts the estimates for economic cycle 3. This was a period of a service-sector based recession in the South. Despite this, the RRF is still significantly higher in the South East. This is due to the overall prosperity of the region, due to several factors, including its close proximity to the EU, more businesses in the South East, and as noted, the severe housing shortage, partly attributed to the inflow of population, has hampered more people moving to the South East, thereby creating acute labour shortages in the South East. Again the RRF is higher in all regions relative to Scotland and in some regions significantly so. For instance, in the East Midlands, there were gains in employment in the engineering establishments. Most of the services industries also reported higher RRF, with the exception of construction industry, some significantly so. This was a period when the demand for houses was at its lowest for a considerably long time. This was reflected in the rise in negative equity for houses. Hence, the negative association of the construction industry to the RRF is due to the demand for buildings being low, on account of high interest rates. In addition, the RRF is also significantly higher in mechanical, instrumental, electrical and marine engineering. Again the supervisory bargaining group is positively significant, in conjunction with the clerical, professional/technical and managerial staff.

Model (4) presents economic cycle 4. The sample size is considerably smaller (with 4
years usable observations). In addition, the three years are in a recovery period. Only the South East has a significantly higher RRF relative to Scotland, with the South West and the West Midlands, which also have a higher RRF. Most other regions have a lower RRF. The RRF is low in the food, drink and tobacco industry, but all industries have a significant RRF, apart from miscellaneous services and transport and communication. Again, the only significant bargaining group is that of the supervisors.

\[41\text{ My investigations of the skill groups in economic cycles, consistently showed that the coefficients were well determined and sometimes had a powerful impact on the RRF being very important for all economic cycles for the professional and technical skill group and the last two cycles for the managerial group.}

In order to investigate the importance of the RRF in greater depth, we also conducted investigations with respect to the economic cycles, by including size of bargaining groups, occupational and introduction of new technology category to the specification 1 of the whole sample in Table 4.7. The results are consistent to expectations. Details are available from the author upon request.
TABLE 4.9
ORDERED PROBIT ESTIMATES OF THE NEED TO IMPROVE ABILITY TO RECRUIT/RETAI
LABOUR AS A FACTOR EXERTING AN UPWARD PRESSURE ON THE LEVEL
OF WAGE SETTLEMENTS DURING ECONOMIC CYCLESa

Dependent variable: RRF

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemicals and Allied</td>
<td>-0.050 (-0.41)</td>
<td>0.177 (2.09)</td>
<td>0.086 (0.81)</td>
<td>0.246 (2.13)</td>
</tr>
<tr>
<td>Metal manufacturing</td>
<td>0.043 (0.30)</td>
<td>0.140 (1.26)</td>
<td>0.190 (1.45)</td>
<td>0.279 (2.09)</td>
</tr>
<tr>
<td>Mechanical engineering</td>
<td>0.216 (2.17)</td>
<td>0.541 (7.18)</td>
<td>0.278 (2.83)</td>
<td>0.514 (4.78)</td>
</tr>
<tr>
<td>Instrument, Electrical and Marine Engineering</td>
<td>0.368 (3.42)</td>
<td>0.649 (9.90)</td>
<td>0.391 (3.71)</td>
<td>0.723 (6.32)</td>
</tr>
<tr>
<td>Textiles, leather, leather goods, fur, clothing</td>
<td>0.031 (0.02)</td>
<td>0.356 (3.69)</td>
<td>0.098 (0.76)</td>
<td>0.486 (3.63)</td>
</tr>
<tr>
<td>and Footwear</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bricks, Pottery, Glass, Cement, Timber,</td>
<td>-0.134 (-0.86)</td>
<td>-0.078 (-0.60)</td>
<td>-0.052 (-0.34)</td>
<td>0.301 (2.01)</td>
</tr>
<tr>
<td>Furniture</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paper, Printing, Publishing</td>
<td>-0.223 (-1.59)</td>
<td>0.153 (1.45)</td>
<td>0.202 (1.54)</td>
<td>0.330 (2.39)</td>
</tr>
<tr>
<td>Construction</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transport and Communication</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distribution</td>
<td>-0.167 (0.77)</td>
<td>0.004 (0.03)</td>
<td>0.238 (1.70)</td>
<td></td>
</tr>
<tr>
<td>Distributive Trades</td>
<td>0.725 (5.12)</td>
<td>0.327 (2.85)</td>
<td>1.008 (8.38)</td>
<td></td>
</tr>
<tr>
<td>Insurance, Banking and Finance</td>
<td>1.120 (6.30)</td>
<td>0.487 (4.05)</td>
<td>0.810 (6.48)</td>
<td></td>
</tr>
<tr>
<td>Business, Professional and Scientific Services</td>
<td>0.630 (3.04)</td>
<td>0.785 (7.41)</td>
<td>0.966 (9.01)</td>
<td></td>
</tr>
<tr>
<td>Leisure</td>
<td>1.171 (4.34)</td>
<td>0.732 (3.75)</td>
<td>0.930 (1.79)</td>
<td></td>
</tr>
<tr>
<td>Miscellaneous Services, Inc. Motor Distribution</td>
<td></td>
<td></td>
<td></td>
<td>-0.007 (-0.02)</td>
</tr>
<tr>
<td>Unskilled Manuals</td>
<td>0.066 (0.91)</td>
<td>-0.001 (-0.01)</td>
<td>0.057 (1.10)</td>
<td>0.063 (1.38)</td>
</tr>
<tr>
<td>Skilled Manuals</td>
<td>0.117 (1.23)</td>
<td>0.059 (0.87)</td>
<td>0.093 (1.35)</td>
<td>0.031 (0.48)</td>
</tr>
<tr>
<td>Supervisors</td>
<td>0.417 (5.44)</td>
<td>0.452 (8.46)</td>
<td>0.483 (7.59)</td>
<td>0.241 (3.39)</td>
</tr>
<tr>
<td>Clerical, Professional/Technical and</td>
<td>0.139 (0.75)</td>
<td>0.178 (1.62)</td>
<td>0.322 (2.39)</td>
<td>-0.108 (-0.44)</td>
</tr>
<tr>
<td>Managerial Staff</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Region</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>North</td>
<td>-0.059 (-0.38)</td>
<td>0.054 (0.49)</td>
<td>-0.016 (-0.17)</td>
<td></td>
</tr>
<tr>
<td>Yorkshire</td>
<td>-0.243 (-1.81)</td>
<td>0.141 (1.45)</td>
<td>-0.087 (-0.99)</td>
<td></td>
</tr>
<tr>
<td>East Midlands</td>
<td>-0.216 (-1.47)</td>
<td>0.314 (4.14)</td>
<td>-0.049 (-0.54)</td>
<td></td>
</tr>
<tr>
<td>East Anglia</td>
<td>0.322 (1.98)</td>
<td>0.448 (3.96)</td>
<td>-0.002 (-0.02)</td>
<td></td>
</tr>
<tr>
<td>South East</td>
<td>0.360 (3.47)</td>
<td>0.820 (10.03)</td>
<td>0.290 (4.35)</td>
<td></td>
</tr>
<tr>
<td>South West</td>
<td>0.134 (1.02)</td>
<td>0.312 (3.27)</td>
<td>0.055 (0.62)</td>
<td></td>
</tr>
<tr>
<td>West Midlands</td>
<td>0.110 (0.95)</td>
<td>0.471 (5.50)</td>
<td>0.119 (1.46)</td>
<td></td>
</tr>
<tr>
<td>North West</td>
<td>0.216 (0.18)</td>
<td>0.231 (2.56)</td>
<td>-0.076 (-0.89)</td>
<td></td>
</tr>
<tr>
<td>Wales</td>
<td>-0.091 (-0.57)</td>
<td>0.034 (0.30)</td>
<td>-0.100 (-0.95)</td>
<td></td>
</tr>
<tr>
<td>Year</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1979/80</td>
<td>0.920 (11.98)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1980/81</td>
<td>0.145 (1.82)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1981/82</td>
<td>0.043 (0.53)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1984/85</td>
<td>0.175 (2.51)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1985/86</td>
<td>-0.201 (2.83)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1986/87</td>
<td>-0.248 (3.55)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1987/88</td>
<td>-0.637 (9.84)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1988/89</td>
<td>-0.876 (13.25)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1989/90</td>
<td>-0.904 (16.01)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1990/91</td>
<td>-0.389 (6.50)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1991/92</td>
<td>-0.090 (1.47)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1994/95</td>
<td></td>
<td>0.213 (3.86)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1995/96</td>
<td></td>
<td>0.325 (6.05)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1996/97</td>
<td></td>
<td>0.539 (9.76)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>5026</td>
<td>6155</td>
<td>6446</td>
<td></td>
</tr>
<tr>
<td>Log L</td>
<td>-1349.82</td>
<td>-2508.42</td>
<td>-2866.87</td>
<td></td>
</tr>
<tr>
<td>Wald ch2b2</td>
<td>330.16</td>
<td>558.26</td>
<td>466.14</td>
<td></td>
</tr>
<tr>
<td>Prob &gt; ch2b2</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td></td>
</tr>
<tr>
<td>Pseudo R2</td>
<td>0.1225</td>
<td>0.1542</td>
<td>0.1089</td>
<td>0.0764</td>
</tr>
</tbody>
</table>

* a-statistics in parentheses.
* The reference categories are the same as specification 1, in Table 4.7 with the exception of the year dummy variables, which are different for each period. The excluded year is 1982/83 for cycle 1; 1983/84 for cycle 2; 1992/93 for cycle 3 and 1993/94 for cycle 4.

4.7. CONCLUSION

No industry or organisation can function without its workforce. The size of the workforce will vary over time, reflecting a host of diverse economic circumstances. This chapter has shown that the impact of the need to recruit/retain labour on wage pressure varies substantially by
industry, region and time. In particular, prosperous industries such as banking, insurance and finance and business professional services are where the RRF exerts the highest pressure on wages. Similarly, in successful regions such as the South East, the importance of the RRF is highest. This is where rent-sharing bargainers, as in IOT, have the most potent influence. So, another reason why the importance of the RRF is highest in successful regions like the South East is because it is where insiders are likely to have the greatest influence (Lindbeck and Snower, 1988c), since turnover costs are the greatest in more prosperous regions. Hence, the more prosperous the firm, the greater the rent that can be appropriated by insiders. In addition, in financially prosperous firms, turnover costs for firms are likely to be the greatest, specifically where firms are large.

The important factors are generally the same in each of the sub-periods, despite these models being estimated at different points in the economic cycle. Previous to this study, existing econometric research has failed to consider the importance of recruitment and retention as a major bargaining consideration in detail. It has been found that more prosperous establishments will want to hire and retain more workers, and more able workers, would want to work for these establishments and retain their employment with them in areas such as the South East. Less prosperous establishments will have difficulties, both in recruiting and retaining their workforce, as we saw, in areas such as the North.

Prior to offering policy prescriptions, it would be useful to bear in mind the fundamental reasons for regional disparities in the importance of RRF. First is the geographical inertia of workers, in conjunction with the immobility of capital and the current belief of the local businesses about economic success/development. In our current economy, locations which are rich in ideas and talent are the key to business, as we saw, for example, with East Anglia. Second, attracting educated people is crucial. Third, physical and cultural amenities are important in attracting key workers. Fourth, prosperity of the regions depends on organisations and individuals having ability to innovate, learn and adapt. Fifth, efficacious partnerships among businesses, government and the non-profit sector can bring forth change.

Now it will be useful to consider the problems that need to be surmounted and or myths that need to be dispelled. First, a strong emphasis on clusters/agglomeration in new regional policy is not devoid of obstacles. Second, the indigenous regional policy model overlooks inter-regional dependencies and relationships. Third, the South East has strong first-mover
advantage since it benefits both by being in close proximity to the European Union markets and it also having close links with strong sectors in the region. Both are essential for economic success. So the way forward is to implement policies which will increase the formal education and training of potential or incumbent workers accredited by an independent authority, other than the establishment seeking it. The Blair government has already set its sights on attaining this although in a small way, by aiming to increasing the proportion of the population that enters university education.

Using the CBI dataset, I found that the need to recruit and retain is a major bargaining consideration in wage determination, notably, where turnover costs are high, with caveats stemming from limitations of the dataset. Having established that retention and recruitment of workers are an important wage determinant over time, in this chapter and in the previous chapter I have established that wage bargainers are forward-looking, with an extremely comprehensive/structured dataset. Naturally, it is clearly of considerable interest to examine the consequences of this and rational behaviour in the bargaining process and this I pursue in the next chapter.
CHAPTER 5
THE DYNAMIC BARGAINING PROBLEM
IN LABOUR MARKETS

5.1. INTRODUCTION

A two-person ongoing bargaining situation arises when two individuals have the opportunity to collaborate in a long-term relationship for mutual benefit in various ways. In the simpler case, which is the one considered in this chapter, all aspects of the game are analysed, within a dynamic equilibrium. No aspect of the game is analysed in steady-state (in particular, the terms of trade of the ongoing partnership), as has been done in the past in the labour economics literature. No agent will bargain with his trading partner, myopically, without taking into account what his partner’s expected bargaining endowments may be in the future, irrespective of whether these are favourable or adverse.

The ongoing labour economics situations of bargaining between members of trade union workers and firms, as expounded in the trade union models of Monopoly Union, Right to Manage and Efficient Bargaining Models, insiders and firms, can be regarded as dynamic bargaining problems. The object of this chapter is to provide a theoretical discussion of this problem, to obtain equilibria and to show overall a definite solution to dynamic analysis of wage determination, which could then provide an explanation of unemployment in a imperfectly competitive labour market. Of course the results found here can be generalised to any economic situation where the relationship is ongoing between the two agents.

This is a classical problem of exchange in a labour market model in a dynamic environment, and more specifically of firms and workers, as developed by Shapiro and Stiglitz (1984), Stigler (1961), Lindbeck and Snower (1988c) and others. A different approach is suggested by Pissarides (2000), which permits the identification of this typical exchange in a dynamic labour market model. However, his analysis imposes Nash’s axiomatic bargaining solution within a dynamic environment, a feature in common with the large literature on decentralised trade. In addition, he focuses on linear utility with risk-neutral agents and linear

I will leave this for my future research.
cost functions. Agents in general are risk averse. I have generalised the Pissarides model by considering risk-averse agents and non-linear cost functions.

In general terms, we assume that the two individuals have perfect foresight, are rational, forward-looking, and each can compare the utility he or she derives from various economic situations, each can accurately estimate the other's expected endowments at the time of bargaining, each is fully equipped with astute bargaining skills and each has perfect knowledge of the other's tastes, preferences and time preferences.

In developing our labour market model with random matching, strategic bargaining as in Pissarides (2000) (henceforth, referred to as Pissarides model), our terms of trade, the wage, is a differential function of time, in contrast to the Pissarides model. We assume that agents are forward-looking, and show that this makes a qualitative difference in the types of equilibria that emerge.

The concept of expectation with foresight in an ongoing relationship is crucial in this theory. This concept will be partly explained by way of illustration. Suppose a worker who, having formed a match with a firm, is bargaining with the firm as to the wage at some period t: the worker knows that the firm is expected to make a great deal of revenue in the near future. With knowledge of this, the worker bargains a higher wage. The firm accepts, which is consistent with rent-sharing theories, the sociological model of the efficiency wage theory (Akerlof, 1982), insider-outsider theory and so forth. On the other hand, if the worker knows that the firm is going to perform adversely in the near future, and may even be on the verge of bankruptcy, the worker suppresses his wage demands. There is a body of evidence which is consistent with workers accepting paycuts, see for example, Smith (1994), Smith (2000), Nickell and Quintini (2003), who indicates that wages are significantly downward flexible. Also Brown, Ingram and Wadsworth (2004) and more recently, stewards of American Airlines accepting paycuts to postpone bankruptcy of the airline.

Labour market models in the past, including that of Pissarides's analyses, imposes the Nash bargaining solution (henceforth, referred to as NBS), in a special case of the dynamic model. That is, although the bargainers are in an ongoing relationship, the bargainers bargain wage at its steady-state values, i.e., the values when $t \to \infty$, or they have equal rates of time preference. But the theory developed there makes no attempt to reconcile that rational

\[ \text{See Financial Times, 26/4/03.} \]
bargainers in an ongoing relationship will bargain with foresight and will be forward-looking in a dynamic environment in all aspects and hence a dynamic equilibrium should be sought for a given non-stationary environment, that is, to determine what it is worth to each agent to have the opportunity to engage in an ongoing game with a long-term partner\textsuperscript{44}. This determination is only accomplished in the case of a game in stationary environment.

In any labour market model, the way in which wage is determined plays a crucial role for the number of job matches taking place per unit of time, and thus for unemployment. Therefore, special attention will be focused on dynamic determination, which has been relatively neglected in the labour economics literature. I state at the outset that I have unified for the first time the Coles and Wright (1998) [henceforth, referred to as CW] and Pissarides (2000) model, to show a stable and unique wage and employment outcome with no limit cycles, that is, I show a new equilibrium concept. Whilst the CW model is equilibrium deficient in an entirely different model and Pissarides does not analyse a fully dynamic labour market model as effectively the steady state Nash solution is imposed in an otherwise dynamic model. In addition, Pissarides only analyses linear cost functions. In contrast, I analyse a fully dynamic labour market model with risk averse agents and non-linear cost functions. The CW model had a limit cycle in their model, whilst Pissarides did not perform any simulations and only analysed a two-dimensional non-linear model. The latter derived the stability properties of his system purely by visually inspecting the signs of his simple two-dimensional system with only the unemployment and the market tightness variable.

Wages should reflect an equilibrium which is derived as a function of time, and by the construction of the said equilibrium the agreement is immediate. That is, this equilibrium will depend continuously on the set of the value of the labour services and the value of the output of these services over time, constituting the mathematical description of the game and which expresses the utility to each player of the opportunity to engage in the ongoing game. The ensuing equilibrium is non deficient, that is, it has a stable and unique wage outcome, in contrast to the extant literature.

CW study forward-looking bargaining in a totally different environment to ours in monetary economics, where of course, agents are different and behave markedly differently to ours.

\textsuperscript{44}I will refrain from discussing the typical difficulty (in terms of both monetary costs and time) of finding long-term partners, although this is an interesting issue. Search theory has covered some elements of this, for example, Mortensen (2002).
For example, where the two agents adopts the role of the other upon completion of the trade. This phenomenon is unobserved in an ongoing game in the labour market. However, their general theoretical result can be applied to our model.

The organisation of the chapter is as follows: In Section 5.2 I review the basic labour market model of matching. In Section 5.3 I analyse dynamic wage-bargaining and characterise the equilibrium in terms of a simple differential equation. In Section 5.4 – 5.7 I integrate the dynamic bargaining solution to market equilibria. Section 5.8 concludes.

5.2. TRADE IN THE LABOUR MARKET MODEL

The main idea of the model is that trade in the labour market is typically a decentralised economic activity by agents in a dynamic environment, which is reflected more importantly in the price the agents trade as well. Trade is uncoordinated, time-consuming and costly for both firms and workers. That is, firms and workers expend resources prior to job creation and production, and existing jobs command rents in equilibrium, unlike the Walrasian labour markets. We use a simple modeling device to capture the implications of trade in a market equilibrium where I ensure that every aspect of the model is dynamic, including wage determination.

Pissarides develops a theory of unemployment which includes as a special case the two-person static wage-bargaining problem within an otherwise dynamic model, that is, where the expected values of employed workers, unemployed workers, the expected value of an occupied job and vacancies to the firm are all dynamic. But the theory there developed makes no endeavour to find a value for a given ongoing wage-bargaining game, that is, to determine what it is worth to each agent to have the opportunity to engage in the ongoing bargaining game, which is crucial to a proper development of any unemployment theory. The determination is accomplished only in the case of the two-person static bargaining game, within an otherwise dynamic environment. In other words, the special dynamic model using steady-state wages developed by Pissarides, makes no endeavour to characterise the wage as a differential function of time, in an ongoing relationship where in all other respects the model is dynamic. The model in this chapter is dynamic in all respects as it should be.
5.3. THE MATCHING FUNCTION AND THE BEVERIDGE CURVE

We use the matching function as a modelling device that captures the outcome of the investment of resources by firms and workers in the trading process as a function of inputs. In order to provide a theoretical treatment of dynamic wage-bargaining situations in the labour market, I abstract from the intricacies of the matching function, for example, with heterogeneous workers, jobs, skills, search intensity of both workers and firms, geographical areas and so forth, to form a mathematical model in terms of which to develop the theory.

Vacant jobs and unemployed workers become matched and move from trading to production activities, in accordance with the prevailing matching technology. Unemployment persists in the steady-state, due to the fact that during the matching process, and prior to all job-worker pairs matching, some of the existing jobs break up, due to shocks such as demand and technology, providing a flow into unemployment. Firms and workers search for the other agent, with full knowledge of the job-matching and job-separation process, but make no attempt to coordinate their actions.

The equilibrium developed in this chapter is a dynamic equilibrium. The aggregate equilibrium is where both agents maximise their respective objective functions, subject to the matching and separation technology and where both the inflows into and outflows out of unemployment are equal. We assume, that there is no on-the-job search. It has been claimed (see, for example, Pissarides (2000)), that it makes no qualitative difference to the theory of unemployment, whether the assumption of no on-the-job or on-the-job search is introduced. Time is considered as a sequence of discrete periods of length $\Delta t > 0$.

Then the number of job matches per unit time is given by the matching function

$$m_L = m(u_L, v_L)$$

where $L$ is the workers in the labour force, $u$ is the unemployment rate, $v$ is the number of vacant jobs as a proportion of the labour force and (1) is assumed to be increasing in both its arguments, concave and homogenous of degree 1. Job matches at any point in time are randomly selected from the sets $vL$ and $uL$. Thus, a typical matching function is

$$m(u, v) = v \left[ 1 - e^{-\frac{v}{u}} \right]$$

(1a)
It follows, the Poisson process that fills vacant jobs \( vL \) has a rate

\[
\frac{mL}{vL} = \frac{m(uL, vL)}{vL} = m\left(\frac{u}{v}, 1\right) = q(\theta)
\]  

(2)

or following (1a)

\[
q(\theta) = \frac{m(u, v)}{v} = 1 - e^{-\frac{1}{\theta}}
\]  

(2a)

where, \( \theta = \frac{v}{u} \), is a measure of labour market tightness, which one can interpret as the balance between the demand and supply of labour as in Brigden and Thomas (2003). Thus, \( q(\theta) \) is the rate at which vacancies become filled. Note that \( q'(\theta) < 0 \). The unemployed workers move into employment according to a related Poisson process with rate

\[
\frac{m(uL, vL)}{uL} = \frac{vL\ m(uL, vL)}{vL} = \frac{v}{u} m\left(\frac{u}{v}, 1\right) = \theta q(\theta) = \theta(1 - e^{-\frac{1}{\theta}})
\]  

(3)

In yet another Poisson process, suppose that the employed workforce of size \( (1 - u)L \) loses jobs at an exogenous rate \( \lambda \) per unit of time. Thus, the outflows from employment are \( \lambda(1 - u) \), per unit of time. The latter can be expressed as \( u\theta q(\theta) L \), from (3). Hence the evolution of unemployment is

\[
\dot{u} = \lambda(1 - u) - \theta q(\theta) u
\]  

(4)

Then, in steady-state

\[
\lambda(1 - u) = \theta q(\theta) u
\]  

(5)

which implies,

\[
u = \frac{\lambda}{\lambda + \theta q(\theta)}
\]  

(6)

This equation can be represented in vacancy-unemployment space, by a downward-sloping convex to the origin curve. The curve is referred to as the Beveridge curve. If we restate (5) in terms of the job flows, then clearly the key driving force of this model is job creation. This is because the empirical literature on job flows defines the job creation rate as \( m(u, v)/(1 - u) \), where \( m(u, v) \) is the number of jobs created and \( (1 - u) \) is employment. In addition, the job destruction rate is also defined as the ratio of \( \lambda(1 - u) \) to \( (1 - u) \). Equating the constant \( \lambda \) to \( \theta q(\theta) u/(1 - u) \) yields (5), thereby demonstrating that it is job creation that is the main driving force of the model.
5.4. THE FIRM: THE VALUE OF A JOB AND A VACANCY

Each firm has one job when entering the market which it desires to fill. When the job is filled the firm obtains revenue by selling its output. The value of the output is some constant \( p > 0 \). While the job is unfilled, the search costs are fixed at \( h > 0 \) each time, which is a proportion of productivity. The rate at which jobs are filled is \( q(\theta) \). These preliminaries are the same as in the Pissarides model.

The number of jobs available at any given time is determined by profit maximisation. All firms can open a vacancy and engage in searching. Thus, profit maximisation requires that the profit from a marginal vacancy is zero. In the environment of this model, with each firm having one vacancy only, profit maximisation is equivalent to a zero profit condition for firm entry. Let \( J(t) \) be the present discounted value of expected profits from a filled job and \( V(t) \) be the corresponding value of a vacant job, both evaluated at the beginning of the period \([t, t+\Delta t]\). Assume the rate at which vacant jobs become filled is \( q(\theta) \) and the rate at which unemployed workers attain jobs is \( \theta q(\theta) \). Assume that at each date \( t \) agents who can match complete negotiations immediately at \( w(t) \), which could possibly be random. Then the job generates a profit \((p - c(w))\Delta t\), during a small time interval and \( c(w) \) is the cost of labour. Assume \( 0 < c'(0) < 1 \), and \( c''(w) > 0 \) for all \( w \geq 0 \), in sharp contrast to the Pissarides model. The latter implies that there are diminishing returns to scale. The reason for the former assumption will be seen later. The Pissarides model is restricted to linear utility only, that is, for instance, \( c(w) = cw \). The job also dies with probability \( \lambda \Delta t \) and survives with a probability \( 1 - \lambda \Delta t \). Hence, the standard dynamic programming (D.P.) equations for filled jobs and vacancies gives us

\[
J(t) = \frac{1}{1 + r\Delta t} \left[ (p - c(w)) \Delta t + (1 - \lambda \Delta t) J(t + \Delta t) \right] + \lambda \Delta t V(t + \Delta t) + o(\Delta) \tag{7}
\]

\[
V(t) = \frac{1}{1 + r\Delta t} \left[ -h \Delta t + (1 - q(\theta) \Delta t) V(t + \Delta t) \right] + q(\theta) \Delta t J(t + \Delta t) + o(\Delta) \tag{8}
\]
where \( r \) is the rate of time preference and the term \( o(\Delta) \) appears due to the Poisson process, which satisfies \( \frac{\sigma(\Delta)}{\Delta} \) as \( \Delta t \to 0 \).

Taking the limit as \( \Delta t \to 0 \) we obtain the standard continuous time equations

\[
\dot{J} = rJ + \lambda (J - V) - (p - c(w))
\]

\[
\dot{V} = rV + q(\theta) (V - J) + h
\]

In equilibrium, with free entry of firms, all profit opportunities from new jobs are exploited, driving rents from vacant jobs to zero. Thus, in equilibrium, the supply of a vacancy is \( V = 0 \), which implies from (10)

\[
J = \frac{h}{q(\theta)}
\]

For an individual firm, \( \frac{1}{q(\theta)} \) is the expected duration of an unfilled vacancy. The interpretation of (11) is that, in equilibrium, market tightness is such that the expected profit from a new job is equal to the expected cost of hiring. The latter is due to the competition for vacant jobs. Given (11), (9) will now be

\[
j = \frac{(r + \lambda) h}{q(\theta)} - (p - c(w)) = 0
\]

Next, we consider the behaviour of workers.

### 5.5. THE WORKER: THE VALUE OF EMPLOYMENT AND UNEMPLOYMENT

Workers receive a wage \( w \) per unit of time if employed and an unemployed insurance and income \( z \) if unemployed. Assume the worker derives current utility of \( \mu(w) \) from the wage. Assume \( \mu'(w) > 0, \mu''(w) < 0 \). That is, agents' behaviour are risk-averse, as mentioned above. This is another contrast to the Pissarides model. Let \( W \) and \( U \) be the corresponding value functions of employment and unemployment. Then following the same reasoning as before the D.P. equations are:

\[\text{For example, the interpretation of (7) is that between } t \text{ and } t + \Delta t \text{ a firm meets a worker, with whom it can form a productive match, which yields payoff } (p - c(w)) \text{ and with the probability } (1 - \lambda \Delta t) \text{ the job-specific shock not occurring and with probability } \lambda \Delta t V(t + \Delta t) \text{ the shock occurring.}\]
\begin{align*}
W(t) &= \frac{1}{1 + r\Delta t} [\mu(w)\Delta t + \lambda \Delta t U(t + \Delta t) + (1 - \lambda \Delta t)W(t + \Delta t) + o(\Delta)] \\
U(t) &= \frac{1}{1 + r\Delta t} [z \Delta t + (1 - \theta q(\theta) \Delta t)U(t + \Delta t) + \theta q(\theta) \Delta t W(t + \Delta t) + z + o(\Delta)]
\end{align*}

where \( z \) is the unemployment benefit and letting \( \Delta t \to 0 \), we obtain

\begin{align*}
\dot{W} &= r W - \mu(w) + \lambda (W - U) \\
\dot{U} &= r U + \theta q(\theta) (U - W) - z
\end{align*}

Since \( q(\theta) = 1 - e^{-\frac{\theta}{\rho}} \), this implies, \( \theta q(\theta) = \theta(1 - e^{-\frac{\theta}{\rho}}) \). Considering both the discrete and continuous time value functions of both the firms and workers, it is abundantly clear, that it is the determination of the wage that plays a very crucial role in this model and indeed, in imperfectly-competitive theories of unemployment that have been put forward over the years.

The wage, \( w(t) \) remains to be determined. In the next section, I analyse explicit strategic bargaining games between the firm and worker. Prior to this, for illustrative purposes, I will consider the implications of the adoption of the NBS as it was in the Pissarides model (except that in the latter's model, strategic bargaining analyses were not used): \( w(t) = w^n(t) \), where

\begin{equation}
w^n(t) = \arg \max_{w} [W(t) - U(t)]^\beta [J(t) - V(t)]^{1-\beta}
\end{equation}

where \( U \) and \( V \) are the threatpoints of worker and firm respectively, and \( \beta \in [0, 1] \) is the bargaining power of the worker. In addition, I need to impose that this maximisation is subject to the constraints that guarantee trade is voluntary; that is, there are gains to trade:

\begin{align*}
\omega_w(w, t) &= \mu(w) + W(t) > U(t) \\
\omega_f(w, t) &= p - c(w) + J(t) > V(t)
\end{align*}
where the instantaneous payoff functions following a successful match are on the LHS of the inequality sign in both these equations.

We will choose a utility function of the form \( \mu(w) = \frac{w^{1-\rho}}{1-\rho} \) with \( 0 < \rho < 1 \), thereby rendering our game to be more general than the Pissarides model. \( c(w) \) can also be normalised. Redefine costs in terms of units of utility. Two points arise from this definition. First, in the vicinity of \( w = 0 \), (18) becomes \( p - c(0)w + J(t) > V(t) \). Hence the reason for the additional assumptions initially of \( c'(0) < 1 \). Second, if \( c(w) = cw \) in conjunction with \( \mu(w) = \frac{w^{1-\rho}}{1-\rho} \), then with \( c < 1 \), there will always be some \( p - c(w) \) and \( V(t) \) such that \( p - c(w) + J(t) > V(t) \). The same applies to (17). I generalise the Pissarides model which has constant returns-to-scale and linear utility with risk-neutral agents and nonlinear cost functions with decreasing returns-to-scale. Therefore, ITE \( \neq \) NBS, in contrast to the assumption of ITE \( \equiv \) NBS in the Pissarides model. Thereby, introducing a new equilibrium concept.

Given bargaining power, an equilibrium can be defined as a list of nonnegative and bounded paths \([J(t), V(t), W(t), U(t), w^n(t)]_{t=0}^{\infty}\) satisfying for all \( t \) the dynamic programming equations in either discrete or continuous time and the maximisation problem in (16) subject to (17) and (18).

In a related model CW claim to have obtained limit cycles. But this gives rise to indeterminacy and instability. Pissarides (2000) also analyses a labour market model, but effectively imposes the steady-state wage-bargaining solution, that is, the Nash solution in an otherwise dynamic model. In addition, he also only analyses a two-dimensional non-linear model, when considering out-of-steady-state dynamics. Second, Pissarides (2000) does not conduct any simulation as noted. In the next section I apply some results of CW to a model of Pissarides. In the succeeding section after that I define a saddle-path stable and unique equilibrium with no limit cycles in a fully dynamic model, in contrast to past studies, including CW and Pissarides (2000), where all or either of these elements are absent/lacking.
5.6. A BARGAINING MODEL BETWEEN FIRMS AND WORKERS

If both firms and workers form a successful match, their instantaneous payoffs are \( \omega_w(w, t) \) and \( \omega_f(w, t) \) as given in (17) and (18) respectively, where \( \omega_w \) is increasing and \( \omega_f \) is decreasing in \( w \) and both explicitly vary with time. Agent \( i \) discounts the future at rate \( r_i > 0 \), so the payoff for \( i \) from trading at \( t \) discounted back to date 0 is \( e_i^{-r_i} \omega(w, t) \). Assume \( \omega_i \in C^2 \), \( \omega_i \) concave in \( w \) for all \( t \), \( \omega_i(w, t) \) bounded in \( t \), and \( \frac{\partial \omega_i(w, t)}{\partial t} \) bounded for all \( (w, t) \). Since firms exploit all profit opportunities from new jobs, in equilibrium \( V = 0 \). Workers derive some utility from not trading, but this is normalised to zero for expositional purposes in this section. This should have no impact on the qualitative result of this chapter. Define \( \zeta(t) = \{ w_i : \omega_i(w, t) \geq 0, \ i = w, f \} \), and assume that \( \zeta(t) \) is nonempty for all \( t \) and uniformly bounded in \( t \).

5.6.1. The Bargaining Process

In making our treatment of wage-bargaining we employ a Rubinstein-type bargaining process of the type considered in CW with the following features:

(i) Random alternating offers, where with some probability \( \pi_w \), nature chooses the worker to propose a value of \( w \) and the firm, with probability \( \pi_f = 1 - \pi_w \).

(ii) There is no delay (immediate agreement)

When agreements are reached, agents trade and depart. But when agreements have not been reached immediately, agents prefer to pursue bargaining until they have reached one in accordance with constraints (17) and (18), which is consistent with individual optimising behaviour\(^{46}\).

Our object is to characterize subgame perfect equilibria in strategies that are history independent, but typically nonstationary, since payoffs are time varying. In equilibrium firms and workers reach immediate agreement upon meeting. This category of equilibrium is referred to as the Immediate Trade Equilibrium (ITE).

Following CW, we define reservation values \( w_w(t) \) and \( w_f(t) \) such that at time \( t \) the worker will accept any \( w \geq w_w(t) \), and the firm will pay any \( w \leq w_f(t) \). In addition, the

\(^{46}\)Later in this section I also generalize the model to permit exogenous breakdown in bargaining.
best proposal is always the reservation value of the other agent. This implies we identify a strategy profile with $[w_w(t), w_f(t)]_{t=0}^\infty$, where each agent proposes the other's reservation values and accepts each agent's own reservation values, when it is his turn to accept.

**Theorem 1.** In an ITE, in the limit as $\Delta t \to 0$, the expected terms of trade, $w(t)$ is a differential function of $t$, (Coles and Wright, 1998), which satisfies

\[
\dot{w} = \pi_f \left[ \frac{r_w\omega_{w}(w,t) - \partial \mu_w(w,t)/\partial t}{\partial \omega_{w}(w,t)/\partial w} \right] + \pi_w \left[ \frac{r_f\omega_f(w,t) - \partial \omega_f(w,t)/\partial t}{\partial \omega_f(w,t)/\partial w} \right]
\]

(22)

By Theorem 1, if we know $w(t) = \hat{w}$ at any given time $\hat{t}$, for example, then the entire path $[w(t)]_{t=0}^\infty$ can be found by iterating on (22). Next, we will establish precisely such a condition, and thereby, identify an ITE. The next result considers the case where $\mu_i$ settle down over time, that is, when $t \to \infty$.

However, (22) permits ambiguity\(^47\), when we consider Binmore's continuum example. In addition, currently, the Theorem is only applicable when agents use Markov strategies. Hence, a uniqueness argument can be provided to render Theorem 1 more general\(^48\).

**Theorem 2** In the limit $t \to \infty$, $w(t) = \lim_{t \to \infty} w^n(t)$, that is, the steady-state of the ITE and the Nash Solution coincide (Coles and Wright, 1998). That is, $\omega_i(w,t) \to \bar{\omega}_i(w)$ as $t \to \infty$, and $\bar{\omega}_i$ satisfies all the assumptions on $\omega_i$, then in the limit as $\Delta t \to 0$, if an ITE exists it is unique and $w(t) \to \bar{w}$ as $t \to \infty$ and satisfies

\[
\bar{w} = \arg \max \bar{\omega}_w(w)^\beta \bar{\omega}(w)^{1-\beta}
\]

where

\[
\beta = \frac{\pi_f r_f}{\pi_f r_f + \pi_w r_w}
\]

Proof as in CW.

Let us consider again the Nash solution, as shown in (16), with different $\beta$ and threat points, $T_i$ set to zero, to those in (16),

\[
w^n(t) = \arg \max \omega_w(w(t) - T_w(t))^\beta(w_f(w(t) - T_f(t))^{1-\beta}
\]

(22a)

\(^47\)I will leave this for my future research.

\(^48\)I will leave this for my future research.
where $T_i(t) = 0$ and $\beta = \frac{\pi w r_f}{\pi w r_f + \pi f r_w}$

The previous result says that, when $\lim_{t \to \infty} w(t) = \lim_{t \to \infty} w^n(t)$, but the coincidence does not generally hold when $t < \infty$. The conditions in Theorem 2 apply to the Pissarides (2000) model, when $\lim_{t \to \infty} w(t) = \lim_{t \to \infty} w^n(t)$, where the steady-state wage is imposed.

To illustrate this, let us take the example of risk-averse workers with foresight. Let $\omega(w) = \frac{w^{1-\rho}}{1-\rho}$, with $0 < \rho < 1$, and $\omega_f(w, t) = e^{-\delta t} - w$, so that the surplus to be divided is depreciating at rate $\delta$ (or, if $\delta < 0$, appreciating). In the Pissarides model, where NS $\equiv$ ITE$^{49}$ when $\rho = 0$, which implies, workers are risk-neutral. Again assume $r_i = r$ and $\pi_i = \frac{1}{2}$, then (22) is

$$w = \frac{r \omega_w [1 + (1 - \rho)] - (1 - \rho) e^{-\delta t} (r + \delta)}{2 (1 - \rho)}$$

Here, Theorem 2 implies $w(t) \to 0$ and the solution to the above differential equation, subject to this boundary condition, is

$$w^* = \frac{(r + \delta) (1 - \rho) e^{-\delta t}}{r (2 - \rho) + 2 \delta (1 - \rho)}$$

It is straightforward to establish that immediate trade is an equilibrium provided $(r + \delta) > 0$. In comparison, the Nash solution with the threatpoints and $\beta$ that is applicable in steady states, implies that

$$w^n = \frac{(1 - \rho) e^{-\delta t}}{2 - \rho}$$

for all $t$. While $w^*$ and $w^n$ converge to the same limit as $t \to \infty$, for finite $t$, $w^* > w^n$ if $\delta > 0$ and $w^* < w^n$ if $\delta < 0$.

**Theorem 3.** Equivalence of ITE and Nash Solution along the entire path, not just in steady-state (Coles and Wright, 1998).

Suppose $\omega_i(w,i) = \eta_i w + \varphi_i(t)$, where $\eta_w > 0 > \eta_f$, and $r_w = r_f = r > 0$. Then if an ITE exists with these functional forms, it is unique and $w(t) = w^n(t)$ with $T_i(t) = 0$ and $\beta = \pi_w$.

Proof as in CW.

$^{49}$When $t \to \infty$ or $r_f = r_w$ (that is, the discount rates of agents are equal).
In other words, \( w^n(t) = w(t) \) for all \( t \) only when payoffs are linear in \( w \), separable between \( w \) and \( t \), and \( \tau_w = \tau_f \).

Notice that the NBS solution (16) is similar to the one used in the Pissarides (2000) labour market model. The NBS used in the Pissarides model does coincide with an ITE, shown in Theorem 3. The conditions in Theorem 3 apply in the Pissarides model, except that the threat points are now \( T_w = U \) and \( T_f = V \) for the worker and firm respectively. This does not affect the logic of the Rubinstein-type solution though, since one simply measures the utility relative to these threat points. As we have shown that this changes, if wage, \( w(t) \) is characterised as a differential function of time, in an ITE in the limit as \( \Delta t \to 0 \), the workers are risk-averse with single period utility given by \( \frac{w^{1-\rho}}{1-\rho} \), \( 0 < \rho < 1 \), as we have shown in an example earlier and if the cost function is for example, \( c(w) = a_0 + a_1 w + a_2 w^2 \).

Theorem 3 also corresponds to how wage-bargaining has been settled in the past in general, in the labour economics models, including all the trade union models and the main unemployment and the wage determination models. In a dynamic environment as in the Pissarides model, in general, where at least one of the functions, that is \( w \) or \( c(w) \), is non-linear, we must use the forward-looking bargaining solution (22) to analyse dynamics.

So far, we have assumed immediate trade. We need to check that this is consistent with equilibrium behaviour. Let \( \pi_i(t) = e_i^{-rt} \omega_i[w(t), t] \) be the equilibrium payoff to \( i \) if agreement is made at time \( t \), given \( w \) solves (22). Then an immediate trade for all \( t \) is an equilibrium, if

\[
\pi_i(t) > 0 \quad \text{and} \quad \pi'_i(t) < 0
\]

for all \( t \) and both firms and workers. The interpretation of this equation is that, agents would prefer to trade sooner than later.

The second inequality will hold for both agents, given \( w \) satisfies (22), if and only if the following condition holds as in CW:

\[
\pi_i(t) = e_i^{-rt} \omega_i[w(t), t]
\]

\[50\text{In the risk averse example, if we assume } \alpha = 1, \text{ then the assumptions of Theorem 3 are satisfied, and we can confirm that } w^n(t) = w^* \text{ for all } t, \text{ as shown below.}
\]

\[w^n = \frac{\epsilon^t}{3} \]

\[w^* = \frac{(r+\delta)\epsilon^{-rt}}{2(r+\delta)} \]

\[w^* = \frac{\epsilon^{-rt}}{2} = w^n \]
The agents will trade sooner as opposed to later if (23) is satisfied. The interpretation of (23) is that e\(^{-r_i t}w_i(w(t), t)\) decreases in \(t \forall w \in \mathcal{C}(t)\) and is strictly decreasing for one agent (Binmore, 1987).

We now consider the case where we permit exogenous breakdowns in the bargaining game. Let \(\sigma_i\) be the Poisson arrival rate with which \(i\) believes an exogenous breakdown will occur during bargaining, and \(b_i\) his utility in this event. Note, we now let \(r_i, \pi_i, \sigma_i, b_i\) be time varying. For brevity, this variance is not made explicit in the notations.

In this case, a simple generalisation of Theorem 1, yields, following CW

\[
\dot{w} = \pi_f \left[ \frac{(r_w + \sigma_w) \omega_w - \sigma_w b_w - \partial \omega_w / \partial t}{\partial \omega_w / \partial w} \right] + \pi_w \left[ \frac{(r_f + \sigma_f) \omega_f - \sigma_f b_f - \partial \omega_f / \partial t}{\partial \omega_f / \partial w} \right]
\] (25)

Just as in the case with no breakdown, we can analogously show, that when \(w_i(w, t)\) converges over time to \(\bar{w}_i(w)\), then \(\lim_{t \to \infty} w(t) = \bar{w}\) is the Nash solution with,

\[
T = \frac{\sigma_i b_i}{r_i + \sigma_i}
\]

\[
\beta = \frac{\pi_w (r_f + \sigma_f)}{\pi_w (r_f + \sigma_f) + \pi_f (r_w + \sigma_w)}
\]

Following Theorem 3, it can be shown that if payoff functions are linear and \(r_w = r_f\) and \(\sigma_w = \sigma_f\), then \(w(t) = w^n[\cdot]\) along the entire path and not just in steady-state\(^{51}\).

5.7. MARKET EQUILIBRIA

We are now in a position to characterize equilibrium in the labour market model, with the dynamic wage-bargaining model. Agents are of measure zero, that is, agents are one of the many in the economy, but of course, their actions are typical; the likelihood of any two traders meeting again after separation is zero. In addition, any delay to trade between two agents has no impact on the aggregate market outcome. Thus, while bargaining, each agent takes the expected value of returning to the market as given. We assume, now, that

\(^{51}\)All calculations of solutions are available upon request from the author.
in the bargaining game \( \pi_i = \frac{1}{2} \) and there are no exogenous breakdowns, that is, \( \sigma_i = 0 \). If the game is subject to delay, constraints (17) and (18) dictate that agents prefer to pursue bargaining than separate.

In discrete time, to describe an ITE, we need to determine \([W(t), U(t), J(t), V(t), w_w(t), w_f(t)]_{t=0}^{\infty}\). The instantaneous payoffs of a successful match are: \( \omega_w(w,t) = \mu(w) + W(t) \) and \( \omega_f(w,t) = (p - c(w)) + J(t) \), for the workers and firm respectively. In an equilibrium, beliefs must be consistent with market outcomes, that is, taking \([w_w(t), w_f(t)]_{t=0}^{\infty}\) as given, \([W(t), U(t), J(t), V(t)]_{t=0}^{\infty}\) must satisfy the dynamic programming equations, in discrete time and vice versa.

In the limiting case, as \( \Delta t \to 0 \); we need to determine \([W(t), U(t), J(t), V(t), w(t)]_{t=0}^{\infty}\), where the value functions solve the continuous time equations, and \(w(t)\) is the value of \(w_w(t)\) and \(w_f(t)\) as \( \Delta t \to 0 \). If an ITE exists in the labour market, then \(w\) satisfies (22), which in this model becomes

\[
\dot{w} = \frac{r\mu(w) + rW(t) - W}{2\mu'(w)} - \frac{r(p - c(w)) + rJ(t) - J}{2c'(w)}
\]

(26)

It is crucial to note, in contrast to the Pissarides model, I generalise the cost function by using non-linear cost function and risk-averse utility function, which is also non-linear. The equilibrium is given by paths for \([W(t), U(t), J(t), V(t), w(t)]_{t=0}^{\infty}\) satisfying the continuous time equations and (26), subject to the constraints, which guarantee, that the trade is voluntary and the condition for immediate trade.

We have reduced the dimensionality of the system, by defining, \(x = U - W\). Subtraction of (14) and (15) is

\[
\dot{x} = x(r + \theta q(\theta) + \lambda) + \mu(w) - \mu(w)
\]

(27)

inserting (9) and (14) into (26) yields

\[
\dot{w} = \frac{r\mu(w) + \mu(w) + \lambda x}{2\mu'(w)} - \frac{r((p - c(w)) + (p - c(w)) - \lambda h\theta)}{2c'(w)}
\]

(28)

In addition, note \(h/q(\theta) = J\). Thus, further simplifications to the system, as shown below, enabled us to depict the system in four dimensions, of \((x, \theta, w, u)\).

Incorporating the results from our analysis in the earlier sections, the full dynamical
system is:

\[
\begin{bmatrix}
\dot{W} \\
\dot{U} \\
\dot{J} \\
\dot{V}
\end{bmatrix} =
\begin{bmatrix}
rW - \mu(w) + \lambda(W - U) \\
rU + \theta q(\theta)(U - W) - z \\
rJ + \lambda(J - V) - (p - c(w)) \\
rV + q(\theta)(V - J) + h
\end{bmatrix}
\]

where in order to maintain proper generality, \( \mu(w) = \frac{w^{1-\rho}}{1-\rho} \). In contrast to the Pissarides model, my model is more general. The Pissarides model pertains to risk-neutral workers. CW also does not explicitly analyse risk-averse workers.

Following (27) and setting \( V = 0 \), implies, \( J = \frac{h}{q(\theta)} \), we now have a system in four dimensions, which is

\[
\begin{bmatrix}
\dot{x} \\
\dot{J} \\
\dot{u}
\end{bmatrix} =
\begin{bmatrix}
r x + \theta q(\theta) x + \lambda x + \mu(w) - z \\
rJ + \lambda(J) - (p - c(w)) \\
\lambda(1 - u) - \theta q(\theta) u
\end{bmatrix}
\]

But

\[
J = \frac{h}{q(\theta)} = h(q(\theta))^{-1}
\]

Then,

\[
\dot{J} = \frac{-h(q(\theta))^{-2} q'(\theta)}{q(\theta)^2} = \frac{h \dot{q}'(\theta)}{(q(\theta))^2}
\]

and the above equation, becomes after rearrangement,

\[
\frac{\dot{q}'(\theta)}{(q(\theta))^2} = -\frac{(r + \lambda)}{q(\theta)} + \frac{(p - c(w))}{h}
\]
Hence, the above dynamic system will now be in $\dot{\theta}$, instead of $\dot{J}$, 

$$
\begin{bmatrix}
\dot{x} \\
\dot{\theta} \\
\dot{u} \\
\dot{w}
\end{bmatrix}
= 
\begin{bmatrix}
x(r + \theta q(\theta) + \lambda) + \mu(w) - z \\
-(r + \lambda) q(\theta) + \frac{(p-c(w))(q(\theta))^2}{q'(\theta)} \\
\lambda (1 - u) - \theta q(\theta) u \\
\frac{\tau \mu(w) + \mu(w) + \lambda x}{2\mu'(w)} - \left(\frac{\tau(p-c(w)) + (p-c(w)) - \lambda h}{2e^\omega(w)}\right)
\end{bmatrix}
$$

(29)

where the appropriate expression for $q(\theta)$ is $q(\theta) = 1 - e^{-\frac{1}{\theta}}$, $q'(\theta) = -\frac{e^{-\frac{1}{\theta}}}{\theta^2}$, which implies $1 - e^{-\frac{1}{\theta}} = \theta^2 \left(1 - e^{-\frac{1}{\theta}}\right)$, $c(w) = a_0 + a_1 w + a_2 w^2$, as shown below. In a few experiments$^{52}$ I also exclude the fixed cost, where $c(w) = a_1 w + a_2 w^2$ and without loss in generality, normalise $\mu(w) = \frac{w^{1-\rho}}{1-\rho}$, $\mu'(w) = w^{-\rho}$. Then an immediate trade equilibrium is any solution to (29), that confines in both constraints (17) and (18), and also satisfies $\pi_w = e^{-\tau t}[\mu(w) + W]$ and $\pi_f = e^{-\tau t}[p - c(w) + J]$.

A special case is a steady-state, which is an equilibrium where $w$ and $x$ are constant. Then $(w, x) = (0, 0)$ is a steady-state. In the Pissarides model, the dynamical system, comprises of purely $\dot{\theta}$ and $\dot{u}$, where $w$ and $x$ are constants.

### 5.8. CALIBRATION OF THE MODEL

The choice of the U.S. data for my empirical analysis is due to all labour market simulation work being U.S. based. The past literature source/econometric studies is based in the U.S., provided all the data I required from one country, specifically, the U.S.. Needless, to say, it is not possible to obtain data for all the variables in my analysis from the UK, since no simulation work is UK based. It is not possible to obtain data for all the variables in my analysis from one particular country, for example, the UK.

Prior to conducting the stability analysis it is useful to conduct a very brief tour of the available data pertinent to our study, in order to make an appropriate choice of the literature source/econometric studies, which would match/reflect the concepts of our model as far as possible. All the data sources pertaining to the literature source/econometric studies are of the U.S., except the econometric estimate of hiring costs, which is from Abowd and Kramarz (2000). The latter claims that all the microeconomic evidence for France has counterparts in

$^{52}$Details available from the author upon request.
the U.S., which are similar to those observed in France. Thus, the calibrations apply to the U.S. in most cases, except due to the scarcity of data on hiring costs (Hamermesh, 1993), the hiring costs is sourced from France’s data53.

5.8.1. Unemployment

We considered the official unemployment rate as the most appropriate data compatible with the concepts of our model. This is because other categories such as those responding affirmatively to the question if they ‘wanted a job now’ are inappropriate.

The reason for exclusion of the out-of-the-labour-force data in our study is obvious, notably, since the out-of-the-labour force flows exhibit distinct cyclical properties relative to flows between employment and unemployment. The unemployment to employment flows are countercyclical or acyclical, whilst the out-of-the-labour-force to employment flows are pro-cyclical.

It is worth noting that there is a high correlation between the official unemployment rate data and other configuration of unemployment rates data, namely, the official plus ‘want a job now’ unemployment rate data (Yashiv, 2005).

Given this choice, it is natural to consider only the official rate data when studying dynamic wage-bargaining in the labour market and the associated worker flows.

5.8.2. Vacancies

The pertinent concept of vacancies compatible to the concepts of the model is the one pertaining to those vacancies that are to be occupied by workers from outside the employment pool, but within the labour force. But the available and widely-used data series relates to another concept, which also includes vacancies that are subsequently occupied with workers in job-to-job transitions.

The available vacancy data series in the U.S. economy has two representations. One is the index of Help Wanted advertising in newspapers published by the Conference Board (see Abraham (1987) for an analysis and discussion of this series). A newer data series is the job

53 Other authors also use Abowd and Kramarz (2000), when all their other data sources are obtained from the U.S. For example, Silva and Toledo (2005).
openings data series available from the BLS since December 2000, utilising the Job Openings and Labour Turnover Survey (JOLTS)\textsuperscript{54}.

The third data series has the gross flows of workers from outside employment (unemployment and out of the labour force) to employment. The latter was recently compiled at the Boston Fed, based on the Current Population Survey (CPS) data, see Bleakley, Ferris and Fuhrer (1999). The hiring flows data series is negatively correlated with the first two series, that is, $-0.27$ with JOLTS series and $-0.36$ with the Help Wanted ads data series (Yashiv, 2005). The flows data series is considerably less persistent than the two vacancies series. The hiring flows data series is less volatile than the Help Wanted Index and the JOLTS data series (Yashiv, 2005).

In addition, there is a body of evidence on gross worker flows. For example, Fallick and Fleischman (2004), using CPS data in the period 1994 – 2003, find that job-to-job transitions are massive, that is 2/5 of new jobs represent employer changes. They also demonstrate that the cyclical properties of job-to-job transitions are distinct from the flows into and out of employment. Nagypal (2004), using microdatasets, also shows the prevalence of job-to-job transitions. Pissarides (1994) provides a possible explanation for the higher volatility of vacancies associated with both job-to-job transitions and to transitions from out of employment.

I conclude that in the light of our model, which is an aggregate\textsuperscript{55}, representative firm and worker type of model, job-to-job transitions are inappropriate, as its behaviour is distinct from the pertinent data series, where vacancies are filled by workers from outside the employment pool. Since the latter is unobserved, I use the vacancy rate from the literature that utilises the rate for the observed worker flow data series.

5.8.3. Wages

The existence of a variety of data series of wages with various cyclical properties was reported by several studies, for instance, Abraham and Haltiwanger (1995), Abraham, Spletzer and

\textsuperscript{54}This survey defines a job as "open", conditional on it fulfilling the following criteria: (i) a specific position exists and there is work available for that position; which can be full or part time, permanent, temporary, short-term or seasonal; (ii) the job could start within 30 days, irrespective of whether the establishment has found a suitable candidate during that time and (iii) the employer is actively recruiting from external establishments to fill the position.

\textsuperscript{55}Although we have bargaining between one worker and firm, they are representative of their respective type.
Stewart (1999), and Krueger (1999). But the analysis in these studies does not lead to any definitive conclusions as to which series is the most pertinent. The Bureau of Economic Analysis (BEA) series using total compensation\textsuperscript{56} and wages, suggests that although the series are correlated 0.83 (Yashiv, 2005), there are a multitude of important differences. Specifically, the wage series declines more over time, it is lower by 10 percentage points on average and exhibits considerably more variation, that is a coefficient of variation of 0.037 as opposed to 0.016 with respect to the compensation series (Yashiv, 2005). Both series have an extremely weak correlation with the cycle. The compensation series has \(-0.05\) correlation and the wage series has a 0.12 correlation with the employment rate (Yashiv, 2005).

Needless to say, econometric study using the U.S. data on wages settled on the basis of future financial performance, does not exist. The series of labour share using total compensation as opposed to wages, reconciles more with the concepts of the model.

Hence, I have used the compensation data series rate from the literature, as it incorporates all the firm's wage-related costs, which is the terms of trade, wage, \(w\), in our model.

\subsection*{5.8.4. Other Data Series}

With respect to the job destruction rate, \(\lambda\), I use the rate which represents the flow from employment to unemployment. The discount rate \(r\), in the model is the rate of time preference for both agents.

\subsection*{5.8.5. Calibration Values}

To conduct the numerical simulation and hence, examine the model's performance, we need to calibrate the model. We parameterise the model to match the relevant U.S. data. That is, we assign values to the variables of the \(v/u\) ratio, \(\theta\), unemployment, \(u\), wages, \(w\), and the difference between the value functions of the unemployed and employed workers, at the steady-state values of these endogenous variables and the steady-state values of the exogenous variables. The latter are: the rate of interest, \(r\); destruction rate, \(\lambda\); the value of output, \(p\); hiring cost rate, \(h\); and unemployment benefit rate, \(z\). I do this by experimenting with

\textsuperscript{56} Defined as the total compensation of employees relative to GDP, latter including wages/salaries, employer contributions for employee pension and insurance funds and government social insurance.
fundamental parameters such as $a_0$, $a_1$, $a_2$ and $p$. To attain this, I utilise, wherever possible, results from econometric studies and prior empirical estimates on U.S. quarterly data, which use the average values of the longest possible sample period available.

I proceed to explain the choice of the parameters. Since the firm's output can be sold at any price, with no loss in generality, I normalise the value of output, $p = 1$. Based on Yashiv (2005), I set the separation rate to $\lambda = 0.0404$. I normalise time period to be a quarter and thus, set the discount rate to $r = 0.01$, which reflects historical U.S. values. Surveys on hiring costs are scant (Hamermesh, 1993) as noted earlier. Based on Silva and Toledo (2005), I set the hiring costs to $h = 0.30$. They follow the econometric estimate of Abowd and Kramarz (2000). They estimate the cost of hiring as a fraction of the annual labour costs per worker to be 30 percent\(^5\) for a representative sample of French establishments. Abowd and Kramarz (2000) also claim that all of the microeconomic evidence for France has counterparts in the U.S., which are similar to those observed in France as mentioned above. Based on Shimer (2004), unemployment benefit is set to $z = 0.40$. Based on Yashiv (2005), I set $u = 0.063$, $v = 0.047$ and hence, $\theta = v/u = 0.75$. Also based on Yashiv (2005), I set total compensation of employees as a proportion GDP, $w = 0.579$. Taking into account $z = 0.40$ and $w = 0.579$, I set $x$ to be the difference between 0.40 and 0.579, implying the difference between the value functions of the unemployed and employed worker to be $x = -0.179$, on the grounds that it is not directly observable nor available/accessable. Table 5.1 describes these parameters, including their calibrated values and sources.

<table>
<thead>
<tr>
<th>Difference between the value functions of the unemployed and employed workers</th>
<th>$x$</th>
<th>-0.179</th>
<th>Own Calculation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vacancy-Unemployment ratio</td>
<td>$\theta$</td>
<td>0.75</td>
<td>Yashiv (2005)</td>
</tr>
<tr>
<td>Unemployment</td>
<td>$u$</td>
<td>0.063</td>
<td>Yashiv (2005)</td>
</tr>
<tr>
<td>Wage</td>
<td>$w$</td>
<td>0.579</td>
<td>Yashiv (2005)</td>
</tr>
<tr>
<td>Discount rate</td>
<td>$r$</td>
<td>0.012</td>
<td>Shimer (2005)</td>
</tr>
<tr>
<td>Separation rate</td>
<td>$k$</td>
<td>0.0404</td>
<td>Yashiv (2005)</td>
</tr>
<tr>
<td>Value of Output</td>
<td>$p$</td>
<td>1</td>
<td>Quarterly Normalisation</td>
</tr>
<tr>
<td>Hiring Costs</td>
<td>$h$</td>
<td>0.30</td>
<td>Abowd and Kramarz (2000)</td>
</tr>
<tr>
<td>Unemployment Benefit</td>
<td>$z$</td>
<td>0.40</td>
<td>Yashiv (2005)</td>
</tr>
<tr>
<td>Coefficient of the quadratic term in the cost function</td>
<td>$a_2$</td>
<td>0.312</td>
<td>Own calibrated value</td>
</tr>
<tr>
<td>Coefficient of the first term in the cost function</td>
<td>$a_1$</td>
<td>0.623</td>
<td>Own calibrated value</td>
</tr>
</tbody>
</table>

\(^5\)This entails reported expenditure on job advertising, search firm fees and compensation of applicants.
5.9. STABILITY ANALYSIS

5.9.1. Constant \( w \) and \( x \): Nash Bargaining Solution

I make it clear at the outset, that we analyse a fully dynamic labour market model in contrast to the Pissarides model, and we also generalise with risk-averse agents and non-linear cost functions. This, shows that \( ITE \neq NBS \) and introduces a new equilibrium concept in labour economics. I have applied the CW general result to my model with risk-averse agents and non-linear cost functions in a fully dynamic labour market model. The issues that arise of immense interest are: is such a model saddle-path stable? In addition, are there limit cycles? CW in related literature show a limit cycle in their two-dimensional non-linear system. This implies there is indeterminacy and instability in their system. For a model to be theoretically consistent and dynamically stable, the equilibrium should be saddle-path stable and unique with no limit cycles. I now undertake to investigate if this is true in my model.

When my parameters, which will be my baseline value of parameters, and the parameters that I will be varying later in my full model with non-linear costs and utility function, will be \( \rho \) and \( a_2 \) in \((\rho, a_2)\) parameter space (these are zero with linear costs and utility functions case) when my experiments are conducted, are given by,

\[
\begin{align*}
    r &= 0.012, \quad \rho = 0, \quad a_0 = 0.02, \quad a_1 = 0.623, \quad a_2 = 0, \quad p = 1, \quad h = 0.30, \quad \lambda = 0.0404, \quad w = 0.579 \\
\end{align*}
\]

the equilibrium is

\[
    \theta = 0.75, \quad u = 0.07
\]

The information about eigenvalues for the linearised equation and its nature and the fixed points are provided in Table 5.2. The eigenvalues are: 1.50 and -0.59 as shown in Table 5.2.

\[
\begin{array}{c}
\text{TABLE 5.2} \\
\text{Equilibria} \\
\text{EQUILIBRIUM} \\
\text{Pissarides Model} \\
\text{NBS} \equiv ITE^x \\
\text{Value of Fixed Points} \\
\theta = 0.75 \\
u = 0.07 \\
\text{Eigenvalues} \\
1.50 \\
-0.59
\end{array}
\]

*When \( t \to \infty \) and \( r_f = r_w \).
where the information about the eigenvalues for the linearised equation are given in the middle; \( c^+ \), the number of complex eigenvalues with positive real parts, is zero; \( c^- \), the number of complex eigenvalues with negative real parts, is zero; \( im \), the number of purely imaginary eigenvalues with zero real part, is zero; \( r^+ \), the number of positive real eigenvalues is 3; and \( r^- \), the number of negative real eigenvalues is, 1. The results of the simulations, with both linear cost and utility is unstable, namely, when \( a_2 = 0 \) and \( \rho = 0 \), as is the case when \( NBS = ITE \).

Numerical simulations of fixed points and eigenvalues using the software XPP, showed the typical equilibria to be saddlepoint, as we would expect, with one positive and one negative eigenvalue, and did not yield a stable limit cycle, that is, an isolated\(^*\) periodic orbit\(^*\) for the differential equations which is stable or attracting. That is, if the system is perturbed from its regular oscillatory state, the ensuing new path will be attracted back to the limit cycle. That is, all the neighbouring trajectories approach the limit cycle. A stable limit cycle model the system exhibiting self-sustained oscillations. That is, the system oscillates devoid of external periodic forcing.\(^*\) If all the neighbouring trajectories approach the limit cycle, then the limit cycle is stable or attracting. The steady-state as remarked is a saddle point, that is there is one positive and negative eigenvalue.

### 5.9.2. The Full Model

For the remainder of the analysis, we assume that \( \dot{w} \) and \( \dot{z} \) are not zero and pursue and show dynamic equilibria. The equilibrium states are found by setting the RHSs of the remaining four differential equations, that is, the full model, to zero, and solving for \( x, \theta, w \) and \( u \). This can only be performed computationally. Further numerical simulations with a wide range of parameter values of the combination of the pair \((\rho, a_2)\), were conducted, where \( \rho \) is the risk aversion parameter of the Constant Relative Risk Aversion utility function of the workers, with \( 0 < \rho < 1 \) and \( a_2 \) is the coefficient of the non-linear wage parameter of the firm's non-linear cost function, as mentioned earlier, where \( a_2 \geq 0 \). Of course, when \( a_2 \geq 1 \),

---

\(^*\) Isolated in the sense that there is not another closed path in its immediate neighbourhood. That is, the neighbouring trajectories are not closed, they either spiral toward or away from the limit cycle. In rare cases, half stable.

\(^*\) A periodic orbit is the orbit of any point through which a periodic solution passes. A periodic solution is a solution which is periodic in time \( \phi(t) = \phi(t + T) \), for a fixed positive constant \( T \). \( T \) is a period of \( \phi(t) \).

\(^*\) Another example, would be the beating of the heart.
we have decreasing returns to scale in the firm's cost function and \( a_2 < 0 \), due to increasing returns to scale. To preserve generality I also constructed examples with \( 0 < \rho \leq 1 \) and \(-3 \leq a_2 \leq 3\), in \((\rho, a_2)\) parameter space. Depending on the accurate/precise combination of the pair \((\rho, a_2)\), the system (29) can lead the labour market into a unique equilibrium with saddle-path stability. We briefly demonstrate this, with the dynamics associated with our dynamical system in (29). We discuss the combination of pairs \((a_2, \rho)\) that lead the system to a unique equilibrium with saddle-path stability.

We combine the dynamics of unemployment with those of labour market tightness, the difference between the value functions of the unemployed and employed workers, and wages, as in (29). We first discuss the results of the combination of the pair \((\rho, a_2)\) which leads the labour market to a unique and stable equilibrium with saddle-path stability. The conditions for a stable and unique equilibrium depend on the magnitude of the eigenvalues of the RHS of (29). If the number of eigenvalues outside the unit circle is equal to the number of non-predetermined variables, the system (29) has a unique equilibrium which is stable. That is, if we have one stable root and three unstable roots\(^{61}\). All examples constructed to examine if the model yields a limit cycle or a unique saddle-path stability, include fixed costs in the firm's cost function.

When the baseline value of the parameters are the same as above; and the parameters varied are given by,

\[
\rho = 0.01 \text{ and } a_2 = 0.312
\]

the equilibrium is

\[
x = -0.19, \theta = 0.74, u = 0.07 \text{ and } w = 0.52
\]

The matrix has eigenvalues\(^{62}\), 1.54, 0.47, -0.59 and 0.80, see Table 5.3. The equilibrium is a saddlepoint (that is, one negative eigenvalue associated with one pre-determined variable \(u\) and three positive eigenvalues associated with three non-predetermined variables). They are consistent with the equilibrium in Maple (where the orbit of \(u\) was converging towards the equilibrium), while attempting to see if there is a limit cycle. The three positive eigenvalues

\(^{61}\)Instability occurs when the number of eigenvalues of the RHS of (32), outside the unit circle is greater than the number of non-predetermined variables. That is, if we have four unstable roots, when the economy is pushed off its steady state following a shock, it will not converge back to it, and results, in explosive dynamics, that is, with the orbits tending to infinity.

\(^{62}\)Eigenvalues informs us of the local stability of the fixed point. XPP computes the Jacobi matrix numerically and then utilises standard eigenvalue routines to compute the eigenvalues of the resulting matrix.
are likely to pertain to the forward-looking variables and the negative eigenvalue (that is, a stable root/root in the unit circle of the complex plane) relates to the unemployment differential equation, $u$ as expected is consistent with the $\theta$, $w$ and $\dot{u}$ in the Pissarides model, except that, as will be noted, the wage there, in their otherwise dynamical model is the steady-state wage, in a two-dimensional dynamical system. Our results are also consistent with the values I obtained for comparable parameters, in $(\rho, a_2)$ parameter space, when I performed numerical simulations of eigenvalues, using the software XPP.

<table>
<thead>
<tr>
<th>TABLE 5.3</th>
<th>Equilibria</th>
</tr>
</thead>
<tbody>
<tr>
<td>SADDLE-PATH STABLE</td>
<td>Non-Linear Costs and Utility Function</td>
</tr>
<tr>
<td>$c^+ = 0$</td>
<td>$c^- = 0$</td>
</tr>
<tr>
<td>$r^+ = 3$</td>
<td>$r^- = 1$</td>
</tr>
<tr>
<td>Fixed Point Values</td>
<td>$im = 0$</td>
</tr>
<tr>
<td>$x = -0.21$</td>
<td>$\theta = 0.74$</td>
</tr>
<tr>
<td>$w = 0.52$</td>
<td>$u = 0.07$</td>
</tr>
<tr>
<td>Eigenvalues</td>
<td>$1.54$</td>
</tr>
<tr>
<td></td>
<td>$0.47$</td>
</tr>
<tr>
<td></td>
<td>$-0.59$</td>
</tr>
<tr>
<td></td>
<td>$0.80$</td>
</tr>
</tbody>
</table>

I have varied a wide range of parameters in $(\rho, a_2)$ parameter space, see Table A5.1 in Appendix B, which reports the results from simulations of the model with dynamic bargaining in labour markets. In the values of the $(\rho, a_2)$ combinations, that is, from $a_2 = 0.01$ to $a_2 = 3$ and $\rho = 0$ to $\rho = 0.09$, the solution is uniquely saddle-path stable.

The conclusion is that for calibrated parameter values the system has a unique equilibrium and is saddle-path stable. Of course, the three positive eigenvalues and the other negative eigenvalue do not necessarily mean that the system is unstable or stable (since any periodic orbit always has an eigenvalue of 1 along the orbit). The other two eigenvalues can be unstable (i.e., $>1$ in magnitude with the one eigenvalue stable). The steady-state is a saddle point. The result of the unstable solution, with linear cost functions, at $a_2 = 0$ and $\rho = 0.09$ in the $(\rho, a_2)$ combination is consistent with expectations, since it further confirms the presence of non-linearities in the model and is not in support of the NBS or the Pissarides model. Similarly, the results of the solution, with both linear cost and utility is unstable, that is, where $a_2 = 0$ and $\rho = 0$, as is the case when $NBS \equiv ITE$ and the Pissarides model. This is also consistent with expectations and confirms support for our model as opposed to the NBS or Pissarides model.

---

63 Except when $a_2 = 0$ to $a_2 = -3$ and $\rho = 0$ to $\rho = 0.09$, in the $(\rho, a_2)$ parameter combinations, the solution/equilibrium of the system is unstable.

64 Where $\gamma = r$ and $t \to \infty$.

65 Or any other wage bargaining model in labour economics.
The numerical simulations and numerical calculations of eigenvalues in XPP, suggest that limit cycles do not exist for realistic values of the parameters. XPP calculates the equilibria of our system. Calculations are performed using the values provided for the initial conditions as a first guess, applying the Newton's method. When a value is found, XPP then finds the eigenvalues, which were given above. The program continues to integrate to calculate the equilibria of our system beyond the current numerical parameters I specified. When the equilibrium is computed, the information on the value of the fixed point and its stability are provided, see Appendix A. Since the eigenvalues on the whole of the non-predetermined variables are unstable, it would be hard to find a limit cycle. Similar results were obtained for several experiments I conducted with a wide range of parameter values in $(\rho, a_2)$ parameter space, to examine if a limit cycle can be detected and the stability if the equilibria. Further numerical simulations, on a wide range of parameters in XPP, also did not yield a limit cycle, as shown in Table A5.1 in Appendix B. In addition, numerical simulations in the software DeTool, also suggest that limit cycles are non-existent for sensible values of the parameters. The ranges I conducted my search are similar to the ranges I constructed in XPP in $(\rho, a_2)$ parameter space.

There are no limit cycles, in the various experiments I conducted, but the equilibrium is unique and saddle-path stable. Overall, the model, where naturally all four variables are dynamic, in contrast to models in the past, performs remarkably well, in reflecting the observed behaviour of wage-bargaining in labour markets found in the U.S. data. As will be seen below, my equilibrium values for most variables match exactly the real life data of the U.S..

Naturally, the $(\rho, a_2)$ parameter combination is the most important for our analysis, as these introduce non-linearities that cause the ITE to depart from the NBS. I then varied a wide range of $\rho$ and $a_1$ parameters from the $(\rho, a_1)$ combination. Table A5.2 in the Appendix reports the results. Again, from $a_1 = 0.1$ and $\rho = 0$ to $\rho = 0.09$, in $(\rho, a_1)$ parameter space\(^{66}\), the system has a unique equilibrium and the solution is saddle-path stable. This reaffirms the consistent remarkably good performance of the model. For example, the equilibrium values from my simulation match precisely the real life time-series data of the U.S. with respect to most variables, except $\theta$ and $w$, where it is 0.01 and 0.05 out, as alluded to above.

\(^{66}\)From $a_1 = 2$ to $a_1 = 3$ and $\rho = 0$ to $\rho = 0.09$ in $(\rho, a_1)$ parameter space, the solution is unstable. This confirms the non-linearities inherent in the system.
We use the combined dynamics of the four variables in (29). The equation for the evolution of unemployment is stable with driving force \( \theta \). Substitution of wages and job values \( J \) from (11) into (9) yield an unstable equation in \( \theta \), with no other unknowns in it. The critical point of the four-dimensional dynamical system is that it yields a unique equilibrium which is saddle-path stable. The simulation were also conducted in the same software XPP, where Newton's method is used to find fixed points and then numerically linearises about them to determine stability as mentioned earlier.

We first discuss the results of the parameter combination of the pair \((\rho, a_2)\) which led the labour market to a unique equilibrium and saddle-path stability. The sign pattern of a first-order linear approximation to the four differential equations are three positive eigenvalues and one negative eigenvalue as noted. Since the number of eigenvalues outside the unit circle is equal to the number of non-predetermined variables of the system, the equilibrium is unique and saddle-path stable. The combination of the pair \((\rho, a_2)\) that lead to the solution of saddle-path stability are from \( a_2 = 0.1 \) to \( a_2 = 3 \) and \( \rho = 0 \) to \( \rho = 0.09 \). All areas from \( a_2 = 0.1 \) to \( a_2 = 3 \) and \( \rho = 0 \) to \( \rho = 0.09 \) in \((\rho, a_2)\) parameter space, are associated with a unique and well behaved rational expectation equilibrium. This could be the result of a one-off moderately favourable tax-reduction, which could induce the dynamics associated with an increase in productivity, for example. Specifically, a fall in tax-reduction shifts the wage curve up and job creation curve to the right, causing an immediate rise in both \( \theta \) and \( w \). Both \( \theta \) and \( w \) jump to their new equilibrium, while there is an anticlockwise rotation of the job creation line in \( u, v \) space.

The saddle point arises since one of the variables, unemployment is sticky and stable, whilst the others, vacancies, difference between the value functions of an unemployed and employed worker and wages are forward-looking and unstable. Firms in this model treat vacancies as an asset, since it is the price that has to be paid now in order to attract employees in the future. The expected arrival of employees is the rate of return on this asset. In common with other assets, there is an instability inherent in the supply of vacancies. If the arrival rate of employees is expected to fall, then firms will want to be left with a lower supply of vacancies, in anticipation of less demand for it. But if the firm wants to hire more workers sooner, the firm needs to create more vacancies. Thus, an expected fall in the arrival rate of employees leads to the creation of more vacancies and to an immediate fall in the arrival rate
of employees to each vacancy.

The expected changes in the arrival rate of employees reflects the expected capital gains or losses on the firm's outstanding vacancies. The unique feature of vacancies is that the firms allocate the current vacancies in accordance to their future needs. For example, if the arrival rate of employees is expected to fall, the firm creates more vacancies now, and hires more employees now. The upshot is that, as a consequence, vacancies overshoot their equilibrium value when an adjustment is anticipated to occur.

The perfect foresight path in the neighbourhood of the equilibrium is stable and unique. The number of stable roots in (29) is equal to the one predetermined variable. The initial condition on the predetermined variable, and the stipulation that the perfect foresight path should converge, uniquely defines an initial point in \((\theta, u, w, x)\) space, from which adjustment to equilibrium occurs. In the absence of anticipated changes in the exogenous variables, the initial point will always be on the saddle-path, since this is the unique convergent path.

In system (29), the saddle-path is easily found, due to the independence of the other three equations from unemployment. This can be easily shown, that is, the exogenity of unemployment from the other three variables, in XPP and Maple. Since \(\theta, w\) and \(x\) are the unstable variables, if \(\theta, w\) and \(x\) are not in equilibrium, it will diverge.

Let us consider the impact of a change in productivity on wages, tightness, the difference in the value functions of the unemployed and employed workers and unemployment. If the initial equilibrium is at \([w(0), \theta(0), u(0), x(0)]\), in \(u, v\) space, vacancies will increase as firms create more vacancies to take advantage of higher productivity. This leads to a decrease in unemployment simultaneously, lowering vacancies. Obversely, in the case of a fall in productivity, the adjustment dynamics will move the economy in the reverse direction. That is, there will be a fall in the job creation in the \(u, v\) space, that is, there will be fewer vacancies, due to firm closures. Unemployment increases, then more vacancies are created as firms anticipate the demand for them will be high. Then this leads to fall in unemployment and vacancies as they are matched with employees\(^{67}\).

\(^{67}\)For some combination of the pair \((\rho, a_2)\) of the four equation system, leads the economy into instability. The combination of parameter values of \(a_2\) and \(\rho\) for which this is applicable are only for \(a_2 = 0\) (this is expected and supports our non-linear cost function and not the NBS or Pissarides model with linear cost functions) to \(a_2 = -3\) (where there are increasing returns to scale, in the firm's cost function). for \(\rho = 0\) and to \(\rho = 0.09\) in \((\rho, a_2)\) combination as mentioned. Instability was triggered naturally by the choice of the pairs \((\rho, a_2)\). These choices were attempted, since I wanted to provide a comprehensive account of what happens in the labour market, when one uses a wide range of parameters. That is, it is purely conducted for expositional purposes. Typically, these combination pairs does not imply a strong enough response to induce the necessary
Since the bottom right entry of the Jacobian matrix of (29) is very complicated, it is infeasible to investigate the characteristic equation analytically. The situation is made worse by the fact that the steady-state (equilibrium) cannot be found analytically (the steady-state has to be substituted into the Jacobian prior to finding the eigenvalues).

As is well known, due to the complex nature of, and the fact, that we have a four-dimensional system, it is infeasible to check all of these, in particular whether the solution stays within both constraints (17) and (18), and to verify by numerical integration the existence of a limit cycle. With regard to the latter, in the extensive experiments I conducted by me, using both a linear cost function of constant returns to scale for the firm of the form, $c(w) = w$ and the non-linear cost function of the form $c(w) = a_0 + a_1 w + a_2 w^2$, and also that workers are risk-averse and have single period utility function of the form, $\mu(w) = \frac{w^{1-\rho}}{1-\rho}$, with $0 < \rho < 1$, where $\rho = 0$, which is the risk-neutral case, the ITE $\equiv$ NBS, for $\rho > 0$, the workers are risk-averse; to numerically prove that there is a limit cycle, we did not find a limit cycle. In principle, we should detect a limit cycle, but as is well known, see for example, McCord, Mishaikow and Mrozak (1995) and Jordan and Smith (1999), we may not find a periodic solution, although there is one in principle. We have no grounds to completely rule out stable limit cycles.

CW, using a two-dimensional dynamical system, claim to have detected a limit cycle; which is reputedly considerably easier, than in higher order systems. Equally, proving it analytically is also considerably easier, as the straightforward application of Poincare-Bendixson Theorem, will theoretically prove its existence, which was indeed claimed to have been applied

changes in wages, vacancies, unemployment and the difference between the value functions of the unemployed and employed worker.

The sign pattern of a first-order linear approximation to (29) of these choices of parameter values in $(\rho, a_2)$ parameter space, is that, there are four positive fixed points, when $x$ should be negative in the model. This implies that when the economy is pushed off its steady state following a shock, it cannot converge back to it, but ends up with explosive dynamics as mentioned, that is the orbits go away from the equilibrium to infinity.

The first thing to note is that the variable unemployment which should be sticky and stable, is not. This implies that the unemployed workers are increasing at a fast rate. This has detrimental effects on the economy: First, firms will not be able to supply sufficient vacancies to provide sufficient jobs for the increase in the arrival rate of employees, that is they are unsustainable when unemployment increases considerably. Second, it engenders an unfavourable signal to both the incumbent and unemployed workers, thereby reducing their incentive to remain in employment or exert the necessary effort as expounded in efficiency wage theory. In the case of the former and in the case of the latter, it discourages the volatility of the unemployed workers, and discourages the unemployed workers from applying to posts. Third, if there is a sudden increase in unemployment, labour market tightness fluctuates, with tightness oscillating from low to high. Fourth, wages similarly will fluctuate from low to high, with it being low when unemployment is high and high when unemployment is low. There is a body if evidence to suggest that unemployment has a negative impact on wages (for example, the empirical Chapter 3 of this thesis). Fifth, the difference in the value functions of the unemployed and employed workers would also naturally fluctuate with the other three variables fluctuating.
by CW to show the limit-cycle's existence. No such standard proof can be applied to dynamical systems of three dimensions or higher. Of course, in our system, the Hopf-Bifurcation theorem can be applied to show the existence of a limit cycle, if one is found by numerical integration. Furthermore, with respect to the CW study, although they provide a distinct analysis of monetary theory, the theory there developed makes no attempt to calibrate the model adequately. In addition, with regard to the CW paper, they did find a limit cycle for their two-dimensional model, but they used values of the parameters, which I feel are unrealistic, given their initial condition. The numerical value used for their cost function, was $a = -27.04902$, which is inconsistent with their condition, $0 < c'(0) < 1$.

In my model, values of the parameters are consistent with first, the experiments with, $0 < c'(0) < 1$, and second the experiments with, $c'(0) < 1$, and the important result is that both sets of experiments show that the system has a unique equilibrium and is saddle-path stable, but do not seem to produce a limit cycle in either set of experiments. Moreover, CW used two special functions, $b_0$ and $b_1$; a cost function, which is inconsistent with their cost function in their model, namely, $c(q)$ in their model, with $b_0$ and $b_1$ functions, and two special parameters, which are both inconsistent to their model. Their functions are 

$$b_0(q, y, z) = q + (y - 2ez)(e - y/2z) + z(e - y/2 * z)^2$$

and $b_1(q) = 2ez$ and their parameters were $d = 0$ and $e = 0.001$. devoid of these functions, but including their $a$ value, which as I noted above is inconsistent to their conditions, the equilibrium in their model is also a saddle point. In my model, the functions employed are consistent with the functions in the model, namely, $c(w) = a_0 + a_1w + a_2w^2$ and $q(\theta) = 1 - e^{-\theta}$, and I produce a unique equilibrium with saddle-path stability when experimenting with a wide range of parameters, but do not appear to produce a limit cycle.

In the past, related literature has shown there is a possibility of limit cycles, as shown in CW, which would give rise to indeterminacy and instability. To claim to represent reality, the equilibrium should be saddle-path stable and unique with no limit cycles. In my model, we have a well-behaved equilibrium.

Policy prescriptions can be made on the basis of whether policy critically influences wages in equilibrium. The supply of jobs is a variable and subject to profit maximisation. The wage, $w$ determined in the model, absorbs/incorporates all variations in parameters. including $w$ determined in the model, absorbs/incorporates all variations in parameters. including

$68$Details available from the author upon request.
policy parameters relevant at the time of bargaining. Hence, there will be no qualitative difference to the results. The policy implication of varying interest rate, $r$ and unemployment benefit, $z$ can be shown over time in XPP69.

5.10. CONCLUSIONS

The chapter has analysed a labour market model with random matching and strategic bargaining. The solution to the bargaining problem was characterised in terms of a dynamical equation. It was also shown that the system in $(\rho, a_2)$ parameter space has a unique equilibrium and is saddle-path stable for all four variables, including the dynamic variable for workers with both risk-neutral and risk-averse single period utility and both linear and non-linear cost functions of the firm, which has not been attempted in the past. But overall, this chapter had shown that there is a well behaved unique and stable equilibrium for plausible ranges of parameter values. Such a characterisation for the wage is important in a dynamic labour market model, besides informing us as to what was originally available for sharing between the bargainers, but also what, why and how it was shared by the same. It is found in this chapter that the solution did coincide with the wage-bargaining analyses in steady-state, but not when $t < \infty$, that is, out of steady-state, except when both the bargainers have equal rates of time preference and the agents are risk-neutral.

We analysed constructing a wide range of examples to show uniqueness and saddle-path stability of equilibrium in our full labour market model and no limit cycles, as in the past related literature of CW. Limit cycles would give rise to indeterminacy and instability. But my model has a well behaved equilibrium. This shows that forward-looking behaviour is consistent with stable and unique outcomes in wage-bargaining. Our analysis complements remarkably well the forward-looking behaviour, empirically established in Chapter 3 of this thesis. Our analysis with one worker and firm bargaining, also shows there is an efficient outcome in terms of both wages and employment.

69This is in my future research agenda.
CHAPTER 6

CONCLUSIONS

This thesis has analysed both an empirical model of forward-looking wage determination and a theoretical model of the consequences of this behaviour with full rationality, in conjunction with another detailed empirical analysis of the importance of the recruitment and retention of labour on wage determination.

I shall cover two main topics in this chapter:

1. Conclusion and Summary of Contributions
2. Future Research

Conclusion and Summary of Contributions

Here I provide short, concise statements of the inferences that I have made as a result of my work and briefly list the contributions of new knowledge that my thesis makes and has substantiated. All conclusions will be directly related to the research question posed in the Research Question Section in Section 2.6 of Chapter 2.

(i) The first problem stated in Chapter 2 has been solved, as shown in Section 3.6 of Chapter 3.

I have utilised WERS98 to show that future financial performance has a significantly positive impact on wage determination, with caveats about a potential endogeneity problem, stemming from the limitations of the dataset. Generally, econometric models follow the analysis of the theorists in wage determination, which as I have noted all analysed focusing in steady states or imposing steady states if dynamics are discussed.

(ii) The second problem stated in Chapter 2 has been solved, as shown in Section 4.6 of Chapter 4.

I exploited the CBI dataset for the first time, to demonstrate for the first time in detail, that more prosperous firms are more likely to report retention and recruitment of labour as an important bargaining consideration in wage determination, with caveats due to data limitations.
The econometric research which established both the above main findings in (i) and (ii) necessitated primarily good, comprehensive and reliable datasets, and a combination of other factors, such as the econometric techniques employed, the structure of the data, and importantly also, the econometric and astute skills and knowledge of the modeler.

(iii) The third problem stated in Chapter 2 has been solved, as shown in Section 5.6.1, in particular Theorem 1 and 5.9.2 of Chapter 5.

I developed for the first time an efficient, satisfactory and adequate analysis for the determination of wages dynamically with a subgame perfect equilibrium in labour economics, pursuing the consequences of forward-looking behaviour with full rationality. I also showed for the first time, that forward-looking behaviour is consistent with stable and unique outcomes in wage-bargaining, crucially with no limit cycles which give rise to both indeterminacy and instability, crucially with no limit cycles, which give rise to both indeterminacy and instability.

The principal mechanism needed to improve rent-sharing theories of wage determination are, first, analysing wage as a function of time in a game which is subgame perfect and therefore, rational. In addition, it is necessary to provide stability analysis, showing that forward-looking behaviour is consistent with stable and unique outcomes in wage-bargaining.

In the past, labour economics literature such as Pissarides (2000) have analysed the steady-state wage bargaining using the Nash solution in an otherwise dynamic model.

In Chapter 1, I provided an overview of the main research questions, I would be investigating in this thesis, highlighting the lacuna that needs to be bridged in the light of the past literature, vis-à-vis one of the main species of rent-sharing theory, the insider-outsider theory. I then undertook a comprehensive review of the insider-outsider theory in chapter 2, pointing out weaknesses of all the models and the main overall deficiency, which has been ignored by all labour market theories.

I then conducted an empirical investigation of the importance of the behaviour of forward-looking behaviour in wage determination in Chapter 3. Using the WERS98 cross-sectional dataset, I found that forward-looking variables have a well determined impact on wages, with caveats noted earlier. I also showed that larger firms pay higher wages to workers.

In Chapter 4, I found that firms that are more prosperous than others in relative terms, such as R&D services, business, insurance and banking, will want to recruit and retain more
workers. Given that these establishments are high technology and high skilled industries, there is a demand for highly skilled labour. The skilled workers would want to work for these establishments and retain their employment in these industries. The main result of this chapter is that recruitment and retention is a very important factor in wage negotiations for more prosperous establishments across the UK, especially in the South East, across particular bargaining groups and over time, with caveats on data limitations. The results indicate that rent-sharing is very important, with caveats.

I then analyse a model of wage-bargaining in a labour market in Chapter 5, pursuing the consequences of forward-looking behaviour with rationality. I unify for the first time Pissarides model and Coles and Wright model, to show saddle-path stability with unique wage and employment outcomes, in a general model with risk averse agents and non-linear cost functions, in contrast to the Pissarides model. In contrast, the Coles and Wright model is equilibrium deficient and Pissarides does not analyse a fully dynamic labour market model, as effectively the steady state Nash solution is imposed in an otherwise dynamic model. The solution to the bargaining problem was characterised by a simple full dynamical system. Equilibrium wages are determined by monopolist pricing and wages determined are forward-looking. The former implies that both workers and firms extract surplus rent from each other. So, each agent is indifferent to the wages settled in equilibrium. Given that wages are monopolistically priced, both new recruits and incumbent workers would want to match at these prices and establishments would want to hire them at these prices. In the context of the labour market model, our characterisation of the wage-bargaining solution provides the same answer as the myopic Nash solution only in steady-state. In particular we constructed examples\(^{70}\) of a unique equilibrium of the full system, which was also saddle-path stable, unique and well behaved, with no limit cycles which would entail indeterminacy and instability.

The main finding of this chapter is that with random matching and strategic wage-bargaining, the equilibrium bargained wage is characterised in terms of a simple differential equation. This suggests that first, the bargained wage is monopolistically priced and both parties are indifferent to the negotiated wage, second, these wages are a function of time. For example, if the firm is expected to have a favourable future financial performance, the wages demanded will be higher, but if the firm is expected to have an adverse financial performance,

\(^{70}\)Using a wide range of parameter combination of the pair \((\rho, a_2)\), where \(\rho\) is from the Constant Relative Risk Aversion utility function of the workers and \(a_2\) is from the nonlinear cost function of the firm.
then the workers will suppress their wage demands or even accept a pay cut. There is a body of evidence which suggests this; a number of examples of this phenomenon have been provided in Chapter 2, 3 and 5. In addition, crucially, forward-looking behaviour is consistent with stable and unique outcomes in wage determination. I also find that the equilibrium is well behaved without the absence of limit cycles, which can give rise to indeterminacy and instability.

My empirical results in Chapter 3, with caveats, and especially in conjunction with the results in Chapter 5 illuminates why large firm pay higher wages. As mentioned before, in the conclusion of both these chapters and elsewhere, the implications of the empirical results are that more workers will want to be employed and retain their employment in more prosperous firms, with caveats, since wages are set and demanded in accordance to the firms future performance. If the firm’s future performance is favourable, higher wages will be demanded and if the firm’s future performance is adverse, wages will be set to a lower level or workers will accept a pay cut, if the firm’s financial circumstances warrant it. So, more workers would want to work with and retain their employment in prosperous firms and vice versa. This was also verified empirically in chapter 3. This being so, in empirical chapter 4 we also showed (with caveats), that larger firms would want to improve their recruitment and retention of labour activity by paying higher wages; this is particularly applicable to more prosperous firms, since in these, the reservation wages of both workers (on account of, for example, general/specific human capital) and firms are higher, as shown in equations (19) and (20) of chapter 5.

In terms of policy, the implications of our findings are that more workers will want to work with more prosperous firms, as noted particularly in the light of findings in Chapter 3 and 5. Conversely, more prosperous firms, in particular, would also want to pay more to recruit and retain more workers as found in Chapter 4, with caveats. This follows as a direct implication of the findings in Chapters 3 and 5, specifically, that more workers would want to work for more prosperous firms. Our empirical analysis in Chapter 4 also indicates that part of the reason for the finding of recruitment and retention being a major bargaining consideration, is attributed to labour shortages and skill shortages, particularly in the engineering industries. The implications of the declining manufacturing sector, for example, as shown in Chapter 4, is that the need to recruit and retain labour will clearly not be of very strong importance. The
reason for skill shortages in more prosperous industries, is primarily due to UK lagging behind
other EU and other major industrialised nations in its provision of education or vocational
training or continuing of education by the young people. The results are highly relevant
for the implementation of optimal employment strategies which would entail increasing the
education and training of the workforce, given that the prosperous establishments are high
technology and high skilled industries, who naturally seek highly skilled labour.

Future Research

The topic of future research is included, so that other researchers or myself picking up/building
on this work, in future have the benefit of the ideas that I generated while I was working on
the project.

As a result of my work, I have found that inevitably that the results of my work would
have been reinforced, by investigating/confirming the global applicability of my outcome, if
I had particularly larger datasets and so forth, covering more countries and years.

In Chapter 3, it would be useful to perform the analysis for my future research across a
wide variety of countries again and over a longer time, using panel type or time-series cross-
sectional data. I would like to conduct the same investigation for Chapter 4 (the dataset
was for a longer period in Chapter 4). I would not expect the results to change much, but it
would nonetheless, be useful to confirm this.

With respect to chapter 5, it would have been useful if we had the time, to develop a
software package in conjunction with an appropriate algorithm than is currently available in
the market, to detect limit cycles in a four-dimensional nonlinear dynamical system. How-
ever, given the softwares that are commercially available, I exploited the packages I have
used, in particular the package I used extensively, to furnish us with information that was
required to carry out our analysis. Crucially, in principle, my full non-linear dynamical sys-
tem, could be integrated with macroeconomic models, which will facilitate the provision of
policy prescriptions.

It would have also been useful to establish that equation (29) in Chapter 5 describes a
limiting equilibrium to the bargaining game between firms and workers as $\Delta t \to 0$, to avoid
ambiguity, given Binmore's continuum example. Second, it would also be useful to provide
a general uniqueness argument, since currently our uniqueness argument\textsuperscript{71} only applies to a

\textsuperscript{71}In order to provide a theoretical treatment of wage bargaining situations, we abstracted from the situation
special case, that agents use Markov strategies, that payoffs are additively separable, that is, \( V_i(x) + y_i(t) \) and that \( y_i(t) \) converge\(^{72}\) to some limit as \( t \to \infty \). The latter necessitates that the underlying market equilibrium converges to a steady-state, since in the worker's case the worker's unemployment benefit, for example, may expire or a worker's job skills may deteriorate whilst unemployed. This should not make much difference to the qualitative results. I believe that my current analysis is satisfactory and adequate to convey my point across.

With respect to Chapter 4, I echo what most econometricians and indeed what generally economists would yearn for, a well-structured, larger dataset with a longer time span as noted.

When these additional requirements are available, I would want to conduct all the future research outlined here.

Again, I believe given the dataset and its limitations, other caveats stemming from the dataset, and with my theoretical analysis, I have attained a unique result for a general and unique, useful and an apt wage determination theory. This thesis has demonstrated bargainers are forward-looking in determining wages, with caveats with respect to the empirical chapters as noted, and shown that wage is a function of time, and that this determination of wage is also efficient, both in terms of employment and wage outcomes, since it also embodies monopolistic pricing as shown in Theorem 1 of Chapter 5. Furthermore, this thesis has demonstrated that the wage-bargaining equilibrium is well behaved with no limit cycles, which would give rise to indeterminacy and instability. Moreover, forward-looking behaviour is consistent with stable and unique outcomes in wage-bargaining. In addition, this thesis has established in detail that recruitment and retention of labour is a very important determinant of the wage (with caveats on data limitations). My research, both theoretically and econometrically, is a solid advancement of the labour economics field, and is applicable to other economic areas.

---

\(^{72}\) \( V_i(x) \) is the instantaneous payoff to \( i = f, w \), where, \( f \) is the firm and \( w \) is the worker respectively. whereas, \( y_i(t) \) is the expected payoff to an unmatched worker or an unmatched vacancy, in the case of a job, for the firm, at time \( t \) in a market equilibrium.
I CHAPTER 3: APPENDIX
DATA APPENDIX

Definitions of Variables Used in the Regression

Variable
Future financial Performance [the current state of the market (for the main product or service)]
Union coverage

Definition (Management questionnaire that provides the relevant information)
"Looking at this list, which of these statements best describes the current state of the market [for the main product or service] in which you operate?": (i) The market is growing (ii) The market is mature (iii) The market is declining (iv) The market is turbulent

"What proportion of all employees, including managers, are covered by collective bargaining either at this workplace or at a higher level?": (i) All 100% (ii) Almost all 80-99% (iii) Most 60-79% (iv) Around half 40-59% (v) Some 20-39% (vi) Just a few 1-19% (vii) None

"How would you rate the proportion of all employees, including managers, who are covered by collective bargaining at this workplace?": (i) Much better than average (ii) Better than average (iii) About average (iv) Below average (v) A lot below average (vi) No comparison possible (vii) Relevant data not available

"What is your firm's financial performance?": (i) Much better than average (ii) Better than average (iii) About average (iv) Below average (v) A lot below average (vi) No comparison possible (vii) Relevant data not available

"How would you assess your workplace's financial performance?": (i) A lot better than average (ii) Better than average (iii) About average for industry (iv) Below average (v) A lot below average (vi) No comparison possible (vii) Relevant data not available

"What is your firm size?": (i) 10 through to 24 employees (ii) 25 to 49 employees (iii) 50 to 99 employees (iv) 100 to 199 employees (v) 200 to 499 employees (vi) 500 or more employees

"How many competitors do you have for your [main] product or service?": (i) None (ii) Few competitors (iii) Many competitors

"Is the output of this establishment concentrated on one product or service or are there several different products or services?": (i) Single product or service (ii) Different products or services

"What percentage of vacancies in the past 12 months have been filled by employees from within this organisation?: (i) All (ii) Almost all 80-99% (iii) Most 60-79% (iv) Around half 40-59% (v) Some 20-39% (vi) Just a few 1-19% (vii) None

"Which of the following statements best describes the ownership of [this workplace/name of organisation]?: (i) UK-owned/controlled (ii) Predominantly UK-owned (51% or more) (iii) UK and foreign owned (iv) Predominantly foreign owned (51% or more) (v) Foreign owned/controlled

Banded average vacancy rate by travel-to-work area: (i) 0-0.80 (ii) 0.80-1 (iii) 1.30-1.60 (iv) 1.60+

Banded total unemployment rate by travel-to-work area: (i) 0-2 (ii) 2-3 (iii) 3-5 (iv) 5-7 (v) 7-7.75 (vi) 7.75+

"How would you describe the formal status of [this establishment/name of organisation]? Is it privately or publicly owned?: (i) Private sector company (PLC) (ii) Private sector-other (iii) Public sector

This is defined as the number of job centre vacancies divided by the total labour force in the travel-to-work area.
II CHAPTER 4: APPENDICES
APPENDIX A
DEFINITION OF VARIABLES

The majority of the variables used in Tables 7 to 9 are drawn or calculated from the CBI Pay Databank. The CBI data are designed to provide continuous wholesome information of the level of wage settlements and related details over time. Moreover, a one-off survey conducted in 1979/80 provides further information for the subset of the dataset covered by the survey. Comprehensive account of the sample are provided by Ingram (1991) and Gregory, Lobban and Thomson (1986).

The question used as the dependent variable in all specifications:

Factors exerting an upward pressure on level of settlement
A need to improve ability to recruit /retain labour
1. Very important (recoded as 3)
2. Fairly important (recoded as 2)
3. Not important/not relevant (recoded as 1)

Other questions asked as factors which exert an upward pressure on wage settlement. Note the answers are coded as 1, 2 and 3 above. These questions and the above form the basis for Table 4.

Management able to pass on substantial part of pay increases in prices
Cost of living increases (e.g., high or rising inflation)
Industrial action threatened
Management unable to pass on a substantial part of any pay increase in prices
Risk of redundancy if larger pay increase awarded
Employee involvement policies
Cost of living decreases (e.g., low or falling inflation)
Low or deteriorating level of orders
Poor labour productivity performance
Other factors influencing level of settlement
Comparisons with other employees in some company (including top management)
Comparisons with other employees in same industry
Comparisons with other employees in same locality
Comparisons with general level of pay and/or pay increases nationally
Repercussions with national/district agreement negotiated by an employer organisation to which you are a party.

Definitions of variables used as explanatory variables in the regression are as follows:

Size of the Bargaining Group: categorised into 6 groups, with more than 500 workers as the reference category.
Bargaining Groups: categorised into unskilled manual, semiskilled manuals, skilled manuals, supervisors, clerical staff.
Professional/Technical staff and Managerial staff.
Management questionnaire that provides the relevant information:
Details of Settlement/Award:
As part of the settlement, have employees accepted any of the following?
Introduction of new technology
Removal of restrictive practices
Adoption or extension of shift working
Reduction of numbers employed
Introduction or extension of incentive payment system
Acceptance of more flexible working time arrangements
Use of sub-contract labour
Other productivity improvements
Measuring Performance
(a) In this section we are seeking to analyse how companies measure their performance. If possible please indicate which of the following best describes how your company measures performance covering this group.
(1) Volume of output per person employed
(2) Value of output per person employed
(3) Value added per person employed
(4) Unit labour costs
(5) None
(6) Other
(b) Please estimate by how much productivity (i.e., output per employee) in this group has increased or decreased in the year before this settlement took effect (if it has decreased, please put a minus sign in front of the relevant figure).
(c) By how much do you expect productivity to increase or decrease in the next 12 months?
# APPENDIX B

## TABLE A4.1

<table>
<thead>
<tr>
<th>Unemploymenta,b</th>
</tr>
</thead>
<tbody>
<tr>
<td>79</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>Regions</td>
</tr>
<tr>
<td>Scotland</td>
</tr>
<tr>
<td>North</td>
</tr>
<tr>
<td>Yorkshire</td>
</tr>
<tr>
<td>East Midlands</td>
</tr>
<tr>
<td>East Anglia</td>
</tr>
<tr>
<td>South East</td>
</tr>
<tr>
<td>South West</td>
</tr>
<tr>
<td>West Midlands</td>
</tr>
<tr>
<td>North West</td>
</tr>
<tr>
<td>Wales</td>
</tr>
</tbody>
</table>

Source: Office of National Statistics

a The claimant count rate is seasonally adjusted.
b The rates are seasonally adjusted and since the statistics are only available in calendar years and CBI dataset commences from August to July of the following year, I have taken the average of two consecutive years statistics.
c Statistics are in respect of the North East, which the region North relates to.
d I have amalgamated London with the South East and taken the average of both regions to obtain the statistics for the South East.
| Regions          | 78  | 79  | 80  | 81  | 82  | 83  | 84  | 85  | 86  | 87  | 88  | 89  | 90  | 91  | 92  | 93  | 94  | 95  |
|------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Scotland         | 94.6| 95.6| 96.4| 96.6| 96.7| 96.2| 95.4| 94.6| 94.2| 93.8| 95.0| 96.8| 98.2| 98.8| 98.9| 99.7| 99.7|
| North            | 91.8| 95.1| 94.5| 94.5| 93.0| 92.4| 91.4| 90.5| 90.0| 89.0| 88.5| 88.5| 89.3| 89.2| 88.4| 88.2| 87.8|
| Yorkshire        | 93.1| 92.7| 94.2| 95.4| 93.6| 93.5| 94.6| 94.2| 92.7| 91.8| 91.6| 91.4| 91.1| 90.3| 89.8| 90.4| 90.4|
| East Midlands    | 96.6| 97.0| 96.6| 99.2| 98.4| 98.9| 98.8| 98.4| 97.7| 97.6| 97.6| 97.3| 97.3| 96.9| 96.7| 96.3| 95.3|
| East Anglia      | 95.3| 96.7| 97.2| 97.5| 100.1| 102| 101.3| 100.8| 100.2| 100.9| 101.5| 101.1| 101.2| 100.2| 100.2| 100.2| 100.2|
| South East       | 116| 116.4| 114.9| 113.9| 114.6| 114.7| 115.1| 115.9| 116.8| 117.4| 117.4| 117.1| 116.6| 116.9| 116.3| 116.5| 117|
| South West       | 92.0| 93.1| 94.1| 94.7| 94.9| 94.6| 94.3| 94.5| 94.4| 94.6| 94.9| 95.6| 95.6| 95.0| 95.4| 95.4| 95.4|
| West Midlands    | 94.8| 92.1| 90.8| 90.5| 90.6| 91.4| 91.7| 91.4| 91.8| 92.3| 93.0| 93.1| 93.1| 93.0| 93.5| 93.7| 93.7|
| North West       | 96.3| 95.4| 95.1| 95.3| 94.9| 94.7| 94.3| 93.6| 93.2| 92.4| 91.1| 90.2| 90.0| 90.0| 90.3| 89.9| 89.9|
| Wales            | 84.7| 84.0| 85.9| 87.4| 86.5| 84.9| 84.7| 86.1| 86.9| 86.3| 85.7| 84.5| 83.2| 83.1| 83.9| 83.7| 83.7|

Source: Office of National Statistics (ONS)

*These statistics are consistent with the Gross Value Added, which the ONS's current regional estimates are based upon.

*Consistent statistics unavailable for 1996/97, as this particular series ceased in December 1996. Since statistics are only available in calendar years, I have taken the average of two consecutive years.

*The statistics are less firmly based.
TABLE A4.3
AVERAGE GROSS WEEKLY EARNINGS (£) a,b

<table>
<thead>
<tr>
<th>Regions</th>
<th>70-80</th>
<th>81-82</th>
<th>83-84</th>
<th>85-86</th>
<th>87-88</th>
<th>89-90</th>
<th>91-92</th>
<th>93-94</th>
<th>95-96</th>
<th>97-98</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scotland</td>
<td>89.9</td>
<td>106.3</td>
<td>119.2</td>
<td>130.3</td>
<td>140.4</td>
<td>149.7</td>
<td>160</td>
<td>171.5</td>
<td>185.1</td>
<td>201.6</td>
</tr>
<tr>
<td>North</td>
<td>66.8</td>
<td>104.9</td>
<td>116.2</td>
<td>126.1</td>
<td>135.1</td>
<td>144.2</td>
<td>155</td>
<td>166</td>
<td>175.9</td>
<td>194.5</td>
</tr>
<tr>
<td>Yorkshire</td>
<td>87.7</td>
<td>102.8</td>
<td>114.6</td>
<td>124.8</td>
<td>133.8</td>
<td>143.3</td>
<td>154.4</td>
<td>165.6</td>
<td>179.3</td>
<td>195.9</td>
</tr>
<tr>
<td>East Midlands</td>
<td>86.8</td>
<td>102.1</td>
<td>113.4</td>
<td>122.4</td>
<td>131.5</td>
<td>140.4</td>
<td>151.6</td>
<td>163.3</td>
<td>176.1</td>
<td>192.4</td>
</tr>
<tr>
<td>East Anglia</td>
<td>86.8</td>
<td>102.9</td>
<td>117.4</td>
<td>124.6</td>
<td>134.5</td>
<td>144.7</td>
<td>158.3</td>
<td>167.5</td>
<td>181.5</td>
<td>200.8</td>
</tr>
<tr>
<td>South East c</td>
<td>99.5</td>
<td>118.3</td>
<td>132.7</td>
<td>146</td>
<td>158.5</td>
<td>170.9</td>
<td>183.4</td>
<td>202.1</td>
<td>210.8</td>
<td>235.7</td>
</tr>
<tr>
<td>South West</td>
<td>85.9</td>
<td>102.8</td>
<td>114.2</td>
<td>123.9</td>
<td>133.8</td>
<td>143.7</td>
<td>155.1</td>
<td>167.3</td>
<td>181.8</td>
<td>200.8</td>
</tr>
<tr>
<td>West Midlands</td>
<td>88.3</td>
<td>102.8</td>
<td>113.7</td>
<td>123.6</td>
<td>133.6</td>
<td>143.8</td>
<td>154.6</td>
<td>166</td>
<td>179.5</td>
<td>196.7</td>
</tr>
<tr>
<td>North West</td>
<td>88.5</td>
<td>105.3</td>
<td>117</td>
<td>126.7</td>
<td>136.9</td>
<td>147.6</td>
<td>157.8</td>
<td>168.9</td>
<td>183.8</td>
<td>201.6</td>
</tr>
<tr>
<td>Wales</td>
<td>88.4</td>
<td>103.7</td>
<td>115</td>
<td>125.1</td>
<td>134.5</td>
<td>143.8</td>
<td>143.8</td>
<td>164.9</td>
<td>177.5</td>
<td>193.7</td>
</tr>
</tbody>
</table>

Source: New Earnings Survey, Part E.
a A weighted average of both full time male and female weekly earnings.
b Since statistics are only available in calendar years, I have taken the average of two consecutive years.
c An average of London and the remainder of the South East region.
| Regions       | 81-82 | 82-83 | 83-84 | 84-85 | 85-86 | 86-87 | 87-88 | 88-89 | 89-90 | 90-91 | 91-92 | 92-93 | 93-94 | 94-95 | 95-96 | 96-97 |
|--------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Scotland     | 0.008 | 0.009 | 0.009 | 0.009 | 0.009 | 0.009 | 0.009 | 0.009 | 0.009 | 0.009 | 0.009 | 0.009 | 0.009 | 0.010 | 0.010 | 0.011 |
| North        | 0.006 | 0.006 | 0.007 | 0.007 | 0.007 | 0.008 | 0.009 | 0.009 | 0.009 | 0.009 | 0.009 | 0.009 | 0.009 | 0.009 | 0.010 | 0.008 |
| Yorkshire    | 0.003 | 0.006 | 0.006 | 0.006 | 0.006 | 0.007 | 0.007 | 0.007 | 0.007 | 0.006 | 0.006 | 0.006 | 0.007 | 0.007 | 0.007 | 0.007 |
| East Midlands| 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.007 | 0.007 | 0.007 | 0.006 | 0.006 | 0.006 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 |
| East Anglia  | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.008 | 0.008 | 0.008 | 0.008 | 0.007 | 0.006 | 0.006 | 0.007 | 0.007 | 0.007 | 0.007 |
| South East   | 0.007 | 0.008 | 0.008 | 0.008 | 0.008 | 0.009 | 0.009 | 0.009 | 0.009 | 0.008 | 0.007 | 0.007 | 0.008 | 0.008 | 0.008 | 0.008 |
| South West   | 0.007 | 0.008 | 0.008 | 0.008 | 0.008 | 0.009 | 0.009 | 0.009 | 0.009 | 0.008 | 0.007 | 0.007 | 0.008 | 0.008 | 0.008 | 0.008 |
| West Midlands| 0.005 | 0.005 | 0.007 | 0.007 | 0.006 | 0.006 | 0.007 | 0.007 | 0.006 | 0.005 | 0.005 | 0.007 | 0.007 | 0.008 | 0.007 | 0.007 |
| North West   | 0.008 | 0.008 | 0.008 | 0.009 | 0.009 | 0.009 | 0.010 | 0.010 | 0.010 | 0.009 | 0.009 | 0.009 | 0.010 | 0.011 | 0.010 | 0.010 |
| Wales        | 0.007 | 0.007 | 0.007 | 0.008 | 0.008 | 0.009 | 0.009 | 0.009 | 0.009 | 0.009 | 0.010 | 0.012 | 0.012 | 0.012 | 0.012 | 0.012 |

Source: Nomis.

*Inflow of newly notified vacancies to JobcentrePlus as a proportion of employee job estimates seasonally adjusted.
Note workforce jobs data have not been adjusted to reflect the 2001 Census Population Statistics.
*Estimates of workforce jobs available only from September 1981. Since the job estimates are only available from September 1981, and the statistics on vacancies are in calendar years, and CBI data commence from August to July of a year, I have taken the average of two consecutive years to obtain vacancy statistics from 1981. In addition, since employee job estimates are only available from September 1981, the statistics are from September of the year to August of the following year.
*Statistics have been shown in three digits at times for greater precision.
*An average of London and the South East regions vacancies.
<table>
<thead>
<tr>
<th>Sector</th>
<th>78</th>
<th>79</th>
<th>80</th>
<th>81</th>
<th>82</th>
<th>83</th>
<th>84</th>
<th>85</th>
<th>86</th>
<th>87</th>
<th>88</th>
<th>89</th>
<th>90</th>
<th>91</th>
<th>92</th>
<th>93</th>
<th>94</th>
<th>95</th>
<th>96</th>
<th>97</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing</td>
<td>6945.5</td>
<td>6458</td>
<td>5950.5</td>
<td>5625.5</td>
<td>5421.5</td>
<td>5383</td>
<td>5293</td>
<td>5214.5</td>
<td>5235</td>
<td>5295</td>
<td>5300</td>
<td>4986.5</td>
<td>4636.5</td>
<td>4438.5</td>
<td>4335</td>
<td>4376.5</td>
<td>4441.4</td>
<td>4492.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td>1913.5</td>
<td>1877</td>
<td>1783</td>
<td>1750</td>
<td>1686.5</td>
<td>1672</td>
<td>1640.5</td>
<td>1934</td>
<td>2047.5</td>
<td>2234.5</td>
<td>2537.5</td>
<td>2248</td>
<td>2049</td>
<td>1913.5</td>
<td>1651.5</td>
<td>1623.5</td>
<td>1694</td>
<td>1772.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transport and Communication</td>
<td>1714.5</td>
<td>1688</td>
<td>1633</td>
<td>1590</td>
<td>1577</td>
<td>1565</td>
<td>1534.5</td>
<td>1540.5</td>
<td>1548.5</td>
<td>1612.5</td>
<td>1863.5</td>
<td>1657.5</td>
<td>1624.5</td>
<td>1593</td>
<td>1568.5</td>
<td>1588.5</td>
<td>1570.5</td>
<td>1600.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distributive</td>
<td>5549.5</td>
<td>5533.5</td>
<td>5454</td>
<td>5433</td>
<td>5561.5</td>
<td>5723.5</td>
<td>5733.5</td>
<td>5779</td>
<td>5920</td>
<td>6192.5</td>
<td>6402</td>
<td>6379</td>
<td>6296.5</td>
<td>6267</td>
<td>6240</td>
<td>6312.5</td>
<td>6384</td>
<td>6497</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trades and Leisure Insurance, Banking and Finance</td>
<td>2934.5</td>
<td>2968.5</td>
<td>2982</td>
<td>3056</td>
<td>3186.5</td>
<td>3354</td>
<td>3492.5</td>
<td>3632</td>
<td>3840.5</td>
<td>4097.5</td>
<td>4336.5</td>
<td>4398</td>
<td>4345.5</td>
<td>4356</td>
<td>4398.5</td>
<td>4530</td>
<td>4717.5</td>
<td>4895</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education, Health and Professional Services and Miscellaneous Services Inc. Motor Distribution</td>
<td>1125</td>
<td>1124.5</td>
<td>1131</td>
<td>1134</td>
<td>1179</td>
<td>1267</td>
<td>1311.5</td>
<td>1339</td>
<td>1389.5</td>
<td>1443.5</td>
<td>1457</td>
<td>1431.5</td>
<td>1399</td>
<td>1399.5</td>
<td>1463.5</td>
<td>1536.5</td>
<td>1576.5</td>
<td>1607.5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Source:** ONS

*Due to unavailability of data on a consistent basis (including, in particular, with the region) for each industry in my analysis from 1979, I have grouped some of the industries together such as manufacturing.*

*Due to unavailability of all other statistics on a consistent basis, (including, in particular, with the region) for each industry in my analysis from 1979, I have taken the average of two consecutive years to obtain the statistics for a year.*

*Workforce jobs by industry sector: seasonally adjusted.*
<table>
<thead>
<tr>
<th>Sectors</th>
<th>79-80</th>
<th>80-81</th>
<th>81-82</th>
<th>82-83</th>
<th>83-84</th>
<th>84-85</th>
<th>85-86</th>
<th>86-87</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing</td>
<td>8041</td>
<td>8243</td>
<td>9549</td>
<td>9906</td>
<td>10234</td>
<td>11204</td>
<td>11028</td>
<td>11636</td>
</tr>
<tr>
<td>Construction</td>
<td>4455</td>
<td>5700</td>
<td>6765</td>
<td>7762</td>
<td>7660</td>
<td>7347</td>
<td>7094</td>
<td>21580</td>
</tr>
<tr>
<td>Transport and Communication</td>
<td>9546</td>
<td>10797</td>
<td>12462</td>
<td>13967</td>
<td>15657</td>
<td>17453</td>
<td>19616</td>
<td>22169</td>
</tr>
<tr>
<td>Distributive</td>
<td>5785</td>
<td>6367</td>
<td>7001</td>
<td>7755</td>
<td>8417</td>
<td>9091</td>
<td>10049</td>
<td>11044</td>
</tr>
<tr>
<td>Trades; Repair and Leisure</td>
<td>18675</td>
<td>20967</td>
<td>22779</td>
<td>25160</td>
<td>27113</td>
<td>28836</td>
<td>31451</td>
<td>33925</td>
</tr>
<tr>
<td>Services</td>
<td>5117</td>
<td>5609</td>
<td>5935</td>
<td>6175</td>
<td>6241</td>
<td>6414</td>
<td>7002</td>
<td>7483</td>
</tr>
<tr>
<td>Miscellaneous Services** Inc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor Distribution</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sectors</td>
<td>87-88</td>
<td>88-89</td>
<td>89-90</td>
<td>90-91</td>
<td>91-92</td>
<td>92-93</td>
<td>93-94</td>
<td>94-95</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>18065</td>
<td>19697</td>
<td>21973</td>
<td>24224</td>
<td>25851</td>
<td>28227</td>
<td>16364</td>
<td>18139</td>
</tr>
<tr>
<td>Construction</td>
<td>24715</td>
<td>26980</td>
<td>30603</td>
<td>30088</td>
<td>30590</td>
<td>32284</td>
<td>34663</td>
<td>37099</td>
</tr>
<tr>
<td>Transport and Communication</td>
<td>24608</td>
<td>26635</td>
<td>28268</td>
<td>29904</td>
<td>31515</td>
<td>33711</td>
<td>36221</td>
<td>38093</td>
</tr>
<tr>
<td>Distributive Trades, Repair and</td>
<td>12055</td>
<td>13081</td>
<td>13719</td>
<td>14381</td>
<td>15216</td>
<td>16084</td>
<td>16888</td>
<td>17399</td>
</tr>
<tr>
<td>Leisure Insurance, Banking,</td>
<td>35534</td>
<td>37376</td>
<td>35265</td>
<td>33819</td>
<td>36389</td>
<td>39126</td>
<td>40286</td>
<td>43465</td>
</tr>
<tr>
<td>Finance, Business, and</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professional Services</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Miscellaneous Services Inc.</td>
<td>7915</td>
<td>8111</td>
<td>11634</td>
<td>19790</td>
<td>20340</td>
<td>20852</td>
<td>22052</td>
<td>23509</td>
</tr>
<tr>
<td>Motor Distribution</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: DNS

*GDP (£ millions) as a proportion of employment (thousands).

*Historical statistics on a consistent basis with the historical regional statistics and covers the period to 1996. GDP is from Table 2.2 of the 1997 Blue GDP Book. Employment statistics are from the 1990 Blue Book which are consistent with those published in the Department of Employment Gazette for August 1990. Note b and c of Table A4.5 also applies.

*Note this category also includes sewage and refuse disposal, due to unavailability of consistent (including, in particular with the regional) statistics from 1979-1997, which excludes sewage and refuse disposal. With respect to employment it comprises of classes 92, 94, 96-99 and 00 of the Standard Industrial Classification Revised 1980.
<table>
<thead>
<tr>
<th>Sectors</th>
<th>79</th>
<th>80</th>
<th>81</th>
<th>82</th>
<th>83</th>
<th>84</th>
<th>85</th>
<th>86</th>
<th>87</th>
<th>88</th>
<th>89</th>
<th>90</th>
<th>91</th>
<th>92</th>
<th>93</th>
<th>94</th>
<th>95</th>
<th>96</th>
<th>97</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food, Drink, Tobacco</td>
<td>15</td>
<td>4</td>
<td>2</td>
<td>9</td>
<td>7</td>
<td>3</td>
<td>9</td>
<td>7</td>
<td>7</td>
<td>17</td>
<td>22</td>
<td>9</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>7</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Chemicals and Allied</td>
<td>13</td>
<td>6</td>
<td>7</td>
<td>2</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>9</td>
<td>18</td>
<td>24</td>
<td>21</td>
<td>16</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>6</td>
<td>11</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>Metals Manufacture</td>
<td>16</td>
<td>2</td>
<td>5</td>
<td>3</td>
<td>7</td>
<td>6</td>
<td>7</td>
<td>17</td>
<td>13</td>
<td>22</td>
<td>13</td>
<td>10</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>11</td>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanical Engineering/Vehicles</td>
<td>29</td>
<td>10</td>
<td>6</td>
<td>6</td>
<td>13</td>
<td>16</td>
<td>17</td>
<td>17</td>
<td>25</td>
<td>30</td>
<td>34</td>
<td>18</td>
<td>11</td>
<td>8</td>
<td>8</td>
<td>16</td>
<td>17</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>Instrument and Electrical/Electronic Engineering</td>
<td>37</td>
<td>13</td>
<td>12</td>
<td>8</td>
<td>15</td>
<td>26</td>
<td>24</td>
<td>21</td>
<td>37</td>
<td>45</td>
<td>40</td>
<td>20</td>
<td>10</td>
<td>13</td>
<td>16</td>
<td>21</td>
<td>23</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>Textiles and Clothing</td>
<td>18</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>14</td>
<td>24</td>
<td>26</td>
<td>29</td>
<td>7</td>
<td>4</td>
<td>10</td>
<td>6</td>
<td>7</td>
<td>20</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>Building Materials</td>
<td>16</td>
<td>4</td>
<td>2</td>
<td>6</td>
<td>3</td>
<td>8</td>
<td>4</td>
<td>10</td>
<td>11</td>
<td>10</td>
<td>22</td>
<td>13</td>
<td>4</td>
<td>3</td>
<td>15</td>
<td>10</td>
<td>10</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Paper, Printing, Publishing</td>
<td>12</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>8</td>
<td>11</td>
<td>7</td>
<td>12</td>
<td>27</td>
<td>28</td>
<td>15</td>
<td>10</td>
<td>4</td>
<td>3</td>
<td>20</td>
<td>13</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>50</td>
<td>25</td>
<td>20</td>
<td>-</td>
<td>-</td>
<td>13</td>
<td>50</td>
<td>18</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>Transport and Communication(^b)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>16</td>
<td>26</td>
<td>22</td>
<td>4</td>
<td>8</td>
<td>8</td>
<td>9</td>
<td>13</td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retailing and Distribution(^b)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>45</td>
<td>47</td>
<td>39</td>
<td>23</td>
<td>12</td>
<td>6</td>
<td>23</td>
<td>35</td>
<td>31</td>
<td>43</td>
<td></td>
</tr>
<tr>
<td>Insurance, Banking and Finance(^b)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>61</td>
<td>58</td>
<td>55</td>
<td>23</td>
<td>14</td>
<td>10</td>
<td>30</td>
<td>17</td>
<td>32</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>Business and Professional Services(^b)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>38</td>
<td>44</td>
<td>43</td>
<td>26</td>
<td>25</td>
<td>21</td>
<td>22</td>
<td>31</td>
<td>34</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>Leisure(^c)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>67</td>
<td>67</td>
<td>79</td>
<td>45</td>
<td>13</td>
<td>14</td>
<td>18</td>
<td>35</td>
<td>58</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Miscellaneous Services (^c)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>21</td>
<td>29</td>
<td>29</td>
<td>-</td>
<td>14</td>
<td>25</td>
<td>9</td>
<td>7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Regions**

| Scotland | 18  | 4   | 5   | 4   | 6   | 7   | 7   | 3   | 12  | 16  | 19  | 13  | 13  | 10  | 8   | 14  | 17  | 26  |
| North    | 7   | 9   | 5   | 3   | 8   | 4   | 3   | 9   | 18  | 14  | 20  | 9   | 7   | 10  | 9   | 20  | 24  | 7   |
| Yorkshire | 13  | 4   | 1   | 3   | 3   | 6   | 10  | 8   | 15  | 18  | 22  | 19  | 16  | 4   | 12  | 14  | 19  | 14  |
| East Midlands | 10  | 5   | 3   | 4   | 8   | 15  | 15  | 10  | 32  | 39  | 42  | 20  | 10  | 12  | 7   | 12  | 19  | 24  |
| East Anglia | 48  | 6   | 5   | 8   | 8   | 11  | 5   | 15  | 33  | 39  | 36  | 16  | 6   | 6   | 9   | 13  | 83  | 23  |
| South East | 37  | 12  | 10  | 9   | 16  | 24  | 25  | 27  | 45  | 50  | 48  | 21  | 14  | 12  | 19  | 29  | 28  | 37  |
| South West | 30  | 5   | 5   | 7   | 9   | 8   | 8   | 10  | 21  | 30  | 28  | 14  | 9   | 8   | 9   | 17  | 17  | 26  |
| West Midlands | 28  | 9   | 5   | 3   | 10  | 10  | 14  | 13  | 22  | 41  | 30  | 19  | 11  | 10  | 15  | 20  | 19  |     |
| North West | 16  | 5   | 5   | 5   | 10  | 10  | 7   | 9   | 21  | 30  | 28  | 14  | 7   | 13  | 8   | 5   | 13  | 26  |
| Wales    | 5   | 4   | 7   | 5   | 1   | 12  | 7   | 8   | 16  | 21  | 20  | 14  | 12  | 4   | 11  | 13  | 11  | 19  |


\(^b\)Not available from 1979/80 to 1986/87.

\(^c\)Not available in 1988-9 and 1992-3.
### TABLE A4.8

**AVERAGE MARGINAL EFFECTS FOR EVERY ESTABLISHMENT OF THE ORDERED PROBIT RESULTS: OF THE NEED TO IMPROVE ABILITY TO RECRUIT/RETAIN LABOUR AS A FACTOR EXERTING AN UPWARD PRESSURE ON LEVEL OF WAGE SETTLEMENTS.*A**

* Dependent variable: RRF

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Specification (1)</th>
<th>Specification (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average Marginal Effect For Every Establishment</strong></td>
<td><strong>Very</strong></td>
<td><strong>Fairly</strong></td>
</tr>
<tr>
<td><strong>Industry</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemicals and Allied Manufacturing</td>
<td>0.022 (2.29)</td>
<td>0.012 (3.13)</td>
</tr>
<tr>
<td>Metal manufacturing</td>
<td>0.014 (1.30)</td>
<td>0.008 (1.55)</td>
</tr>
<tr>
<td>Mechanical engineering</td>
<td>0.073 (5.03)</td>
<td>0.038 (5.62)</td>
</tr>
<tr>
<td>Instrument, Electrical, shipbuilding and Marine Engineering</td>
<td>0.123 (6.06)</td>
<td>0.051 (3.87)</td>
</tr>
<tr>
<td>Textiles, leather, leather, goods, fur, clothing and Footwear</td>
<td>-0.014 (-1.42)</td>
<td>-0.009 (-1.22)</td>
</tr>
<tr>
<td>Bricks, Pottery, Glass, Cement, Timber, Furniture</td>
<td>0.022 (1.99)</td>
<td>0.013 (2.64)</td>
</tr>
<tr>
<td>Paper, Printing, Publishing</td>
<td>0.120 (3.23)</td>
<td>0.044 (3.09)</td>
</tr>
<tr>
<td>Construction</td>
<td>0.024 (1.64)</td>
<td>0.013 (1.97)</td>
</tr>
<tr>
<td>Transport and Communication</td>
<td>0.157 (6.29)</td>
<td>0.051 (2.82)</td>
</tr>
<tr>
<td>Distribution</td>
<td>0.162 (6.28)</td>
<td>0.051 (2.72)</td>
</tr>
<tr>
<td>Trades Insurance, Banking and Finance Business, Professional and Scientific Services</td>
<td>0.201 (7.45)</td>
<td>0.057 (2.42)</td>
</tr>
<tr>
<td>Leisure</td>
<td>0.232 (5.65)</td>
<td>0.047 (1.71)</td>
</tr>
<tr>
<td>Miscellaneous Services Inc. Motor Distribution</td>
<td>0.038 (1.34)</td>
<td>0.020 (1.62)</td>
</tr>
<tr>
<td><strong>Size of Bargaining Group</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 25 workers - - -</td>
<td>0.053 (3.19)</td>
<td>0.021 (2.54)</td>
</tr>
<tr>
<td>26-50 - - -</td>
<td>0.060 (3.37)</td>
<td>0.022 (2.42)</td>
</tr>
<tr>
<td>51-100 - - -</td>
<td>0.049 (3.11)</td>
<td>0.019 (2.51)</td>
</tr>
<tr>
<td>101-200 - - -</td>
<td>0.033 (2.40)</td>
<td>0.013 (2.51)</td>
</tr>
<tr>
<td>201-500 - - -</td>
<td>0.024 (1.90)</td>
<td>0.010 (2.18)</td>
</tr>
<tr>
<td><strong>Bargaining Group</strong></td>
<td>Unskilled</td>
<td>0.005 (1.10)</td>
</tr>
<tr>
<td></td>
<td>Skilled</td>
<td>0.012 (1.93)</td>
</tr>
<tr>
<td></td>
<td>Supervisors Clerical, Professional/Technical and Managerial Staff Financial Variable</td>
<td>0.103 (6.72)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.047 (2.90)</td>
</tr>
</tbody>
</table>

**Note:** *A:* Significant at the 5% level.
## TABLE A4.8

(CONTINUED)

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>'Very Important'</th>
<th>'Fairly Important'</th>
<th>'Not Important'</th>
<th>'Very Important'</th>
<th>'Fairly Important'</th>
<th>'Not Important'</th>
</tr>
</thead>
<tbody>
<tr>
<td>North</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yorkshire</td>
<td>0.011 (1.17)</td>
<td>0.007 (1.33)</td>
<td>-0.018 (-1.24)</td>
<td>0.011 (0.70)</td>
<td>0.005 (0.80)</td>
<td>-0.016 (-0.74)</td>
</tr>
<tr>
<td>East Midlands</td>
<td>0.084 (5.28)</td>
<td>0.038 (4.23)</td>
<td>-0.122 (-9.34)</td>
<td>0.129 (4.55)</td>
<td>0.033 (1.58)</td>
<td>-0.163 (-8.75)</td>
</tr>
<tr>
<td>East Anglia</td>
<td>0.065 (4.18)</td>
<td>0.031 (4.23)</td>
<td>-0.095 (-6.06)</td>
<td>0.094 (3.64)</td>
<td>0.028 (1.85)</td>
<td>-0.122 (-5.71)</td>
</tr>
<tr>
<td>South East</td>
<td>0.114 (6.10)</td>
<td>0.056 (4.61)</td>
<td>-0.170 (-15.41)</td>
<td>0.119 (4.58)</td>
<td>0.042 (2.22)</td>
<td>-0.162 (-10.94)</td>
</tr>
<tr>
<td>South West</td>
<td>0.030 (2.81)</td>
<td>0.016 (3.58)</td>
<td>-0.046 (-3.45)</td>
<td>0.035 (1.99)</td>
<td>0.014 (2.21)</td>
<td>-0.048 (-2.44)</td>
</tr>
<tr>
<td>West Midlands</td>
<td>0.058 (4.53)</td>
<td>0.030 (4.74)</td>
<td>-0.088 (-7.06)</td>
<td>0.094 (3.98)</td>
<td>0.030 (1.99)</td>
<td>-0.123 (-6.91)</td>
</tr>
<tr>
<td>North West</td>
<td>0.037 (3.50)</td>
<td>0.020 (4.45)</td>
<td>-0.057 (-4.71)</td>
<td>0.078 (3.67)</td>
<td>0.026 (2.16)</td>
<td>-0.104 (-5.99)</td>
</tr>
<tr>
<td>Wales</td>
<td>0.023 (2.12)</td>
<td>0.013 (2.61)</td>
<td>-0.036 (-2.42)</td>
<td>0.063 (2.85)</td>
<td>0.022 (2.16)</td>
<td>-0.085 (-3.92)</td>
</tr>
<tr>
<td><strong>Year</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1979/80</td>
<td>0.246 (7.21)</td>
<td>0.049 (1.71)</td>
<td>-0.30 (-21.00)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1980/81</td>
<td>0.023 (1.65)</td>
<td>0.013 (2.44)</td>
<td>-0.30 (-21.00)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1981/82</td>
<td>0.000 (-0.04)</td>
<td>-0.000 (-0.04)</td>
<td>0.001 (0.04)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1983/84</td>
<td>0.071 (3.62)</td>
<td>0.033 (5.03)</td>
<td>-0.104 (-5.63)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1984/85</td>
<td>0.115 (4.73)</td>
<td>0.044 (3.82)</td>
<td>-0.160 (-9.12)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1985/86</td>
<td>0.118 (4.74)</td>
<td>0.045 (3.72)</td>
<td>-0.163 (-9.07)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1986/87</td>
<td>0.130 (5.02)</td>
<td>0.047 (3.45)</td>
<td>-0.177 (-10.19)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1987/88</td>
<td>0.249 (7.33)</td>
<td>0.051 (1.75)</td>
<td>-0.300 (-23.46)</td>
<td>0.194 (6.04)</td>
<td>0.041 (1.29)</td>
<td>-0.235 (-16.61)</td>
</tr>
<tr>
<td>1988/89</td>
<td>0.346 (9.44)</td>
<td>0.035 (6.85)</td>
<td>-0.381 (-29.65)</td>
<td>0.291 (7.64)</td>
<td>0.033 (0.69)</td>
<td>-0.324 (-18.54)</td>
</tr>
<tr>
<td>1989/90</td>
<td>0.330 (9.02)</td>
<td>0.041 (1.05)</td>
<td>-0.371 (-31.27)</td>
<td>0.270 (7.18)</td>
<td>0.041 (0.92)</td>
<td>-0.312 (-19.98)</td>
</tr>
<tr>
<td>1990/91</td>
<td>0.162 (5.73)</td>
<td>0.052 (2.91)</td>
<td>-0.214 (-13.64)</td>
<td>0.115 (4.84)</td>
<td>0.034 (1.90)</td>
<td>-0.149 (-10.32)</td>
</tr>
<tr>
<td>1991/92</td>
<td>0.075 (3.77)</td>
<td>0.034 (5.02)</td>
<td>-0.109 (-6.03)</td>
<td>0.028 (2.08)</td>
<td>0.012 (2.28)</td>
<td>-0.040 (-2.56)</td>
</tr>
<tr>
<td>1992/93</td>
<td>0.045 (2.75)</td>
<td>0.023 (4.83)</td>
<td>-0.068 (-3.72)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1993/94</td>
<td>0.097 (4.38)</td>
<td>0.041 (4.43)</td>
<td>-0.138 (-7.89)</td>
<td>0.048 (3.07)</td>
<td>0.018 (2.50)</td>
<td>-0.067 (-4.42)</td>
</tr>
<tr>
<td>1994/95</td>
<td>0.169 (5.90)</td>
<td>0.059 (2.86)</td>
<td>-0.222 (-14.73)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1995/96</td>
<td>0.190 (6.29)</td>
<td>0.055 (2.58)</td>
<td>-0.245 (-17.25)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1996/97</td>
<td>0.260 (7.55)</td>
<td>0.051 (1.69)</td>
<td>-0.311 (-24.88)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

* a-statistics in parentheses.
* b'Very important' refers to the establishments who reported that the need to improve ability as a very important factor in exerting upward pressure on wage settlements. 'Fairly important' refers to the establishments who reported the need to improve ability as a fairly important factor in exerting upward pressure in wage settlements. 'Very not important' refers to the establishments who reported the need to improve ability as not an important factor in exerting upward pressure on wage settlements.

The reference categories are the same as those for Specification (1) and (2), which are provided in the footnote of Table 4.7.
APPENDIX A

1. Solving of the fixed points, eigenvalues and its stability:
XPP finds fixed points as follows:
First by solving
\[ G(X) = 0 \]
where \( G(X) = F(X) \) for differential equations \( X' = F(X) \) and \( G(X) = \lambda - F(X) \). Newton's method is iterative and satisfies the scheme
\[ X_{k+1} = X_k - J^{-1}G(X_k) \]
where \( J \) is the matrix of partial derivatives of \( G \) evaluated at \( X_k \). XPP uses three parameters to implement Newton's method, namely the maximum number of iterates, the tolerance and a parameter for the numerical computation of the matrix \( J \), referred to as epsilon in XPP. If successive iterates falls within the tolerance, then the convergence is assumed and the root is found. The matrix \( J \) is found by perturbing each of the variables by an amount proportional to epsilon and utilizing this perturbation to approximate a derivative.
Following the finding of a fixed point, the matrix \( J \) is evaluated once again and the eigenvalues of \( J \) are computed using standard linear algebra routines. This information is utilized to compute the stability of solutions.
## APPENDIX B

### TABLE A5.1

STABILITY PROPERTIES

<table>
<thead>
<tr>
<th>$\rho$</th>
<th>Equilibria$^{b,c}$</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fixed Points</td>
<td>$\theta$</td>
<td>$u$</td>
<td>$w$</td>
<td>$x$</td>
</tr>
<tr>
<td></td>
<td>$Q$</td>
<td>0.75</td>
<td>0.07</td>
<td>0.57</td>
<td>-0.39</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.44</td>
<td>0.09</td>
<td>0.57</td>
<td>-0.39</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.36</td>
<td>0.11</td>
<td>0.50</td>
<td>-0.26</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.34</td>
<td>0.11</td>
<td>0.44</td>
<td>-0.12</td>
</tr>
<tr>
<td></td>
<td>$\gamma$</td>
<td>1.50</td>
<td>3.38</td>
<td>4.94</td>
<td>5.89</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.59</td>
<td>0.42</td>
<td>0.38</td>
<td>0.37</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.59</td>
<td>1.59</td>
<td>3.33</td>
<td>0.36</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.43</td>
<td>-0.38</td>
<td>5.05</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>$\Delta$</td>
<td>1.50</td>
<td>3.38</td>
<td>4.94</td>
<td>5.89</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.59</td>
<td>0.42</td>
<td>0.38</td>
<td>0.37</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.59</td>
<td>1.59</td>
<td>3.33</td>
<td>0.36</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.43</td>
<td>-0.38</td>
<td>5.05</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>$\phi$</td>
<td>0.75</td>
<td>0.07</td>
<td>0.57</td>
<td>-0.39</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.44</td>
<td>0.09</td>
<td>0.57</td>
<td>-0.39</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.36</td>
<td>0.11</td>
<td>0.50</td>
<td>-0.26</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.34</td>
<td>0.11</td>
<td>0.44</td>
<td>-0.12</td>
</tr>
<tr>
<td></td>
<td>$\epsilon$</td>
<td>1.50</td>
<td>3.38</td>
<td>4.94</td>
<td>5.89</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.59</td>
<td>0.42</td>
<td>0.38</td>
<td>0.37</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.59</td>
<td>1.59</td>
<td>3.33</td>
<td>0.36</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.43</td>
<td>-0.38</td>
<td>5.05</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>$\gamma$</td>
<td>1.50</td>
<td>3.38</td>
<td>4.94</td>
<td>5.89</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.59</td>
<td>0.42</td>
<td>0.38</td>
<td>0.37</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.59</td>
<td>1.59</td>
<td>3.33</td>
<td>0.36</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.43</td>
<td>-0.38</td>
<td>5.05</td>
<td>0.05</td>
</tr>
</tbody>
</table>

---

$^{a}$ Denotes stability properties for Risk Neutral Workers with linear utility function and Pissarides Model with linear costs.

$^{b}$ Denotes stability properties for Risk Averse Workers with linear utility function and Pissarides Model with linear costs.

$^{c}$ Denotes stability properties for Risk Averse Workers with linear utility function and Pissarides Model with nonlinear costs.
TABLE A5.1
(CONTINUED)

<table>
<thead>
<tr>
<th>( \rho )</th>
<th>Equilibria</th>
<th>( a_2 )</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Points</td>
<td>0.06</td>
<td>Eigenvalues</td>
<td>-0.73</td>
<td>3.29</td>
<td>4.85</td>
<td>5.81</td>
</tr>
<tr>
<td>( \theta )</td>
<td>1.24</td>
<td>0.44</td>
<td>0.36</td>
<td>0.34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( w )</td>
<td>0.06</td>
<td>0.09</td>
<td>0.11</td>
<td>0.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( x )</td>
<td>0.37</td>
<td>0.57</td>
<td>0.50</td>
<td>0.44</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( 0.06 )</td>
<td>0.04</td>
<td>-0.37</td>
<td>-0.25</td>
<td>-0.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed Points</td>
<td>0.07</td>
<td>Eigenvalues</td>
<td>-0.73</td>
<td>3.27</td>
<td>4.81</td>
<td>5.78</td>
</tr>
<tr>
<td>( \theta )</td>
<td>1.25</td>
<td>0.45</td>
<td>0.37</td>
<td>0.34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( w )</td>
<td>0.06</td>
<td>0.09</td>
<td>0.11</td>
<td>0.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( x )</td>
<td>0.37</td>
<td>0.57</td>
<td>0.50</td>
<td>0.44</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( 0.07 )</td>
<td>0.04</td>
<td>-0.37</td>
<td>-0.25</td>
<td>-0.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed Points</td>
<td>0.08</td>
<td>Eigenvalues</td>
<td>-0.73</td>
<td>3.25</td>
<td>4.80</td>
<td>5.76</td>
</tr>
<tr>
<td>( \theta )</td>
<td>1.25</td>
<td>0.45</td>
<td>0.37</td>
<td>0.34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( w )</td>
<td>0.06</td>
<td>0.09</td>
<td>0.11</td>
<td>0.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( x )</td>
<td>0.37</td>
<td>0.56</td>
<td>0.50</td>
<td>0.44</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( 0.08 )</td>
<td>0.04</td>
<td>-0.36</td>
<td>-0.25</td>
<td>-0.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed Points</td>
<td>0.09</td>
<td>Eigenvalues</td>
<td>-0.73</td>
<td>3.23</td>
<td>4.78</td>
<td>5.74</td>
</tr>
<tr>
<td>( \theta )</td>
<td>1.26</td>
<td>0.45</td>
<td>0.37</td>
<td>0.34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( w )</td>
<td>0.06</td>
<td>0.09</td>
<td>0.11</td>
<td>0.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( x )</td>
<td>0.36</td>
<td>0.56</td>
<td>0.50</td>
<td>0.44</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( 0.09 )</td>
<td>0.05</td>
<td>-0.36</td>
<td>-0.25</td>
<td>-0.11</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\( a_1 \) have also conducted experiments of parameter values in between \( a_2 = 0 \) to \( a_2 = 1 \) and \( a_2 = 1 \) to \( a_2 = 2 \) and \( a_2 = 3 \) for values of \( = 0 \) to \( \rho = 0.09 \) in \( (\rho, a_2) \) parameter space and found the equilibrium of the system to be unique and saddle-path stable. Details available from the author upon request.

\( b \) The nature of eigenvalues for all variations in \( (\rho, a_2) \) parameter space, are 3 positive and 1 negative eigenvalue; except where NBS = ITE Pissarides model with linear costs and utility function.

\( c \) The \( a_2 \) values from -1 to -3, that is decreasing cost functions and \( \rho \) values from 0 to 0.09 in \( (\rho, a_2) \) parameter space, the solution is unstable.

\( d \) When \( r_f = r_w \) and \( t \to \infty \), with linear costs and utility function.
## TABLE A5.2

### STABILITY PROPERTIES

<table>
<thead>
<tr>
<th>( \rho )</th>
<th>Equilibria*</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Risk-Neutral Workers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nash Equilibrium</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Workers Model</td>
<td>Linear Costs and Linear utility Function</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed Points</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \theta )</td>
<td>0.47</td>
<td>0.35</td>
<td>0.32</td>
<td></td>
</tr>
<tr>
<td>( w )</td>
<td>0.09</td>
<td>0.11</td>
<td>0.12</td>
<td></td>
</tr>
<tr>
<td>( x )</td>
<td>-0.23</td>
<td>0.06</td>
<td>0.33</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>Eigenvalues</td>
<td>3.00</td>
<td>5.25</td>
<td>6.54</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.44</td>
<td>-0.37</td>
<td>0.36</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.45</td>
<td>2.96</td>
<td>5.43</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.28</td>
<td>0.37</td>
<td>-0.35</td>
</tr>
<tr>
<td>Fixed Points</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \theta )</td>
<td>0.47</td>
<td>0.35</td>
<td>0.32</td>
<td></td>
</tr>
<tr>
<td>( u )</td>
<td>0.09</td>
<td>0.11</td>
<td>0.12</td>
<td></td>
</tr>
<tr>
<td>( w )</td>
<td>0.50</td>
<td>0.37</td>
<td>0.28</td>
<td></td>
</tr>
<tr>
<td>( x )</td>
<td>-0.22</td>
<td>0.07</td>
<td>0.33</td>
<td></td>
</tr>
<tr>
<td>0.01</td>
<td>Eigenvalues</td>
<td>2.98</td>
<td>5.23</td>
<td>6.53</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.44</td>
<td>-0.37</td>
<td>0.36</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.45</td>
<td>2.96</td>
<td>5.43</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.28</td>
<td>0.38</td>
<td>-0.35</td>
</tr>
<tr>
<td>Fixed Points</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \theta )</td>
<td>0.47</td>
<td>0.35</td>
<td>0.32</td>
<td></td>
</tr>
<tr>
<td>( u )</td>
<td>0.09</td>
<td>0.11</td>
<td>0.12</td>
<td></td>
</tr>
<tr>
<td>( w )</td>
<td>0.50</td>
<td>0.37</td>
<td>0.28</td>
<td></td>
</tr>
<tr>
<td>( x )</td>
<td>-0.22</td>
<td>0.07</td>
<td>0.33</td>
<td></td>
</tr>
<tr>
<td>0.02</td>
<td>Eigenvalues</td>
<td>2.97</td>
<td>5.21</td>
<td>6.51</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.44</td>
<td>-0.37</td>
<td>0.36</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.46</td>
<td>2.95</td>
<td>5.43</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.27</td>
<td>0.38</td>
<td>-0.35</td>
</tr>
<tr>
<td>Fixed Points</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \theta )</td>
<td>0.47</td>
<td>0.35</td>
<td>0.32</td>
<td></td>
</tr>
<tr>
<td>( u )</td>
<td>0.09</td>
<td>0.11</td>
<td>0.12</td>
<td></td>
</tr>
<tr>
<td>( w )</td>
<td>0.50</td>
<td>0.37</td>
<td>0.28</td>
<td></td>
</tr>
<tr>
<td>( x )</td>
<td>-0.21</td>
<td>0.07</td>
<td>0.33</td>
<td></td>
</tr>
<tr>
<td>0.03</td>
<td>Eigenvalues</td>
<td>2.95</td>
<td>5.10</td>
<td>6.49</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.44</td>
<td>-0.37</td>
<td>0.36</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.46</td>
<td>2.95</td>
<td>5.42</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.27</td>
<td>0.38</td>
<td>-0.35</td>
</tr>
<tr>
<td>Fixed Points</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \theta )</td>
<td>0.47</td>
<td>0.35</td>
<td>0.32</td>
<td></td>
</tr>
<tr>
<td>( u )</td>
<td>0.09</td>
<td>0.11</td>
<td>0.12</td>
<td></td>
</tr>
<tr>
<td>( w )</td>
<td>0.50</td>
<td>0.37</td>
<td>0.28</td>
<td></td>
</tr>
<tr>
<td>( x )</td>
<td>-0.21</td>
<td>0.07</td>
<td>0.33</td>
<td></td>
</tr>
<tr>
<td>0.04</td>
<td>Eigenvalues</td>
<td>2.94</td>
<td>5.17</td>
<td>6.48</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.44</td>
<td>-0.37</td>
<td>0.36</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.46</td>
<td>2.95</td>
<td>5.42</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.27</td>
<td>0.38</td>
<td>-0.35</td>
</tr>
<tr>
<td>Fixed Points</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \theta )</td>
<td>0.48</td>
<td>0.35</td>
<td>0.32</td>
<td></td>
</tr>
<tr>
<td>( u )</td>
<td>0.09</td>
<td>0.11</td>
<td>0.12</td>
<td></td>
</tr>
<tr>
<td>( w )</td>
<td>0.50</td>
<td>0.37</td>
<td>0.28</td>
<td></td>
</tr>
<tr>
<td>( x )</td>
<td>-0.21</td>
<td>0.07</td>
<td>0.33</td>
<td></td>
</tr>
<tr>
<td>0.05</td>
<td>Eigenvalues</td>
<td>2.92</td>
<td>5.15</td>
<td>6.46</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.44</td>
<td>-0.37</td>
<td>0.36</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.46</td>
<td>2.95</td>
<td>5.42</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.26</td>
<td>2.95</td>
<td>-0.35</td>
</tr>
<tr>
<td>Fixed Points</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \theta )</td>
<td>0.48</td>
<td>0.35</td>
<td>0.32</td>
<td></td>
</tr>
<tr>
<td>( u )</td>
<td>0.09</td>
<td>0.11</td>
<td>0.12</td>
<td></td>
</tr>
<tr>
<td>( w )</td>
<td>0.50</td>
<td>0.37</td>
<td>0.28</td>
<td></td>
</tr>
<tr>
<td>( x )</td>
<td>-0.21</td>
<td>0.07</td>
<td>0.33</td>
<td></td>
</tr>
<tr>
<td>0.06</td>
<td>Eigenvalues</td>
<td>2.90</td>
<td>5.13</td>
<td>6.44</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.44</td>
<td>-0.37</td>
<td>0.36</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.46</td>
<td>2.95</td>
<td>5.42</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.26</td>
<td>2.95</td>
<td>-0.35</td>
</tr>
<tr>
<td>Fixed Points</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \theta )</td>
<td>0.48</td>
<td>0.35</td>
<td>0.32</td>
<td></td>
</tr>
<tr>
<td>( u )</td>
<td>0.09</td>
<td>0.11</td>
<td>0.12</td>
<td></td>
</tr>
<tr>
<td>( w )</td>
<td>0.50</td>
<td>0.37</td>
<td>0.28</td>
<td></td>
</tr>
<tr>
<td>( x )</td>
<td>-0.20</td>
<td>0.08</td>
<td>0.33</td>
<td></td>
</tr>
<tr>
<td>0.07</td>
<td>Eigenvalues</td>
<td>2.89</td>
<td>5.11</td>
<td>6.43</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.44</td>
<td>-0.37</td>
<td>0.36</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.46</td>
<td>2.98</td>
<td>5.41</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.26</td>
<td>2.94</td>
<td>-0.35</td>
</tr>
</tbody>
</table>
TABLE A5.2
(CONTINUED)

<table>
<thead>
<tr>
<th>( \rho )</th>
<th>Equilibria</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( \frac{\theta}{\rho} )</td>
<td>( u )</td>
<td>( w )</td>
<td>( X )</td>
</tr>
<tr>
<td>Risk Averse Workers</td>
<td>( \theta )</td>
<td>0.48</td>
<td>0.99</td>
<td>0.49</td>
</tr>
<tr>
<td>Fixed Points</td>
<td>( u )</td>
<td>0.35</td>
<td>0.11</td>
<td>0.37</td>
</tr>
<tr>
<td></td>
<td>( x )</td>
<td>-0.20</td>
<td>0.08</td>
<td>0.33</td>
</tr>
<tr>
<td>0.08</td>
<td>Eigenvalues</td>
<td>2.87</td>
<td>5.08</td>
<td>6.41</td>
</tr>
<tr>
<td></td>
<td>( \alpha )</td>
<td>0.44</td>
<td>-0.57</td>
<td>0.39</td>
</tr>
<tr>
<td></td>
<td>( \lambda )</td>
<td>-0.46</td>
<td>0.38</td>
<td>5.41</td>
</tr>
<tr>
<td></td>
<td>1.25</td>
<td>2.94</td>
<td>-0.35</td>
<td></td>
</tr>
<tr>
<td></td>
<td>( \frac{\theta}{\rho} )</td>
<td>2.86</td>
<td>5.06</td>
<td>6.39</td>
</tr>
<tr>
<td>Fixed Points</td>
<td>( u )</td>
<td>0.36</td>
<td>0.11</td>
<td>0.28</td>
</tr>
<tr>
<td></td>
<td>( x )</td>
<td>-0.19</td>
<td>0.08</td>
<td>0.33</td>
</tr>
<tr>
<td>0.09</td>
<td>Eigenvalues</td>
<td>2.86</td>
<td>5.06</td>
<td>6.39</td>
</tr>
<tr>
<td></td>
<td>( \alpha )</td>
<td>0.44</td>
<td>-0.37</td>
<td>0.38</td>
</tr>
<tr>
<td></td>
<td>( \lambda )</td>
<td>-0.46</td>
<td>0.38</td>
<td>5.40</td>
</tr>
<tr>
<td></td>
<td>1.25</td>
<td>2.94</td>
<td>-0.35</td>
<td></td>
</tr>
</tbody>
</table>

I have also conducted experiments of values of \( a_1 \) in between \( a_1 > 0 \) to \( a_1 = 1 \) and \( a_1 = 2 \) to \( a_1 = 2 \) and \( a_1 = 3 \) for values of \( \rho = 0 \) to \( \rho = 0.09 \) in \((\rho, a_1)\) parameter space and found the equilibrium of the system to be unique and saddle-path stable. Details available from the author upon request.

*The nature of the eigenvalues for all variations of the parameters in \((\rho, a_1)\) parameter space, are 3 positive and 1 negative eigenvalues, except in the models with linear cost and utility function.

**where \( r_f = r_w \) and \( t \to \infty \), with linear costs and utility functions.
REFERENCES


Cost of Living Differences in Great Britain. Papers of the Regional Science Association, 69, 43 – 45.


