Unemployment, Earnings and Absence: British and European Labour Market Experience

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Abstract

This thesis comprises five chapters that together offer some contribution to the economics of unemployment, earnings and absence.

Chapter One: Unemployment Stigma investigates the implications of an occupational hierarchy on labour market behaviour. The ideas developed are applied, firstly, to a model of the wage curve where it is shown that the relationship between unemployment and pay may be upward slopping over some range; and secondly, to a non-shirking model of efficiency wages where the potential for multiple labour market equilibria is highlighted.

Chapter Two: The Economics of Absence investigates the relatively neglected issue of worker absence. The Chapter reviews and offers some perspective to existing studies of absence, develops a theoretical model of absence that incorporates both the supply and demand aspects of the employment relation, and sets out an empirical analysis of the relationship between absence and labour supply.

Chapter Three: Absence and Profit Sharing explores the relationship between employee sharing and worker absence using data from a panel of 127 French firms over the period 1981-1991. The results suggest that both profit sharing and employee share ownership schemes are associated with significantly lower absence, the extent of the decline depending crucially upon whether or not the schemes operate exclusively of one another. An interesting question also emerges concerning the relationship between contractual flexibility and absence behaviour, the empirical analysis suggesting that a more widespread use of part-time contracts may act to reduce the incidence of absence in firms operating profit sharing schemes.

Chapter Four: U.K. Unemployment profiles the incidence of unemployment in the U.K. over the period 1985-91 by quantifying the differential

probabilities of unemployment faced by particular groups within the population. The results indicate that, even after controlling for a plethora of demographic characteristics, regional disparities in unemployment risk are prevalent.

Chapter Five: Trade and Trade Unions examines the effects of international trade on the employment and earnings prospects of a sample of U.K. workers. The Chapter develops a model of international oligopoly with generally unionised labour markets which suggests that an increased exposure to trade is more likely to impact negatively upon the wage (employment) prospects of workers the greater (lesser) the degree of union bargaining power to which they are subservient. The empirical analysis in the Chapter offers substantive support for this proposition.

Acknowledgements

On a personal note, I take this opportunity to acknowledge the love and guidance of my family, particularly that of my parents. They have taught me so much. Not least, in the present context, the beauty of understanding.

And finally: To Tracey - for never giving up on me, I am more grateful than I can ever express. This is for you. I hope it was worth the wait!

Certificate of Originality

This is to certify that I am responsible for the work submitted in this thesis, that the original work is my own except as specified in acknowledgements or in footnotes, and that neither the thesis nor the original work contained therein has been submitted to this or any other institution for a higher degree.

John Sessions

Outline

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Chapter One

Unemployment Stigma[1]

I.   Introduction

There is a growing dissatisfaction amongst economists with the conventional neo-classical axioms. At one extreme the paradigm of 'rational economic man' is rejected completely [Simon (1957)]. A more conciliatory view criticises the paradigm because of its presumption that agents are individualistic maximisers. Such an attitude implies a view of the world in which agents operate within a social vacuum. In fact, it is argued, social interaction is a key feature of a market economy and an important constraint on individual behaviour. Due allowance for such considerations should be incorporated into economic model building, one method of which is to supplement the basic foundations of the paradigm with behavioural assumptions derived from the social-psychological literature. Prominent in this respect is the work of Akerlof (1984).[2]

This chapter follows in the Akerlof tradition. It models a peculiar feature of socio-economic behaviour that has been largely neglected by conventional theory. Introspection suggests that there exists in most societies an occupational hierarchy that does not depend entirely upon financial remuneration. Certain occupations bestow 'social status' and are *ceteris paribus* preferred to other less 'prestigious' occupations. The aim of the chapter is to investigate the implications of such a hierarchy for labour market behaviour.

The key assumption is that agents are not exclusively concerned with the monetary rewards with an occupation. The social status associated with an

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[2] Recent investigations into the implications of these assumptions for labour market behaviour are contained in Booth (1985), Booth and Chatterji (1993), Naylor (1989, 1990).

occupation plays a significant role in individual decision making. To ease exposition, occupations are categorised simply as 'good', 'bad' or 'neutral'. The status associated with a 'good' occupation is denoted 'prestige' and is assumed to increase worker utility. The status associated with a 'bad' occupation is denoted 'stigma' and is assumed to reduce worker utility. A 'neutral' occupation is one that offers neither 'prestige' nor 'stigma'.

Status is endogenous and is modelled as a social pressure emanating from workers *not* employed within the occupation under consideration. As the proportion of the workforce employed within a particular occupation declines the status associated with that occupation increases. To be sure, as the proportion of the workforce employed in 'good' occupations declines the 'prestige' associated with good occupations increases. Conversely, as the proportion of the workforce employed in 'bad' occupations declines the 'stigma' associated with 'bad' occupations increases. Such an assumption accords with the social psychology theory of minority-majority groups and is attractive in that it enables status to be modelled as, essentially, a reduced form. Whatever the social-psychological root cause of status the underlying social pressures must operate via the conduit of society [Crocker and Major (1989), Killian (1985), Davies (1984)].

These ideas are applied to two issues that have attracted considerable interest amongst commentators in recent years. First, the chapter investigates the implications of incorporating the notion of social status into the Blanchflower and Oswald (1990) model of the wage curve, with unemployment playing the role of the bad occupation, and 'unemployment stigma' the accompanying social pressure. It is shown here that, under certain not unreasonable conditions, the relationship between unemployment and pay may be upward sloping over some range, a possibility alluded to by Blanchflower and Oswald (1990) in their study.

Second, the chapter investigates the effects of incorporating social pressures into the Shapiro-Stiglitz (1984) non-shirking model of efficiency wages. It is shown here that allowing for the presence of social status as an argument in

agents' utility functions has implications for the shape of the non-shirking constraint and, thereby, for the number and type of labour market equilibria. Such a finding is of considerable interest as it conforms to recent empirical work suggesting the existence of multiple labour market equilibria [Carruth and Oswald (1988), Manning (1992)] and may provide a further rationale for the apparent hysteresis observed in western labour markets since the 1970's [see Blanchard and Summers (1986)].

At a more general level, the chapter adds to the recent flurry of activity on the part of economists in attempting to put some structure on the interface between economics and the other social sciences - notably social psychology, sociology and psychology. Fershtman and Weiss (1993), for example, have constructed a general equilibrium model in which the drive for social status can affect economic performance. An increase in the demand for status, resulting from differences in culture or in the distribution of non-wage income may create a wage gap amongst equally skilled workers thereby leading to reductions in output. In a similar vein Baumol (1990) has discussed the role of social interaction in economic growth. In his model the desire by individuals to undertake prestigious, but non-productive (i.e. rent-seeking), activities, as opposed to less prestigious, productive activities can have important implications for an economy's growth rate.[3]

The chapter is set out as follows: Section II discusses some background issues regarding the concept of unemployment stigma. Section III outlines the formal model whilst Sections IV and V apply the model to the Blanchflower and Oswald (1990) wage curve and the Shapiro and Stiglitz (1984) model of efficiency wages respectively. Conclusive comments are collected in Section VI.

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[3] Other papers likening social behaviour and growth are Cole *et al* (1991) and Benabou (1991). The former highlights the relevance of social status to marriage patterns and, thereby, to both intra- and inter-generational transfers of wealth. The latter investigates the effect of social stratification by way of peer pressure on growth rates. Away from the labour market Robson (1992) and Bagwell and Bernheim (1992) have discussed the influence of wealth on social status, whilst Becker (1991) has discussed the role of social interaction in consumption.

II.   Unemployment Stigma

The central feature of what follows is the social status associated with unemployment. This status is defined as 'unemployment stigma' and is claimed to reduce worker utility. There have been numerous definitions of stigma in the social psychological literature. Goffman (1968), for example, spoke of it as a term " ... used to refer to an attribute of a person that is deeply discrediting." He went on, however, to argue that it should be interpreted within the context of relationships rather than attributes.

> The central feature of the stigmatised individual's situation in life ... is a question of what is often, if vaguely called 'acceptance'. Those who have dealings with him fail to accord him the respect and regard which the uncontaminated aspects of his social identity have led him to anticipate extending, and have led him to anticipate receiving. [Goffman (1968), p. 19].

In terms of the economic literature the application of status as a formal concept was first made by Weber (1978) who defined it as an " ... effective claim for social esteem." Weber's analysis is interesting from the point of view of this chapter because of his perception of occupations as 'status groups' whereby occupational status depends on the amount of training required by, and the monetary rewards to, a particular occupation.

There is strong support amongst social-psychologists as regards the stigmatising effects of unemployment. Emphasis on the stigmatisation felt by unemployed workers has been made by many authors, and the stigma associated with unemployment has come to be regarded as one of its most damaging social and psychological consequences [see, for example, Kelvin and Jarret (1985), Gould and Kenyon (1972), Marsden and Duff (1975), Harrison (1976), Hayes and Nutman (1981), Sinfield (1981) and Warr (1987)]. A review of the early social-psychological literature on unemployment concluded that:

> Two of the most important psychological effects of unemployment that were identified by nearly all the researchers were the sense of social stigma attached to being unemployed and the suffering resulting from the lack of structure that people experience. [Furnmam and Lewis (1986) pp. 120].

Similarly, a recent investigation into the psychological impact of continuing

unemployment sets out the various aspects that influence the extent of trauma

suffered by the unemployed. The loss of a valued social position is a key element:

> The final aspect considered to be important in determining any person's mental
> health is a position within a social structure which carries some esteem ... on
> becoming unemployed a person looses a valued social position and the positive
> self-evaluations which go with it. The new position is widely felt to be one of
> lower prestige, deviant, second-rate, or not providing full membership of
> society.

And it is not only the pecuniary difficulties imposed by unemployment that cause

this distress. The author continues:

> Even when welfare benefits remove the worst financial hardship, there may be
> shame attached to the receipt of funds from public sources and a seeming
> failure to provide for one's family. [Warr (1987) pp. 274-275].

The model of occupational status developed in this chapter takes into account such

considerations. It is assumed that the social status associated with unemployment

plays an important role in individual decision making. Moreover, this social status

is assumed to be endogenous to a population. As more individuals become

unemployed, the stigma, or psychological pain, associated with unemployment is

reduced.[4] Such an assumption follows closely the social-psychological ideas of

majority-minority groupings [Crocker and Major (1989), Davies (1984), Killian

(1985)] and is supported by much of the research into the social effects of

unemployment on individuals during the 1930's and 1970's. Throughout the latter

period researchers repeatedly commentated on the keen awareness shown by the

unemployed of the low social status, i.e. stigma, associated with their predicament

[Cohen (1972), Gould and Kenyon (1972), Marsden and Duff (1975), Briar

(1977), Campling (1978) and Hill (1978)].[5] This is in contrast to the accounts of

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[4] For symmetry a converse effect in terms of (primary sector) employment is also assumed, with individuals regarding such employment as more prestigious the fewer people are employed.

[5] The preoccupation of the unemployed with such issues as: 'what the neighbours think'; of 'sitting on skid row'; of 'not wanting their children to be looked down upon for having free school meals', has been a common thread in these studies. Kelvin and Jarret (1986) argue that such an awareness may be related to the 'scrounging controversy' of the period [see e.g. Emmett (1977) and Deacon (1978)].

the 1930's. The unemployed during this period certainly felt that they were 'different', both from those individuals in work, and from how they themselves had been when they were in work [Jahoda *et al* (1933), Bakke (1933)]. They often felt bitter about being unwanted, at being displaced (by both women and machines) and some felt deeply at their loss of independence (Pilgrims Trust (1938)]. But there is little reported evidence of actual unemployment stigma. The definitive account of the period makes no mention whatsoever of anything resembling unemployment stigma [Eisenberg and Lazarsfield (1938)] whilst other studies point to a stigma of poverty, but not to one of unemployment [Zawadski and Lazarsfield (1935), Pilgrim Trust (1938), Komarovsky (1940)]. Kelvin and Jarret (1986) argue that much of the reason for this discrepancy in the experience of the unemployed is due largely to the difference in the macroeconomic background of the two periods:

> First ..., and this cannot be stressed too strongly, reactions to unemployment are profoundly affected by the extent of unemployment, both in numbers and over time. The research of the *thirties* covers a period of very high unemployment, itself preceded by some ten years of high unemployment. The *seventies* saw only the onset of a rise in unemployment after two decades of historically quite exceptionally low unemployment.

And the authors continue:

> It is, we suggest, much more plausible to stigmatise the unemployed in an age of full employment than in times of widespread unemployment. When unemployment is very low and everyone is doing nicely, the ... unemployed are mostly treated sympathetically, as people who need to be helped. ... At the other extreme, when unemployment is high, when almost anyone can find himself without a job, and when there are few jobs to be had, stigmatisation comes to lack credibility - it could happen to oneself. [Kelvin and Jarret, pp. 120-122 (1986)].[6]

Thus it is during periods of low unemployment that the unemployed are more stigmatised against by the rest of society, where this stigmatisation is on account of their failure to work rather than on the poverty that such a failure implies. Moreover, it is at these times that any such stigmatising behaviour will be

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[6] A related point is made by Sinfield (1981) who posits the question as to whether workers have a lesser feeling of stigma in the context of large scale redundancies.

especially painful, with the unemployed being particularly receptive to the increased disdain of the more numerous employed. Kelvin and Jarret conclude:

> It is ... important to recognise that this sense of unemployment as a stigma is essentially a contingent phenomenon. It does not arise primarily because to be unemployed is to infringe some fundamental and absolute standard, such as the work ethic: it is very largely a function of the level of unemployment at any given time, and with it, of the probability of being unemployed oneself; that affects potential stigmatisers as much as those who potentially see themselves as stigmatised.

The key social psychological process in all this is the individual's identification with reference groups [Shibutani (1955), Hyman and Singer (1968)]. When unemployment is low the non-frictionally unemployed will be, rightly or wrongly, perceived by the rest of society as 'problem cases', that is, individuals who are in some way inadequate or incapacitated. When unemployment is high such that almost anyone can find himself out of a job, the 'unemployed' will include a lot of workers similar to oneself, whether or not one happens to be unemployed at the time. It also includes workers similar to one's closest reference groups, namely family, friends and neighbours. In such a situation the 'unemployed' is not an intrinsically degrading reference group - although few individuals would actively chose to join it given the choice.

This notion of unemployment stigma being dependent on the level of (and/or change in) unemployment hints to a further reason for the presence of unemployment hysteresis as has been witnessed in recent years. High unemployment which extends over many years may largely eliminate the stigma, and sense of stigma, of being without a job. Whether wages are perceived as resulting from a bargain between employers and unions, or as being set unilaterally by the former in the face of efficiency wage considerations, such a process would act to immunise workers from the 'shame' (i.e. stigma) of unemployment. This would reduce the fear of layoff on the part of workers, necessitating the payment of higher wages on the part of employers, and thereby dragging up the equilibrium level of unemployment. Alternatively, a similar effect may be envisaged on the part of the currently unemployed. It is not difficult to imagine that the stigma felt by an

unemployed worker diminishes the longer the duration of that worker's current (or historical) spell(s). In such a situation an increase in long term unemployment may reduce the embarrassment of such a worker's current situation and make him less likely to chase jobs.

Such effects complement the human capital explanation of hysteresis. If the long term unemployed feel less stigma at their situation then firms may be reluctant to employ them because if they did it would necessitate the paying of higher wages on account of both the reduced fear of layoff of such workers, and because such workers would be less willing to accept any job offers in the first place.

The model that follows abstracts from such dynamic considerations to consider a static framework in which it is only the level of unemployment that influences social status.

III.   A Formal Representation of Unemployment Stigma

Consider an economy consisting of N identical workers each of whom cares about his standing in society. This standing is determined by occupational affiliation, the utility from which is assumed to be separable from the monetary rewards or physic effort cost associated with that occupation. Indexing occupations by i this assumption may be written:

$$u_i = u(m_i, s_i, e_i) \tag{1}$$

where u_i denotes the utility of an individual employed in occupation i, m_i the income reward to occupation i, e_i the physic effort cost associated with occupation i, and s_i the social status associated with occupation i. Workers are assumed to enjoy income but to dislike effort. Their attitude towards social status depends upon the type of occupation in which they are employed.

Occupations are categorised as 'good', 'bad', or 'neutral'. The status of a 'good' occupation is denoted 'prestige' and is assumed to increase worker utility.

The status of a 'bad' occupation is denoted 'stigma' and is assumed to reduce worker utility. A 'neutral' occupation is one that offers neither prestige nor stigma. For simplicity it is assumed that only one occupation of each type is available to workers, namely 'primary' employment, 'secondary' employment and unemployment, where these are assumed to be 'good', 'neutral' and 'bad' respectively.[7]

It is further assumed that both prestige and stigma vary with the composition of the labour market. As the proportion of the workforce employed within a particular occupation declines the status associated with that occupation increases. To be sure, as the proportion of the workforce employed in 'good' occupations declines, the prestige associated with 'good' occupations increases. Conversely, as the proportion in 'bad' occupations declines, the stigma associated with 'bad' occupations increases.[8]

Assuming risk neutral, separable utility functions these notions may be represented formally by:

$$u_1 = m_1 + s_1 - e_1 \tag{2}$$

$$u_2 = m_2 - e_2 \tag{3}$$

$$u_3 = m_3 - s_3 \tag{4}$$

where the subscripts refer to primary employment, secondary employment, and unemployment respectively. u_1 is the utility of primary employment and comprises monetary remuneration, m_1, plus employment 'prestige', s_1, minus psychic effort cost e_1. u_2 is the utility of secondary employment and comprises monetary remuneration m_2, minus psychic effort cost e_2. u_3 is the utility of unemployment

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[7] The paper follows Doeringer and Piore (1971) and Bulow and Summers (1986) in interpreting secondary employment as readily available low pay employment that workers can obtain without lengthy prior formalities.

[8] An implicit assumption in the model is that individuals cannot vary amount of social pressure they emit. For example, the stigma associated with unemployment cannot increase as the level of unemployment rises because employed workers are each more disdainful of the unemployed.

and comprises the income equivalent value of leisure, m_3, minus unemployment 'stigma', s_3.[9]

The social pressure associated with a particular occupation i is represented by the function:

$$s_i = s(n_i)$$
(5)

where n_i is the proportion of the workforce employed within occupation i. The social pressure function, $s(\cdot)$, is assumed to be declining with limits $s(x) = 1$ as $x \to 0$, and $s(x) = 0$ as $x \to 1$, $\forall x \in [0,1]$.[10] There is no social pressure associated with an occupation if the entire workforce is employed within that occupation. The social pressure associated with an occupation increases as the proportion of the workforce employed within that occupation falls, and approaches a unique (normalised) maximum as this proportion approaches zero.

The following two sections examine the effects of incorporating this basic representation of unemployment stigma into recent models of the relationship between unemployment and pay.

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[9] The form of equations (2)-(4) corresponds to findings that rankings of perceived occupational status are remarkably consistent across occupational groups. It has been observed, for example, that: "People in all walks of life, rich and poor, educated and ignorant, urban and rural, male and female, view the prestige hierarchy in the same way". [Treiman (1977), p.50].

[10] Note that no assumption is yet made regarding the second derivative of the social pressure function.

IV.   Application One - The Wage Curve

IV.1   Introduction

The relationship between unemployment and pay has recently been encapsulated in terms of a 'wage curve' whereby increasing unemployment acts to curb the general level of pay [Blanchflower and Oswald - hereafter BO - (1990, 1993, 1994a, 1994b, 1994c)]. BO's early results [BO (1990)] allude to the possibility of an upturn in the curve with the level of pay tending to rise as unemployment passes some critical rate. Strong support for a 'u' shaped relationship between unemployment and pay is also found by Groot *et al* (1992). BO attribute the upturn observed in their study to a data aberration arguing that the idea that the wage curve takes a positive gradient ".... appears to go against common sense." The shape of the wage curve has important policy implications and although the empirical evidence in BO (1990) for an upturn is far from conclusive, such a possibility should not be dismissed *a priori*.

The aim of this section is two-fold: First, to stimulate further research into the nature of the relationship between unemployment and pay; and second, to illustrate the potentially wide ranging implications of incorporating behavioural assumptions into models of economic behaviour. The approach is to supplement the standard neo-classical model of the wage curve with behavioural assumptions drawn from the social-psychology literature and, by so doing, to derive sufficient conditions for an upturn from a formal model.

IV.2   Background

Despite the obvious relevance of pay determination to the labour market, and through the labour market to the wider macro-economy, the question as to what determines pay continues to perplex economists. The wage-unemployment nexus has aroused particular intrigue with interest focusing on two broad lines of

enquiry. The seminal work of Phillips (1958) laid the foundations for a large, macroeconomic based literature, in which the aim was to relate wage inflation to unemployment.[11] Despite early acclaim, Phillips' empirical evidence was progressively disputed and the 'Phillips Curve' is now regarded as a fragile relationship at best.[12]

An alternative approach was that adopted by Sargan (1964) who employed microeconomic data to focus upon the relationship between unemployment and the level of wages. Sargan regarded this latter relationship - the 'wage curve' - as fundamental. He rationalised it in terms of union wage demands, which he assumed were calibrated by the level of unemployment within the whole economy. Sargan down played the importance of the Phillips Curve, arguing that it could be interpreted as an adjustment mechanism around a long run relationship linking the level of wages and unemployment as set out by the wage curve. Sargan estimated the average long run unemployment elasticity of pay at -0.03 and a large number of time series studies, most of which employed highly aggregated data, set out to follow his lead. Layard and Nickell (1986), for example, estimate a real wage equation on British data for the period 1950-1983 and obtain an elasticity estimate of -0.06, whilst Carruth and Oswald (1987, 1989) and Holly and Smith (1987) obtain somewhat larger elasticities of -0.10 or over. In contrast to these British results, Sneesens and Dreze (1986) find a statistically insignificant elasticity for Belgium, whilst very small elasticities emerge from studies of Scandinavian pay [Hoel and Nymoen (1988) and Anderson and Risager (1988)].

Common to all these studies is the paucity of degrees of freedom and other weaknesses associated with highly aggregated time series data. A more profitable

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[11] See, for example, Lipsey (1960), Solow (1969), the survey by Laidler and Parkin (1975), Wadhwani (1985), the debate between Desai (1975, 1984) and Gilbert (1976), and the work on cross-country Phillips Curves in Grubb et al (1983), Paldam (1980), Newell and Symons (1985) and Grubb (1986).

[12] The theoretical weaknesses of the Phillips Curve were exposed by Phelps (1967) and Friedman (1968) who argued that the curve should be vertical in the long run. Recent negative empirical results have been obtained by, for example, Christofides et al (1989) and Beckerman and Jenkinson (1986).

method of analysis is to focus on the relationship between unemployment and pay through cross section data and from the mid-1980s a flurry of activity on the part of economists undertaking such studies was witnessed. The results of these studies are tabulated in Table I below, an examination of which yields three key points: First, there is extensive evidence that unemployment depresses the level of real wages, although some positive elasticities may be discerned; second, the elasticity of pay is fairly small - estimates of approximately -0.1 are the norm, although some insignificant estimates exist;[13] and third, broadly similar estimates of the unemployment elasticity of pay emerge from studies of countries with quite distinct pay bargaining systems. Indeed, this last point is illustrated most clearly in BO (1994) who find compulsive evidence of approximately -0.1 elasticities for the USA, UK, Canada, South Korea, Austria and Italy, Holland, Switzerland, Norway and West Germany.

IV.3   Blanchflower and Oswald (1990)

Interest in the relationship between unemployment and pay was re-vitalised by the wide-ranging study by Blanchflower and Oswald (1990). In this paper, which built on work previously reported in Blanchflower *et al* (1990), wage curves are estimated for the UK and the US on a number of large, and highly detailed, microeconomic data sets. The principal finding is that a wage curve linking the level of pay to unemployment exists and that it has a negative gradient over low levels of unemployment. The authors follow Sargan in rationalising such a curve in terms of a firm-union bargain, with increasing unemployment acting to curb union bargaining power. Unlike Sargan, however, they argue that such an effect is finite,

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[13] Adams (1985) and Beckerman and Jenkinson (1988) even obtain estimates of a positive elasticity on one unemployment rate and a negative elasticity on another (when the two rates are entered simultaneously).

Table I
Estimates of the Unemployment Elasticity of Pay (E$_{wu}$)

	Study	Data	Comment	E$_{wu}$
1	Bils (1985)	US NLS Panel, 1970's, 5000 young males	Aggregate annual US unemployment used as independent variables. Few annual observations	-0.12
2	Rayack (1987)	US PSID Panel, 1968-90, 27000 white males.	Aggregate annual US unemployment rates	-0.10[a]
3	Adams (1985)	US PSID Panel, 1970-76, various samples	State and industry unemployment rates	-0.02 to -0.11 (industry rates) -0.13 to 0.020 (state rates)
4	Beckerman and Jenkinson (1986)	Panel of 12 OECD countries, 1963–83	National unemployment rates	0.00
5	Beckerman and Jenkinson (1986)	Panel of 14 UK Manufacturing Companies, 1972-86	Unemployment by industry and nationality. Data on 1983-86 constructed by authors.	-0.13 (aggregate rates) +0.18 (industry rates)
6	BO (1988b)	British BSA, 1983-86, 3800 adult workers	Regional unemployment.	-0.12
	Blanchflower (1989)	British BSA, 1983-86, 3800 adult workers	Regional unemployment.	-0.10
7	Blackeby and Manning (1987)	British General Household Survey, 1975, 7300 white males	Regional unemployment.	-0.16
8	McConnell (1988)	U.S. union contract data, 1970-81, 3000 contracts	State unemployment	0.00
9	Holmlund and Skedinger (1988)	Panel on Swedish timber industry, 70 regions, 1960-85.	Regional and national unemployment	0.00 to -0.04
10	Blanchflower, Oswald and Garrett (1988)	British 1984 WIRS, manual workers in 1200 establishments	County unemployment	0.00 to -0.14
11	BO (1990)	British 1984 WIRS, manual workers in 1200 establishments	Regional unemployment (regional wage include as a control)	0.00 to -0.08
12	Nickell and Wadhwani (1987, 1988)	Panel of 219 UK firms, 1974-82	Industry and national unemployment	-0.05 (industry) -0.03 (national)
13	Christofides and Oswald (1988)	Canadian union contract data	Provincial unemployment.	-0.03 to -0.12.
14	Card (1988)	Canadian union contract data, 1293 contracts, 1966-83	Provincial unemployment (national unemployment for some provinces).	0.00 to -0.10[a]
15	Symons and Walker (1988)	British FES data, 6500 married males, 1979-84. Various samples	Monthly regional unemployment.	0.00 to -0.20
16	Freeman (1988)	US state data. British county data. Changes from 1979-85	State and county unemployment.	0.00 to -0.10[c]
17	BO (1990)	(i) British Workplace Industrial Relations Survey (WIRS), 1980 ; (ii) British National Child Development Survey (NCDS), 1981; (iii) British Social Attitudes Survey (BSA), 1983-87; (iv) International Social Survey Programme (ISSP), 1985-87 (United States)	British Regional and U. S. (two-digit) industrial unemployment rates.	-0.10
18	Groot et al (1992)	Dutch Organisation of Strategic Labour Market Research (OSA), 1985, 1986, 1988.	Regional, occupational and age-specific unemployment.	0.05 to -0.17

Table I (Continued)			
Estimates of the Unemployment Elasticity of Pay (E$_{wu}$)			
Study	**Data**	**Comment**	**E$_{wu}$**
19 BO (1994b)	(i) British Social Attitudes Survey (BSA), 1983-91; (ii) British General Household Survey, 1973-87; (iii) International Social Survey Programme (ISSP), 1985-89 (Austria, Italy, Holland, Switzerland, Norway, West Germany); (iv) Current Population Survey, 1964-88 (United States); (v) Korean Occupational Wage Surveys, 1983, 1986 (vi) Survey of Consumer Finances, 1986 (Canada)	Regional and industrial unemployment rates	-0.10
20 BO (1994c)	British General Household Survey (GHS) data, 1973-90	Regional Unemployment	-0.10

Notes:
a. Rayack (1987) and Card (1988) do not report an elasticity explicitly. BO (1990) calculate the above approximations by inserting their 'best estimate' of the unemployment rate in their data sets.
b. It is not possible to calculate the elasticity in Freeman (1988). Accordingly, BO (1990) insert their own estimate of the British and US means. The US elasticity is insignificant at 5 per cent confidence, thus the lower bound of zero reported in the table.

their hypothesised wage becoming flat as unemployment approaches some critical rate. Beyond this critical rate, further increases in unemployment have no effect on the union fall-back, and so have no effect on the level of union pay.

This is an important issue because the shape of the wage curve has wide ranging macroeconomic implications. If it is flat beyond some particular rate of unemployment, then demand or productivity shocks to the economy over this range will bear more heavily on quantities rather than prices. Wage adjustment will be minimal but employment will change substantially. If the curve turns up, wages will adjust negatively to such shocks. An increase in aggregate demand will lower both unemployment and wages.

The BO conclusion of an asymptotically flattening curve appears to contradict sharply with their results. These suggest that the wage curve turns up as unemployment passes a critical rate.[14] Despite the evidence of an upturn, BO are sceptical:

> The idea that the wage curve turns up significantly, and so takes a positive gradient, is not predicted by the ... theoretical model and appears to go against

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[14] See Figures 1 and 2 and the accompanying commentary in the second paragraph of page 230 of their paper [BO (1990)].

> common sense. It may be that, because few observations occur over that range,
> the results there are unreliable. [BO pp. 230].

Evidence of an upturn in the wage curve is also noted by Groot *et al* (1992), but only for male workers. For female workers, Groot *et al* observed an inverse u-shaped relationship between unemployment and pay which they attribute to a 'discouraged worker' effect. They argue that unemployment has two influences on equilibrium pay: Firstly, high unemployment diminishes the bargaining power of workers and thereby reduces wage pressure; secondly, however it may encourage workers to opt out of the labour force, thereby reducing labour supply, which, for a given level of labour demand, will increase the pressure on wages. This second effect is argued to be relatively more pronounced for females.

Interpreting the wage curve is not straightforward and in their subsequent work BO address the various problems pertaining to any estimation of the relationship between unemployment and pay [BO (1994c)]:

Fixed Effects

The paucity of sufficient longitudinal data has led to a major shortcoming in many wage curve studies - including BO (1990) - *viz.* the impossibility of properly allowing for regional fixed effects. By using pooled General Household survey (GHS) data sets over the period 1973-90, BO (1994c) are able to check whether or not the British wage curve holds in a convincingly stable way across sub-samples of different years.

Labour Supply

Another potential difficulty arises from the possibility that unemployment is acting as a form of aggregate labour supply variable. If this is the case then the correct interpretation of the wage curve is as mis-measured labour supply curve. Such an objection is potentially important because it throws into doubt the main component and novel feature of recent non-competitive theoretical explanations of the relationship between unemployment and pay [Akerlof and Yellen (1990), Bowles

(1985), Carlin and Soskice (1990), Layard and Nickell (1986), Lindbeck (1992), Phelps (1990, 1992), Rowthorn (1977), Shapiro and Stiglitz (1984)]. As observed by Woodford (1992), the central and distinguishing feature of this new family of macroeconomic models is the idea that there exists a negatively sloped curve tying the level pay to the rate of unemployment. BO deal with this objection, which would be difficult to test convincingly with aggregate time series data, by including a local labour force participation variable instead of the unemployment rate in their empirical work.

Harris-Todaro Simultaneity

It has been argued that unemployment and pay are determined by the interaction of a negatively sloped wage curve with a positively sloped Harris and Todaro (1970) or Hall (1970) zero-migration condition, thereby leading to the possibility of simultaneity bias. BO argue that, although serious in single cross section data, this is less of a problem when longitudinal data are available. Assuming that migration is costly, and so chosen on the basis of long run views about the desirability of living in different regions, the Harris-Todaro condition requires that it is permanent unemployment and wages that are positively associated. A regression that includes a set of regional dummies is equivalent to estimating deviations from long run means, and is thus one that has been effectively purged of the effects of a zero-migration equation defined on unchanging regional means. BO concede that such an argument may be less applicable in a country undergoing dramatic spatial restructuring, but that Great Britain, with little inter-regional net migration, is not of that type.[15]

Labour Demand

A further potential source of simultaneity is through labour demand responses with regional wages driving regional unemployment. Perhaps because of a perception

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[15] In 1989, for example, there were only 4000 net movements of individuals aged 15-44 to or from the South-East, the latter having a total population of over 17 million [BO (1994c)].

that this effect is likely to be small - apparently confirmed in US data by the instrumenting in Blanchard and Katz (1992) - the existing literature has largely ignored the issue. BO examine whether or not instrumenting unemployment with lagged values of itself leaves the results unchanged - which given the lack of other instruments is probably the best that can be done. If any simultaneity bias remains, it will tend to make it harder to obtain a negatively sloped wage curve.

Hourly Wages

Most previous studies used annual or weekly earnings rather than wages and BO (1994c) are also constrained to the use of weekly earnings, rather than what might be considered to be a preferable form of hourly wage variable, by the lack in the GHS sample of hourly wage data over most of the period. To check whether this is a problem, BO estimate the same framework over a sub-sample for which an hourly pay series can be calculated and the findings are compared with those from weekly earnings equations.

Group Errors

Early British estimates of the effects of regional unemployment defined unemployment at a highly aggregated level and the dependent wage variable at a microeconomic level [Blackaby and Manning (1987), BO (1990)]. As argued by Moulton (1986, 1987, 1990), the t-statistics in such estimations are likely to be biased upwards by common group errors. BO correct for this problem by estimating regressions on cell means, thereby ensuring that the levels of aggregation are the same on each side of the wage equation.[16]

Utilising GHS data, BO are able to deal with each of these problems and still find comprehensive and conclusive evidence against any upturn in the wage curve, with

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[16] The utilisation of cell means also enables BO (1994c) to study wage dynamics. They find that, in contrast to conventional macroeconomic thinking, lagged wages and/or unemployment proffer no additional statistical explanation in a wage equation once a full set of regional dummies is incorporated.

unemployment elasticities of pay coalescing around the -0.10 level.[17] It is, however, the *theoretical* possibility of an upturn that is addressed in this chapter and despite the weight of empirical evidence I would defend the validity of the analysis on two counts: First, it was developed before publication of BO's compulsive evidence of a monotonically falling curve [BO (1993, 1994b, 1994c)]; second, I believe it illustrates the *potentially* wide ranging implications of incorporating behavioural assumptions into a conventional economic model.

The approach draws on Akerlof's (1980) model of social custom, in which an individual's environment plays an important role in his decision making. Akerlof borrows from sociology and social psychology to explain behaviour that is apparently irrational under conventional neo-classical assumptions. For example, the question as to why individuals do not automatically free ride the consumption of a public good when given the opportunity to do so is difficult to rationalise within a conventional neo-classical framework.

The following model emphasis the social aspects of the employment relation. Workers are assumed to be concerned with more than the simple monetary reward to an occupation. The status associated with an occupation is a crucial decision variable, and this status is assumed to depend explicitly on conditions within the labour market. The labour market is regarded as comprising a number of employment 'states', membership of which imparts both monetary reward and status. An upturn in the wage curve is possible because status is modelled endogenously as a social pressure emanating from those workers outside the state under consideration. As unemployment rises the stigma of being unemployed falls and firms may be compelled to pay higher wages to overcome the temptation of workers to strike.

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[17] See also their reply to the exposition on which this Section is based for extensive US evidence against an upturn [BO (1993), Sessions (1993)].

IV.4   Unemployment Stigma and the Wage Curve

IV.4a   The Economy

Assume a large number of firms each sufficiently small to have individually no affect on any macroeconomic aggregates. Following BO, firms are either unionised or non-unionised, with the former bargaining with a single trade union over wages whilst setting employment unilaterally. Unionised firms, therefore, retain the 'right to manage' [Nickell and Andrews (1983)] and employment lies on the labour demand curve. Unions and unionised firms are risk neutral with objective functions denoted by U and V respectively. The case of a single, competitive unionised firm bargaining over wages with a single trade union is considered.

IV.4b   Workers

Following BO, workers are restricted to three occupations; unionised (i.e. primary) employment, non-unionised (i.e. secondary) employment, and unemployment, where these are assumed to be 'good', 'neutral', and 'bad' respectively. For ease of analytical exposition there is assumed to be no psychic cost of effort associated with employment (or, alternatively, that any such effort does not enter workers' utility functions) such that the key assumptions regarding worker utility - equations (2) - (4) - reduce to:

$$u_1 = m_1 + s_1 \tag{6}$$

$$u_2 = m_2 \tag{7}$$

$$u_3 = m_3 - s_3 \tag{8}$$

where the subscripts refer to union employment, non-union employment, and unemployment respectively. u_1 is the utility of union employment and comprises a monetary wage, m_1, and employment prestige, s_1. u_2 is the utility of non-union

employment and comprises monetary remuneration m_2. u_3 is the utility of unemployment and comprises the income equivalent value of leisure, m_3, and unemployment stigma, s_3.

Without undue loss of generality and to ease the exposition of what follows it is assumed that the prestige of union employment depends on the total proportion of the working population employed, rather than on the proportion employed within the union sector only. This permits prestige and stigma to be defined symmetrically through $s_1 = s(1 - n_3)$ and $s_3 = s(n_3)$ respectively, where $n_3 = N_3/N$ denotes the rate of unemployment.[18]

IV.4c   Firms

Unionised firms are concerned only with their level of economic profit such that $V = \pi(m_1, L_1)$ with:

$$\pi(m_1, L_1) = f(L_1) - m_1 L_1 \tag{9}$$

where m_1 is the unionised wage rate, L_1 is firm employment and $f(L_1)$ is a well behaved concave production function.[19] Since the firm retains the right to manage, attention may be restricted to the maximised profit function:

$$\pi(m_1) = \underset{L_1}{Max}\, f(L_1) - m_1 L_1 \tag{10}$$

The diminishing marginal product of labour implies a conventional downward sloping labour demand curve on the part of the firm:

$$L_1 = L_1(m_1) \tag{11}$$

where $dL_1/dm_1 = L_1'(m_1) < 0$.

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[18] That is, N_i, i = 1, 2, 3, denotes the number of individuals within occupation i with $\sum_{i=1}^{3} N_i = N$.

[19] The price of output is normalised to unity in what follows.

IV.4d   Bargaining

Assume for simplicity that the union's utility function can be described locally by $U = u_1$ such that the union is risk neutral and assigns no weight to employment. Such an assumption implies a particular type of seniority model in which the union is dominated by some coalition who know themselves to be insulated from job cuts [Oswald (1987)].[20]

Wage determination is modelled in terms of a generalised Nash bargain.[21] According to this concept, the wage that emerges from the bargaining process is that which maximises the 'cake' to be divided up between the firm and the union. The cake is simply the utility that will be enjoyed by the combatants in the event of a successful conclusion to the bargain. If negotiations falter, however, then both the firm and the union are obliged to look elsewhere for their utility. It is assumed that both have access to some 'fall-back' utility defined by $\bar{V} = \bar{\pi}$ and $\bar{U} = \bar{u}$ respectively. $\bar{\pi}$ might be thought of as the level of profit during a closure or strike. Similarly, $\bar{u}$ might represent the utility available to union members whilst on strike, and may be defined as:

$$\bar{u} = \beta(n_3)u_2 + [1 - \beta(n_3)]u_3 \qquad (12)$$

where $\beta(n_3)$ is a function representing the probability of obtaining non-unionised, employment. It is assumed, following BO and Sessions (1993), that $\beta(n_3)$ is convex and declining with limits $\beta(n_3) = 1$ as $n_3 \to 0$ and $\beta(n_3) = 0$ as $n_3 \to n_3^c < 1$. n_3^c is interpreted as the 'critical search rate of unemployment', that is, the rate of unemployment at which a striking union worker has no chance of obtaining non-union employment utility from the labour market.

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[20] A state contingent version is contained in Oswald (1986a). The flat-indifference curves generally implied by this formulation of utility have been criticised by Holmlund and Skedinger (1988).

[21] The concept of the Nash bargain was originally justified in axiomatic terms [Nash (1953)]. A recent strategic interpretation has been offered by Binmore et al (1986).

In all other respects the model follows BO. The Nash bargain solves the problem:

$$\max_{m_1} \Omega = \left[(\pi - \bar{\pi})^\alpha (u_1 - \bar{u})^{(1-\alpha)} \right]$$ (13)

where $\pi = \pi(m_1)$ and α is a parameter representing the relative bargaining power of the union vis a' vis the firm. To be sure, α represents the ratio of the firm's vis the union's rate of time discount such that $\alpha > 0.5$ $(\alpha < 0.5)$ implies that the firm (union) discounts the future more heavily than the firm and therefore has a weaker negotiating position in the bargain [Jackman (1991)].

It is helpful to rewrite the maximisation programme (13) in log form:

$$\max_{m_1} \log \Omega = \alpha \log(\pi - \bar{\pi}) + (1 - \alpha)\log(u - \bar{u})$$ (14)

An interior solution to which implies:[22]

$$\frac{d\log\Omega}{dm_1} = \frac{\alpha}{(\pi - \bar{\pi})} \cdot \frac{d\pi}{dm_1} + \frac{(1-\alpha)}{(u_1 - \bar{u})} \cdot \frac{d(u_1 - \bar{u})}{dm_1} = 0$$ (15)

Assuming that workers are paid their marginal value products and applying the envelope theorem implies $d\pi/dm_1 = -L_1$ such that (15) can be rewritten:

$$u_1 = \bar{u} + \left(\frac{1-\alpha}{\alpha}\right)\left[\frac{(\pi - \bar{\pi})}{L_1}\right]$$ (16)

Equation (16) implies that the outcome of wage negotiations will be influenced by three factors: First, profitability per employee as measured by $[(\pi - \bar{\pi})/L_1]$ which will in turn reflect the productivity of labour; second, $\bar{u}$ the utility available to union members during a strike; and finally, α reflecting the relative strength of the firm and the union in the bargain. As union bargaining power falls $(\alpha \rightarrow 1)$, union

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[22] Note the assumption regarding the number and size of individual firms implies $\partial n_3/\partial m_1 = (\partial n_3/\partial L_1)L_1'(m_1) = 0$.

utility falls to the level of the fallback. Put loosely, the equilibrium level of union utility depends upon a mixture of internal and external forces.[23]

To avoid unnecessary complications in what follows I make the following simplifying assumptions. First, I ignore the role played by bargaining power and assume a symmetric bargain in which the rate of time discount for the firm and union are equal. Second, I set the firm's fall back, $\bar{\pi}$, to zero. Third, I ignore considerations regarding the secondary labour market [i.e. $m_2 = 0$, $\beta(n_3) = 0$, $\forall n_3 \in (0,1)$] such that the union's full back reduces to $\bar{u} = u_3 = m_3 - s_3$. And finally, I assume Cobb-Douglas technology with $f(L_1) = L_1^b$, $b \in [0,1]$.[24] In this light, equation (16) reduces to:

$$m_1 = \frac{1}{2}\{m_3 + L_1^{b-1} - [s(n_3) + s(1 - n_3)]\}$$
(17)

The union wage is now governed by government policy regarding the level of unemployment insurance, internal pressure within the firm as represented by the average product of labour, and the relative social pressures associated with employment and unemployment.

It is apparent from equation (17) that the union wage will increase with revenue per employee. This could represent some form of rent seeking on the part of the union. It also implies an inverse relationship between m_1 and L_1. This is consistent with the firm operating at a point where $f'(L_1) = bL_1^{b-1} = m_1$ so that an increase in firm employment beyond this equilibrium lowers wages.

Totally differentiating equation (17) yields the following equation defining the relationship between union pay and unemployment:

$$\frac{dm_1}{dn_3} = \frac{1}{\theta}[s'(1 - n_3) - s'(n_3)]$$
(18)

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[23] This is consistent with industrial relations surveys of manager's views on the forces determining pay [see, Blanchflower and Oswald (1988), Blanchflower et al (1990)].

[24] The implications of introducing social status into the original BO model (i.e. one without these simplifying assumptions) are explored in Sessions (1993).

where $\theta = 2 + (1 - b)L_1^{b-2}L_1'(m_1)$. Assuming a zero profit competitive equilibrium we may write:

$$\theta = 2 + (1-b)\ L_1^{b-2}L_1'(m_1)$$

$$= 2 + (1-b)\frac{L_1^b}{m_1 L_1}\cdot L_1'(m_1)\cdot\frac{m_1}{L_1} \qquad (19)$$

$$= 2 - (1-b)E_{L_1 m_1}$$

where $E_{L_1 m_1} = -L_1'(m_1)\cdot(m_1/L_1) > 0$ such that $\theta > 0$ $\forall$ $E_{L_1 m_1} \leq 2$. The shape of the wage curve is therefore determined by the numerator of (18), an inspection of which reveals the following proposition:

Proposition 1: The shape of the wage curve depends critically upon the shape of the social pressure function. A convex (concave) function implies an 'n' ('u') shaped with a turning point of $n_3 = 0.5$. A linear social pressure function implies a horizontal wage curve.

The proof of the above proposition is confirmed by an examination of the second derivative of (19) and the three limits (21) - (23) following:

$$\frac{d^2 m_1}{dn_3^2} = -\frac{1}{\theta}[s''(1 - n_3) + s''(n_3)] \qquad (20)$$

$$\lim_{n_3 \to 0} m_1(n_3) = \Theta - 0.5 \qquad (21)$$

$$\lim_{n_3 \to 0.5} m_1(n_3) = \Theta - s(0.5) \qquad (22)$$

$$\lim_{n_3 \to 1} m_1(n_3) = \Theta - 0.5 \qquad (23)$$

where $\Theta = 0.5(m_3 + L_1^{b-1})$. Thus $m_1(1) = m_1(0)$ whilst $s(0.5) < (=)[>]0.5$ given a convex (linear) [concave] social pressure function.

Intuitively, if the secondary labour market option is unavailable then increases in unemployment serve only to alter the relative social pressures associated with unemployment and employment. To be sure, increases in unemployment both reduce the stigma of unemployment and raise the prestige of

employment. With a convex social pressure function, such increases in unemployment initially reduce the stigma of unemployment by more than they raise the prestige of employment. Workers therefore become relatively less fearful of unemployment *ceteris paribus* and so marginally more strident in their wage demands. Once unemployment has reached fifty percent, further increases in unemployment reduce the stigma of unemployment by less than the corresponding fall in employment raises the prestige of employment. *Ceteris paribus*, employed workers become more concerned with holding on to their jobs and thus more accommodating in their wage demands. Such effects generate an 'n' shaped wage curve.

It is apparent that the shape of the wage curve in this model is crucially sensitive on the assumptions made regarding the nature of the social pressure function.[25] A 'u' shaped wage curve would follow from the assumption of a concavely declining social pressure function – that is, of an increasing marginal social pressure effect with increases in unemployment (employment) reducing the stigma (status) of unemployment (employment) at an increasing rate. Such an assumption may be introspectively satisfying, but there is hardly compelling empirical evidence for it, and diminishing or constant marginal social pressure would imply an 'n' shaped or flat curve. These are, however, details, which do not alter the central message *viz.* that the shape of the wage curve is not obvious but depends critically upon the assumptions made regarding individuals' concerns with the social status of their labour market occupations.[26]

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[25] In particular, the somewhat artificial turning point of fifty per cent unemployment is a direct result of the assumption that both prestige and stigma may be modelled symmetrically through a single functional form with a maximum social pressure of one in each case.

[26] Sessions (1993) shows that incorporating stigma into the standard BO model of the wage curve permits an upturn in the curve at a range not disconsonent with the empirical evidence collected in Table I.

IV.5   Final Remarks

The shape of the wage curve in the model developed in this Section depends crucially upon the assumptions made regarding the nature of the social pressure function. Allowing prestige and stigma to depend linearly, convexly or concavely upon the rates of employment and unemployment implies a number of alternatively shaped relationships between unionised wages and unemployment. To be sure, a positive relationship between the two variables over some range of unemployment cannot be dismissed *a priori* - a local upturn in the wage curve is certainly possible. Whether such an upturn is a robust empirical phenomenon, and if so, whether it is attributable to the forces of social status is another question. This analysis serves merely to emphasis that such questions should not be addressed lightly.

V.   Application Two - Unemployment Hysteresis

V.1   Introduction

The protracted rise in unemployment that occurred in most Western European economies during the 1970's and early 1980's, coupled with the general reluctance of inflation rates to fall significantly, led to a revision of previously accepted ways about thinking about the labour market. Standard theory tended to make a sharp distinction between the equilibrium and actual rates of unemployment. The former was assumed to depend upon the institutional characteristics of the labour market, to change slowly (if at all) over time, and to be independent of the actual rate. Unanticipated shocks to demand or supply would cause the actual rate to deviate from the equilibrium rate, leading to changes in the rate of inflation and so reconciling, eventually, the two rates of unemployment.

The European experience of the late 1970's and early 1980's cast considerable doubt on this accepted wisdom. Estimated equilibrium rates of

unemployment in a number of OECD countries appeared to be tracking the actual

recorded rates of unemployment in these countries, [Layard *et al* (1986), Coe and

Gagliardi (1985)]. Table II illustrates this phenomenon for France, West Germany,

Italy and the UK along with overall estimates for the EEC as a whole.

	Actual Unemployment (%)		Estimated NAIRU (%)	
	1976-80	1981-83	1976-80	1981-83
France	5.3	7.3	5.3	6.9
West Germany	3.7	6.7	3.7	5.3
Italy	7.1	9.4	8.9	7.7
UK	5.5	10.8	4.6	9.5
EEC	5.4	8.8	5.3	7.3

Table II
Actual and Estimated Equilibrium Unemployment (NAIRU)
Source: Layard *et al* (1986), pp. 47-8.

Such observations lead to the development of alternative 'hysteresis' theories of

unemployment, the key to which was the idea that the equilibrium rate of

unemployment is largely determined by the actual rate of unemployment. In simple

terms hysteresis defines the phenomenon of lagged adjustment - the state of a

variable may become arbitrary and dependent upon its past behaviour. In terms of

the labour market it is used to describe a form of inertia in which there is path

dependence of the steady state equilibrium (i.e. 'natural') rate of unemployment.[27]

This has important policy implications. For example, if the government allows

unemployment to rise in an attempt to deflate the economy, it might also affect the

equilibrium rate of unemployment, that is, the rate of sustainable unemployment at

which the economy can function.

Three major explanations have been adduced to explain the existence of

hysteresis; namely, 'physical capital', 'human capital' and 'Insider-Outsider'

theories.

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[27] The idea of unemployment inertia is not new. Antecedents can be seen in the work of e.g.
Phelps (1972).

The physical capital story highlights the effect of an adverse demand shock on capacity utilisation and, through this, to investment.[28] The fall in investment induced by the lower rate of capacity utilisation leads in the medium term to a rundown in the size of the capital stock. Thus, capacity utilisation rates begin to rise again. If, as is suspected, profit margins are widened at very high rates of capacity utilisation, and if each firm believes that its competitors will be unable to take advantage of a price rise by holding their own price unchanged and expanding output because they lack the capacity to do so, then price increases at high rates of capacity utilisation are likely to occur. To the extent that this is the case, the equilibrium rate of unemployment will be shifted up as prices respond to the shortage of capacity in the economy. Thus, one would expect to see concurrently high actual unemployment, high rates of capacity utilisation and a high equilibrium rate of unemployment. Reductions in the capital stock, associated with the reduced employment that accompanies adverse shocks, reduce the subsequent demand for labour and so cause protracted unemployment.[29]

The second line of argument, insider-outsider, or 'membership' theories are based on the distinction between employed insiders and unemployed outsiders and explore the idea that wage setting is largely determined by firms' incumbent workers rather than the unemployed.[30] In this analysis two groups of workers are identified: 'insiders' who are those currently employed and in a strong bargaining position because of their possession of firm specific skills; and 'outsiders', those currently unemployed and without firm specific skills. This dichotomy means that

[28] See, for example, Sneessens and Dreze (1986), Soskice and Carlin (1989), van der Klundert and van Shaik (1989).

[29] The argument is frequently made in terms of the European context where it is emphasised that, despite the very substantial increase in the rate of unemployment that occurred in the early 1980's, capacity utilisation remained at fairly normal levels. For example, capacity utilisation in the EEC displayed no trend over the decade 1976-86. In 1986 capacity utilisation stood at 81%, compared with 76% in 1975, 83% in 1979 and 76% in 1983.

[30] The idea that wages are the result of a bargain between insiders and the firm has been extensively explored by Lindbeck and Snower (1988). The argument that insider considerations might explain high, sustained unemployment was first mooted by Gregory (1986) in relation to the Australian labour market.

firms cannot simply sack a recalcitrant workforce and replace it with new workers. Furthermore, insiders are presumed to be interested exclusively in maintaining their own employment and increasing their real wage - they attach negligible, if any, importance to the creation of employment for outsiders. This means that the bargained real wage will depend on the level of actual employment. If employment is high, the number of insiders is high and therefore, in order to preserve their jobs, the bargained real wage is low. Conversely, if employment is low there are few insiders and a high real wage is consistent with maintaining their employment; thus the bargained real wage is high. If in this latter scenario aggregate demand is reduced, the low number of insiders will not bargain for wage reductions to give employment to ex-insiders - they will instead simply set the wage consistent in equilibrium with their remaining employed. Because of the monopoly power of the insiders, the higher level of unemployment has no effect on subsequent wage setting and the economy will be stuck at a new higher equilibrium rate of unemployment.

The final line of argument concentrates on the notion of human capital broadly defined. Persuasive statements of the potentially important effects of unemployment on human capital accumulation and subsequent labour supply can be traced back to Phelps (1972) with suggestive empirical evidence in Hall (1976), Drazen (1979), Hargraves-Heap (1980), and Clark and Summers (1982). The contemporary view is closely associated with the work of Layard and Nickell (1986, 1987) who offer a variety of evidence suggesting that most, if not all, of the pressure on wages in the UK comes from those workers who have been unemployed for one year or less. The argument is that workers who are unemployed lose the opportunity to maintain and update their skills by working. Particularly for the long term unemployed the atrophy of skills may combine with disaffection from the labour force, associated with the inability to find a job, to reduce the workers' productivity below their reservation wages, or the wage at which insiders allow firms to offer. Alternatively, workers' reservation wages or

search intensity may decline as their unemployment spell continues. This may be because they adjust to a lower standard of living, become addicted of living on unemployment benefit, or become discouraged about the prospects of re-employment. Indeed, the Human Capital and Insider-Outsider stories are mutually self reinforcing. The former implies that a worker is less likely to be re-employed as his spell of unemployment lengthens. And the discouragement of the long term unemployed in turn strengthens the hand of insiders in wage setting. Moreover, even if neither scenario is true, that skills and/or motivation do not atrophy, it may simply be the case that employers regard long term unemployment as an adverse signal of these effects.

This chapter proffers a further rationale for the apparent hysteresis. It argues that the natural rate of unemployment may not be unique. There may in fact be several. Thus an increase in unemployment may not necessarily lead to an increase in the equilibrium rate of unemployment - it may instead be the case that actual unemployment is shifted up towards a higher equilibrium rate, lending the impression of a hysteresis type moving equilibrium situation. A casual look at the empirical evidence suggests that such non uniqueness of equilibria is a distinct possibility. Between 1921 and 1940 unemployment in the UK averaged 12 per cent with only short, sporadic falls to a minimum of 9 per cent. From 1940 to 1970 this average fell to under 2 per cent with a range of between 0.5 and 3.5 per cent. Since 1980 the labour market appears to have returned the 'high' inter war equilibrium.

In what follows I model a labour market with the potential to display multiple equilibria. The potential results from the social pressures surrounding occupational affiliation and, in particular, the social pressures surrounding unemployment.

V.2   Unemployment Stigma, Efficiency Wages and Shirking

V.2a   Workers

In what follows I incorporate the assumptions regarding social status into the Shapiro-Stiglitz (1984) - hereafter SS - model of worker shirking. I therefore continue to focus on 'good' and 'bad' occupations only and ignore consideration regarding secondary (i.e. neutral) occupations. For clarity of exposition I maintain the notation introduced previously with the workforce (N) being comprised of employed (N_1) and unemployed (N_3) workers such that $N = N_1 + N_3$. I reinstate the assumption that employment entails some psychic cost of effort which implies separable risk neutral utility functions:

$$u_1 = m_1 + s_1 - e_1 \tag{24}$$

$$u_3 = m_3 - s_3 \tag{25}$$

Following SS it is assumed that workers can provide either minimal effort $e_1 = 0$ or some fixed positive level of effort $e_1 > 0$ and that there is a probability b per unit time that an employed worker will be separated from his job and forced to enter the unemployment pool. Workers are assumed to maximise the expected present discounted value of utility with a discount rate $r > 0$. The model is set in continuous time.[31]

V.2b   The Effort Decision

The only choice available to workers is the discrete one regarding effort. A non shirking worker (i.e. one who sets $e_1 > 0$) receives an exogenous wage m_1, enjoys employment prestige s_1, and retains his job until exogenous factors force a

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[31] The implicit assumption here, following SS, is that individuals are infinitely lived, can neither borrow or lend, and have a pure rate of time preference r.

separation. If he chooses to shirk (i.e. to set $e_1 = 0$) he faces a probability q per unit time of detection. If detected he is fired and forced to enter the unemployment pool. The probability of escaping the unemployment pool - *viz.* the job acquisition rate - is endogenous and determines the expected length of the unemployment spell faced by such a worker. Whilst unemployed the worker receives unemployment compensation m_3 but suffers unemployment stigma s_3.

The worker's objective is to select the level of effort that maximises his discounted utility stream. The expected lifetime utility of an employed shirker, employed non-shirker and unemployed individual are defined as V_1^S, V_1^N and V_3 respectively. The fundamental asset equations for a shirker and non-shirker are given by:

$$rV_1^S = m_1 + s_1 + (b + q)(V_3 - V_1^S)$$ (26)

$$rV_1^N = m_1 + s_1 - e_1 + b(V_3 - V_1^N)$$ (27)

Equations (26) and (27) are of the form interest rate times asset value equals flow benefits (dividends) plus expected capital gains (or losses) and may be solved simultaneously for V_1^S and V_1^N :[32]

$$V_1^S = \frac{m_1 + s_1 + (b + q)V_3}{r + b + q}$$ (28)

$$V_1^N = \frac{m_1 + s_1 - e_1 + bV_3}{r + b}$$ (29)

The worker will choose not to shirk *iff* the non shirking constraint (NSC) of $V_1^N \geq V_1^S$ is satisfied which, from (28) and (29), requires:[33]

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[32] A derivations follows: Taking V_3 as given and looking at a short time interval $[0, t]$ we have $V_1 = (m_1 + s_1)t + (1 - rt)[btV_3 + (1 - bt)V_1]$ since there is a probability bt of leaving the job during the interval $[0, t]$ and given $e^{-rt} \approx 1 - rt$. Solving for V_1 implies $V_1 = [(m_1 + s_1)t + (1 - rt)btV_3]/[1 - (1 - rt)(1 - bt)]$. Taking limits as $t \to 0$ yields equation (28). Equation (29) can be derived similarly.

[33] Alternatively, the NSC could be written $q(V_1^s - V_3) \geq e_1$ which highlights the key implication of the NSC - unless there is a penalty associated with being unemployed everyone will shirk. If

$$m_1 \geq rV_3 + \left(\frac{r+b+q}{q}\right)e_1 - s_1 \equiv \hat{m}_1 \tag{30}$$

It is apparent from equation (30) that the firm can prevent shirking by paying a sufficiently high wage. This critical wage, $\hat{m}_1$, is higher: (a) the higher the required effort level (e_1); (b) the higher the expected utility of unemployment (V_3); (c) the lower the probability of detection (q); (d) the higher the rate of interest (r) – the higher the rate of interest, the relatively more weight is attached to the short-run gains from shirking (i.e. until detection) compared to the losses after detection; (e) the higher the exogenous quit rate b - if separation is inevitable the optimal policy is to shirk.

V.2c   Firms

There are M, $j = 1, 2, \ldots, M$ identical firms each having a production function $Q_j = f(L_j)$, generating an aggregate production function $Q = F(N_1)$, where $F(N_1) = \max_{L_j} \sum_{j=1}^{M} f(L_j)$ such that $\sum_{j=1}^{M} L_j = N_1$. $f()$ is a well behaved concavely increasing function with L_j denoting firm j's effective labour force - a worker is assumed to contribute one unit of effective labour if he does not shirk and nothing otherwise. Thus firms compete in offering wage packages subject to the constraint that their workers choose not to shirk and it is assumed that $F'(N) > e_1$ - i.e. full employment is efficient.

V2.d   Equilibrium

Following SS it is assumed that employment contracts comprise a wage, m_1, and a level of unemployment benefits m_3. Each firm finds it optimal to fire shirkers since the only other punishment - a reduction in wages - would simply induce the disciplined worker to shirk again. It follows from (30) that all firms will offer the

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an individual could immediately obtain employment after being fired, then $V_1^s = V_3$ and the NSC could never be satisfied.

smallest level of unemployment benefits permitted (e.g. by law).[34] An increase in

m_3 raises V_3 and hence requires a higher m_1 to meet the NSC. Thus, increases in

m_3 impact upon the firm both directly (higher unemployment benefits) and

indirectly (higher critical wage). Since the firm has no difficulty in attracting labour

(in equilibrium) it sets m_3 as small as possible such that m_3 can be interpreted as

the minimum legal level of benefits offered consistently by all firms.

Having set m_3 an individual firm will pay a wage just sufficient to induce

employee effort, that is $m_1 = \hat{m}_1$. The firm's demand for labour is given by

equating the marginal product of labour to the cost of hiring an additional

employee. This latter comprises wages and future unemployment benefits. If

$m_3 = 0$ then labour demand is given by $f'(L_j) = \hat{m}_1$ with aggregate labour demand

$F'(N_1) = \hat{m}_1$. In the more general case of $m_3 > 0$ the expected cost of a worker is

the wage cost for the expected employment period of $1/b$ followed by m_3 for the

expected period of unemployment $1/a$ implying labour demand of

$f'(L_j) = \hat{m}_1 + [b/(a+r)]m_3$.

A Nash equilibrium occurs when each firm, taking as given the wages and

employment levels at other firms, finds it optimal to offer the going wage rather

than a different wage. The key market variable which determines individual firm

behaviour is V_3, the expected utility of unemployment, the asset equation for

which is given by:[35]

$$rV_3 = m_3 - s_3 + a(V_1 - V_3) \tag{31}$$

where a denotes the job acquisition rate and V_1 the expected utility of an employed

worker (which equals V_1^N in equilibrium). Solving (29) and (31) simultaneously for

V_1 yields:

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[34] The implicit assumption is that the firm cannot offer unemployment benefits only to those workers who quit - intuitively, if this were not the case then it would be optimal for the firm to fire any worker who wishes to quit.

[35] Since all firms offer the same (minimal) level of unemployment benefits it follows that V_3 is a single number such that an unemployed person's utility is independent of his previous employer.

$$rV_1 = \frac{(m_1 + s_1 - e_1)(a + r) + (m_3 - s_3)b}{a + b + r} \qquad (32)$$

$$rV_3 = \frac{(m_1 + s_1 - e_1)a + (m_3 - s_3)(b + r)}{a + b + r} \qquad (33)$$

Substituting the expression for rV_3 into the NSC (30) yields the *aggregate* NSC:

$$m_1 = m_3 + \left(\frac{a + b + r + q}{q}\right)e_1 - (s_1 + s_3) \qquad (34)$$

The critical (*viz.* 'efficiency') wage is dependent crucially upon the relative social pressures associated with employment and unemployment and this relationship is explored in more detail below. Notwithstanding, the wage is greater: (a) the higher is the required effort level, e_1; (b) the lower the probability of detection, q; (c) the higher the exogenous quit rate, b; (d) the higher the rate of interest, r; (e) the higher the unemployment benefit, m_3; and (f) the higher the job acquisition rate, a - the higher the probability of obtaining a job per unit of time, a, the less time a worker caught shirking can expect to spend unemployed, $1/a$.

In a steady-state equilibrium the flow *into* the unemployment pool per unit time, bN_1, must equal the flow *out* of the pool per unit time such that $a(N - N_1) = aN_3$ or:

$$aN_3 = bN_1 \Rightarrow a = b\left(\frac{N_1}{N_3}\right) \qquad (35)$$

Substituting for a into (34) implies an equilibrium *efficiency* wage:

$$m_1 = m_3 + \left[b\left(\frac{N_1}{N_3}\right) + b + r + q\right]\left(\frac{e_1}{q}\right) - [s_1 + s_3]$$

$$= m_3 + \left[\left(\frac{b}{n_3}\right) + r + q\right]\left(\frac{e_1}{q}\right) - [s(1 - n_3) + s(n_3)] \equiv \hat{m}_1(N_1) \qquad (36)$$

where $n_3 = N_3/N$. It is apparent from equation (36) that the shape of the aggregate NSC is critically dependent upon the nature of the social pressure

function $s_i = s(n_i)$. To be sure, maintaining the assumptions that $s(x) = 1$ as $x \to 0$, and $s(x) = 0$ as $x \to 1$, $\forall x \in (0,1)$, implies:

$$\lim_{N_1 \to 0} \hat{m}_1(N_1) = m_3 + (b + r + q)\left(\frac{e_1}{q}\right) - 1 \tag{37}$$

$$\lim_{N_1 \to N} \hat{m}_1(N_1) = \infty \tag{38}$$

The SS conclusion that *no shirking is inconsistent with full employment* is maintained. If $N_1 = N$ then $a \to \infty$ and there is no way of deterring shirking since any worker detected as such would be immediately re-hired. Monontonicity of the aggregate NSC, however, is not guaranteed. Differentiating (36) with respect to the level of employment implies:

$$\frac{\partial \hat{m}_1}{\partial N_1} = \frac{1}{N}\left\{\left(\frac{b}{n_3^2}\right)\left(\frac{e_1}{q}\right) + [s'(n_3) - s'(1 - n_3)]\right\} \tag{39}$$

the sign of which is somewhat equivocal. To be sure, taking the value of the efficiency wage at $N_1 = 0.5N \Leftrightarrow n_3 = 0.5$ implies:

$$\hat{m}_1(0.5N) = m_3 + (2b + r + q)\left(\frac{e_1}{q}\right) - 2s(0.5) \tag{40}$$

and subtracting from its zero employment value implies:

$$\Delta\hat{m}_1 = \hat{m}_1(0) - \hat{m}_1(0.5) = [2s(0.5) - 1] - b\left(\frac{e_1}{q}\right) \tag{41}$$

Given equation (38) above, non-monotonicity requires $\Delta\hat{m}_1 < 0$. This is certainly possible, but depends crucially upon the nature of the social pressure function. Indeed, we can make:

Proposition 2: A necessary condition for an upturn in the aggregate NSC is a concavely declining social pressure function.

It is apparent that equation (41) can only be negative if the social pressure function

is of the form $s'(x) < 0$, $s''(x) > 0$, $\forall x \in (0,1)$, such that $s(0.5) > 0.5 \Rightarrow 2s(0.5) > 1$.

The shape of the aggregate NSC is important because any non-monotonicity may imply multiple equilibria. The equilibrium wage and employment level occurs when each (small) firm, taking the aggregate job acquisition rate, a, as given, finds it optimal to offer the going efficiency wage $\hat{m}_1(N_1)$, rather than any different wage. Each firm's demand for labour then determines how many workers it hires at $\hat{m}_1(N_1)$ with market equilibrium occurring where the aggregate demand for labour intersects the aggregate NSC *vis*:

$$F'(N_1) = \hat{m}_1(N_1) \tag{42}$$

The nature of this equilibrium may be discerned through the differential equation:

$$\dot{N}_1 = \lambda[F'(N_1) - \hat{m}_1(N_1)] \tag{43}$$

where $\lambda > 0$ is some constant parameter representing the speed of adjustment. Stability is determined by:

$$\frac{d\dot{N}_1}{dN_1} = \lambda[F''(N_1) - \hat{m}_1'(N_1)] \tag{43}$$

and requires:

$$F''(N_1) < \hat{m}_1'(N_1) \tag{44}$$

Stability is ensured if the aggregate NSC is upward sloping. Instability *may* arise if the constraint is downward sloping, but only then if it intersects the aggregate demand for labour from above. An example of multiple equilibria is illustrated graphically in Figure I following:
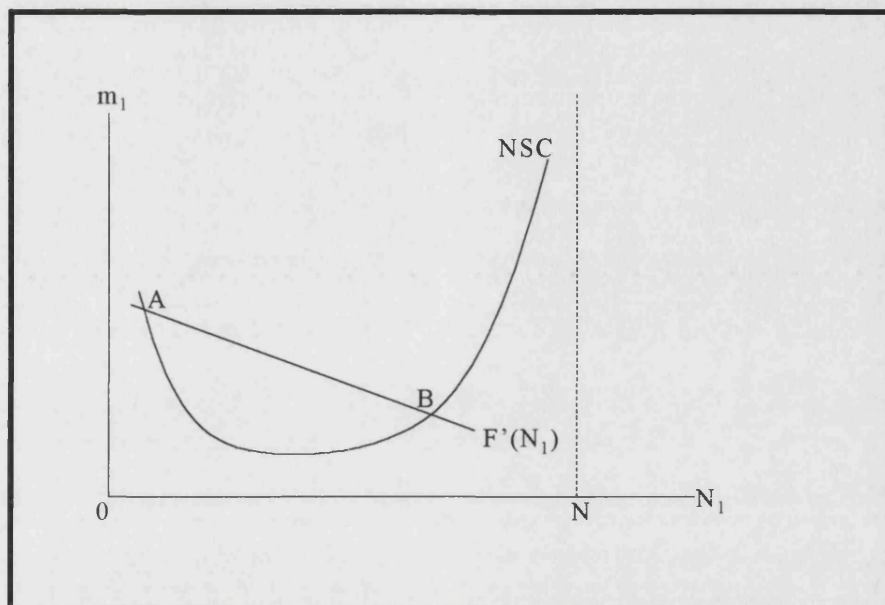
Figure I: Multiple Equilibria

Assuming monotonically falling labour demand, multiple equilibria are only possible if the aggregate NSC initially falls with the level of employment. Increases in employment reduce the prestige of employment and, through the accompanying fall in unemployment, increase the stigma of unemployment. Given that increases in employment reduce the conventional costs of shirking - by reducing the expected length of time a shirker can expect to spend in the unemployment pool – the efficiency wage can only decline in value if initial increases in employment induce a *smaller* decline in employment prestige than the associated rise in unemployment stigma. In such a scenario workers would be *ceteris paribus* less inclined to shirk and risk loosing their positions. Such a scenario requires a concave social pressure function. With such a functional form, increases in employment beyond $N_1 = 0.5N \Leftrightarrow n_3 = 0.5$ would reduce the prestige of employment relatively more than they would increase the stigma associated with unemployment. Workers here would become marginally less fearful of unemployment, and so marginally more inclined to shirk *ceteris paribus*.

The possibility of multiple labour market equilibria has aroused much interest recently [Carruth and Oswald (1988), Manning (1992)]. It has been long apparent that unemployment often appears to spend long periods at very different

unemployment rates, a finding that is difficult to explain using traditional single equilibrium models. Manning's empirical work suggests that whilst the UK economy appears to have a short run, unique natural rate of unemployment, in the long run multiple equilibria are apparent. Indeed, he argues that Mrs Thatcher, by her policies of reducing wage pressure pushed the economy from a low equilibrium unemployment rate to a high equilibrium unemployment rate during the period 1979 – 1981. Such a conclusion is in accord with a movement from B to A in Figure I.

V.3   Final Remarks

This section has supplemented the standard Shapiro-Stiglitz non-shirking efficiency wage model with behavioural assumptions drawn from the social-psychological literature. A model of social interaction was developed in which the status associated with various labour market options yielded implications for the shape of the non-shirking constraint and, thereby, for the number and type of labour market equilibria. The significance of such a finding for the existence of unemployment hysteresis was explored. My concern, however, has been less that of generating empirically testable hypothesis regarding the multiplicity of unemployment equilibria, but rather to illustrate the potentially wide ranging implications of incorporating behavioural assumptions into a conventional economic model.

VI.   Conclusion

This chapter has investigated the implications of an occupational hierarchy on labour market behaviour. Agents are assumed to be primarily, but not exclusively, interested in the monetary rewards to an occupation with social status playing a significant role in their individual decision making. To ease exposition, occupations are categorised simply as 'good', 'bad' or 'neutral'. The status associated with a 'good' occupation is denoted 'prestige' and is assumed to increase worker utility. The status associated with a 'bad' occupation is denoted 'stigma' and is assumed

to reduce worker utility. A 'neutral' occupation is one that offers neither 'prestige' nor 'stigma'.

Status is endogenous and is modelled as a social pressure emanating from workers *not* employed within the occupation under consideration. As the proportion of the workforce employed within a particular occupation declines the status associated with that occupation increases. To be sure, as the proportion of the workforce employed in 'good' occupations declines the 'prestige' associated with 'good' occupations increases. Conversely, as the proportion in 'bad' occupations declines the 'stigma' associated with bad occupations increases. Such an assumption accords with the social psychology theory of minority-majority groups and is attractive in that it enables status to be modelled as, essentially, a reduced form.

These ideas are applied to: (a) the Blanchflower and Oswald (1990) model of the wage curve; and to (b) the Shapiro-Stiglitz (1984) model of efficiency wages. The theoretical analysis for (a) suggests that the relationship between unemployment and pay may be upward sloping over some range, a possibility alluded to by Blanchflower and Oswald (1990) in their study. The implications of such a result on the shape of the non-shirking constraint and, thereby, on the number and type of labour market equilibria are investigated in (b). Here the potential for multiple labour market equilibria, and thus for an alternative explanation of labour market hysteresis, is explored.

At a more general level, the chapter's main contribution is to increase the interface between economics and the other social sciences - notably social-psychology, sociology and psychology.

Chapter Two

The Economics of Absence[1]

I.   Introduction

Economists have been somewhat remiss in dealing with the issue of worker absence. This is surprising given the figures involved. Empirical evidence from Doherty (1979), for example, suggests that the number of working days lost in the UK as a result of absence over the 1970's was at least as great as the number lost as a result of unemployment.[2] In the year of the last miner's strike 27 million working days were lost as a result of strike activity, a figure which pales by comparison with the 375 million working days lost on average as a result of absence over the 1980's [*Economic Trends*]. Furthermore a study by management consultants Arthur Anderson recently estimated the cost to UK Industry at £6 billion per year [*Independent*, 22/10/91].

Absenteeism is also important for what it says about the determinants of worker behaviour. Absence can occur for either valid (i.e. 'sickness') or invalid (i.e. 'shirking') reasons. Assuming there is some punishment if detected, an understanding of the factors motivating the latter can yield valuable insights into how workers value their employment contracts - as with all shirking models, the inclination of workers to violate their employment contracts can tell us much about the forces underpinning worker behaviour [Weiss (1991)].

Despite all this, relatively little attention has been paid in the economic literature to either the causes and/or the effects of absenteeism. This is in marked

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[1] Some of the material in this chapter is presented in Barmby *et al* (1993) and Brown and Sessions (1996).

[2] Similar evidence for Canada is presented by Akyeampong (1988). Evidence for the US indicates that in the late 1970's approximately 5 million working days per month were being lost as a result of worker absenteeism, equivalent to a loss of more than $2 billion in wages and salaries per month [Dunn and Youngblood (1986)].

contrast to other disciplines in the social sciences. In the field of applied psychology, for example, much research has been undertaken to determine the psychological aspects underpinning a worker's decision to absent. The situation is, however, changing and recent years have witnessed a mild flurry of activity on the part of economists in attempting to understand this most pervasive of worker behaviours. This chapter contributes both theoretically and empirically to this growing body of work.

The chapter is broadly divided into three parts: The first part reviews and offers some perspective to the existing literature on absence. The key findings here are that the majority of existing work is predominately empirical, with the theoretical work which does exist tending to model absence as an optimal labour supply response by workers to exogenous contractual obligations.

The second part of the chapter explores empirically how the *potential* to absent differs across specific demographic, occupational and regional sub-samples of the British economy. The results here suggest that labour supply constraints are not insignificant and that, in many instances, the type of individuals facing such constraints can be ascertained. This is an important finding because a positive divergence between contractual and desired work hours (i.e. over-employment) may tempt workers to effectuate their antipathy through absence. The analysis is, however, somewhat lacking in being unable to say anything about how firms might respond to such a threat. Employers are unlikely to remain passive in the face of a costly outbreak of absence and may implement a series of inducements and punishments to alleviate the problem. A more complete examination of such issues would require highly detailed firm/personnel data. This is beyond the scope of the present study but is, perhaps, the direction that future research should be heading.

The final part of the chapter attempts to rectify some of the weaknesses in existing theoretical work on absence by setting out a simple model that incorporates the interactive nature of the employment relation whilst focussing explicitly on the role of health in the labour-leisure trade off. The model is used to

investigate the absence behaviour of workers when there is an asymmetry of information regarding worker health. This is assumed to be private information and only observable to a third party at cost. Workers are *ex ante* uncertain as to their state of health and supply labour on the basis of an 'all or nothing' utility maximising decision taken once a realisation of this state has been received. Utility is a function of income, leisure and health, and workers are assumed to value leisure more the 'sicker' they are. Conditions under which the firm can control its absence rate are derived and an optimal employment contract comprising firm financed sick pay is specified. The model is then extended to allow workers the opportunity to take 'unacceptable' absence. The firm is able to exert some control over such behaviour by monitoring workers and threatening to fire any it discovers to have 'shirked'. An efficiency wage effect is highlighted with the firm reacting to an increase in the cost of monitoring by raising wages. Finally, the model is extended to allow some interdependency between workers. It is shown here that uncertainty regarding the labour supply of colleagues may induce an overall decrease in absence.

The chapter is set out as follows: Section II outlines some key theoretical issues underpinning the economics of absence. Section III reviews the existing economic literature, highlighting the links with the theoretical foundations exposed in Section II. Sections IV and V set out the key empirical and theoretical contributions of the chapter whilst final comments are collected in Section VI.

II.   Economic Considerations

Economists have tended to analyse absence within the framework of the static neo-classical labour supply model. The potential for absence, it is argued, emerges when individuals are obliged to supply a certain amount of labour within a given time period. Such constraints are common because employers are unlikely to be indifferent as to how much labour individuals supply. For example, where production takes place on an assembly line workers may be technically constrained

to supply the same amount of labour at specified times [Deardorff and Stafford (1976)].[3]

It follows, therefore, that workers will have an incentive to absent if the level of contractual hours specified by the employer exceeds their desired hours. The formal analysis of this incentive is set out below.

An individual has a utility function of the form:

$$U = U(x, l) \tag{1}$$

and is endowed with a stock of time:

$$T = h + l \tag{2}$$

where x represents a vector of consumption goods, h, labour supply and l, leisure. The individual's budget constraint is denoted:

$$x \leq m = m_0 + wh \tag{3}$$

where m_0 is unearned income and w is the exogenous real wage.[4]

The individual's problem is to maximise utility subject to his time and budget constraints. Assuming positive but declining marginal utilities, an interior solution to this problem implies:

$$\frac{\partial U(x^*, l^*)/\partial l}{\partial U(x^*, l^*)/\partial x} = \frac{U_l(x^*, l^*)}{U_x(x^*, l^*)} = w \tag{4}$$

$$x^* = m_0 + wh^* = m^* \tag{5}$$

such that the individual's marginal and economic rates of substitution between consumption and leisure are in accord and his budget constraint is exhausted. In terms of Figure I the individual faces the budget constraint (T, E_0, E^c, l^c) and

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[3] Similarly, Balchin and Wooden (1992) remark that cost minimisation generally dictates that workers perform tasks at specified times in order to prevent bottlenecks, meet co-ordination requirements or perhaps to promote effective utilisation of capital.

[4] In what follows I normalise the price level to unity.

maximises utility by moving to the point on the constraint which is tangential to his indifference curve. Thus, if the individual were not supply-constrained his equilibrium would appear at $E^* = (x^*, l^*)$, where $l^* = T - h^*$ and h^* represents the individual's optimal labour supply decision.
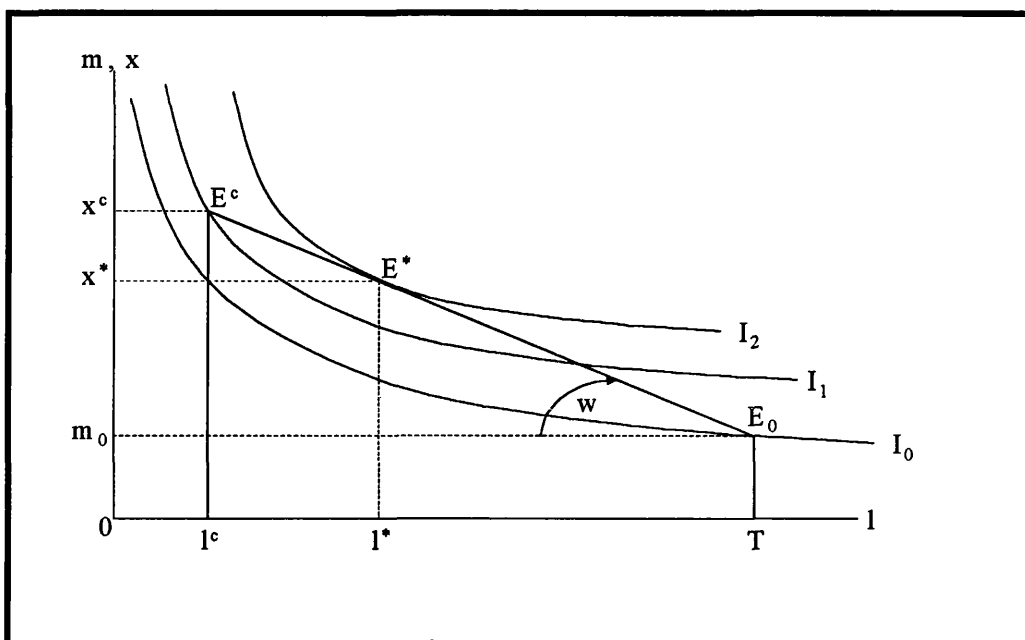
Figure I: Over Employment and the Work Attendance Decision

If the employment contract specifies contractual hours $h^c = T - l^c$, where $h^c > h^*$, then the individual would still accept the contract, since so doing enables more utility than would be the case should he not accept. Accepting the contract puts the individual at $E^c = (x^c, l^c)$ with $U(x^c, l^c) > U(m^0, T) = U(x^0, T)$ - i.e. compare I_1 to I_0. The individual would, however, be tempted to absent at E^c in an attempt to move towards E^* where $U_l(x^*, l^*)/U_x(x^*, l^*) = w$.[5]

The comparative statics of absence behaviour in this simple model are relatively straightforward. An increase (decrease) in the wage rate produces an income effect which increases (decreases) the tendency to absent if leisure is a normal good, and a substitution effect which serves to decrease (increase) the

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[5] I have modelled a situation here in which the worker is over-employed. Alternatively, individuals may be under-employed, i.e. they may be constrained to work less hours than those which maximise utility. In such a situation the individual may have an incentive to engage in moonlighting [see Shishko and Rostker (1976) and Killingsworth (1983)].

tendency unequivocally. An increase (decrease) in unearned income acts as a pure income effect and so increases (decreases) the tendency to absent if leisure is normal. Finally, an increase in contractual hours will increase the tendency to absent on account of the diminishing marginal utility of leisure. This can be seen formally by defining the temptation to absent as:

$$\Theta\left(x^c, l^c; w\right) = \frac{U_l\left(x^c, l^c\right)}{U_x\left(x^c, l^c\right)} - w \tag{6}$$

with:

$$\frac{\partial\Theta\left(x^c, l^c\right)}{\partial h^c} = \frac{U_{xl}\left(x^c, l^c\right)U_l\left(x^c, l^c\right) - U_{ll}\left(x^c, l^c\right)U_x\left(x^c, l^c\right)}{\left[U_x\left(x^c, l^c\right)\right]^2} > 0 \tag{7}$$

since $U_{xl}\left(x, l\right) > 0$ if leisure is normal. An increase in contractual hours increases the temptation to absent because as contractual hours lengthen, the utility derived from additional leisure (income) increases (decreases).

This analysis may be supplemented with a more detailed appraisal of the costs incurred by the worker as a result of the absence. The model depicted in Figure I assumes that the penalty to absence is simply lost earnings. It is likely, however, that any earnings lost as a result of absence are to some extent offset by sick pay, the provision of which will increase the temptation to absent. The effect of a simple sick pay scheme on the individual is illustrated in Figure II below.

Assuming for (extreme) simplicity that all individuals receive sick pay at a rate $s < w$ for each hour of absence then two budget constraints are in operation; the conventional wage line increasing from right to left and the new sick pay line increasing from left to right. If the individual supplies no work to the firm then he moves to a point E_1 with $x^s - m_0$ being the sick payment to the individual. If the individual takes only a portion of his total time allocation as absence, then he is effectively moving along the budget constrain $\left[E_1, E^c\right]$ with slope $w - s$.
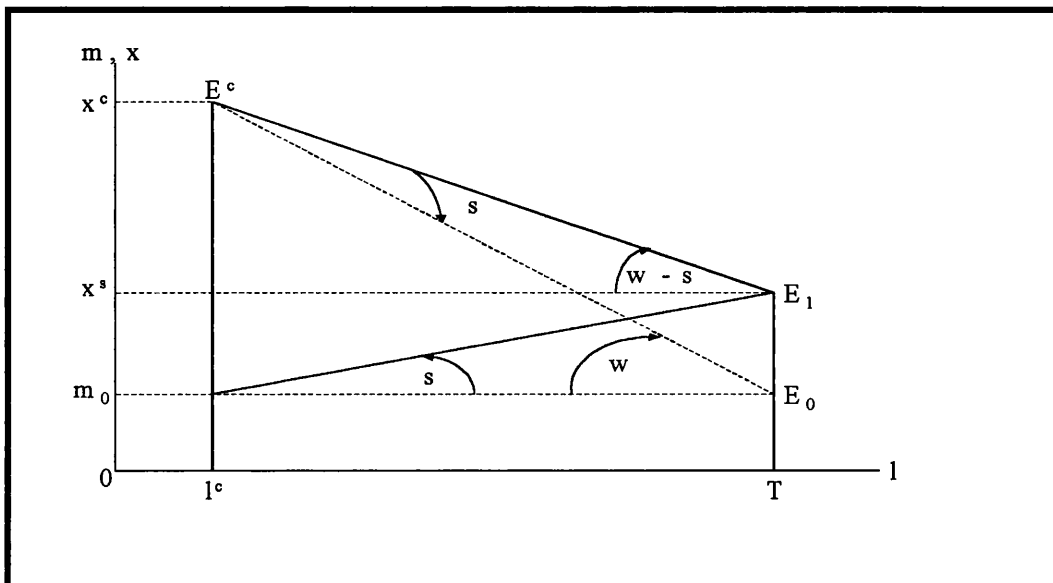
Figure II: The Budget Set with Sick-Pay

It is apparent that the provision of sick pay will increase the temptation to absent. This is shown in Figure III which examines graphically the introduction of such a sick pay scheme.
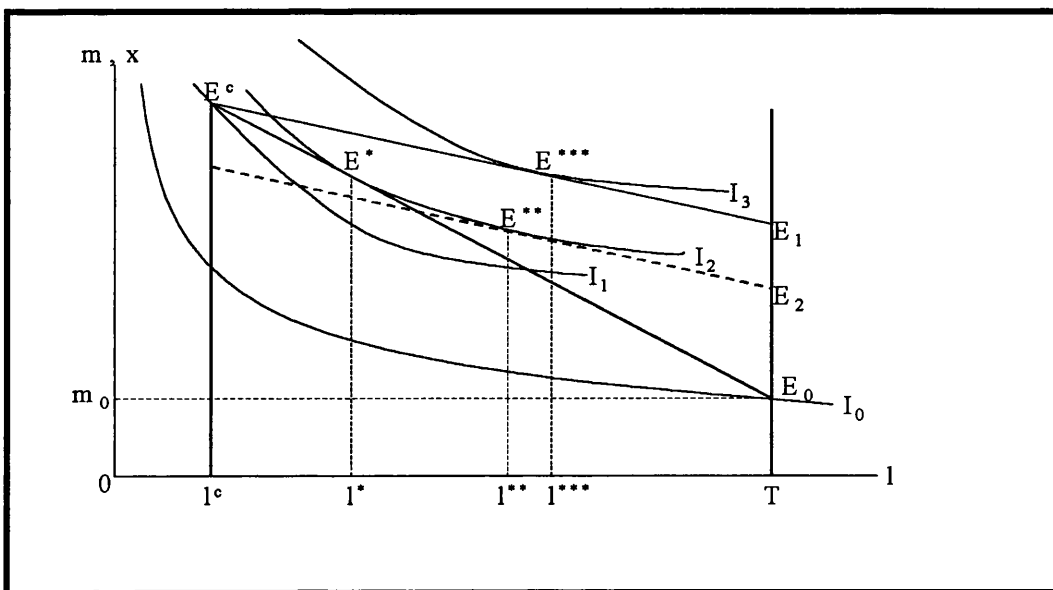
Figure III: Absenteeism, Labour Supply and Sick-Pay

In Figure III contractual hours h^c are, as in Figure I, in excess of utility maximising hours h^*. The introduction of a sick pay scheme in which absence is compensated at a rate $s < w$ enables a partial offset in the loss of earnings resulting from non-attendance. The budget constraint facing the individual will pivot at E^c to become (T, E_1, E^c, l^c). The introduction of such a scheme creates both an

income and a substitution effect; the movement from E^* to E^{**} represents the substitution effect, which serves to increase absence, whilst the movement from E^{**} to E^{***} represents the income effect, which gives a further impetus to absence on account of the assumed normality of leisure.

In this model absence arises from a discrepancy between the individual's marginal and economic rates of substitution at the level of contractual hours. Any change in the former, therefore, will also affect the incentive to absent. One would expect, for example, an individual's marginal rate of substitution to be particularly high when leisure is relatively highly valued, for example at important family events such as weddings, births and funerals. This would lead to a steepening of the individual's indifference curves in Figure I - recall equation (4) - and an increased temptation to absent as the individual attempts to equalise his marginal and economic rates of substitution. Similarly, an individual's marginal rate of substitution may be particularly high when the individual is sick. As sickness increases, leisure time may become more valuable because of the need for recuperation and/or the fact that work may become increasingly onerous.[6]

It is apparent from the above analysis that absence can only be defined if contractual hours are specified in the employment contract. If the individual were free to supply his desired hours then the phenomenon of absence would not arise. Such contracts are, however, quite rare. Although in principle the array of contracts on offer to a particular worker of given skills could be very large, in practice they tend to be quite small - normally a full-time contract of 35-40 hours per week or a part-time contract of 15-20 hours per week. The question as to why this is the case involves issues regarding the nature of the firm's production process.

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[6] Such an assumption, however, is not obvious. In a world where individuals can take 'illegitimate' absence, they may prefer to recuperate on the firm's time and 'go sick' when healthy so as to enjoy unauthorised leisure. To deal with such issues would require a re-working of the simple bi-variate decomposition of time in the standard labour supply model.

Some jobs require very precisely defined hours constraints on account of the co-ordination between factor inputs. Such contracts typically specify very clearly where and when workers are expected to be present. For example, a contract for production line workers will be heavily influenced by the fact that the line has an optimum manning level. Start and finish times will, therefore, be carefully co-ordinated with the operating times of the line. Indeed they are often staggered in order that the flow of product through the line might be matched by the manning level. In such cases absenteeism is easily defined.[7]

Jobs that do not require such co-ordination will offer more flexible work hours whilst focussing on other aspects of employee performance. For example, the process of academic research and teaching is extremely flexible. Time spent on these activities can be easily moved from one part of the day to another with little or no output loss. It can be concentrated in certain parts of the week or spread out over several days. For this reason the typical university academic's contract fails to specify any hours at all, concentrating on adequate performance of the job rather than time spent working at it. Absenteeism in this case is impossible to define since attendance is not required.

In between these two extremes lies a wide variety of contractual arrangements each of which might be supposed to be peculiarly suited to the task in hand. Flexi-time schemes, for instance, specify a fixed period of attendance over some period of time (usually a week or month) but leave it to the individual to decide, within some broadly defined parameters, when hours are to be supplied. In such a regime absence can only be defined over the period for which attendance is required.[8]

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[7] Moreover, having specified contractual hours so clearly, such firms would tend to be far more rigorous in enforcing the terms of the contract than other firms where co-ordination is not so valuable.

[8] It is interesting to note that the majority of flexitime schemes relate to white-collar workers for whom the timing of a flow of work is not an essential consideration. It matters little, for example, whether an invoice is despatched at 10.00am or 4.00pm.

Such considerations mean that it is inappropriate to interpret absence statistics purely in terms of labour supply. The very definition of what constitutes absence is determined by labour demand, and observed absence is necessarily conditioned by contract structure. Simply concentrating on the psychology of workers is only half the problem and a prime consideration must be to consider the broader context of contract design.

This line of thought raises several interesting questions: First, if absence-control mechanisms are costly then one would expect employment contracts to specify non-work time when leisure (income) is particularly highly (lowly) valued by large numbers of workers. Indeed, there are many instances when leisure time requires some degree of social co-ordination - for example weekends and Christmas Day - and if a firm has to produce within these periods it will be obliged to pay a wage premium to entice workers into the market.

Second, it is not obvious that absenteeism is in any way inefficient. If the worker is induced to take an employment contract at which his marginal and economic rates of substitution are in discord, then he will have an incentive to break that contract. If the worker realises this incentive then he is simply signalling the dissonance between his and the market's valuation of the allocation of time implied by the contract. Such behaviour is not inefficient for the worker because he is behaving rationally given the constraints he faces.

The firm, for its part, when faced with such a worker will have to chose between attempting to enforce the contract - through monitoring, fines, inducements, threats of dismissal and perhaps increased contractual flexibility - or simply permitting the non-compliant behaviour. This choice will depend on a number of complex issues related to the nature of the production process, the psychology of the available work force, and the relationship of the worker to other inputs (including other workers). If the firm chooses the latter option then it must be because it perceives the marginal cost of enforcing the contract to be in excess of the marginal benefit of so doing. In such a case observed absence is simply the

manifestation of a solution to a market problem. If, on the other hand, the firm chooses the former option, and thereby devotes valuable resources to ensuring contract compliance, then it is reasonable to infer that the market was initially generating an inefficient solution to the problem.

Third, in light of the above discussion it becomes meaningless to talk in terms of observed absence being in any way either supply or demand constrained. As with all economic behaviour it is the interaction of the two forces which is relevant. In terms of the above analysis, the market mechanism will determine not only the observed absence, but also the system of absence control employed by the firm. This leads to an important identification problem. Observed variations in absence may be due to the behaviour of both the firm's management as well as its employees. An increase in absenteeism, for example, might induce a firm to amend its absence control mechanism by more stringently monitoring absentees.

I turn now to the economic literature on absence and attempt to evaluate the extent to which economists has been successful in addressing these questions.

III.   The Literature

This section surveys the economic literature on absence in chronological order. The aim is to identify the extent to which the predictions of the labour supply approach to the modelling of absence have been empirically verified, and the ways in which economists have attempted to surmount its theoretical and empirical shortcomings.

III.1   Early Contributions

Treble (1990) argues that the first serious attempts to analyse absence were two reports issued by the Medical Research Council based on micro-data from ten collieries in the Nottinghamshire coal field over the periods 1920-26 and 1926-28 [Vernon and Bedford (1928) and Vernon, Bedford and Warner (1931)]. The authors investigated the relationship between variables proxying working

conditions (e.g. the depth and thickness of seam, temperature, humidity and airflow) with three different classes of absence; absence due to sickness, absence due to accidents, and a residual class, interpreted as voluntary absence. The authors focussed particularly on this latter class which they found to vary with the distance walked underground to the workplace, to turnover, to the distance of men's homes from the colliery, and to the proximity of a large town.

Treble (1990) identifies several important shortcomings with the Vernon-Bedford studies. For example, the co-linearity of many of the explanatory variables, which was difficult to avoid given the lack of sophisticated computing facilities and regression techniques, renders many of the empirical results largely uninterpretable. Also, the study makes no distinction between the start and termination of an absence spell - i.e. between the incidence and duration of absence. As Barmby *et al* (1991) argue, employers may react quite differently to these with the uncertainty caused by the former being of chief concern.

Yet despite all this the studies remain of considerable importance. They highlighted for the first time the significance of the various characteristics of the employment contract, such as the remuneration system and the availability of sick pay, on observed absence - absence was found to be substantially affected by the presence of a sick pay scheme ('compensation') and to be very sensitive to pay rates. They also highlighted the influence of the working environment (temperature and humidity) - a theme that has been stressed since in the applied psychology literature.

III.2   The Revival

Despite its somewhat promising start, the economic literature on absence was sadly neglected for the best part of fifty years. It is only in the past two decades that some form of revival can be observed, with the emphasis being placed largely on empirical analysis. This desultory performance stands in marked contrast to that of applied psychologists who have maintained a long tradition of investigation into

the motivations underpinning the decision of a worker to absent. The general theme followed by these researchers was that absence could be regarded as a withdrawal response to a negative work environment.

One of the major contributions in this field is the study by Steers and Rhodes (1978) in which the authors attempt to construct a theory of absence based on the results of empirical investigations to date. Although the authors do not set out a formal specification for their model, certain interesting features can be discerned. Following Chadwick-Jones *et al* (1973), a distinction is made between 'unavoidable' ('Type A') absence, whereby the individual is unable to attend on account of sickness; and 'avoidable' ('Type B') absence, whereby the individual lacks the motivation to attend. Job satisfaction, the outcome of an interaction between job and personal characteristics, determines the former, whilst sickness is seen as crucial to the latter. Observed absence is then interpreted as a complex function of both ability and motivation.

The Steers-Rhodes model has been criticised from an economic standpoint by Barmby *et al* (1991) who claim that the model is incapable of falsification because many of the variables used are poorly defined (e.g. 'role stress', 'work group norms', 'personal work ethic') and the direction of influences is not specified. For example, does the pressure to attend lead to an increase or decrease in observed absence? Similarly, do family responsibilities increase or decrease attendance? Moreover, for a model so grounded in empirical observation the integrity of the empirical work on which the results are based is somewhat doubtful:

> Steers and Rhodes themselves have some harsh things to say about the quality of the empirical work on which their results were based ... At the time of writing, studies had been largely based on the examination of simple bi-variate correlations. There are problems of comparability (partly caused by poor reporting practices), and a failure in experimental work to design experiments carefully [Barmby *et al* (1991)].

Steers and Rhodes have also attracted criticism from within the applied psychology literature. Fichman (1984), for example, criticises both the theoretical and

empirical content of their model and outlines a alternative theoretical framework, based on a dynamic model of the allocation of time, which is intended to overcome some of the more problematic areas of their contribution.[9]

Despite its shortcomings the Steers-Rhodes study remains an important contribution. In particular, it highlights the efficiency implications of absenteeism, a significant consideration because even today many commentators, particularly in the field of management, regard absence as unequivocally bad. Steers and Rhodes, however, noted that:

> ... some absenteeism may in fact be healthy for organisations in that such behaviour can allow for temporary escape from stressful situations ... (R)igid efforts to ensure perfect attendance may lead to unintended and detrimental consequences on the job ... [Steers and Rhodes (1978)].

The notion of an efficient level of absence has emerged as a key thread in the contemporary absence literature.

III.3   Contemporary Economic Literature

The Steers-Rhodes model is typical of the applied psychology literature in its lack of a rigorous theoretical basis. Moreover, job satisfaction is highlighted as central to an individual's voluntary absence decision. There is, however, a strong positive correlation between job satisfaction and wages [Freeman (1978, Borjas (1979)] such that the effect of job satisfaction on absence may have been exaggerated. But it was not until the 1980's, when economists at last re-entered the fray, that the role of wages was demonstrated formally. That decade witnessed a revival of interest amongst economists into the causes and consequences of worker absence, at last taking the lead from the advancements that had been made in other disciplines. These researchers applied their traditional labour market modelling techniques to worker absence with mixed results.

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[9] Indeed, in later work Steers and Rhodes themselves address many of the weaknesses of their 1978 study [Steers and Rhodes (1984)].

III.3a   Absenteeism and Labour Supply

The majority of economists have modelled absence in terms of the basic labour supply model set out in Section II, with emphasis being placed on factors representing the employment contract. From that analysis it is clear that conflicting income and substitution effects render the effect of wages on absence somewhat ambiguous. Hence empirical evidence plays a key role in adjudicating.

Dunn and Youngblood (1986) investigate the issue of whether an individual with contractual hours in excess of desired hours will absent. An empirical measure of the individual's marginal rate of substitution between income and leisure is derived by asking each worker in the sample: (1) how much per week he would be willing to pay to enjoy each of a set of specified job benefits if they were not provided by the employer; and (2) how much longer he would be willing to work each week with *no pay* in order to enjoy each of the same benefits. The equivalence between the money and the time evaluations gives the worker's marginal rate of substitution and the authors find a significant positive relationship between absence and the worker's 'temptation to absent', defined as the difference between the worker's marginal and economic rates of substitution – recall equation (6).[10]

Allen (1981a) analyses a sample of workers with self-reported measures of days absent in terms of an extended income-leisure model with absentees assumed to suffer a lump sum penalty to cover any loss their action causes the firm. The penalty is assumed to be reflected in a decreased chance of promotion and/or an increased probability of being fired, with the opportunity cost of dismissal being proxied by industry dummy variables and personal characteristics.

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[10] Supportive evidence of a negative relationship between wage rates and absence is also found in Drago and Wooden (1992) and Chaudhury and Ng (1992). Leigh (1991), however, finds wages and paid sick leave to be statistically insignificant predictors of absence.

Allen's paper is largely bereft of any real formal theoretical modelling and so, perhaps not surprisingly, his empirical results are somewhat difficult to interpret. He finds that wages and paid sick leave are inversely related to absenteeism, although the significance of these results is questionable. Evidence of a significant wage effect, for example, is found only in an equation that excludes personal characteristics. When the data is divided into occupational subgroups (blue collar/white collar) a wage effect is only present for the blue collar workers, and only then when sick pay is controlled for.

Scott and Markham (1983) re-test Allen's hypothesis using aggregate firm data from a survey undertaken by the American Society of Personal Administration containing employer-reported absence rates for each firm. They find no statistically significant relationship between average hourly pay and average absence rates. Their results should, however, be interpreted with caution because the individual behaviour in question is being inferred from averages of average data.[11]

A common finding in many of the labour supply based studies is that females exhibit a relatively higher propensity to absence than males [Allen (1981a, 1984), Leigh (1981, 1991), Drago and Wooden (1992), and Paringer (1983)]. Such a finding is difficult to interpret in terms of the standard income-leisure model. It may be that women require more contractual flexibility on account of their generally more demanding domestic duties.[12] For example, it is typically argued that women assume prime responsibility for the children within a household and are more likely to stay at home if these fall ill. Indeed, Leigh (1986, 1991) finds a significant positive correlation between absence and an interactive

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[11] Other studies that attempt to assess the impact of wages and/or fringe benefits as explanatory variables include Chelius (1981), Dalton and Perry (1981), Deitsch and Ditts (1981) and Youngblood (1978, 1984) and Winkler (1980).

[12] Morbidity indices indicate that women report more illness than men despite having a higher life expectancy. Nathenson (1975) surveys sociological, psychological and biological explanations for this trend. McKeown and Furness (1987,1989) discover that males take fewer episodes of absence than females, who in turn exhibit shorter but more frequent absence.

sex/young-dependent variable – a finding that accords with the medical literature on absence.[13]

The interesting question then is why contracts are not drawn up to accommodate these aspects of female employment. One reason may be that the circumstances that cause married women to have higher absence rates relate to the variability rather than to the average of their circumstances. Contracts that provide for shorter as opposed to more flexible working hours will be unable to cope with a situation in which an employee's propensity to absent is, rightly or wrongly, the concatenation of the chances of all the members of her household falling ill, and who therefore has *both* a higher mean *and* variance of absence. Note also that the provision of childcare facilities would be unlikely to alleviate this problem - such facilities are usually set up to cope with healthy children and not sick ones.[14]

The significance of demographic factors on absence is not, however, universally accepted. The above results contrast sharply with those of Barmby and Treble (1991a), for example, who stress instead the importance of contractual characteristics. Estimating an individual's propensity to absent through a probit model, Barmby and Treble find that personal characteristics such as age, sex and marital status do not exert a significant influence on the probability of absence *ceteris paribus*. Significant factors include the marginal wage rate, working conditions and contract type.

To summarise, it is apparent that some dispute exists within the empirical literature regarding the underlying causes of absence. The puzzling results that have emerged are arguably due to weak theoretical priors and hence I turn now to some of the recent advances in the theoretical underpinnings of absence.

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[13] Emphasis in the medical statistics literature is placed primarily on the empirical analysis of health statistics. Relationships are examined between health status, sickness absence, personal and occupational characteristics [see, for example, Pines *et al* (1985), Ryan (1981), Jenkins (1985), Broadhead *et al* (1990) and Parker *et al* (1987)]. Results are broadly in line with those found in the economic literature i.e. married females with young children exhibit a relatively high degree of sickness absence.

[14] A related explanatory variable is marital status. Evidence suggests that married people exhibit a relatively low propensity to absent. This may be due to financial pressures [Allen (1984), Keller (1983), Leigh (1986)].

III.3b   Absenteeism and Labour Demand

Barmby and Treble (1991a, 1991b) argue that the weak and ambiguous nature of most empirical work on absence is due to a problem of identification. Absence has been generally examined with limited reference to labour demand and as such the interpretation of results is inevitably problematic. A more balanced approach to the issue should consider why certain employment contracts prevail in particular sectors of the economy.

It was seen in the simple labour supply model depicted in Figures I-III that an hours constraint is a necessary pre-condition for absence. This suggests that the introduction of some degree of contractual flexibility may enable the firm to exercise some control over the level of absence.[15] In this vein overtime systems have been proposed as a way of counteracting absence. The basic argument is that the stochastic nature of absence means that 'stand-by' workers are not always readily available. If production schedules are dependent on fixed team sizes then it might pay the firm to introduce some form of overtime working to enhance the flexibility of the employment input. Thus, it is the randomness of absence which rationalises the presence of overtime working - if absence rates were known with certainty *ex ante* management would be able to take appropriate remedial action without call to additional overtime. Ehrenberg (1970), however, challenges this conventional view, demonstrating that an optimal response by the firm to an increase in a (certain) absence rate is to raise the amount of overtime worked per worker. The intuition underlying this result is that many labour costs must still be paid to the employee even when he is absent. Overtime payments, however, are payable only to non-absenters.

Dalton and Mesch (1992) highlight the essence of the paradox that exists if a firm provides overtime to attenders in order to compensate for absentees.

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[15] The idea that workers may absent to counteract inflexible work schedules is suggested by Allen (1981a) who points out that the opportunity cost of working varies over time as alternatives present themselves.

"Employers working additional overtime hours may be able to 'afford' absence" (p. 292). Such an effect may lead to another group of workers working overtime and so on. This tendency has been called the 'snowball effect'.

To resolve the theoretical debate one must resort to empirical evidence. This is again, however, far from definitive. Leslie (1982) and Kenyon and Dawkins (1989) find an inverse relationship between overtime hours and absence whilst Chaudhury and Ng (1992) find evidence to suggest that the income effect associated with overtime actually increases absence.

It is apparent that overtime affects absence partly through alterations to the length of the working day. A related point, therefore, concerns the distinction between full- and part-time workers. One might expect individuals with a high marginal utility of leisure to opt for a part-time contract, thereby minimising any mismatch between contractual and desired hours. A reasonable conjecture, therefore, is that part-time workers exhibit relatively low propensities to absent. Support for this is found by Drago and Wooden (1992) and Chaudhury and Ng (1992), the latter of whom use firm level panel data to show a positive relationship between the proportion of part-time workers and average absence.

Such results highlight the crucial role of flexibility in the determination of absence. Indeed, Leigh (1991) finds individuals with 'inflexible' working hours to be relatively more prone to absence whilst Kenyon and Dawkins (1989) and Leigh (1986) find white-collar workers to be relatively less prone than their blue-collar counterparts. Balchin and Wooden (1992), however, find the ability of the largest occupational group within the work place to exercise discretion over start and finish times to be an insignificant predictor of absence.

All this highlights the significance of contract design for absence. In the light of such considerations Barmby and Treble (1991b) argue that measures taken to control absence should be considered alongside the response of workers to absence controls. Their model focuses on a worker's marginal contribution to profit as central to the employer's optimal choice of contractual hours, given the

wage, with the firm balancing the contributions made by over-employed and under-employed workers.

Indeed, to fully address the question of contract design the determination of all the characteristics of the employment contract must be considered, i.e. wages, sick pay and hours. Coles and Treble (1993) make significant headway here by examining the relationship between wages, sick pay and production technology. They attribute the existence of differential pay rates across firms to technological factors and conclude that the costs of absence to the firm, and hence the type of absence control employed, are fundamentally related to the nature of the firm's production process.

III.3c   Absenteeism and Shirking

One would expect firms to minimise their employment costs by coming down hard on voluntary absence. To be sure, interpreting such absence as a form of shirking, the firm will have an incentive to monitor and punish absentees accordingly. Such punishments might take the form of fines or dismissals and will serve to increase the expected cost of absence faced by the worker. Such an approach is resonant of the efficiency wage hypothesis whereby the prospect of unemployment serves to act as a worker discipline device [Akerlof and Yellen (1984), Shapiro and Stiglitz (1984)].

Barmby *et al* (1993) explore the relationship between absenteeism and efficiency wages explicitly. Their model incorporates a health based utility function in which increased levels of sickness alter the individual's marginal rate of substitution in favour of leisure. A 'reservation' level of sickness, at which individuals are indifferent between attendance and absence, is derived and individuals are shown to face a temptation to 'shirk' and take illegitimate absence. The theoretical results indicate a negative relationship between wages and the

probability of absence.[16] Weiss (1985) postulates a similar relationship for workers employed along a production line.

Although the empirical work in this area is still somewhat underdeveloped, some limited progress has been made. Leigh (1985), for example, includes a variable which captures the expected duration of an unemployment spell if dismissed and finds this to exert a significant negative effect on absence. Similar evidence is found in Kenyon and Dawkins (1989) and Drago and Wooden (1992). Balchin and Wooden (1992) extend this line of analysis by defining a penalty function in terms of the opportunity cost and threat of dismissal, both of which are found to be significant correlates of absence.[17]

The effectiveness of a dismissal-based penalty system may be compromised by additional factors such as unionisation. Union members, for example, may perceive themselves to be relatively more insulated against dismissal than their non-union counterparts. On the other hand, union members may have less incentive to absent on account of the benefits that unionisation confers, for example higher wages and more attractive work schedules. Empirical work in this area suggests that the former effect dominates; Chaudhury and Ng (1992) find that the degree of unionisation within a firm increases the number of days lost due to absence whilst Leigh (1981, 1985) and Allen (1984) conclude that union members are relatively more likely to absent. Indeed, Allen (1984) finds that job dissatisfaction is actually higher amongst union members, a claim supported by Freeman (1978) and Borjas (1979).

III.3d   Sickness and Health

The discussion so far has presumed that absence is to some extent voluntary with individuals choosing to absent as a way of moving closer to their preferred supply

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[16] The Barmby et al (1994) model is explored in detail in Section V of this chapter.

[17] These results should be treated with some caution, however, since problems were encountered finding suitable proxies for many of the variables specified in the theoretical model. The threat of dismissal variable, for example, is proxied by the actual dismissal rate.

of hours. Interpreting empirical results is, however, problematic because individuals invariably claim their absence to be involuntary [see Dunn and Youngblood (1986)]. Indeed, Nicholson (1976) shows that when control is exerted over non-sickness (i.e. voluntary) absence the level of reported sickness (i.e. involuntary) absence tends to rise. And the problem is further compounded by worker and firm heterogeneity – the degree to which a given level of sickness is incapacitating varies widely across individuals whilst firms may harbour different opinions as regards what constitutes an 'acceptable' level of sickness. [see Barmby *et al* (1993) for work in this area].

Whilst theoretical models of absence have generally ignored the state of an individual's health, empirical studies have been somewhat more considerate. Allen (1981), for example, finds self-administered reports of ill-health to be significant correlates of absence. Leigh (1991) finds significant effects from variables reflecting health status (e.g. obesity, insomnia) and hazardous working conditions, whilst Paringer (1983) finds strong evidence that female absence is largely attributable to health considerations.

The severity of a worker's illness will have important implications for employers. In the long term the firm can replace a seriously injured or sick worker by making temporary recruitments or rescheduling existing employees. If a worker is seriously ill, however, absence control will be all but ineffective with even the most harsh of penalties unable to induce a return to work. Indeed, the results of Chaudhury and Ng (1992) suggest that 'short' and 'long' absence spells – the latter defined as those exceeding five days - are influenced by quite different factors, with long spells primarily determined by personal characteristics. [18]

One way of rendering the labour supply model more realistic is to incorporate sickness explicitly into the individual's utility function. Viscusi and Evans (1990), for example, estimate health-state dependent utility functions and

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[18] Leigh (1989) analyses the contribution of 36 specific illnesses to absenteeism. Those that appear to have the most influence are day-to-day illnesses such as colds and flue.

find that job injuries reduce both total utility and the marginal utility of income. Similarly, Kahana and Weiss (1992) specify a discrete framework in which an individual is either healthy or sick. If the individual is sick then he is unable to work such that only healthy individuals face the decision between absence and work.

Although informative, such approaches are clearly compromised by their failure to recognise the full spectrum of potential health states. An alternative approach is therefore to treat health as a continuum.[19] Barmby *et al* (1993) express individual utility as a function of consumption, leisure and the individual's level of sickness or health and assume that utility is increasing in the first two arguments and decreasing in the third. Moreover, the marginal utility of leisure (consumption) is assumed to increase (decrease) with sickness. The essence of the Barmby *et al* approach is illustrated in Figure IV following.
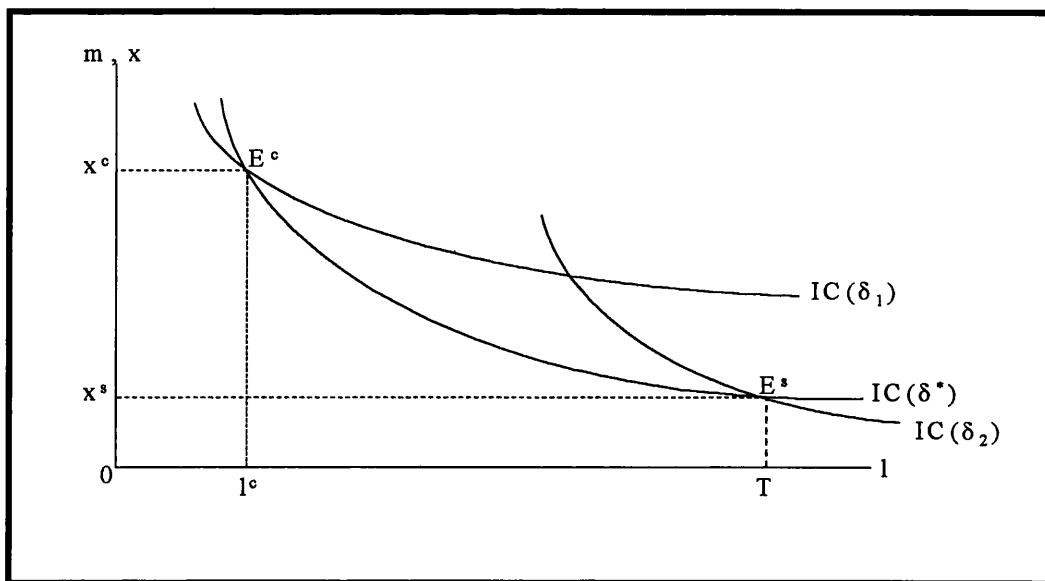
Figure IV: Marginal Rates of Substitution and Health

Consider an individual faced with an extremely rigid budget set consisting of only the two points E^c and E^s. If he attends work then he is positioned at point $E^c = \{x^c, l^c\}$, with $l^c = T - h^c$, where h^c represents the hours of work specified in

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[19] An early advocate of such a methodology is Cochrane (1972) who stressed the need to move away from simple medical models which treated health dichotomously. A survey of methodological issues concerning research into health and illness is set out by Long (1984).

the employment contract. Absence is described by the point $E^s = \{x^s, T\}$. Sickness is indexed by some random variable $\delta \in [0,1]$, higher realisations of which denote greater levels of sickness. δ is revealed to the worker after the employment contract has been signed but before production has commenced and it is apparent that different realisations of δ will serve to pivot the indifference curve - higher values of δ lead to a relatively steep curve and *vice versa*. Intuitively, an increase in δ (i.e. an increase in 'sickness') increases the marginal rate of substitution between consumption and leisure such that the individual places relatively more (less) value on leisure (consumption). The realisation of δ will determine whether utility is maximised at E^c or E^s, with some 'reservation' level of sickness, δ^*, denoting the realisation of δ at which the individual is indifferent between attendance and absence.

A natural extension of this approach is to consider the dynamic effects of health on absence, in particular, the relationship between health and past absence. Keller (1983) and Breaugh (1981), for example, argue that an individual's past absence record is a good predictor of future absence. This argument is supported by the Confederation of British Industry which claims that nine out of ten firms take some measures to avoid the recruitment of potential absenters [CBI (1994)]. Employers may even be able to exert some control over the future health of employees. Bertera (1990), for example, analyses the effects of workplace health promotion programmes involving information on nutrition, smoking, and fitness and concludes that the benefits of reduced absence from such schemes far outweighs their costs of implementation. This type of finding echoes recent empirical evidence suggesting that education is positively (negatively) related to good health (absence) [Steers and Rhodes (1984), Drago and Wooden (1992)].

A similar approach relates to the issue of adverse selection and screening – firms that find absence relatively expensive will tend to offer relatively high wages and relatively inflexible work schedules. In this vein Borofsky and Smith (1993) analyse the rates of turnover, work accidents and unauthorised absence amongst

two groups of employees, one of which was screened before hiring. The screening process comprised of a set of self-administered questions designed to garner information on attitudes, motivation, job-commitment and lifestyle, and the empirical results suggested that turnover, accident and absence rates were all significantly lower in the pre-screened group. In contrast, Allen (1981b) models the selection mechanism with hedonic wage equations, an approach which emphasises the idea of a trade-off between wages and expected absence and allows absence to be viewed as a characteristic of the job:[20]

> .... the ability to miss work repeatedly while keeping one's job is a job characteristic desirable to many workers, regardless of whether that time is spent recovering from short-term illnesses or enjoying three-day weekends. [Allen (1984)].

Some support for the hedonic approach is found by Turnbull and Sapsford (1992) who cite evidence that historically some groups of workers considered absenteeism to be a characteristic of the job: '... for the docker absenteeism was regarded as an entitlement, and as such it was not considered to be a legitimate disciplinary offence.' (p.298).

III.3e   Dynamics

A major criticism of almost all theoretical models of absence to date is their ignorance of dynamic considerations. As Kenyon and Dawkins (1987) point out:

> The existence ... of paid sick leave entitlements could introduce a dynamic structure to the model in that a heavy usage of sick leave entitlements through labour absence in one period could lead to a more parsimonious use of entitlements in the subsequent period (or periods), and conversely. Secondly, expectations about the future path of real wages over time or the state of industrial relations could also affect dynamic adjustment. Thirdly, habit persistence may play a part in determining labour absence. Thus the accurate specification of a model of labour absence may well require the inclusion of lagged dependent and/or independent variables. However, it is difficult a priori to be precise about the appropriate dynamic structure in that theory, in this case, appears to provide no obvious guide to dynamic relationships. Our modelling strategy, then, will be to search empirically for appropriate structure estimations and appropriate econometric specification diagnostics. [Kenyon and Dawkins (1987). p. 4].

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[20] A weakness of Allen's model is its presumption that only wages adjust in response to a change in absence, the other arguments in the individual's utility function remaining fixed.

Indeed, it would seem more appropriate to develop a dynamic theoretical framework in order to channel empirical work through a more structured environment. To be fair, some progress has been achieved in this endeavour. Brown (1993) has explored the implications of absence behaviour within a two period context whilst Kahana and Weiss (1992) and Carlin (1989), emphasising that the detection of shirking does not always lead to immediate dismissal, have analysed the phenomenon as a repeated game between workers and firms. The suitability of such an approach was first recognised by Johns and Nicholson (1982) who proposed six 'counter-propositions' to challenge the then contemporary theories of absence. 'Counter-Proposition Four (CP-4) stated that:

> *Absence is temporal behaviour and continually subject to dynamic change.* By definition, absence relocates the distribution of time from work to non-work. Thus, the meaning of absence events to both absentees and others in their social framework, may be distinguished by duration as well as by perceived causes ... This compels us to view absence causation as a recursive learning process, and ... to expect 'lawful changes' in absence behaviour over time and from episode to episode. [Johns and Nicholson (1982), p. 136.).[21]

Once the need for dynamics is accepted, the next issue regards the particular dynamic estimation approach to be adopted. This has proved rather problematic, with the paucity of theoretical foundations resulting in rather *ad hoc* empirical specifications. Nethertheless, some progress has been achieved.

The empirical literature since the mid-1980's has taken on board many of the suggestions regarding dynamics outlined in the papers collected by Goodman and Atkins (1984). Fichman (1988, 1989) constructs a dynamic model that emphasises the motivational aspects of absence behaviour whilst Barmby *et al* (1991) allow for demand side considerations by focussing on a 'real-world' experience rated sick pay scheme which incorporated bonuses for 'good' attendance and alterations in the level of sick pay according to absence histories.

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[21] This dichotomy between incidence and duration was picked up by Drago and Wooden (1992). Acknowledging Johns and Nicholson (1982), Drago and Wooden argue that the appropriate empirical specification may require separate predictions of 'absence events' (i.e. incidence) and 'absence rates' (i.e. duration). The authors point out that '... although absence events and absence rates may have different determinants, they are related by the fact that an event is required for any positive rate.' [Drago and Wooden (1992), p. 774.]

The rationale of the scheme was that if the level of sick pay is dependent on past absence then a temporal aspect emerges - today's absence decision will affect tomorrow's sick pay entitlement.

These papers, along with Harrison and Hulin (1989), have a common theme in terms of statistical methods of regarding absence and attendance as dynamic phenomena. Over time an individual switches from one state to another and the analyst's task is to model the determinants of these switches. The methods used by the researchers are also similar. Fichman uses a Weibull hazard function to model the probability of transition from attendance to absence. This entails assuming that the nature of the hazard function is determined by the Weibull probability density function *viz*:

$$f(x;a,b) = abx^{b-1}e^{-ax^b} \tag{8}$$

where a, $b > 0$.[22] Fichman finds significant differences in the hazard function for the start of an absence spell that is unpaid as compared to the start of one that is paid. Harrison and Hulin (1989) apply the related Cox proportional hazard rate model to the daily attendance records of 2130 incumbent, white-collar employees. Their analysis, which includes no quantitative measure of financial variables, demonstrates that both temporal and historical variables have a significant effect on the hazard rate of voluntary absence. Demographic variables that were significantly correlated with aggregated absences do not, however, improve prediction of the hazard rate.

Barmby *et al* (1991) incorporate both financial considerations and personal characteristics into a Weibull hazard model of absence duration in order to model the transition from non-absence to absence. Their results suggest that sex and marital status are important determinants of duration, with female and married

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[22] Although to a certain the extent the choice of density function is somewhat arbitrary, Cox and Oakes (1984) attempt to evaluate the relative merits of the numerous distributions on offer and conclude that a key advantage of the Weibull distribution is its ease of computation.

workers tending to take more prolonged absence spells than their male and single counterparts. Furthermore, 'acceptable' absence spells (i.e. medically certified spells attracting minimal, if any, penalties) were found to be of longer duration than 'unacceptable' spells.

Despite their achievement in introducing dynamics into the empirical analysis of absence modelling, these models are nethertheless lacking in several respects [see Treble (1990)]. First, both Fichman and Harrison and Hulin classify absence spells, somewhat synthetically, as either voluntary or involuntary. Harrison and Hulin, for example, define three categories of absence - short-term voluntary absence, short-term semi-voluntary absence and long-term involuntary absence - the distinction resting on rather subjective criteria. Barmby *et al* avoid this and find significant effects of sick pay variables on the duration of absence, implying that the constraint imposed on the system by the involuntary-voluntary classification is probably unjustified.

Second, implicit in each of the above models is an inefficiency resulting from the separate modelling of the two transitions involved. Harrison and Hulin include in their specification a large number of variables intended to capture the absence and holiday history of individual workers both before and during the absence spell under examination. Barmby *et al* include in their specification measures of past absence using a sequential logit model for the commencement of a spell. Many of these variables are found to have a relatively large, significant effect on the probability of starting an absence spell which suggests that a fruitful way forward may be the simultaneous modelling of both transitions. The relevant statistical methods for this kind of modelling are outlined by Lancaster (1990) and Lancaster and Imbeds (1990).

Finally, and most importantly, none of the papers offers a clearly specified, fully integrated model of the absence decision. Barmby *et al* (1991) develop a model which is clearly in the tradition of the economics of labour supply but which

is applicable only to their particular data - itself drawn from a firm operating a somewhat idiosyncratic sick pay scheme.

To conclude, the statistical methods based on models of this kind are developing rapidly and there is little doubt that their use in future studies will yield dividends [see Rust (1987) and Hotz and Miller (1989)]. The main advantage of the approach is that it permits the incorporation into the model of highly complex constraints, thereby permitting the explicit modelling of wage, tax, overtime and other absence control instruments, and thereby offering one solution to the identification problem outlined by Fichman (1984), Barmby and Treble (1989) and Barmby *et al* (1991).

III.4.   Interim Remarks

Clearly some progress has been made in both the theoretical and empirical analyses of worker absenteeism. The area remains, however, somewhat underdeveloped relative to other areas of labour economics. This is unfortunate given that absenteeism constitutes a significant loss of work-time and, therefore, has important implications for both household income and firm productivity.

In general, economists have modelled absence as an optimal labour supply response on the part of workers to contractual obligations dictated by the employer. Consequently, demand side aspects have attracted limited attention. Such an approach is clearly at odds with general economic behaviour in which the interaction of demand and supply plays a central role in determining market allocations. This exclusion is all the more surprising given the emphasis that has recently been placed on contract design in other areas of labour economics. Hopefully the present survey will help to promote the development of a more general theory of absence capable of providing more solid foundations on which to base empirical work. Indeed, the theoretical analysis of the third part of this chapter (Section V) is developed with this in mind. Before that, however, I remain

focussed on the labour supply approach by attempting to empirically profile within

such a framework the *potential* to absent.

IV.   Over-Employment and Absence

IV.1   Introduction

It is apparent from Section II that the canonical model of labour supply presumes a

freedom of choice over actual work hours, implying a (simplified) labour supply

equation:[23]

$$h_i^* = \alpha \ln w_i + \mathbf{BX}_i + \varepsilon_i \qquad\qquad\qquad (9)$$

where h_i^* represents desired work hours, $\mathbf{X}_i$ a vector of explanatory variables, w_i

the wage rate and ε_i an i.i.d. random error term [see, for example, Ilmakunnas and

Pudney (1990) and the comprehensive surveys by Ashenfelter and Layard (1986)

and Heckman *et al* (1981)]. Relatively little information on h_i^*, however, is

available and the majority of empirical work has focused instead on actual hours

viz:

$$h_i = \alpha \ln w_i + \mathbf{BX}_i + v_i \qquad\qquad\qquad (10)$$

where h_i represents actual or observed hours of work and $v_i = \varepsilon_i + \left(h_i - h_i^*\right)$.

Unless $\left(h_i - h_i^*\right)$ is orthogonal to $\left(w_i, \mathbf{X}_i\right)$, OLS estimation of (11) will be biased.

This is, however, not particularly likely:

> For both institutional and technical reasons, many jobs are associated with a
> fixed length for the working week and there is little scope for individuals to
> control their hours of work, except by changing job. But changing job is a
> costly operation, and there are also very few job opportunities available in large
> sectors of the spectrum of weekly hours. Consequently many individuals are
> likely to be observed out of equilibrium with respect to their labour supply at
> any given time. [Ilmakunnas and Pudney (1990), p. 183].

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[23] This does not necessarily imply that individuals have a free choice of hours with their current
employer, but rather that the feasible set of jobs presents such a choice.

Indeed, there are a number of labour market models, as well as mounting empirical evidence, suggesting that employment contracts specify both hours and pay [Stewart and Swaffield (1997), Dickens and Lundberg (1993), Altonji and Paxson (1992), Kahn and Lang (1991)]. Any such constraint on desired work hours will have potentially important implications for worker behaviour. To be sure, a constraint may lead to 'over-employment' or 'under-employment' depending upon whether it implies an upper or lower bound on hours worked. An upper bound set below desired hours renders the worker under-employed, since he would ideally like to supply more hours of labour. Conversely, a lower bound in excess of desired hours renders the worker over-employed. This latter situation is particularly worrisome for the firm since such a worker *might* be tempted to effectuate his dissatisfaction through taking unauthorised absence.

This section investigates these issues by empirically profiling those individuals who deem themselves to be over-, under-, or optimally- (i.e. neither over- or under-) employed at their existing level of contractual hours. The analysis thus offers some insight into *potential* absenters – i.e. those individuals who are relatively more likely to absent *ceteris paribus*.[24]

The analysis should, however, be interpreted with caution. Data limitations mean that nothing can be said as to whether an over-employed individual is indeed relatively more likely to absent. As stressed repeatedly in Section II, absence should be interpreted in terms of an interaction between the forces of supply and demand. Firms are unlikely to remain passive in the face of a threat of costly absence but the data do not permit any insight into how they might react to such threats. What is needed here ideally is highly detailed firm *and* personnel data such that both the employee's and employer's characteristics may be discerned. This is

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[24] Although not of equal interest, an equivalent insight is offered into *potential* 'moonlighters' – that is, individuals deeming themselves to be under-employed at their current contractual hours and thus likely to take over-time work.

beyond the scope of the present study, but is perhaps the direction that future research in this area should be heading.

IV.2   Data and Methodology

The data analysed in this section are derived from the British Social Attitudes (BSA) Survey. The BSA Survey is a series of surveys started by the Social and Community Planning Research in 1983 and core funded by the Monument Trust. Surveys were conducted annually over the period 1983-1991, excluding 1988. Additional contributions are also made by the Department of the Environment, the Countryside Commission, the Nuffield Foundation, the ESRC, Marks and Spencer Plc and Shell UK Ltd. The data are derived from a cross-sectional sample of adults aged 18 and over living in private households whose addresses were included in the electoral registrar. The sampling was facilitated by selecting 114 Parliamentary constituencies from among all those in Great Britain on the basis of the Registrar General's Standard Regions.

From each parliamentary constituency a polling district was randomly identified and selected. Addresses were chosen from these polling districts by treating the listed electors as circular with a fixed interval and marking the name of the individual on which the sampling interval landed. This method ensured a probability proportionate to the number of listed electors. Where possible these electors were chosen for the survey. Where there was a difference between the register entry and the current members of the household, the interviewer selected one respondent by means of a random selection grid.

The surveys for 1985, 1989, 1990, 1993 and 1994 contained a question that asks employees if:

(a)   They would like to work fewer hours than they are currently working;

(b)   They would like to work more hours than they are currently working;

(c)   They are happy with their current hours of work and, hence, would not like to change these contractual hours.

A sub-sample of 5715 employees who answered the above questions was isolated from the surveys, 3717 (65%) of whom reported that they were satisfied with contractual hours, 1729 (30%) that they would like to work fewer hours, and the remaining 269 (5%) that they would like to work more hours.[25] Hence, over one-third of the sub-sample reported hours of work constraints of some kind which would suggest that the presumption that individuals are able to choose work hours within a job (or are able to costlessly switch to another employer offering contractual hours equal to preferred hours) is clearly inappropriate.

To ascertain the effects of various personal job characteristics on the probability of being in one of the three states, a multinomial logit model was estimated.[26] The regression results thereby obtained offer a compact method of cross-tabulating the incidence of over-employment (OE), under-employment (UE) and optimal, or utility-maximising employment (UME) against a set of specified regressors. Given the limited objective of simply identifying the three types of employees, such an approach is appropriate.

IV.3   Results

The effects of a number of characteristics are explored which can be broadly split into three groups: personal, work place, and attitudinal. Table I presents the sub-sample rates – i.e. the proportion of respondents exhibiting a particular characteristic deeming themselves to be UE, OE or UME – and the multinomial logit results. The regression coefficients represent the relative (log) likelihood of a

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[25] These figures are consistent with those from other studies. A recent National Opinion Poll survey found 35 per cent of full-time, male employees to be working in excess of their desired level of hours. Similarly, Stewart and Swaffield (1997) found 38.8 (8.4) per cent of male manual workers surveyed in the British Household Panel Survey declaring themselves as over-employed (under-employed).

[26] A similar bi-variate analysis was undertaken by Ham (1982) in order to explore the determinants of the probability of under-employment using US data. His results suggested that years in education reduce the probability of under-employment whilst union membership and increases in the rate of unemployment raise the probability of under-employment. In addition, the probability of under-employment appears to differ across geographic regions.

respondent exhibiting a particular characteristic reporting UME or OE rather than UE.

IV.3a   Personal Characteristics

Age, Sex, Family and Race

Age appears to exert a significantly positive influence on the probability of reporting OE.[27] This accords with the findings of Kahn and Lang (1991), which also suggest that OE rises with age, and is in line with the findings of many researchers that the propensity to absent increases with age [see, for example, Allen (1981a, 1981b)].

The studies surveyed in Section III suggested that females exhibit a higher propensity to absent than males. It is apparent from Table I that the sub-sample rate of OE (UE) is indeed significantly higher (lower) for female respondents than for their male counterparts. Moreover, the female dummy variable impacts significantly positively on the probability of being over-employed, suggesting that the potential to absent is higher amongst female employees *ceteris paribus*. Mean labour supply for male (female) respondents in the sample is 43.2 (31.3) hours per week. Thus, although female respondents work less hours than men, they are significantly more likely to find these hours constraining. This may reflect family commitments not picked up elsewhere in the data.

The sub-sample rate of OE amongst married respondents exceeds that of single respondents, whilst the sub-sample rates of UE and UME are somewhat lower. The multinomial logit analysis suggests, however, that marital status does not exert a significant influence, *ceteris paribus*, implying that the differential sub-sample rates of OE, UE and UME amongst married and single employees is attributable to other factors. Similarly, although differentials are apparent in the sub-sample rates of OE, UE and UME between respondents with and without a

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[27] The mean (standard deviation) value of age is 39.12 (11,48), 34.18 (11.34) and 38.38 (12.80) years for respondents declaring themselves to be OE, UE and UME respectively.

pre-school child, the regression analysis suggests that the existence of such a child does not exert a significant effect on the differentials once other factors are controlled for.

A dummy variable relating to an often-ignored dimension of domestic arrangements was included in the analysis to indicate whether the respondent co-habited with his parents. Two conflicting effects may be identified with such an arrangement. On the one hand the respondent's parents may assist in domestic duties such as childcare, thereby relieving the respondent of the need to absent to attend to such matters. On the other hand, they may be elderly, sick or in some other way themselves dependent on the respondent. Table I suggests that the former effect dominates with respondents living in the same residence as their parents being significantly less likely to declare themselves OE.

There have been mixed findings as to the relationship between absence and race. Allen (1981a) and Leigh (1991), for example, include a non-white dummy in their empirical specifications which they find to be an insignificant predictor of absence. In a later analysis, however, Allen (1984) finds the propensity to absent to be significantly higher among non-whites *ceteris paribus*. It is clear from the sub-sample rates set out in Table I that the incidence of OE (UE) amongst white respondents is lower (higher) than amongst their non-white counterparts. However, the insignificant regressions coefficients suggest that the differential probabilities can be accounted for by other factors.

Housing Tenure

It is apparent from Table I that the sub-sample rate of OE amongst owner-occupiers exceeds that of non owner-occupiers, the opposite holding for the sub-sample rates of UE and UME. Furthermore, the logit analysis suggests that owner occupation raises the probability of OE, *ceteris paribus*. This is an interesting finding given the financial pressures associated with owner occupancy.

Table I
Multinomial Logit Analysis

Variable	Sub Sample Rate X%	Utility Maximising Employment			Over Employment		
		X%	Coef	T-Stat	X%	Coef	T-Stat
Personal Characteristics:							
Age	-	-	-0.1903	-0.696	-	0.0734	2.367
Age Squared	-	-	0.0026	1.159	-	-0.0011	-2.671
Male	5.00	74.41	0.0309	0.221	20.59	0.4005	2.746
Female	3.71	64.21	-	-	32.08	-	-
Single	5.73	71.73	-	-	22.54	-	-
Married	3.74	67.90	0.0505	0.318	28.36	0.0056	-0.034
Pre-School Child	5.86	66.89	-0.1614	-0.566	27.25	0.1900	1.448
No Pre-School Child	4.10	69.31	-	-	26.60	-	-
No Parents in Home	3.82	67.71	-	-	28.47	-	-
Parents in Home	6.94	75.87	-0.8746	-1.371	17.19	-0.1747	-1.940
White	4.19	69.08	0.3806	1.432	26.73	0.5482	1.503
Non-White	3.92	62.75	-	-	33.33	-	-
Owner Occupier	3.68	68.31	-0.2269	-1.479	28.01	0.1507	2.4297
Non Owner-Occupier	6.58	71.52	-	-	21.90	-	-
No Qualifications	5.96	55.45	-	-	21.90	-	-
Foreign Qualification	7.34	69.48	-0.0683	-0.099	24.39	-0.2946	-0.416
CSE	6.13	69.48	-0.5650	-1.241	24.39	-0.7010	-1.487
'O' Level	3.82	67.56	-0.8011	-1.888	28.62	-0.7121	-1.621
'A' Level	2.75	65.98	-0.3319	-1.145	31.27	-0.3206	-1.063
Higher/Further Education	2.41	75.90	-0.2133	-0.829	21.69	-0.2942	-1.079
Degree	2.05	63.01	-1.0720	-2.093	34.93	-1.2884	-2.288
Unp. History	11.27	75.92	-0.7535	-5.406	32.81	-0.8590	-5.789
No Unp. History	6.67	62.00	-	-	31.37	-	-
Regional Unp. %	-	-	-0.0257	-1.274	-	-0.0852	-2.723
Job Characteristics							
Real Wage Income	-	-	0.0001	0.342	-	0.0005	2.201
Real Unearned Income	-	-	0.0001	1.153	-	0.0001	1.850
Contractual Hours	-	-	0.0495	10.931	-	0.0822	15.206
Union Member	3.44	66.99	-0.3020	-1.200	29.57	0.3445	1.877
Non-Union Member	4.99	70.56	-	-	24.45	-	-
Blue Collar	6.08	67.94	-0.5133	-2.352	25.99	0.2571	2.254
White Collar	3.07	69.77	-	-	27.16	-	-
Firm Size: 0 < N < 25	2.64	62.64	-	-	34.73	-	-
Firm Size: 25 < N < 100	2.90	68.18	-0.4020	-1.174	28.92	0.5003	2.206
Firm Size: 100 < N < 500	4.68	70.39	-0.3599	-1.187	24.92	0.5827	3.625
Firm Size: N > 500	5.10	74.35	-0.4176	-1.906	20.55	0.4035	2.895
Public Sector	4.12	71.71	-	-	24.17	-	-
Private Sector	4.41	67.36	-0.2897	-1.343	28.23	-0.4223	-1.984
Industry							
Agriculture	4.17	79.17	0.5028	0.895	16.67	-0.6437	-0.969
Energy	3.60	73.87	0.4170	1.895	22.52	-0.5158	-1.887
Metal Extraction	4.69	59.38	-0.4038	-1.854	35.94	0.4738	2.020
Engineering	2.27	59.95	-0.2675	-1.822	37.78	0.4036	2.591
Construction	3.49	66.86	-0.0543	-0.278	29.65	0.1334	0.635
Distribution	7.09	69.90	-0.2275	-1.923	23.01	0.1497	1.012
Transport/Communications	4.67	63.55	-0.0419	-0.240	31.78	-0.0361	-0.190
Other Manufacturing	3.52	68.04	-0.0184	-0.117	28.45	0.1355	0.800
Banking/Services	2.54	73.54	-	-	23.92	-	-

| Table I: Continued Multinomial Logit Analysis | | | | | | |
| | Under Employment | Utility Maximising Employment | | | Over Employment | | |
Variable	Sub Sample Rate X%	X%	Coef	T-Stat	X%	Coef	T-Stat
Attitudinal Variables							
Firm Well Managed	4.53	71.44	0.1780	1.8945	24.03	-0.3007	-2.6603
Firm Poorly Managed	3.44	58.82	-	-	37.73	-	-
Too Small Pay Gap	3.48	60.00	-0.4143	-1.926	36.52	0.4387	1.923
Too Large Pay-Gap	4.53	64.42	-0.2924	-3.528	31.05	0.3445	3.814
Acceptable Pay Gap	4.15	72.61	-	-	23.25	-	-
Good Industrial Relations	4.13	71.49	0.3120	2.827	24.38	-0.2688	-2.267
Poor Industrial Relations	5.18	57.84	-	-	36.99	-	-
Redundancy Expected	3.24	67.57	-0.5927	-4.188	29.19	-0.1983	-2.938
Redundancy Not Expected	4.37	69.09	-	-	26.54	-	-
Wage Cut Expected	4.54	65.78	0.1889	1.437	29.67	-0.0293	-0.214
Wage Cut Not Expected	4.14	71.53	-	-	24.33	-	-
Satisfactory Wage	4.52	67.11	0.2139	2.460	28.37	-0.2473	-2.598
Unsatisfactory Wage	5.17	63.48	-	-	31.34	-	-
Other Variables							
Constant	4.71	65.04	-0.9161	-2.6739	30.25	4.3561	7.1397
Sample Size	269	3717			1729		
Log Likelihood Restricted (Slopes =0) LL. Chi-Squared (46)	-	-4268.2 -4488.2 440.00					

Education

The relationship between education and absence has attracted considerable attention in the literature. The balance of evidence suggests an inverse relationship due to the positive relationship between attendance and good health and between good health and education (recall Section III.3).[28] Moreover, there is a high degree of correlation between education, occupational status and contractual flexibility. University graduates, for example, are mostly professionals, whilst unskilled manual workers usually have few, if any, qualifications.

Six categories of educational attainment are specified in the analysis ranging from 'no education' to degree. Although, there are some relatively large differentials across the three sub-samples, a significant difference *ceteris paribus* is only found for graduates who are relatively more likely to report UE. This accords with the findings of Coleman and Pencavel (1993a, 1993b) for the US which

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[28] Allen (1981a, 1981b) and Leigh (1986, 1991), for example, find an inverse relationship between education and absence.

suggest that work hours have risen over the past two decades in the US for both male and female college graduates.

Finally, the effects of unemployment are investigated through the inclusion of two variables: *Unemployment History* - a zero-one dummy indicating whether or not the respondent had been unemployed within the past five years; and *Regional Unemployment %* – the male/female unemployment rate within the twelve UK standard regions *viz.* East Anglia, East Midlands, London, North-East, North-West, Scotland, South-East, South-West, Wales, West Midlands, Northern Ireland, Yorkshire and Humberside (source: Employment Gazette). The results here suggest that the threat of unemployment and/or the memory of previous unemployment reduces the degree to which respondents deem themselves to be over-employed *ceteris paribus*, and thus may reduce the propensity of such individuals to absent.

IV.3b   Job Characteristics

Wages, Unearned Income and Hours

It was seen in Section II that the 'temptation' to absent is critically dependent on the divergence between the individual's marginal and economic rates of substitution. Income, both earned and unearned, was therefore included in the analysis.[29] Some summary statistics relating to these variables are presented in Table II below. There is a small, although statistically significant, positive correlation between real wage income and the probability of OE *ceteris paribus* whilst, in contrast to Allen (1981a), unearned income is significant and takes the expected positive sign in the over-employed regression. These findings should, however, be interpreted with caution. Unearned income is a difficult concept to measure and the definition incorporated is clearly deficient in some areas. Ideally

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[29] Unfortunately, the BSA survey does not contain questions relating to the sick pay arrangements prevailing at the work place.

one would like to have information on transfer payments and income from asset

holdings. [30]

Table II Summary Statistics						
Variable	Over Employment		Under Employment		Utility Max Employment	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
Real Wage Income	11421	6585.7	5762.8	4954.8	9012.4	6801.8
Real Unearned Income	5486.5	6429	5346.2	6488.1	5804.5	6655.4
Hours of Work	44.283	10.481	28.391	12.612	35.883	11.562

To allow for the length of the working week, contractual hours were included in

the regression analysis. In accordance with *a priori* expectations, these are seen to

reduce the relatively probability of under employment *ceteris paribus*.[31]

Union Status, Occupation, Firm Size, and Ownership

It is apparent from Table I that differentials in the sub-sample rates of OE, UE and

UME exist across trade union and non-trade union members. The sub-sample rate

of OE is higher and that of UE and UME lower amongst union as opposed to non-

union members. Moreover, the regression analysis suggests that union membership

impacts significantly positively on the relative probability of OE *ceteris paribus*.

This would accord with empirical findings that union workers do indeed exhibit a

relatively high propensity to absent – recall Section III.3.

It was also seen in Section III.3 that contractual arrangements play an

important role in the theory of absence. Accordingly, a dummy variable

representing blue-collar employment was incorporated into the empirical analysis.

Differentials in the sub-sample rates of OE, UE and UME are apparent across

blue- and white-collar employees, with the sub-sample rate of OE being, somewhat

surprisingly perhaps, higher amongst the latter, and the sub-sample rate of UE

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[30] The unearned income proxy was constructed by subtracting the individual's earnings from household income, defined in the BSA survey as the summation of income across all household members.

[31] Kahn and Lang (1991) find evidence, which suggests that workers who desire to work longer hours tend to work longer hours.

(UME) higher (lower) amongst the former. Controlling for other factors, the multinomial logit analysis suggests that blue-collar workers are relatively more (less) likely to report OE (UME) than their white-collar counterparts. This accords with empirical evidence that blue-collar employees are indeed more prone to absence than white-collar employees [see, for example, Kenyon and Dawkins (1989)].

There has been some debate in the literature as regards the relationship between firm size and absence. Employees in a large firm may, on the one hand, believe that absences can be relatively easily covered by other workers and, as such, will be relatively less subject to control. This is consistent with the results of a survey undertaken by Ashworth *et al* (1993) which suggests that small firms experience relatively low rates of absence since employees are aware of the difficulties generated by absence spells for both the firm and their non-absenting colleagues.[32] Similarly, evidence supporting the hypothesis that larger work places are characterised by relatively high rates of absence has been found by Winkler (1980), Allen (1981b), Leigh (1984) and Peel and Wilson (1991), Balchin and Wooden (1992)].[33]

On the other hand, there is evidence to suggest that more committed employees are attracted to large firms which, as a result, experience relatively less absence. Garen (1985), for example, finds a positive correlation between firm size and earnings and that individuals who choose to acquire more schooling – also correlated to low absence – are also more likely to enter a large firm. It is clear from Table I that the sub-sample rate of OE declines with firm size whilst those of UE and UME increase. The logit results are generally in accordance with these raw sub-samples with the relative probability of OE (UME) increasing (declining)

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[32] Applied psychologists such as Steers and Rhodes (1978, 1984) have argued that employees in large work places may feel more alienated, less satisfied and so more prone to absence or even quit behaviour.

[33] It should also be noted that the analysis in Chapter Three supports the contentions that absence rates increase with firm size.

with firm size *ceteris paribus*. One explanation for these findings may be that there is more interaction between employers and employees over contractual arrangements in a small firm.

Finally, a dummy variable denoting 'ownership' was incorporated into the analysis. This indicated that respondents employed within a private sector firm were significantly less likely to declare themselves OE *ceteris paribus*.

Industry

Allen (1981a) discusses the role industry dummies play in the determination of absence but finds that only one of his sixteen industrial classifications - durable manufacturing - appeared to exert any significant (to be sure, positive) effect on the rate of absence.[34]

Table I shows the sub-sample rate of OE to be more than twice that prevailing in the agricultural sector - the sector characterised by the lowest sub-sample rate. The logit analysis confirms the industrial specificity of OE incidence with individuals employed in the engineering sector significantly more likely to report OE *ceteris paribus*. One explanation for this could lie in recent moves towards shorter working hours. Over the 1980s, the engineering industry in the UK was involved in a prolonged dispute between employers and the engineering unions following the latter's claim for a reduction in the length of the working week [see Labour Research (1989, 1990) and McKinlay and McNulty (1992)]. One impetus behind this movement was the high amount of overtime working prevalent in the industry; cuts in the length of the working week were proposed as a stimulus to the employment of additional workers rather than utilising the existing work force more intensively.

The metal extraction industry dummy variable is characterised by a positive coefficient in the OE regression and a negative coefficient in the UME regression.

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[34] One explanation for this might lie in the fact that the durable manufacturing sector in the US is characterised by a highly unionised work force [Tigges and Tootle (1990)].

These results are indicative of dissatisfaction with the level of contractual hours, and thus potential absence behaviour, in this sector. The recent survey undertaken by the CBI (1994) confirms the prediction that the metal extraction sector does indeed experience a relatively high degree of absence. The figures for 1993 indicate the highest sectoral rate of sickness absence (5.1%) - more than twice that of the media and broadcasting sector, the sector with the lowest recorded rate (2.0%).[35]

The results also suggest that such dissatisfaction may prevail in the distribution sector since the logit results suggest that the incidence of UME is particularly low in this sector. This echoes the CBI's findings that this sector experienced the fourth highest rate of sickness absence (4.3%) in 1993 [CBI (1994)].

In contrast, the sub-sample rates of OE (UME) in the energy industry is relatively low (high). The regression analysis confirms this with the estimated coefficients being characterised by a relatively large negative (positive) coefficient in the OE (UME) regression, suggesting that employment in this sector lowers the potential to absent. One explanation for this may relate to recent substantial job losses in this sector. The number of individuals employed in the Electricity, Gas and Other Energy and Water Supply sector, for example, fell from 356,000 in 1981 to 265,000 in 1992 [*Employment Gazette* (1995)]. As seen in the following section, individuals who feel threatened by future job loss may be less likely to voice job dissatisfaction.

IV.3c   Attitudes

Finally use was made of the BSA survey questions regarding individual attitudes and attitudes.

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[35] Absence rates are defined here as sickness absence time as a percentage of total working time.

It can be seen that the sub-sample rate of OE (UME) is higher (lower) amongst individuals who believe that their work place is not well-managed. Some confirmation for this differential is obtained from the regression results which suggest that a perception that the firm is well managed reduces the probability of OE and increases that probability of UME *ceteris paribus*. Such results would suggest that the potential to absent is reduced if workers have confidence in the ability of management.

The sub-sample rates of OE, UE and UME are also related to individual's perceptions regarding the variance of pay within the firm. The sub-sample rate of OE (UME) amongst individuals who feel the pay gap to be too large (small) are higher (lower) than the rate for individuals who express satisfaction with the pay gap. The sub-sample rate of UE amongst individuals who believe that the pay gap is too small is lower than that of individuals who are satisfied with the prevailing pay gap, whilst the sub-sample rate of UE amongst individuals who believe that the pay gap is too large is higher than that of individuals who are satisfied with the prevailing pay gap. One explanation for this may lie in the fact that individuals who perceive the pay gap as being too small are likely to be in managerial positions with relatively high levels of educational attainment, whilst those who perceive it as too large are likely to be relatively less-skilled employees in non managerial positions who face the most insecurity in time of economic decline.

The logit results suggest that, *ceteris paribus*, dissatisfaction with the pay gap exerts a (relatively large) positive effect on the probability of being over-employed and a (moderate) negative effect on the probability of being satisfied with contractual hours. It would thus appear that an employee's satisfaction or otherwise with his employment conditions may impact significantly on the potential to absent.[36]

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[36] Rees (1993) has recently emphasised the important role played by the perceived 'fairness' in wage comparisons across, for example, individuals or unions in observed labour market behaviour.

The sub-sample rates of OE and UE (UME) are higher amongst individuals who believe that industrial relations at the workplace are poor (good). These findings are confirmed by the logit analysis with the estimated coefficients suggesting a significant negative effect on the probability of OE and a significant positive effect on the probability of UME. The results, therefore, imply that the impetus to absent (moon-light) from the work place is somewhat curbed if the worker is satisfied with the state of industrial relations at the workplace.[37]

The sub-sample rate of OE is higher amongst individuals who believe that they will be made redundant in the near future, whilst the sub-sample rates of UE and UME are lower amongst this group of individuals. It is apparent from the logit results that the prospect of involuntary redundancy exerts a significant negative (positive) effect on the probability of OE (UME). No such effect is seen for individuals who anticipate cuts in their real wage.

Finally, respondents expressing satisfaction with their current wage are seen to be significantly less likely to report OE and significantly more likely to report UME *ceteris paribus*. This would suggest that even the large array of control variables offered by the BSA survey is unable to fully account for all the aspects of contractual (dis)satisfaction.

IV.4   Final Remarks

This section has explored how the potential to absent differs across specific demographic and occupational sectors of the economy. The approach taken was to compare the characteristics of individuals who ideally would prefer to supply fewer hours of labour with those of individuals who, according to various empirical studies, are more prone to absence behaviour. The analysis is incomplete in being unable to say anything about whether or not the potential to absent is translated

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[37] It should be noted that any variable representing job satisfaction will be correlated with the existence of managerial innovations, such as flexi-time arrangements, which enhance flexibility in the work place.

into actual absence, or how firms might respond to curb such costly behaviour. The analysis does, however, emphasise the importance of contractual constraints and provides a coherent mandate for future work into this area.

V.   Theoretical Analysis

V.1   Introduction

This section concludes the chapter by developing a theoretical model of absence behaviour that incorporates both the demand and supply aspects of the employment relation. Moreover, it explicitly incorporates the notion of health-sickness into the individual worker's utility function. My aim is to complement existing work into the issue of absence behaviour which has tended to treat the phenomenon exclusively as a labour supply decision on the part of workers [Allen (1981), Barmby and Treble (1991), Barmby, Orme and Treble (1991), Dunn and Youngblood (1986)].

The model investigates absence behaviour when there is asymmetric information regarding worker health. An individual's health is assumed to be private information to that individual and only observable to a third party at cost. Workers are *ex ante* uncertain as to their state of health and supply labour on the basis of an 'all or nothing' utility maximising decision taken once a realisation of this state has been received. Utility is a function of income, leisure and health, and workers value leisure more the 'sicker' they are. A critical level of sickness is derived at which individuals are just indifferent between absence and non-absence. This critical level is seen to be a function of contractual characteristics *viz.* wages, sick pay, and contractual hours, and thus permits firms to control absence through the setting of an optimal contract.

The model is then extended to allow for a more realistic setting. Specifically, a distinction is made between 'acceptable' and 'unacceptable' absence, the latter being interpreted as a form of 'off-the-job' shirking on the part

of workers. This extension highlights an efficiency wage effect through the use of wages as a method of optimally controlling worker absence. In particular, the optimal response of the firm to an increase in the cost of monitoring absenters is to discourage shirking by raising wages.

Finally, the model is extended to allow for the effects of worker interdependency and its possible role in the generation of workplace absence.

V.2   The Basic Model

V.2a   Preferences

Individuals are homogenous utility maximisers and are endowed with a stock of time, T, which they allocate between work and leisure. Utility is an increasing function of consumption (i.e. income) and leisure and a decreasing function of sickness. It is further assumed that the marginal utility of leisure (income) is increasing (decreasing) in sickness.[38] Replacing consumption with money income yields the income equivalent utility function to equation (1):

$$U = U(m,l;\delta) \tag{11}$$

with $\partial U / \partial m > 0$, $\partial U / \partial l > 0$, $\partial U / \partial \delta < 0$, $\partial U^2 / \partial l \partial \delta > 0$ and $\partial U^2 / \partial m \partial \delta < 0$. m is money income, l is leisure and δ is an index of an individual's level of sickness. To be sure, δ is increasing in sickness and randomly uniformly distributed over the unit interval with individuals valuing non-market (i.e. leisure) time more as $\delta \rightarrow 1$.[39]

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[38] As mentioned previously, this latter assumption is not obvious. Individuals might, for example, be tempted to claim sickness and take absence when their health is good in order to enjoy leisure. However, in this model the implicit assumption is that leisure is used for the purpose of recuperation and/or that it becomes increasingly onerous to supply effort at higher levels of sickness. There is empirical support for the assumption that individuals do value leisure time relatively more as sickness increases [Viscusi and Evans (1990), Allen (1981)]. In a more general sense the issue highlights a weakness of the model in not distinguishing between leisure and recuperative time.

[39] δ is defined formally as a special case of the beta distribution $f(\delta) = [1/B(a,b)]\delta^{a-1}(1-\delta)^{b-1}$, where $B(a,b) = \int_0^1 \delta^{a-1}(1-\delta)^{b-1} d\delta$. and $a = b = 1$.

All workers have access to some reservation utility paying an amount $b > 0$ and requiring no sacrifice of time. The obvious interpretation is in terms of unemployment insurance. To attract workers, firms must write contracts offering at least this reservation utility and it is assumed that once an employment contract is signed the worker is not eligible for such utility until after the contract ends.

Employment contracts specify remuneration in return for a particular supply of effort. Considerations as to the intensity or quality of effort are ignored and for simplicity productivity is construed by mere attendance. There are no separation costs and firms are entitled to fire (costlessly) any worker not providing contracted labour hours. After the contract is signed, but before production commences, each worker realises his state of health and makes an *ex post* utility maximising decision as regards absence. There is no re-contracting and this decision depends on the options available to workers.

I assume initially that there is the *possibility* of one such option *viz.* sick pay, s, which firms *may* chose to offer as part of their compensation package. To ease tractability the following logarithmic representation of (11) is used:

$$U = (1 - \delta)\ln m + \delta \ln\left[(T - h^c) + zh^c\right]$$ (12)

where h^c represents contracted employment hours, $m = db + (1-d)[ps + (1-p)w]$ and $z = d + (1-d)p$. The dummy variables (d,p) indicate the employment and attendance status of a particular individual. d takes the value unity if the individual is unemployed and zero otherwise and p takes the value unity if the individual is employed but absent due to sickness and zero otherwise.

Equation (12) implies the following utilities for 'non-absence', 'absence', and 'unemployment' respectively:

$$U^{na} = (1 - \delta)\ln w + \delta \ln(T - h^c)$$ (13)

$$U^a = (1 - \delta)\ln s + \delta \ln T$$ (14)

$$U^u = (1 - \delta)\ln b + \delta \ln T \tag{15}$$

The assumptions regarding the relative utilities of absence and non-absence imply a critical or 'reservation' level of sickness, δ^*, at which workers will be indifferent between absence and non-absence. δ^* is determined implicitly through $U^{na}(\delta^*) = U^a(\delta^*)$ such that:

$$\delta^* \equiv \frac{\ln(w/s)}{\ln(w/s) + \ln[T/(T-h)]} \tag{16}$$

Given the shape of their preferences individuals will prefer absence (attendance) for all realisations of δ greater than (less than) δ^*. Figure V below illustrates the situation for $w > s > 0$.
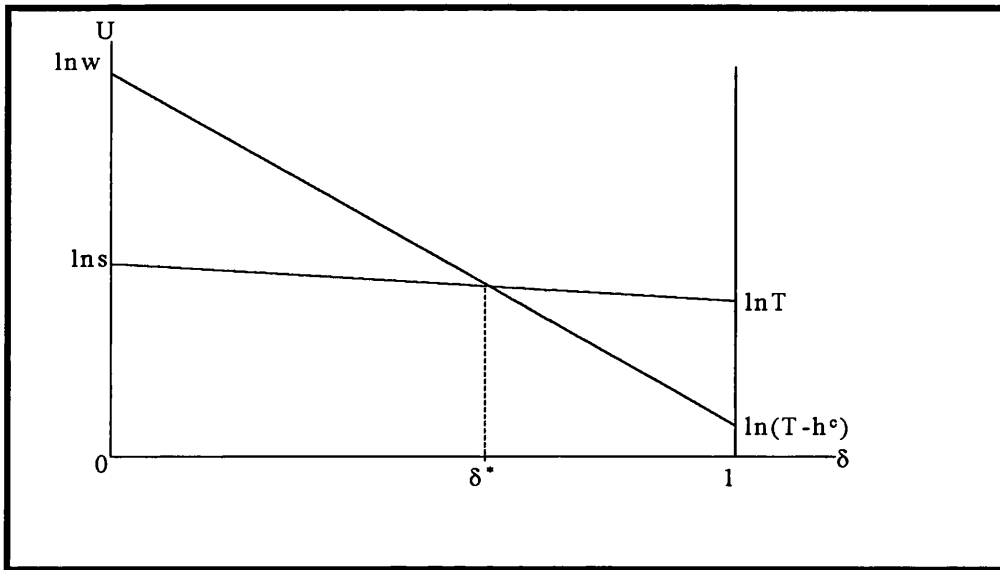
Figure V: The Reservation Level of Sickness

V.2b   The Optimal Contract

Given the nature of the reservation level of sickness it is apparent that the firm can control expected absence by the appropriate setting of wages, sick pay and contractual hours. To be sure:

$$\frac{\partial \delta^*}{\partial w} = \delta_w^* = \frac{\ln[T/(T-h^c)]}{w\{\ln(w/s) + \ln[T/(T-h^c)]\}^2} > 0 \tag{17}$$

$$\frac{\partial \delta^*}{\partial s} = \delta_s^* = -\frac{\ln\left[T/\left(T-h^c\right)\right]}{s\left\{\ln(w/s)+\ln\left[T/\left(T-h^c\right)\right]\right\}^2} < 0 \tag{18}$$

$$\frac{\partial \delta^*}{\partial h^c} = \delta_{h^c}^* = -\frac{\ln(w/s)}{\left(T-h^c\right)\left\{\ln(w/s)+\ln\left[T/\left(T-h^c\right)\right]\right\}^2} < 0 \tag{19}$$

That is, workers will be relatively less inclined to absent the higher (lower) the wage (sick pay) rate and the lower the contractual hours.

An interesting question thus arises as to the form of the *optimal* employment contract. *Ceteris paribus*, the firm would prefer not to offer sick pay, since any such compensation rewards workers for non-attendance – recall (18) above. Workers, however, are risk averse and would prefer to be fully insured against costly sickness.[40] Given the relative utilities of absence and non-absence, however, workers would never attend if $w = s$. The tension is illustrated in Figure VI below. The firm would like to offer no sick pay and thus maximise the expected level of attendance. The worker would prefer full insurance, but would then prefer absence to attendance always.
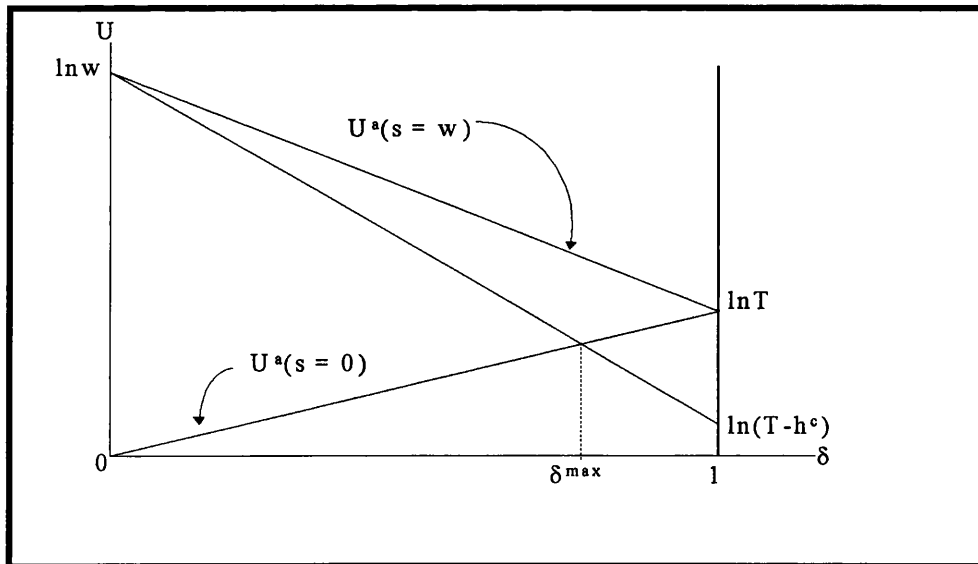
Figure VI: Full and Zero Insurance

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[40] The worker's desire for full insurance can be seen formally from solving $\max_{\{w,s\}} E\{U\}$ *s.t.* $E\{C\} \equiv \delta^* w + \left(1-\delta^*\right) = \overline{C}$.

The resolution of this dilemma can be examined formally though the solution to the following problem.

Assume for simplicity a single worker firm with expected revenue $f(\delta^*)$, $f'(\delta^*) > 0$, $f''(\delta^*) < 0$. Assuming contractual employment hours are exogenous, the firm's expected level of profit may be written:

$$\pi = f(\delta^*) - [\delta^* w + (1 - \delta^*)s] \qquad (20)$$

The first best contract for the firm is derived from the unfettered maximisation of (20). A second best contract ensues from the maximisation of (20) subject to the worker's reservation and participation constraints. The worker's reservation utility constraint ensures that the expected level of utility from accepting the contract is at least as great as the expected level of utility from not accepting the contract and may be written:

$$E\{U\} = \delta^* E\{U^{na}\} + (1 - \delta^*)E\{U^a\} \geq E\{U^u\} \qquad (21)$$

Intuitively, given the assumed uniform distribution of sickness, there is a δ^* $(1 - \delta^*)$ probability that the individual will not absent (absent). The expected utilities to non-absence and absence are defined by:

$$E\{U^{na}\} = [1 - E\{\delta|\delta < \delta^*\}]\ln w + E\{\delta|\delta < \delta^*\}\ln(T - h^c) \qquad (22)$$

$$E\{U^a\} = [1 - E\{\delta|\delta > \delta^*\}]\ln s + E\{\delta|\delta > \delta^*\}\ln T \qquad (23)$$

where:

$$E\{\delta|\delta < \delta^*\} = \int_0^{\delta^*} \frac{\delta}{(\delta^* - 0)}d\delta = \left[\frac{\delta^2}{2\delta^*}\right]_0^{\delta^*} = \frac{\delta^*}{2} \qquad (24)$$

$$E\{\delta|\delta > \delta^*\} = \int_{\delta^*}^1 \frac{\delta}{(1 - \delta^*)}d\delta = \left[\frac{\delta^2}{2(1 - \delta^*)}\right]_{\delta^*}^1 = \frac{1 + \delta^*}{2} \qquad (25)$$

Some straightforward, but tedious, manipulation yields:

$$E\{U\} = \frac{1}{2}\left[\delta^* \ln w + \left(1 - \delta^*\right)\ln s + \ln T\right]$$ (26)

$$E\{U^u\} = \frac{1}{2}\left[\ln b + \ln T\right]$$ (27)

Thus, the reservation constraint may be written:

$$\delta^* \ln w + \left(1 - \delta^*\right)\ln s \geq \ln b$$ (28)

A further constraint facing the firm follows from the definition of the reservation level of sickness. This implies that employed workers will only attend if sick pay is strictly less than the wage. The 'participation' constraint facing the firm is thus:

$$(w - s) > 0$$ (29)

The firm's problem is to maximise its expected level of profits subject to the constraints that potential employees are prepared to accept the offered employment contract, and that once employed they have a positive probability of attending. The constrained maximisation problem and subsequent Kuhn-Tucker conditions facing the firm are thus:

$$\max_{(w,s,\lambda_1,\lambda_2)} \Theta = f(\delta^*) - \left[\delta^* w + \left(1 - \delta^*\right)s\right] + \lambda_1\left[\delta^* \ln w + \left(1 - \delta^*\right)\ln s - \ln b\right] + \lambda_2(w - s)$$ (30)

$$\Theta_w = \delta_w^*\left[f'(\delta^*) - (w - s)\right] - \delta^* + \lambda_1\left[\delta_w^*(\ln w - \ln s) + \left(\frac{\delta^*}{w}\right)\right] + \lambda_2 \leq 0$$ (31)

$$\Theta_s = \delta_s^*\left[f'(\delta^*) - (w - s)\right] - \left(1 - \delta^*\right) + \lambda_1\left[\delta_s^*(\ln w - \ln s) + \left(\frac{1 - \delta^*}{s}\right)\right] - \lambda_2 \leq 0$$ (32)

$$\Theta_{\lambda_1} = \delta^* \ln w + \left(1 - \delta^*\right)\ln s - \ln b \geq 0$$ (33)

$$\Theta_{\lambda_2} = (w - s) \geq 0$$ (34)

with $w \geq 0$, $s \geq 0$, $\lambda_1 \geq 0$, $\lambda_2 \geq 0$, and complementary slackness conditions $\Theta_w w = 0$, $\Theta_s s = 0$, $\Theta_{\lambda_1}\lambda_1 = 0$, and $\Theta_{\lambda_2}\lambda_2 = 0$.

The definition of the reservation level of sickness, and the subsequent endogeneity of the probability of absence, renders a tractable solution to the above problem unfeasible. Some feeling for the nature of the optimal contract is, however, still possible. First, if w is assumed to be strictly positive in the optimal solution then (31) will be satisfied as an equality. Moreover, unless the worker has some bargaining power the firm will not pay more than it has to such that the reservation constraint (33) will be satisfied at the optimum as an equality. Finally, the participation constraint (34) must be strictly positive at the optimum such that $\lambda_2 = 0$.

Under these conditions it is straightforward to show that the firm will offer sick pay as part of its optimal contract, despite the detrimental effect on worker attendance this will induce. Denote the solution to (30) as $\left(w^*, s^*; \lambda_1\right)$ where w^* is strictly positive and s^* is strictly non-negative. From the envelope theorem, the firm can pertubate w and s at this optimum and maintain the reservation constraint providing:

$$\left(\delta^*/w^*\right)dw + \left[\left(1 - \delta^*\right)/s^*\right]ds = 0 \tag{35}$$

Thus the firm can cut the wage by one unit without contravening the reservation utility constraint provided it raises sick pay by:

$$ds = \left[\frac{\delta^*}{\left(1 - \delta^*\right)}\right]\left(\frac{s^*}{w^*}\right) > 0 \tag{36}$$

However, cutting wages by one unit and raising sick pay by this amount allows the firm to raise its profits by:

$$d\pi = \delta^* - \left(1 - \delta^*\right)ds = \delta^* - \left(1 - \delta^*\right)\left[\frac{\delta^*}{\left(1 - \delta^*\right)}\right]\left(\frac{s^*}{w^*}\right) = \delta^*\left(\frac{w^* - s^*}{w^*}\right) > 0 \tag{37}$$

Thus the optimum contract must offer strictly positive sick pay. Essentially the firm is providing insurance for risk averse workers by providing insurance for them

should they fall ill and absent; and workers are prepared to pay for this insurance by accepting lower remuneration when they attend.[41]

It follows then that $s > 0$ such that (32) is satisfied as an equality. Finally, we can use (31) to solve explicitly for the Lagrange multiplier λ_1 :

$$\lambda_1\left[\delta_w^*\left(\ln w^* - \ln s^*\right) + \left(\frac{\delta^*}{w^*}\right)\right] = \delta^* - \delta_w^*\left[f'\left(\delta^*\right) - \left(w^* - s^*\right)\right] \tag{38}$$

Given the definition of the reservation level sickness, it can be shown that $\delta_w^* w + \delta_s^* s = 0$. Thus:

$$\lambda_1\left[\delta_w^*\left(\ln w^* - \ln s^*\right) + \left(\frac{\delta^*}{w^*}\right)\right] = \delta^* + \left(\frac{s^*}{w^*}\right)\delta_s^*\left[f'\left(\delta^*\right) - \left(w^* - s^*\right)\right] \tag{39}$$

But from (32):

$$\delta_s^*\left[f'\left(\delta^*\right) - \left(w^* - s^*\right)\right] = \left(1 - \delta^*\right) - \lambda_1\left[\delta_s^*\left(\ln w^* - \ln s^*\right) + \left(\frac{1 - \delta^*}{s^*}\right)\right] \tag{40}$$

Some rearrangement implies:

$$\delta^* w^* + \left(1 - \delta^*\right)s^* = \lambda_1\left[\left(\delta_w^* w^* + \delta_s^* s^*\right)\left(\ln w^* - \ln s^*\right) + 1\right] \tag{41}$$

Now $\delta_w^* w + \delta_s^* s = \delta_w^* w - \delta_w^*\left(w/s\right)s = 0$ such that:

$$\lambda_1 = -\frac{\partial \pi^*}{\partial b} \cdot b = \delta^* w^* + \left(1 - \delta^*\right)s^* \tag{42}$$

where $\pi^* = \pi\left(w^*, s^*\right)$ denotes the optimal level of (constrained) firm profit. The optimal contract is thus described collectively by:

$$\left(w^* - s^*\right) > 0 \tag{43}$$

$$\delta^* \ln w^* + \left(1 - \delta^*\right)\ln s^* = \ln b \tag{44}$$

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[41] There is a slight circularity issue with this proof. The logarithmic utility function – employed for expositional clarity – is undefined if $s = 0$. The same intuition, however, holds for all functional forms whereby the individual is relatively more risk averse than the firm. A more general proof is presented in the Appendix.

$$\frac{\partial \pi^*}{\partial b} = -\frac{\left[\delta^* w^* + \left(1 - \delta^*\right)s^*\right]}{b} \tag{45}$$

V.3   Absence and Efficiency Wages

I now extend this simple set up to investigate the possible effiemncy wage implications of absence. Specifically, I analyse a situation where voirkers may choose to absent themselves from work with what the firm deefis to be an unacceptable level of sickness. Such 'shirking' is potentially costly anid the firm may chose to discourage such behaviour by optimally setting a rdatively high 'efficiency wage'.

To simplify the exposition I assume that sick pay is set exogenioulsy with firms being required to pay $s > 0$ to all employees for whom $\delta \geq \delta^z$, wlhere δ^z is some exogenoulsy determined level of sickness. Workers will, hovever, prefer absence for all $\delta \geq \delta^*$ and, given the asymmetry of information, will have an incentive to overstate their true sickness for all $\delta \in \left[\delta^*, \delta^z\right]$. Suct shirking is potentially costly to firms and may incite them to monitor absenters. I envisage a monitoring technology in which a firm is able to purchase for some average cost k a probability, $\alpha < 1$, of determining each absenter's true state of health. To ease the exposition of what follows further, I assume that k is always sufficiently small for the firm to chose to monitor.

The possibility of dismissal alters individual behaviour as follows. Given that individuals form their reservation level of sickness before their health status is revealed to them, they will be unsure as to whether their actual level of sickness will exceed or fall short of the minimum acceptable level of sickness. Thus their reservation level of sickness is determined through the equation of the expected utilities of attending and non-attending:

$$U^{na}\left(\delta^*\right) = \delta^z\left[\alpha U^u\left(\delta^*\right) + \left(1 - \alpha\right)U^a\left(\delta^*\right)\right] + \left(1 - \delta^z\right)U^a\left(\delta^*\right) \tag{46}$$

Assuming, for simplicity, linear preferences *viz*:

$$U = (1-\delta)m + \delta[(T-h^c) + zh^c]$$
(47)

Implies:

$$\delta^* = \frac{w - \beta^z}{w - \beta^z + h^c}$$
(48)

Where:

$$\beta^z = \delta^z \beta + (1 - \delta^z)s$$
(49)

$$\beta = \alpha b + (1 - \alpha)s$$
(50)

Since the reservation level of sickness is a function of the minimum acceptable level of sickness, $\delta^* = \delta^*(\delta^z; w, s, h^c)$, it is possible, though not particularly illuminating, to solve an equation of the form $\hat{\delta}^z = \delta^*(\hat{\delta}^z; w, s, h^c)$ in terms of some critical level of acceptable sickness, $\hat{\delta}^z$ - i.e. the level of acceptable sickness that accords with the worker's reservation level of sickness. The key implication is, however, clear from the following limits:

$$\lim_{\delta^z \to 0} \delta^* = \frac{w - s}{w - s + h} > 0$$
(51)

$$\lim_{\delta^z \to 1} \delta^* = \frac{w - \beta}{w - \beta + h^c} < 1$$
(52)

Thus the individual's reservation level of sickness may exceed or fall short of the minimum acceptable level of sickness as δ^z itself falls short or exceeds $\hat{\delta}^z$. Thus the setting of δ^z is critical - too high and individuals will be tempted to shirk, too low and they may choose to attend work when their health suggests they should absent.

It has long been recognised within the medical literature that individuals may choose to attend work when employers would prefer them to stay away. In an early study of the introduction of a paid scheme of sick leave, Buzzard and Shaw (1952) noted:

> The introduction of any sick pay scheme ... will enable many people to be
> absent who ought to have been absent before. Many executive officials stressed
> this aspect to us, and commented on the number of cases before the scheme
> where men came to work who ought to have stayed at home. [Buzzard and
> Shaw (1952), p. 293]

A similar notion is apparent within the economics literature. In the theoretical

model of Kahana and Weiss (1992), for example, daily paid workers employed by

a profit maximising firm will, under some circumstances, work when it is in the

firm's interests that the workers absent. In the context of their proposed two-

worker model, workers are only paid when they attend work whilst their marginal

products are inter-dependent and enhanced when the attendance overlap is

minimised. Since individuals are only paid for attendance and since prior to the

formulation of their work attendance decision they are not aware as to whether or

not their colleague is sick, attendance is sub-optimally in excess of the pareto

optimal level.

Similarly, Kenyon and Dawkins (1987) argue that individuals may reduce

recovery time from illness below socially optimal levels as a response to economic

incentives. This may result in a reduction of the productivity at the work place by,

for example, spreading illnesses such as flue throughout the work force. Doherty

(1979) quotes from Morgan and Martin (1975):

> The most important reason determining how soon a person who has been sick
> returned to work was thought by all samples to be the drop in income during
> illness, followed by the fear of losing one's job and boredom at home. [Morgan
> and Martin (1975), p. 7].

Fenn (1981) finds similar evidence which supports the claim that the duration of

sickness in the UK is influenced by economic factors.

For simplicity, it is assumed in what follows that $\delta^z \in \left[\delta^s, 1\right]$ such that the

relationship between δ^* and the various critical sickness values may be illustrated

as follows:[42]

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[42] Although this assumption is made primarily to simplify the exposition of the model some
rationale can be given by supposing that firms prefer 'very' sick workers not to work in order to
minimise the danger of costly epidemics or accidents.
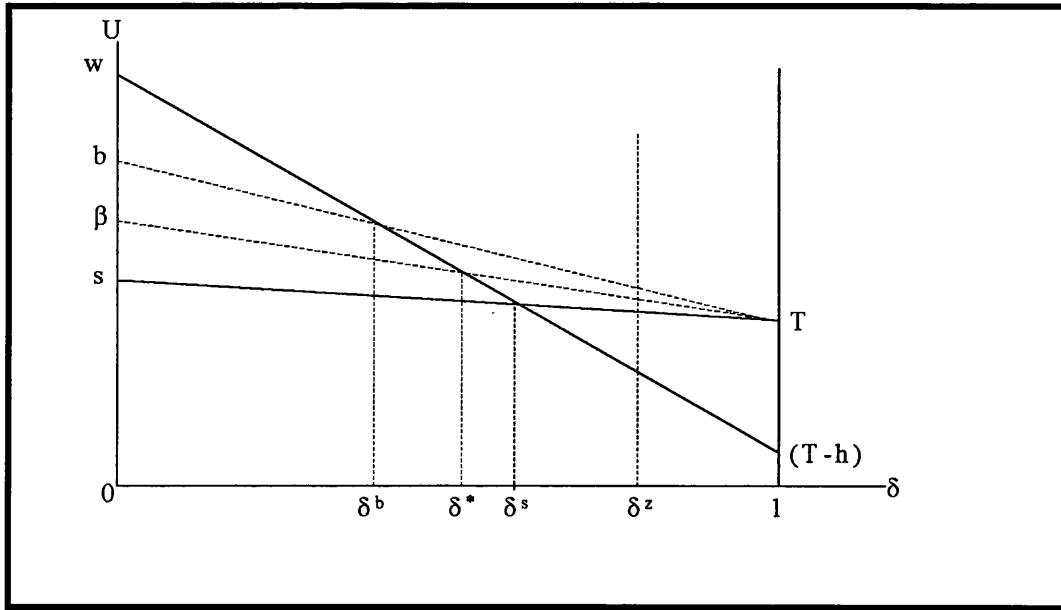
Figure VII: Absenteeism and Shirking

The firm's problem is to maximise expected profits given the temptation of workers to shirk. I assume for simplicity that the firm has an expected revenue function of the form $E\{R(n)\} = g(n)$, with partial derivatives $g_n > 0$ and $g_{nn} < 0$. n denotes the number of employees who attend such that $E\{n\} = \delta^* \bar{n}$, where $\bar{n}$ denotes the number of contracts offered by the firm. Since $\delta^* = \delta(w; \beta^z, h^c)$ the firm's profit maximising programme is to chose the wage rate and the number of employment contracts to solve the problem:

$$\max_{\{w,\bar{n}\}} E\{\pi(w,\bar{n})\} = g(n) - \left[\delta^* w + (1 - \delta^*)k + (1 - \delta^z)s - (1 - \alpha)(\delta^z - \delta^*)s\right]\bar{n} \qquad (53)$$

The firm's costs are as follows: The first term in the bracketed expression represents the firm's expected wage bill; the second and third term represent the total expenditure on monitoring absenters, $(1 - \delta^*)\bar{n}k$, the total expected 'valid' sick pay bill, $(1 - \delta^z)\bar{n}s$, and the amount of sick pay the firm can expect to pay to those workers it fails to detect as shirking, $(1 - \alpha)(\delta^z - \delta^*)\bar{n}s$.

The solution to (53) yields the two first-order conditions:

$$\frac{\partial E\{\pi\}}{\partial w} = g_n \delta_w^* \bar{n} - \{\delta_w^*[w - k - (1 - \alpha)s] - \delta^*\}\bar{n} = 0 \qquad (54)$$

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$$\frac{\partial E\{\pi\}}{\partial n} = g_n \delta^* - C = 0 \tag{55}$$

where $C = \delta^* w + (1 - \delta^*)(k + s) - \alpha(\delta^z - \delta^*)$. Taken together, (54) and (55) imply the following equations defining the equilibrium wage rate and number of employment contracts:

$$g_n - w - \left(\frac{1}{\delta^*}\right)\left[(1 - \delta^*)k + (1 - \delta^x)s\right] = 0 \tag{56}$$

$$\Theta(w, k) = (\delta^*)^2 - \delta_w^* \left[s(1 - \alpha\delta^z) + k\right] = 0 \tag{57}$$

where $\delta^x = \alpha\delta^z + (1 - \alpha)\delta^*$. Total differentiation of (56) and (57) above imply the following relationships:

$$\frac{\partial w}{\partial k} = \frac{\delta_w^*}{\theta} > 0 \tag{58}$$

$$\frac{\partial w}{\partial \alpha} = \frac{1}{\theta}\left\{-(\delta_\alpha^*)^2 + \delta_{w\alpha}^*\left[s(1 - \alpha\delta^z) + k\right] - \delta_w^* \delta^z s\right\} < 0 \tag{59}$$

$$\frac{\partial w}{\partial s} = \frac{1}{\theta}\left\{-(\delta_s^*)^2 + \delta_{ws}^*\left[s(1 - \alpha\delta^z) + k\right] + \delta_w^*(1 - \alpha\delta^z)\right\} > 0 \tag{60}$$

$$\frac{\partial w}{\partial \delta^z} = \frac{1}{\theta}\left\{-(\delta_{\delta^z}^*)^2 + \delta_{w\delta^z}^*\left[s(1 - \alpha\delta^z) + k\right] - \delta_w^* \alpha s\right\} < 0 \tag{61}$$

$$\frac{\partial w}{\partial b} = \frac{1}{\theta}\left\{-(\delta_b^*)^2 + \delta_{wb}^*\left[s(1 - \alpha\delta^z) + k\right]\right\} > 0 \tag{62}$$

$$\frac{\partial w}{\partial h^c} = \frac{1}{\theta}\left\{-(\delta_{h^c}^*)^2 + \delta_{wh^c}^*\left[s(1 - \alpha\delta^z) + k\right]\right\} \gtrless 0 \tag{63}$$

where:

$$\theta = (\delta_w^*)^2 + \delta_{ww}^*\left[s(1 - \alpha\delta^z) + k\right] > 0 \tag{64}$$

$$\delta_w^* = \frac{h^c}{(w - \beta^z + h^c)^2} > 0 \tag{65}$$

$$\delta_\alpha^* = \frac{\delta^z(s - b)h^c}{(w - \beta^z + h^c)^2} > 0 \tag{66}$$

$$\delta^*_s = -\frac{(1-\alpha\delta^z)h^c}{(w-\beta^z+h^c)^2} < 0 \tag{67}$$

$$\delta^*_{\delta^z} = \frac{\alpha h^c(s-b)}{(w-\beta^z+h^c)^2} > 0 \tag{68}$$

$$\delta^*_b = -\frac{\alpha\delta^z h^c}{(w-\beta^z+h^c)^2} < 0 \tag{69}$$

$$\delta^*_{h^c} = -\frac{(w-\beta^z)}{(w-\beta^z+h^c)^2} < 0 \tag{70}$$

$$\delta^*_{ww} = -\frac{2h^c}{(w-\beta^z+h^c)^3} < 0 \tag{71}$$

$$\delta^*_{w\alpha} = -\frac{2\delta^z(s-b)h^c}{(w-\beta^z+h^c)^3} < 0 \tag{72}$$

$$\delta^*_{ws} = \frac{2(1-\alpha\delta^z)h^c}{(w-\beta^z+h^c)^3} > 0 \tag{73}$$

$$\delta^*_{w\delta^z} = -\frac{2\alpha(s-b)h^c}{(w-\beta^z+h^c)^3} < 0 \tag{74}$$

$$\delta^*_{wb} = \frac{2\alpha\delta^z h^c}{(w-\beta^z+h^c)^3} > 0 \tag{75}$$

$$\delta^*_{wh} = \frac{(w-\beta^z-h^c)}{(w-\beta^z+h^c)^3} \gtrless 0 \tag{76}$$

Equations (58) - (63) illustrate the firm's optimal wage policy. Increases in the cost of monitoring (assuming that monitoring remains the efficient option), or in the levels of unemployment insurance or sick pay induce an increase in the firm's optimal wage. Improvements in the efficacy of detection or in the minimum acceptable level of sickness lead to a fall in the firm's optimal wage. It is impossible to ascertain the response of the firm's optimal wage to an increase in the level of contractual hours.

V.4   Interim Remarks

The preceding model defines a relationship between absenteeism and 'shirking' with interaction between workers and firms in defining an optimal level of absence, and therefore shirking, for the firm. This idea of firms permitting an 'optimal' amount of shirking has been noted in a related model by Carlin (1989).

The analysis also highlights an interesting efficiency wage effect with the firm optimally responding to an increase in the cost of monitoring or in the level of the worker's outside option by raising wages relative to sick pay in order to discourage shirking. This finding parallels the result in Coles and Treble (1993) where different production technologies generate different costs of absence. Firms operating assembly lines have, *ceteris paribus*, higher costs of absence and therefore pay higher wages relative to sick pay to discourage worker absence. The preceding analysis complements these results by introducing monitoring costs explicitly into the firm's decision.

V.5   Worker Interdependency

The analysis so far has said nothing about the idea of worker interdependency and its possible role in the generation of workplace absenteeism. The following extension adheres to the basic model set up in the previous section although to ease tractability I ignore issues shirking by assuming that sick pay is payable to all workers irrespective of their level of sickness (i.e. $\delta^z = 0$).

The key assumption is that production within a firm is assumed to necessitate the employment of two individuals whose work is interdependent in the sense that absence by one of them imposes some cost on the other modelled, for simplicity, as additional contractual hours, e. This will have the effect of changing the utility each worker attaches to his work option. This is now stochastic with expected value:

$$\mathrm{E}\{U_1^{na}\} = (1 - \delta_1)w + \delta_1[T - h^c - (1 - \delta_2^*)e] \tag{77}$$

$$E\{U_2^{na}\} = (1 - \delta_2)w + \delta_1 [T - h^c - (1 - \delta_1^*)e] \qquad (78)$$

The expected utility of absence is defined as in the previous section *viz*:

$$E\{U_i^a\} = (1 - \delta_i)s + \delta_i T \qquad (79)$$

where δ_i^*, $i = 1, 2$, represents the reservation sickness level of each individual. It is apparent that in computing their δ_i^* each individual will be comparing a certain option against an uncertain one, thereby defining the following two reaction functions:

$$\delta_1^* = \frac{w - s}{w - s + h^c + (1 - \delta_2^*)e} \qquad (80)$$

$$\delta_2^* = \frac{w - s}{w - s + h^c + (1 - \delta_1^*)e} \qquad (81)$$

It is apparent that the notion of worker interdependency introduced into the model has increased the probability of absence:

$$\delta_i^* = \frac{w - s}{w - s + h^c + (1 - \delta_j^*)e} \leq \frac{w - s}{w - s + h^c} = \delta^* \qquad (82)$$

Essentially, an individual's attendance decision is now taken under uncertainty - he knows the wage rate and other characteristics of the employment contract with certainty but does not know for sure whether his co-worker will attend, and therefore, whether or not he will be called upon to deliver an additional amount of effort equivalent to *e* hours. The situation is illustrated graphically in Figure VIII below.
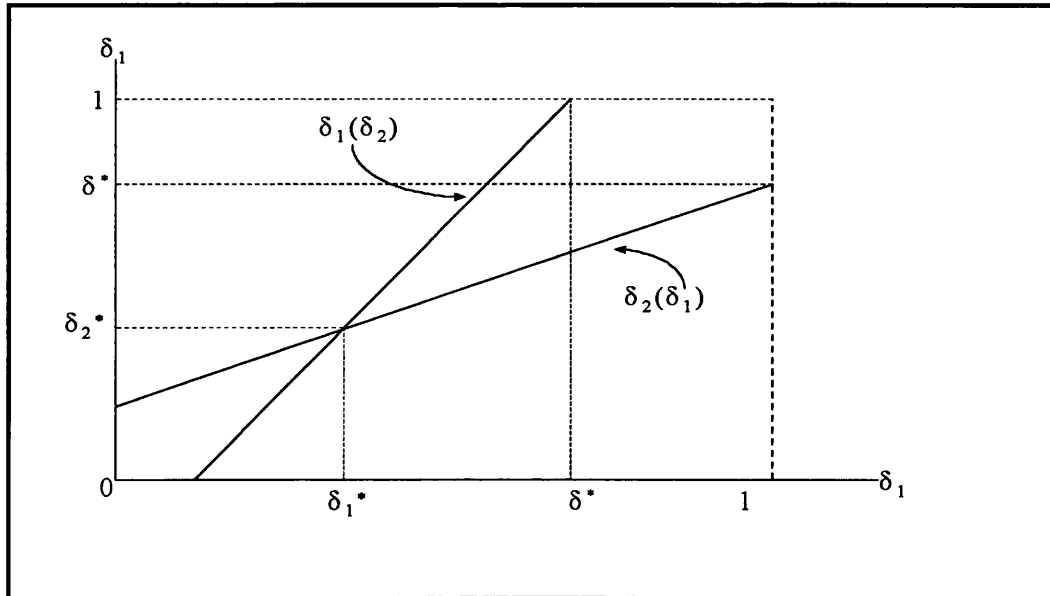
Figure VIII: Interdependency and Absence

The influence of interdependency in the model can be seen most clearly by writing individual one's reservation sickness level in the form:

$$\delta_1^* = f\left[w, s, h, e; \delta_2^*()\right]$$ (83)

Differentiating (69), for example, with respect to the wage, yields:

$$\frac{d\delta_1^*}{dw} = \frac{\partial \delta_1^*}{\partial w} + \frac{\partial \delta_1^*}{\partial \delta_1^*} \cdot \frac{d\delta_2^*}{dw}$$ (84)

Thus the effects of an increase in wages on the level of absence is felt through two routes: First, there is direct effect whereby an individual improves his attendance in response to the higher reward to working; and second, there is an indirect effect which operates *via* the increased attendance of the individual's co-worker which reduces the expected cost of attendance. Such an idea is very much in keeping with the analysis of Coles and Treble (1992) who identify the incentives of firms to pay higher wages and lower sick pay when there is a 'team' work in order to discourage shirking.

V.6   Final Remarks

This section has developed a theoretical model of absence behaviour that incorporates both the demand and supply aspects of the employment relation Moreover, the notion of health-sickness is incorporated explicitly into the individual worker's utility function. Provided workers were relatively more risk averse than firms, an optimal contract was characterised as one that offered positive sick pay, despite the detrimental effect on expected attendance.

The model was used to investigate the absence behaviour of workers when the state of their health is private information and only observable to a third party at cost. It was shown here that the firm might choose to control unacceptable absence (*viz.* shirking) by offering relatively high wages. An extension of the model was also used to analyse the effects of worker interdependency and absence.

The aim of the analysis throughout the section was to complement the existing, largely empirical, literature on absence, which has tended to treat the phenomenon exclusively as a labour supply decision on the part of workers. It is also hoped that the model will offer a framework for future empirical studies into absence.

VI.   Conclusion

Economics has been somewhat laggard relative to the other social sciences in confronting the issue of worker absence. This is surprising given both its associated costs and pertinence to the employment relation. In a given survey week in 1994, more than 5 per cent of all British employees were estimated to be absent on account of sickness [Regional Trends (1994). Given the total number of employees in employment in 1994 of 21.5 million, this would imply that more than one million workers reported absence *for at least one day* during the year, a figure which contrasts sharply with the 0.65 million working days lost in 1994 as a result of industrial action [Employment Gazette (1994)]. The situation is, however,

changing and recent years have witnessed a mild flurry of activity on the part of economists in attempting to understand this most pervasive of worker behaviours. This chapter contributes both theoretically and empirically to this growing body of work .

The chapter is broadly divided into three parts: The first part reviews and offers some perspective to existing studies of absence. There are two key findings here: First, the majority of existing work has been predominately empirical. This has proved to be somewhat unsatisfactory, with the lack of rigorous theoretical underpinnings confounding the interpretation of many results. Second, the theoretical work that does exist has tended to neglect demand side issues, modelling absenteeism generally in terms of an optimal labour supply response on the part of workers to exogenous contractual obligations. Such an approach is clearly at odds with conventional economic theory, in which the interaction of demand and supply plays a central role in determining market allocations, and the exclusion is all the more surprising given the emphasis that has recently been placed on contract design in other areas of labour economics.

The second part of the chapter explores empirically how the *potential* to absent differs across specific demographic, occupational and regional sub-samples of the British economy. The results here suggest that labour supply constraints are not insignificant and that, in some instances, the type of individual they most affect can be ascertained. This is important because supply constraints that lead to a divergence between contractual and desired work hours may, in the case of a positive divergence (i.e. over-employment), lead workers to effectuate their antipathy through absence. The analysis is, however, unable to say anything about how firms are likely to respond to this threat. A more complete examination of such issues would require highly detailed firm *and* personal data. This is beyond the scope of the present study but is perhaps the direction that future research should be heading.

The final part of the chapter attempts to rectify some of the shortcomings in existing theoretical work by setting out a simple model of worker absence that incorporates the interactive nature of the employment relation whilst focusing explicitly on the role of worker health in the labour-leisure trade-off. The model is used to investigate absence behaviour when there is an asymmetry of information regarding worker health. This is assumed to be private information to that worker and only observable to a third party at cost. Workers are *ex ante* uncertain as to their state of health and supply labour on the basis of an 'all or nothing' utility maximising decision taken once a realisation of this state has been received. Utility is a function of income, leisure and health, and workers are assumed to value leisure more the 'sicker' they are. It is shown here that, under certain reasonable conditions, an optimal contract implies the provision of firm financed sick pay. The model is then extended to consider the temptation of workers to misrepresent their true state of health. Specifically, a minimum acceptable level of sickness is envisaged with firms presumed to monitor absenters and to dismiss those it detects as having 'shirked'. The extension highlights an efficiency wage effect through the use of wages as a method of optimally controlling worker absence. Finally, the model is extended to allow for a more realistic setting in which there is some interdependency between workers.

VII.   Appendix

I present below a more general proof of the optimality of firm financed sick pay. Assume the following utilities of non-absence, absence and unemployment' respectively:

$$U^{na} = (1-\delta)v(w) + \delta(T - h^c) \tag{A1}$$

$$U^a = (1-\delta)v(s) + \delta T \tag{A2}$$

$$U^u = (1-\delta)v(b) + \delta T \tag{A3}$$

where $v(0) = 0, v'(\ ) > 0, v''(\ ) < 0$.

The assumptions regarding the relative utilities imply the following values for the reservation level of sickness and reservation utility constraint:

$$\delta^* \equiv \frac{v(w) - v(s)}{v(w) - v(s) + h^c} \tag{A4}$$

$$\delta^* v(w) + (1-\delta^*)v(s) = v(b) \tag{A5}$$

Assume again an optimal contract in which $w > 0$ and $s = 0$. The firm can pertubate w and s at this optimum without contravening the reservation utility constraint providing:

$$\delta^* v'(w)dw + (1-\delta^*)v'(s)ds = 0 \tag{A6}$$

Thus the firm can cut the wage by one unit and maintain the reservation utility constraint at the optimum provided it raises sick pay by:

$$ds = \left[\frac{\delta^*}{(1-\delta^*)}\right]\frac{v'(w)}{v'(s)} > 0 \tag{A7}$$

However, cutting wages by one unit and raising sick pay by this amount changes profit by:

A further three dummy variables (Asian, African and White) were incorporated into the analysis to represent ethnic origin. Once again there have been mixed results reported in the existing literature on absence behaviour concerning the implications of ethnic origin. Allen (1981a) and Leigh (1991), for example, both include a non-white dummy in their empirical specifications which proves to be an insignificant explanatory variable for absence behaviour. In a later analysis, Allen (1984), however, obtains results which suggest that absence rates are higher among non-whites, contradicting his earlier results. It would appear from the current analysis that ideally one should make a distinction between Asian and African individuals rather than simply classifying such culturally diverse groups as 'non-white'.

It is clear from the sub-sample rates that the incidence of OE (UE) amongst respondents of an African origin is higher (lower) than that of respondents of both other ethnic backgrounds. Relative to Whites, however, it is only respondents of an Asian origin who are characterised by a significantly higher (lower) probability of being UE (OE) *ceteris paribus*. Thus, being of African origin does not appear to influence the differential probability of being in any of the three states relative to Whites implying that the differential across the sub-sample rates for Africans and Whites can be accounted for by other factors.

Education

The implications of education for absence behaviour have attracted some attention in the literature with the empirical evidence suggesting an inverse relationship between absence and education due to the perceived positive association between absence and good health and good health and education (recall Section III.3).[34] A further dimension to the relationship between absence behaviour and education exists, however, if one acknowledges the high degree of correlation which exists between educational attainment and occupational status. University graduates, for

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[34] Allen (1981a, 1981b) and Leigh (1986, 1991), for example, obtain results which suggest that education is inversely related to absenteeism.

Chapter Three

Absence and Profit Sharing[1]

I.   Introduction

Worker absenteeism constitutes a significant loss of work-time and therefore has important implications for both household income and firm productivity. In France more than 4.5 percent of the total available working days in 1986 were lost as a result of absence [Fourrier (1989)] whilst empirical evidence from Doherty (1979) suggests that the number of working days lost in the UK as a result of absence over the 1970's was at least as great as the number lost as a result of unemployment.[2] Similar evidence for Canada and the United States is presented by Akyeampong (1988) and Dunn and Youngblood (1986) respectively, the latter of whom shows that in the late 1970's approximately 5 million working days per month were being lost as a result of worker absenteeism.

This chapter focuses on a mechanism through which firms may be able to reduce costly absence. Economists have for a long time been interested in employee sharing as a potential method of increasing morale, motivation and job satisfaction. This, predominately micro-oriented, interest was revitalised in the 1980s through the work of Weitzman (1983, 1984, 1985) which outlined extensive macroeconomic benefits of economy-wide profit sharing. Weitzman's thesis is somewhat difficult to prove empirically, essentially because no economy has adopted profit sharing to anything approaching the extent that a rigorous test would require. Economists have therefore confined themselves with testing the microeconomic incentives of profit sharing, concentrating in particular on the

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[1] Some of the material in this chapter is presented in Brown, Fakhfakh and Sessions (1997).

[2] Indeed, in the year of the last UK miner's strike 27 million working days were lost as a result of strike activity, a figure which pales by comparison with the 375 million working days lost on average as a result of absence over the 1980's [*Economic Trends*].

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effects on enterprise productivity and profitability [Cable and Wilson [1990),
Wadhwani and Wall [1990)] and on employee morale and motivation [Bell and
Hanson (1984), Blanchflower and Oswald (1988)].

A significant contribution in this vein is the analysis of Wilson and Peel
(1991) which suggests that UK firms adopting sharing schemes experience below
average absence and quit rates. Although Wilson and Peel's study yields some
interesting and important insights into the potential benefits of employee sharing, it
is nethertheless compromised by the industrial specificity of their data which
focuses exclusively on engineering firms. Employment in this sector is almost
entirely blue collar and the employment contracts of such employees are generally
far more rigid than those of their white-collar counterparts. This is important since
the definition of absence depends crucially upon the specification of work hours
within the employment contract. If the employee is free to supply his/her desired
hours then the issue of absence does not arise. More generally, the less rigidly
defined are work hours the more difficult it is to define absence and the relatively
strong results of Wilson and Peel may be attributable to the relative ease of
defining absence in this sector.

This chapter presents the first cross-plant/time series study of the effects of
profit sharing and employee share ownership plans (ESOPs) on the propensity to
absent.[3] My data are derived from a panel of French firms drawn over the period
1981-1991 from the following industrial sectors: Engineering and Capital Goods,
Agriculture, Energy, Intermediate Goods, Motor Vehicles, Telecommunications,
Transport; and Services.[4]

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[3] Prior to this study the only cross-plant/time series investigation into absence was that by
Markham and McKee (1991) which focused on the relationship between unemployment,
organisation size and absence, both within and between seventeen plants over a five-year period.
Markham and McKee's data were drawn from the organisational records of a single textile
manufacture and indicated a positive (negative) relationship between changes in firm size (local
unemployment) and absence.

[4] Sharing arrangements in France are a relatively recent phenomenon, with profit sharing and
employee share ownership plans only receiving official recognition in 1959 and 1970
respectively. They have, however, proven to be extremely popular. By 1986 (1990) over 0.6 (2.0)
million workers were covered by a profit sharing arrangement. ESOP's have been more popular

The reminder of the chapter is set out as follows. Section II discusses some of the key theoretical issues pertaining to the economics of profit sharing. Section III outlines the data and model specification employed in the empirical analysis, the results of which are set out in Section IV. Final comments are collected in Section V.

II.   Theoretical Issues

The economics of absence behaviour have been discussed extensively in Chapter Two of this thesis. In this chapter I focus on the key issues relating to the economics of employee sharing and participation.

Weitzman's as yet unproved claim regarding the macroeconomic benefits of economy-wide profit sharing has rekindled interest in the potential micro-benefits of group pay incentives. It would appear incontrovertible that any pay scheme relating remuneration to labour effort will induce higher productivity, with group schemes dominating where monitoring of individual effort is problematic.[5]

Intuitively, the implementation of a profit sharing and/or employee share ownership plan can be expected to affect both the supply and demand aspects of the labour contract. Greater identification and motivation on the part of employees may impact favourably upon their marginal rates of substitution, reducing the extent to which they perceive themselves as 'over-employed' and, therefore, their incentive to absent, at any given economic rate of substitution. Moreover, any improvement in motivation and morale may have favourable demand implications, reducing, for example, the costs associated with the monitoring and control of involuntary absence. It has been suggested, for example, that ESOPs impact favourably upon enterprise productivity [see, for example, Conte and Tannenbaum (1978), Conte and Svejnar (1988, 1990)] whilst theorists have argued that both

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amongst larger firms with 350 firms having such arrangements in place covering 0.6 million people by 1989 [see Uvalic (1991), DARES (1995)].
[5] Extensive reviews of the benefits of profit sharing and other incentive schemes are set out in Blinder (1990) and Kruse (1993).

profit-related-pay and share ownership plans act to reduce absenteeism through increased employee commitment [Florkowski (1987)], employee involvement and satisfaction [Long (1980)], and employees' psychological and financial motivation [Hammer *et al* (1981)]. Empirical support for such hypotheses is found in Wilson and Peel (1991) and Hammer *et al* (1981).[6]

Some contradictory evidence, however, is highlighted by Rhodes and Steers (1981) whose analysis of two otherwise similar firms suggests that employees within an employee-owned firm exhibited a higher rate of absence than employees within a conventional organisation.[7] Similar caution is highlighted by Kahana and Weiss (1992) who, within a dynamic game-theoretic framework, demonstrate circumstances wherein members of labour managed firms will absent when it is collectively optimal to work. The impetus behind their result lies in the assumption of an egalitarian division of profits throughout the work force regardless of how many times an individual is absent.

This latter issue highlights one of the key problems associated with all group sharing schemes:

> A dilution or free rider problem seems to arise whenever it is hard to monitor a single person's contribution, as is presumably frequently the case. An externality is present because any one person's reward depends on everyone else's effort. With n members of the group, the extra profit sharing reward associated with marginal effort on any single worker's part is diluted by a factor of $1/n$. The result is an inefficiently low level of effort, which is lower as n is larger. [Weitzman and Kruse (1990), p. 98].

The problem has been interpreted as a form of prisoners' dilemma with a dominant strategy under which each member holds back effort in order to free ride of the others. The temptation to obtain the 'first-best' individual free ride outcome renders the 'second-best' co-operative outcome unsustainable and thus forces workers to the 'third-best' outcome in which all workers free ride. Applying the

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[6] To be sure, Hammer *et al* (1981) found that although absenteeism did not decline after the introduction of share ownership, workers were more likely to legitimise absence by calling in when sick.

[7] These results should, however, be approached with caution. As Rhodes and Steers (1981) point out, only the conventional firm had a control system, including warnings and possible dismissal, to curb absenteeism.

logic of the static Nash equilibrium framework, one would expect sharing schemes to impact negligibly, if at all, on large organisations in which, by default, greater attention should be placed upon individual incentives. But there is an important caveat to this argument - if the game is repeated then the conclusion may be quite different.

> All members of a sharing scheme are potentially better off if everyone 'co-operates' and works harder. Within a repeated 'supergame' context, the existence of a future implies a much richer set of equilibrium strategies in which co-operation may be sustained. Intuitively, co-operating members can punish their shirking colleagues by, for example, withholding their own effort or ostracising the offending anti-social shirkers.[8] Moreover, it has been shown that an insignificantly small amount of co-operation is sufficient to support the second best [Fitzroy and Kraft (1986, 1987)].

Dilution aside, however, there are other problems associated with group sharing. First, all incentive schemes that tie pay to performance will, to a greater or lesser degree, expose members to unwanted risk. Introducing some form of uncertainty into the production relationship implies that sharing workers bear relatively more of the cost of this uncertainty than their fixed wage counterparts. The optimal contract must now balance the two opposing effects of linking pay to effort and limiting risk, and the optimal profit share is typically inversely related to the degree of risk aversion and/or level of uncertainty, and positively related to the elasticity response of output to increased effort. It should be noted, however, that although risk considerations reduce the optimal profit share component, a corner solution involving fixed remuneration only is very unlikely [see Hart and Holmstrom (1987)].

And finally, all group incentive schemes have implications for worker participation in management and control. Requiring workers to bear more of the risk of the enterprise may open the door to demands for co-determination and may ultimately compromise managerial discretion. Whether or not this is a desirable outcome remains an open question. One argument pertains to the 'property rights'

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[8] This is an application of the so-called 'folk-theorem' of non-co-operative game theory [see Fudenberg and Maskin (1986), Axelrod (1984)].

notion that profit sharing will be inefficient insofar as it diverts the vesting of property rights from the 'capitalist central monitors' to individualistically oriented workers whose motivation is diluted by the free rider problem [Alchian and Demsetz (1972), Jensen and Meckling (1979)]. In this scenario profit sharing lowers productivity because of, for example, an increase in shirking and/or enjoyment of on-the-job leisure, laggard and/or flawed managerial decisions, an overtly short time horizon and/or excessive risk aversity resulting from a non-diversified pay portfolio.

A defence of worker participation centres around a challenge to the basic tenets of the property rights school [see Putterman (1984) and Nalbantian (1987)]. Participation might raise productivity if workers are better able to motivate and monitor each other than are management, or if they can provide technical information to management that would be otherwise prohibitively costly or time consuming to obtain [see, for example, O'Dell and McAdams (1987), and Kanter (1987)]. Similar benefits include the potential for improved channels of communication, better conflict resolution, a greater willingness to accept new technology and an increased possibility of acquiring on-the-job human capital from other workers. To ascertain the merit of such arguments Levine and Tyson (1990) survey twenty-nine empirical studies of worker participation and find only two concluding that participation hinders productivity. In contrast, fourteen studies find in favour of participation with the remaining thirteen offering somewhat ambiguous results. Levine and Tyson conclude that successful participation requires: (i) some form of profit sharing to reward co-operative behaviour; (ii) guaranteed long term employment to increase the time horizons of workers and so render them more adaptable to change, (iii) relatively narrow wage differentials to promote group cohesiveness; and (iv) guaranteed worker rights - for example dismissal only for just cause.

Whatever the true relationship between employee sharing, participation and productivity, the present study is hindered by ignorance as to the extent of worker co-determination within the panel of firms. This is potentially serious:

> "... many studies include variables only on financial participation (return rights) or participation in decision making (control rights), but not both. This is extremely problematic because ... there are strong theoretical reasons to believe that the two rights interact with each other and do so non-monotonically. The omitted variable is severe, and the estimates of the employee ownership variables that arise from such studies may have the wrong sign." [Ben-Ner and Jones (1995), p. 551].

III.   Data and Model Specification

III.1   Data

The data are derived from the Equipe de Recherche sur les Marches, l'Emploi at la Simulation (ERMES) database over the period 1981-1991.[9] The database was constructed to improve understanding of the French labour market and contains a firm level survey of a sample of French-based firms that employ more than 300 employees.[10] There were 1002 such firms in existence in 1983 when the database was set up, 500 of which were surveyed by post and 230 of which provided information.[11] The survey includes questions relating to the employment practices adopted by the firm as well as firm characteristics such as industrial affiliation. Industries covered were: Engineering and Capital Goods (Eng/Cap); Agriculture (Agric); Energy; Intermediate Goods (Int Gds); Motor Vehicles (Mtr Veh); Telecommunications (Telecom), Transport (Transp); Services.[12]

Companies were selected from the databases according to the following criteria. First, only those companies providing information on a number of key variables such as the company's 'Sirene' (i.e. registration code), the total wage bill

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[9] ERMES is a labour market research group based in Paris II University and is affiliated to the National Centre of Scientific Research (CNRS).

[10] The survey is derived from the 'social accounts' that all firms employing more than 300 workers are legally obliged to furnish.

[11] Each annual sweep contains accounting information on the current and two preceding years. Thus, although the database was set up in 1983, data is available from 1981.

[12] Extensive details of the ERMES database are contained in Ballot and Fakhfakh (1996) and d'Arcimol (1995).

and absenteeism were selected. The initial sample thus comprised 195 companies, 76 of which appeared for the whole ten year period, thereby forming an unbalanced panel of data.

The following were then eliminated: (i) any company which appeared in the database for less than three years in total; and (ii) any 'appearance' by a company of less than three years occurring immediately before or after a 'disappearance' of more than two years. The aim here was to exclude lengthy disappearances during which companies may experience unobservable, and thus potentially misleading, changes; 12 of the 119 intermittent companies were eliminated through this process. Finally, eliminating firms with missing values for any of the specified regressors left 127 firms for the econometric analysis. Of these, 36 were profit sharing and 25 were ESOP firms. The number of firms introducing and abolishing sharing schemes, and the sectoral distribution of sharing and non-sharing firms, across the panel is set out in Tables I and II following.

Table I **Introduction and Abolition of Sharing Schemes** *Number of Firms*										
	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Introduced PS	0	1	1	1	4	2	3	14	6	1
Abolished PS	1	0	0	0	1	0	0	3	5	6
Introduced ESOP	0	1	1	1	2	1	2	2	4	1
Abolished ESOP	0	0	1	2	0	0	0	1	3	1

The sectoral distribution of companies remained relatively stable over the sample period with the majority of companies that were eliminated, whether temporally or permanently, being generally those which had not supplied information for the pre-1983 period. This derives from the fact that the database only became fully operational in 1984 and no means of verification were available for the preceding years. [13]

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[13] It is apparent from Table II that there has been a three-fold increase in the proportion of sample firms operating some form of employee sharing arrangement. This is not specific to our sample, but rather accords with general trends in the growth of profit sharing schemes in France over the 1980s, especially following the 1986 Ministry of Labour Ordinance abolishing the requirement of firms to obtain prior ministerial approval before the implementation of any profit

Table II
Sectoral Distribution of Firms

		Eng/Cap	Agric	Energy	Int Gds	Mtr Veh	Telecom	Transp	Services	Total
81	PS	0	0	0	2	0	0	1	0	3
	ESOP	4	0	1	1	1	0	0	0	7
	NO	19	9	3	16	5	5	9	3	69
82	PS	0	0	0	2	0	0	0	0	2
	ESOP	4	0	1	1	0	0	0	0	6
	NO	21	9	3	17	5	5	11	3	74
83	PS	0	1	0	2	0	0	1	0	4
	ESOP	5	0	1	1	0	0	0	0	7
	NO	21	9	3	18	6	7	12	4	80
84	PS	1	1	0	1	0	0	0	0	3
	ESOP	3	0	1	3	1	0	0	0	8
	NO	13	6	3	11	6	4	7	0	50
85	PS	1	1	0	2	0	0	1	0	5
	ESOP	3	0	1	3	0	0	1	0	8
	NO	22	9	3	16	8	7	12	4	81
86	PS	2	1	0	3	0	0	2	1	9
	ESOP	4	0	1	4	1	0	1	0	11
	NO	22	8	3	17	7	8	11	3	79
87	PS	1	2	0	4	0	0	2	1	10
	ESOP	3	1	1	3	0	0	1	0	9
	NO	18	7	3	11	5	8	9	2	63
87	PS	4	2	0	5	0	0	2	1	14
	ESOP	7	1	1	4	1	0	2	0	16
	NO	19	9	3	17	6	9	11	2	76
88	PS	6	2	1	7	2	2	6	0	26
	ESOP	6	1	2	3	1	0	3	0	16
	NO	14	8	2	13	5	7	10	5	64
89	PS	7	3	2	8	1	2	3	0	26
	ESOP	8	0	1	2	2	0	2	0	15
	NO	12	6	2	11	5	6	10	5	57
90	PS	4	2	2	5	2	2	3	0	20
	ESOP	8	0	1	2	2	0	1	0	14
	NO	12	6	2	12	7	5	7	5	56

Notes:
(i) Figures denote the number of firms operating a particular sharing scheme where PS = Profit Sharing Scheme; ESOP = Employee Share Ownership Plan; NO = No Sharing Scheme.
(ii) Sample used: 127 firms and 953 observations.
(ii) Since a firm may have both sharing schemes, the total number of firms within a particular sector/year is not necessarily the sum of PS, ESOP and NO.

III.2   Theoretical Underpinning

In the empirical analysis that follows I estimate the propensity to absent within a panel of French firms by focusing on both the supply and demand characteristics of the employment contract. The approach emanates from the reservation sickness model of worker absence introduced in Chapter Two, a simplified version of which is presented below for illustration.

Consider a single firm employing a single worker for a single period of time. The worker is a risk neutral utility maximiser endowed with a stock of time,

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sharing scheme. By the end of 1985 (1990), 1300 (10000) profit sharing contracts had been signed covering 0.4 (2.0) million employees [see Fakhfakh and Mabile (1997)].

T. Utility is an increasing function of income and leisure with the individual attaching a weight to each depending upon some parameter, δ, representing his/her general level of health. δ is increasing in sickness and randomly distributed over the interval $[0,1]$ with individuals valuing non-market (i.e. leisure) time more highly as $\delta \to 1$.[14]

The worker is assumed to sign an enforceable employment contract specifying a wage, w, in return for a particular supply of effort. Considerations as to the intensity or quality of effort for the firm's revenue are ignored and for simplicity productivity is construed as mere attendance which is normalised across all firms. There is, however, a disutility $(h < T)$ associated with work attendance on the part of the worker. There are no separation costs and the firm is entitled to fire any worker failing to provide contracted labour hours. After the contract is signed, but before production commences, the worker realises his/her state of health and makes an *ex post* utility maximising decision as regards absence. There is no re-contracting and this decision depends on the outside options available.

Assume for simplicity just one such option. Should the worker absent himself/herself from work he/she will be entitled to firm financed sick pay that is set exogenously at some rate $s < w$. This assumption implies the following utilities for 'non-absence' and 'absence', respectively:

$$U^{NA} = (1 - \delta)w + \delta(T - h) \tag{1}$$

$$U^{A} = (1 - \delta)s + \delta T \tag{2}$$

which together imply a critical level of sickness, δ^*, at which the worker will be indifferent between absence and non-absence. δ^* is determined implicitly by $U^{NA}(\delta^*) = U^{A}(\delta^*)$ such that:

$$\delta^* = \frac{w - s}{w - s + h} \tag{3}$$

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[14] This could be for the purpose of recuperation or because it becomes increasingly onerous to supply effort at higher levels of sickness.

Equation (3) defines a *reservation level of sickness* at which the worker is indifferent between attending and absenting. Realisations of sickness in excess (falling short) of δ^* will induce the worker to absent (attend). The reservation level of sickness is determined by the relative utilities of attendance and non-attendance with an increase (decrease) in w and/or a decrease (increase) in s and/or h acting to raise (lower) the reservation level of sickness, and thereby to reduce expected absence.

The firm's problem is to choose w to maximise expected profits subject to (3) and any reservation constraint on the part of the worker. Denoting this optimal choice wage $w^* = w(s,h)$ with $\delta^* = \delta(w;s,h)$ from (3) above, it is apparent that there will be a potential issue of endogeneity and hence in the empirical specifications that follow I instrument for wages.

There are two key complications to the above model that must be addressed in developing a formal theory of profit sharing and absence. First, how the *form* of the compensation contract affects worker utility; the argument here is that the same expected level of compensation may yield more (or less) expected utility if paid in the form of some sharing contract. One could envisage this in terms of a change in the level of h - that is, the disutility associated with work attendance.[15]

The second issue pertains to the $1/n$ problem. Once a more realistic multi-person setting is assumed the issue of free riding becomes prevalent. The line of argument would then be to present a multi-period model in which the prisoners' dilemma free riding equilibrium might be avoided. I do not address such issues in the present study but instead focus on the empirical evidence regarding the relationship between profit sharing and absence.

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[15] A related issue within a more general model is the impact of any change in h on the level of worker productivity, *viz* the question: does employee sharing raise worker productivity *ceteris paribus*?

III.3   Empirical Specification

The reservation sickness approach suggests that absence is a function of both labour supply/health considerations and contractual characteristics.[16] My estimating equation is therefore specified in the following form:

$$\log Abs_{it_i} = \alpha W_{it_i} + \beta Z_{it_i} + u_{it_i} \tag{4}$$

where $i = 1, ..., N$ denotes the firm specific subscript, N the total number of firms in the panel and $t_i = 1_i, ..., T_i$ the firm specific time subscript representing the tth appearance by firm i in the panel.[17] The error structure allows for firm specific fixed effects with $u_{it_i} = \mu_i + v_{it_i}$, where μ_i and v_{it_i} are iid, $\mu_i \to N(0, \sigma_\mu^2)$ and $v_{it_i} \to N(0, \sigma_v^2)$. Abs_{it_i} represents the 'absence propensity' of firm i whilst W_{it_i} and Z_{it_i} represent vectors of job/wealth and socio-demographic characteristics respectively. Full variable definitions are detailed in Table III following.

The propensity to absent within firm i is defined as the total number of absence 'events' occurring in firm i's t^{th} appearance in the panel, divided by the total number of employees employed by firm i over the same period. An absence event occurs whenever a worker misses a scheduled calendar work day on account of absence. Such a definition is not ideal and does not compare perfectly with the ideal measure of absence rates - namely actual work days divided by scheduled work days. The poor response rate of the numerator of this latter variable precluded its adoption in the present study.[18] In addition, it is unable - in line with most other studies - to discern between voluntary and involuntary absence.[19] But this flaw may not be critical:

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[16] The probability of absence may be written explicitly as: $P(A) \equiv (1 - \delta^*) = (h/w - s + h) = \delta(w; s, h)$ with partial derivatives $\delta_w < 0, \delta_s > 0, \delta_h > 0$.

[17] It is important to note that the periods of observation are not necessarily the same for all companies. Likewise the first and last period of eligibility of a company to the sample is not necessarily the first year (i.e. 1981) or the last year (i.e. 1991).

[18] The dependent variable is perhaps preferable to that of Wilson and Peel, the latters' being defined as " ... the average annual number of working days lost per employee, excluding days lost though work stoppages." [Wilson and Peel (1991), p. 457].

[19] One exception here is Hammer *et al* (1981)].

> Except in cases of obvious (usually lengthy) illness, however, short absences
> which are recorded as illness (involuntary) may be *de facto* voluntary in nature
> [see, for example, Dilts *et al* (1985)]. Furthermore, it could be argued that the
> incidence of 'genuine' illness should not, *ceteris paribus*, differ significantly
> between firms in the same industrial sector. [Wilson and Peel (1991), p. 457].

Indeed, workers typically cite illness as an explanation for absence, even if this is not the case [Dunn and Youngblood (1986)] and evidence from Nicholson (1976) suggests that the level of reported sickness absence tends to rise when control is exerted over non-sickness absence.

There are several reasons to presume an inverse relationship between wages and absenteeism. Within the conventional labour supply framework the wage rate plays a pivotal role in the dissension between income and substitution effects. Under an efficiency wage interpretation [Akerlof and Yellen (1986), Shapiro and Stiglitz (1984)] one might expect the firm to use the wage to optimally control (voluntary) absence [Barmby *et al* (1994)].[20] Finally, Allen's (1981b, 1983) hedonic interpretation of absence as an 'agreeable' job attribute predicts an inverse relationship between wage rates and absence. To control for these possible influences the average salary per company net of any sharing bonus (WAGE) is included in the set of explanatory variables.

Building on the efficiency wage argument, one might expect the level of absence to be inversely related to the rate of unemployment with the latter acting as a form of worker discipline device [Markham and McKee (1991), Drago and Wooden (1992), Chaudhury and Ng (1992)].[21] A variable UNEMP (the national annual unemployment rate) was therefore included to control for this effect. A variable (LAYOFFS), which measures the number of involuntary quits as a proportion of total employment within the firm, was also incorporated. Theoretically, random layoffs, as opposed to layoffs targeting low effort

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[20] Krueger and Summers (1988) assess the empirical support of efficiency wage theories and discover that lower absenteeism is indeed one of the benefits of paying higher wages.

[21] Applied psychologists have generally acknowledged the importance of the state of the economy for absence decisions. For example: ' ... in times of high unemployment, there may be increased pressure to maintain a good attendance record for fear of losing one's job.' [Steers and Rhodes (1984), p. 240].

employees, should undercut the effect of efficiency wages and should, therefore, positively influence absence. Moreover, current layoffs may be interpreted as a sign of future layoffs and employees may be tempted to take absence to search for alternative, more secure, employment [Brown and Sessions (1996)].

Given the central role played by contract type, a variable representing the proportion of part-time employees within a firm (PARTIME) is incorporated into the analysis. One may argue that individuals whose specific preferences demand a high proportion of non-work time will opt for a part-time contract since it minimises the mismatch between contractual and desired hours. Thus, one could conjecture that part-time employees will absent themselves less frequently on account of their more flexible work schedules. Such employees are also likely to have lower marginal rates of substitution and less job security than their full-time counterparts. They may, therefore, have both a lower incentive to absent, and face a higher expected cost to 'illegitimate' absence. This has been borne out to some degree by empirical work [see, for example, Chaudhury and Ng (1992) and Drago and Wooden (1992)].

The issue of part-time work highlights the crucial role played by flexibility in the determination of absence decisions. This area is somewhat problematic in the respect that flexibility is a difficult concept to define and measure. Allen (1981a) attempts to control contractual flexibility by incorporating a dummy variable which equals one if the same hours are worked each day; the estimated coefficient is significant and indicates that these employees are characterised by relatively higher absence rates *ceteris paribus*. A similar finding is reported by Leigh (1991).

Differences between the absence behaviour of white and blue collar employees has also been alluded to by researchers in terms of contractual flexibility, the available evidence suggesting that white collar (i.e. flexible) employment reduces the incentive to absent [Leigh (1984, 1986) and Kenyon and Dawkins (1989)]. French evidence supporting this hypothesis is documented by Fourier (1989) who calculated average days absence per annum amongst white

(blue) collar workers at 3.5 (16) days. Similar evidence for Britain is documented by the CBI (1994) which found that full-time manual employees in the manufacturing sector took twice as much absence as their non-manual counterparts.

To account for the effects of contractual flexibility variables representing the proportion of managerial staff (MANAGE) and the proportion of the work force employed within a supervisory capacity (SUPERVISE) are incorporated into the empirical analysis . Theoretically, the relationship between absence and the extent of supervision is ambiguous. A high degree of supervision may reduce the potential for employees to act on their own initiative, perhaps lowering the degree of job satisfaction and thereby raising absence. On the other hand, a high degree of supervision may enable the supervisor to form closer links with his/her supervisees which may lead to a more appropriate and effective allocation of tasks within the firm. It might also reflect a greater attention to absence control on the part of the firm, which if effective, should lower absenteeism.

Following Leigh (1991), the possibility that workers take absence in order to avoid the actual or perceived danger associated with their job is also controlled for by the inclusion of variables representing the number of working days lost following a workplace accident (ACCIDENT) and the amount of voluntary and safety expenditure per employee (SECURITY).[22]

In accordance with other studies such as Allen (1983) and Dunn and Youngblood (1986), socio-economic variables representing personal characteristics such as sex, age and nationality are incorporated into the empirical specifications.[23]

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[22] The number of working days lost following an accident are not included in the dependent variable.

[23] The significance of demographic factors is not, however, universally accepted. Kenyon and Dawkins (1989) find that absence is primarily affected by variables pertaining to the worker's budget constraint rather than to the composition of the labour force.

A common finding in many of the labour supply based studies of absence has been that females exhibit higher absence rates than males [Allen (1983, 1984), Leigh (1981, 1991), Drago and Wooden (1992), and Paringer (1983)]. Such a finding is somewhat difficult to interpret in terms of the standard income-leisure model of labour supply. It may be that women play a larger role in domestic duties and hence may absent themselves from work in order to gain a greater degree of flexibility. Indeed, it has typically been argued that women tend to assume responsibility for the children within a household, and so will tend to stay at home if these become ill. Leigh (1986, 1991), for example, finds a positive and significant effect between absence and an interactive 'sex - young dependant' variable. To ascertain the impact of sex on absence rates a variable representing the proportion of female employees within the company (FEMALE) is incorporated into the analysis.

The age composition of the work force may also have important implications for absenteeism. Younger employees may, for example, turn jobs over more frequently and undertake off-the-job search through labour absence [Allen (1981a), Kenyon and Dawkins (1989), Dunn and Youngblood (1986)]. This may be due to younger employees having less commitment to either the firm or the work group, less financial and family commitments and higher opportunity costs for any foregone leisure, than their older counterparts.[24] To account for the effects of age two variables representing the proportion of 'young' (i.e. under 35) and 'old' (i.e. over 50) employees employed by the firm (YOUNG, OLD) are included.

Absence levels may also vary across workplaces according to the ethnic composition of the work force, especially if immigrants are confined to relatively dissatisfying jobs. Balchin and Wooden (1992) find evidence to suggest that absence is indeed higher amongst immigrants *ceteris paribus*, and especially so

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[24] The relationship between age and absenteeism has attracted a great deal of interest in the applied psychology literature [Steers and Rhodes (1978, 1984), Rhodes (1983) and Martocchio (1989), Hackett (1990)]. Steers and Rhodes argue that the relationship between age and 'avoidable' absence is direct, i.e. it can be explained by the positive relationship between age and susceptibility to illness.

amongst immigrants from non-English speaking backgrounds. This is consistent

with US findings of lower absence rates amongst whites [Flanagan *et al* (1974),

Leigh (1986)]. To account for such an effect a variable representing the proportion

of foreign employees employed by the firm (FOREIGN) is incorporated into the

analysis.

A variable representing training expenditure per employee (TRAINEXP) is

also incorporated. There are two reasons for this: First, if absence is sympatic of,

at least in part, dissatisfaction with contractual arrangements then one might

expect absence rates to be relatively lower where management is relatively more

receptive to grievances, which may be itself correlated with training. Alternatively,

as the investment in firm-specific human capital increases, the costs of separation

for both the employee and employer rise [Drago and Wooden (1992)]. In the

context of efficiency wage considerations, workers may be less inclined to take

excessive absence and risk dismissal on account of the higher expected utility loss.

Employers, in contrast, may be more tolerant of any such lapses of behaviour such

that it is impossible to predict *a priori* the direction of any such relationship.

The size of a work place may also impact upon observed absence. Leigh

(1991) argues that there are conflicting hypotheses concerning the effect of firm

size on absenteeism. Employees in a large firm may, on the one hand, believe that

they can be more easily replaced if they go absent than they would in a small firm.

Evidence which supports the hypothesis that large work places are characterised

by higher rates of absence has been found by Winkler (1980), Allen (1983), Leigh

(1984), Markham and McKee (1991) and Wilson and Peel (1991).

On the other hand, there is some evidence which suggests that more

committed employees are attracted to large firms and, as a result, large firms

experience relatively less absenteeism.[25] Leigh's results indicate, however, that the

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[25] Garen's (1985) job screening model finds a positive correlation between firm size and
earnings. Moreover, the findings indicate that individuals who choose to acquire more schooling
are also those who are more likely to enter a large firm.

firm size variable is on the borderline of significance and as such does not settle the ambiguity surrounding the sign of this variable.[26] To attempt to resolve the ambiguity surrounding the implications of firm size for absence behaviour a variable representing total employment within the firm (EMP) is included.

Finally, I control for the effects of employee sharing through five dummy variables denoting the presence (PROFITSHARE, STOCK), the exclusive presence, (PROFITSHAREONLY, STOCKONLY), or the combined presence (PROFITSHARE&STOCK) of a particular sharing scheme. I also follow Blasi (1988) in attempting to control for the extent of employee sharing by including a variable denoting the ratio of the average profit sharing bonus to the average base salary per firm (BONUS%). The data does not, unfortunately, discriminate between the number of workers covered by a profit sharing or ESOP scheme, nor the percentage of stock which is employee owned.[27]

Tables III and IV below present full definitions of the variables incorporated into the empirical analysis and descriptive statistics for sharing and non-sharing firms.

Somewhat surprisingly there is no significant difference in the average rates of absence across sharing and non-sharing firms. It is misleading, however, to read too much into this since there are significant differences across the two types of firms which may themselves be correlated with employee sharing and/or absence. To control for such factors I turn to my econometric analysis.

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[26] Balchin and Wooden (1992) conjecture that larger work places tend to be more x-inefficient and, as such, characterised by lower levels of dismissal threat. In addition, employees in large work places may feel more alienated which in turn leads to lower levels of job satisfaction and ultimately to absenteeism or even quit behaviour. Balchin and Wooden's results suggest that firm size is positively related to absenteeism which is consistent with the hypothesis cited above.

[27] Although often confused, profit sharing and ESOP's are, at least in principle, quite distinct. The latter pay benefits in company stock rather than in cash and the company's contribution need not be tied to profits. In practice, however, deferred profit sharing plans are *de rigour* and these are much more akin to ESOP's, especially when the deferred compensation is held in company stock [Blasi (1988)]. Nevertheless, the argument that tying the fortunes of capital and labour together might impact favourably upon firm performance has been applied to both schemes [Conte and Svejnar (1990)].

Table III **Variable List and Definitions**[28]	
VARIABLE	**DEFINITION**
ABSENCE	Number of Calendar Days Lost per Employee as a Result of Absence
ACCIDENT	Number of Calendar Days Lost per Employee Following an Accident
BONUS	Average Profit Share Bonus per Firm
BONUS%	(BONUS/WAGE)*100%
EMP	Total Employment
FEMALE	Percentage of Female Employees within the Work Force
FOREIGN	Percentage of Foreign Employees within the Work Force
LAYOFFS	Percentage of Involuntary Quits within the Work Force
MANAGE	Percentage of Managerial Staff within the Work Force
OLD	Percentage of Employees over age-50
PARTIME	Percentage of Part-Time Employees.
PROFITSHARE	Profit Sharing Dummy Variable =1 if profit sharing scheme present
PROFITSHAREONLY	Profit Sharing Dummy Variable = 1 if profit sharing scheme present and ESOP scheme not present
PROFITSHARE&STOCK	Employee Sharing Dummy Variable = 1 if both profit sharing and ESOP scheme present
SECURITY	Average Security Expenditure per Employee
STOCK	ESOP Dummy Variable = 1 if ESOP scheme present
STOCKONLY	ESOP Dummy Variable =1 if ESOP scheme present and profit sharing scheme not present
SUPERVISE	Percentage of Employees in Supervisory Capacity.
TRAINEXP	Expenditure on Training per Employee
UNEMP	National Unemployment Rate (Percent)
WAGE	Average (Base) Salary per Firm
YOUNG	Percentage of Employees under age-35 within the Work Force

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[28] All monetary variables have been deflated by the GDP price index base 1980. This deflator is taken from 'The Accounts of the Nation'.

Table IV Descriptive Statistics									
Variable	Min	Max	Mean	Sub-Sample Means			Sub-Sample Means		
				PS	Non-PS	T-Stat	ESOP	Non-ESOP	T-Stat
ABSENCE	0.064	57.30	13.37	13.33	13.38	0.07	14.32	13.22	1.48
ACCIDENT	0	9.16	1.202	0.907	1.142	6.69[c]	0.956	1.24	4.24[c]
BONUS%	0.50	18.00	5.35	5.35	-	-	-	-	-
EMP	303	10488	5286	4539	5387	1.42	8290	4797	3.00[c]
FEMALE	24.00	90.60	26.60	30.80	26.10	3.06[c]	29.40	26.20	2.36[b]
FOREIGN	0	88.60	7.40	5.60	7.60	3.59[c]	6.60	7.60	1.47
LAYOFFS	0	53.00	3.10	2.00	3.30	2.99[c]	2.00	3.30	3.26[c]
MANAGE	2.52	97.00	13.40	13.50	13.30	0.28	13.80	13.30	0.63
OLD	0	53.50	18.70	19.90	18.60	2.50[b]	18.45	18.77	0.68
PARTIME	0	51.20	3.20	5.10	2.90	4.09[c]	5.90	2.70	5.66[c]
SECURITY	0	22.7	1.43	1.389	1.43	0.29	1.21	1.46	1.65[a]
SUPERVISE	6.80	14.00	2.19	2.02	2.21	0.71	2.121	2.21	0.31
TRAINEXP	0	34.37	2.47	2.99	2.40	1.86[a]	2.359	2.49	0.50
WAGE	28.00	242	77.19	79.47	76.88	1.67[a]	79.43	76.82	1.64[a]
YOUNG	6.00	86.00	36.40	33.21	36.84	3.66[c]	36.50	36.40	0.12

Notes:

1. PS = Firms operating a profit sharing scheme; ESOP = firms operating an employee share ownership scheme.

2. [a] Significant at 10 percent level; [b] Significant at 5 percent level; [c] Significant at 1 percent level
The absolute value of the T-statistics refer to the significance of the differential between the sharing and non-sharing sub-sample means

IV.   Results

Empirical results are presented in Table V below. Given the unbalanced nature of the panel I employ a fixed effects estimator - see the Technical Appendix for an outline of this approach - with instruments for WAGE to control for the endogeneity issue alluded to previously.

Four specifications are presented, all of which appear to be generally well defined. In particular, assuming the underlying econometric model is correctly specified and given Table I, the significance of the Hausman Chi-sq statistic confirms my use of the fixed effects approach. Specifications (i) and (ii) control for the effects of employee sharing through two dummy variables which denote the presence within a firm of an profit sharing or employee share ownership scheme (PROFITSHARE, STOCK). The somewhat finer specification (iii) incorporates

three dummy variables which denote the exclusive or combined presence within a firm of a profit sharing or employee share ownership scheme (PROFITSHAREONLY, STOCKONLY, PROFITSHARE&STOCK). Specification (iii) thus indicates the relationship between absence and the use of *one* or *both* sharing schemes, from which one can derive an estimate of the *marginal* impact on absence of the adoption of a *second* sharing scheme. Finally, specification (iv) controls for the extent of employee sharing by examining the impact of BONUS% on the absence propensities of profit sharing firms within the panel.[29]

In all specifications bar the fourth, there is a significant negative relationship between absence and wages, in line with my *a priori* predictions. Amongst profit sharing firms, however, wages exert no statistically significant influence on absence once account is taken of the extent of the profit share, which is itself negatively and significantly (at the 9 percent level) related to absence. The coefficients on PROFITSHARE and STOCK in specifications (i) - (ii) suggest that such schemes are associated with a significantly lower level of absence - approximately 5 and 9 percent respectively. A clearer indication of the relationship between sharing and absence, however, is available from specification (iii). The separate sharing dummies in specifications (i) - (ii) indicate merely the presence of a particular sharing scheme whilst those in specification (iii) indicate the exclusive presence of a particular sharing scheme. Thus, the presence of *only* profit sharing (share ownership) is associated with an approximate 7 (14) percent fall in absence. Moreover, the coefficient on the interactive term PROFITSHARE&STOCK indicates that the presence of *both* schemes is associated with an 11 percent fall in absence, suggesting a declining marginal impact of sharing on absence. To be sure,

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[29] To maximise both the goodness of fit and degrees of freedom of specification (iv) I eliminated on experimentation several of the more insignificant explanatory variables. The intuition for entering the wage level variable only in log form is as follows: $w^{ps} = w^b + b = w^b(1+\theta) \rightarrow \log w^{ps} = \log w^b + \theta$ where $\theta = (b/w^b)$ [see Wadhwani and Wall (1990)].

the implementation of a share ownership scheme, with a profit sharing scheme already in place, is associated with only a 4 percent decline in absence, whilst the implementation of a profit sharing scheme with a share ownership scheme already in place, is associated with a 3 percent *increase* in absence.

Table V Empirical Results *Dependent Variable: Log of Average Absence Events per Worker per Annum* Fixed Effects Estimation								
Independent Variable	**All Firms**						**Profit Sharing Firms**	
	(i)		**(ii)**		**(iii)**		**(iv)**	
	Coef	T-Stat	Coef	T-Stat	Coef	T-Stat	Coef	T-Stat
PROFITSHARE	-0.050	-1.89[c]	-0.049	-1.89[c]	-	-	-	-
STOCK	-0.100	-2.65[a]	-0.090	-2.39[b]	-	-	-	-
PROFITSHARE ONLY	-	-	-	-	-0.068	-2.34[b]	-	-
STOCK ONLY	-	-	-	-	-0.139	-3.00[a]	-	-
PROFITSHARE&STOCK	-	-	-	-	-0.116	-2.35[b]	-	-
BONUS%	-	-	-	-	-	-	-1.986	-1.69[d]
Log WAGE	-0.845	-4.33[a]	-0.856	-4.38[a]	-0.837	-4.29[a]	0.104	0.50
Log SECURITY	0.032	2.62[a]	0.031	2.56[b]	0.033	2.70[a]	-0.014	-0.40
Log EMPLOYMENT	0.139	3.57[a]	0.142	3.64[a]	0.146	3.73[a]	0.821	2.23[b]
FOREIGN	2.094	5.55[a]	2.065	5.46[a]	2.127	5.63[a]	-	-
Log TRAINEXP	0.187	3.39[a]	0.197	3.58[a]	0.193	3.50[a]	-0.002	-0.05
MANAGE	-3.178	-7.73[a]	-3.150	-7.65[a]	-3.192	-7.76[a]	3.496	1.89[c]
FEMALE	3.503	6.61[a]	3.472	6.54[a]	3.521	6.65[a]	-	-
SUPERVISE	-0.076	-5.75[a]	-0.078	-5.90[a]	-0.077	-5.81[a]	-0.305	-2.76[a]
PARTTIME	0.967	2.14[b]	-	-	0.983	2.18[b]	-8.107	-6.34[a]
Log ACCIDENT	0.045	3.82[a]	0.048	4.04[a]	0.046	3.88[a]	-0.016	-0.32
UNEMP	-4.251	-6.06[a]	-3.943	-5.73[a]	-4.270	-6.09[a]	-5.009	-1.54
LAYOFFS	11.661	6.67[a]	11.390	6.52[a]	11.812	6.75[a]	-	-
YOUNG	1.840	8.20[a]	1.789	8.00[a]	1.861	8.29[a]	-1.063	-2.35[b]
OLD	0.557	3.08[a]	0.595	3.30[a]	0.560	3.10[a]	-0.173	-0.29
Degrees of Freedom	937		938		936		83	
Number of Firms	127		127		127		22[e]	
Number of Observations	953		953		953		95[e]	
Hausman Chi Sq. Statistic	86.85[a]		78.60[a]		87.30[a]		29.70[a]	
F-Statistic	32.50		34.23		30.75		5.56	

Notes:

Hausman and Taylor instruments for WAGE.[30]

a. Significant at 1 percent level; b. Significant at 5 percent level; c. Significant at 10 percent level; d. Significant at 9 percent.

e. Re-application of the various selection criteria (see p. 11) reduced the number of profit sharing firms from 36 in specifications (i) - (iii) to 22 in specification (iv).

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[30] That is, all the variables in Table V, except the employee sharing variables, taken in means and in deviation from mean [see Hausman and Taylor (1981)].

All bar one of the other variables in the four specifications appear to conform with the *a priori* expectations, and for brevity I comment on this exception only.[31] The PARTIME variable exhibits a positive and significant coefficient in specifications (i) and (iii) which would appear to contradict accepted wisdom regarding the relationship between part-time work and absence [recall Chaudhury and Ng (1992), Drago and Wooden (1992)]. Moreover, the direction of the relationship is reversed when one focuses only on profit sharing firms in specification (iv). An obvious explanation for such a finding may be specification error, particularly in the dependent variable. Although this latter is not a perfect measure of absence, it should be nevertheless unaffected *per se* by the composition of the work force between full- and part-time workers. Indeed, one finds that the other coefficients are highly robust when the PARTIME variable is eliminated in specification (ii).

One explanation for the findings may be that even though part time workers are less likely to absent than their full time counterparts, the latter are themselves relatively more likely to absent when surrounded by more part-time workers since these may provide the firm with some slack in calling upon additional labour hours in the event of absence, and may therefore reduce the incentive of the firm to costly monitor and punish 'excessive' absence. Such a hypothesis cannot, unfortunately, be tested with the data at hand. The opposite finding amongst profit-sharing firms may reflect either the dominant co-operative empathy encouraged within such environments, or simply the relatively paucity of data within the panel pertaining to such firms.

An alternative explanation may lie in the nature of French part-time employment. The majority of French part-time contracts are centred on young workers as a point of entry into the full time labour market and who do not, as a

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[31] There is also some perplexity in the results regarding the relationship between MANAGE and absence. This is significantly negative in specifications (i) - (iii) and significantly positive in specification (iv). As discussed previously, however, the relationship between the two variables is not obvious.

result, generally choose such contacts voluntarily [Symes (1995)].[32] They may, therefore, take absence in order to search for more suitable, full time employment, or may be simply less concerned with any threat of punishment instigated by the firm for excessive absence.

V.   Conclusion

This chapter has explored how firms might reduce costly absence through the implementation of schemes encouraging employee sharing. The study utilises data from a panel of 127 French firms over the period 1981-1991 to ascertain the effects of profit sharing and employee share ownership plans on absence. The results indicate that both profit-sharing and employee share ownership schemes are associated with significantly lower absenteeism.[33] There is, however, some evidence of a declining marginal impact of sharing. The impact of a particular form of sharing (i.e. profit sharing or employee share ownership) depends critically upon whether or not the other form of sharing is already in place. A scheme introduced *second* is never as effective as when it is introduced *first*, with the introduction of profit sharing on top of employee share ownership actually serving to raise absence.

The analysis also highlights an interesting question regarding the nature of the relationship between employment flexibility and absence within the French labour market. An increased use of part-time work appears to raise the incidence of absence events within conventional firms but to reduce them within profit sharing firms. Both this, and the preceding issue, would benefit from further research.

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[32] Ponthieux (1997) estimates that 48% of young workers and 75% of part-time workers in 1991 would have preferred to work more hours.

[33] Although introspection would suggest otherwise, I am unable to dismiss the possibility that it is absence, or some other factor, which drives employee sharing. It may be the case that particular firms enjoy lower absence rates because they are relatively more receptive to the needs and desires of their employees, with the implementation of a sharing scheme being but one by-product of this ethos.

VI.   Technical Appendix

Econometric analysis is somewhat problematic on account of the unbalanced nature of the panel. Numerous approaches have been proposed to take account of the incomplete nature of sample groups [see Hsiao (1986), Verbeek and Nijman (1992) and Wansbek and Kapteyn (1989) for surveys of this area]. It is appropriate to use the fixed effects estimator when there is significant correlation, as indicated by the Hausman Chi-sq statistic, between the individual effects and the explanatory variables. Feasible Generalised Least Squares (FGLS), on the other hand, is used when there is no such correlation [see Hsiao (1986)].

Assuming a general framework whereby the dependent variable is only determined by the specified set of regressors, the standard error components model may be specified as follows:

$$Y_{it} = X_{it}\beta + \mu_i + v_{it} \tag{A1}$$

where μ_i and v_{it} are normally distributed and *iid*.

The standard fixed effects estimator applied to the variable deviations in relation to their individual averages are inefficient. The perturbation of the regression in the fixed effects transformation is effectively: $u_{it} - u_i$. The variance of this perturbation is:

$$V(u_{it} - u_i) = V(u_{it}) + V\left(\sum_{t=1}^{T_i} \frac{u_{it}}{T_i}\right) - 2Cov\left(u_{it} - \sum_{t=1}^{T_i} \frac{u_{it}}{T_i}\right) = \sigma_v^2 \frac{T_i - 1}{T_i} \tag{A2}$$

As the values of T_i are not identical across individuals, a problem of heteroscedasticity arises. To solve for this problem, it is sufficient to multiply the variables by $\sqrt{T_i/(T_i - 1)}$ so that the variance of the perturbation is constant.

Chapter Four

U.K. Unemployment[1]

I.   Introduction

Unemployment has become *the* labour market variable on whose record hinges the entire economic reputation of governments.[2] Why this should be the case is usually attributed to the macroeconomic implications of unemployment - higher unemployment means lower output, whilst the comprehensive welfare systems prevalent in most OECD countries imply considerable indirect costs.

A second, and often neglected, aspect of the problem concerns the microeconomic implications of unemployment. Unemployed individuals suffer in both monetary and non-monetary terms. Clearly, unemployment involves some loss of income (and by definition an increase in leisure), but there are equally important non-pecuniary effects relating to the loss of social status and self-esteem [Warr (1987)]. This latter problem is accentuated since the longer an individual remains unemployed the harder it becomes to secure a job. Employer discrimination aligned with the erosion of human capital and/or motivation on the part of the unemployed has resulted in unemployment outflow rates declining by more than 30 per cent after 12 months of unemployment [Jackman and Layard (1991)].

These microeconomic issues are accentuated because unemployment is concentrated in certain local areas/regions and population sub-groups. In Britain, the variance of relative unemployment rates across the twelve standard regions is approximately 7%, whist that across the 322 'travel-to-work' areas is almost 25

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[1] Some of the material in this Chapter is presented in Brown and Sessions (1996). I am grateful to Kenneth Button and Jonathon Wadsworth for helpful comments.

[2] Over the past decade unemployment in the European Union has averaged nearly ten per cent of the workforce, inducing the Commission to identify it as the overriding challenge to be met by the single market.

per cent. Irrespective of region, however, young, unskilled blacks are significantly more likely to experience an unemployment spell than prime-aged, skilled whites [see Jackman and Roper (1987), Layard *et al*, 1991)].

To profess lost national output and expanding social security commitments as the main costs of unemployment is, thus, to tell only part of the story - and from the point of view of an individual suffering 'excessive' unemployment risk, a somewhat unimportant part. Whilst the risk of unemployment is so non-random, it is the potential atrophy of skill and work habits that is crucial.

This Chapter attempts to quantify the differential risk of unemployment faced by various groups within a representative sample of British workers. In particular, it attempts to evaluate the differential effects of regional and demographic influences on an individual's propensity to experience a spell of unemployment. This is an important issue given the differing policy implications implied. If unemployment is primarily associated with demographic characteristics then micro-based supply-side policies *viz.* job-training and unemployment benefits may be the appropriate method of reducing unemployment. If regional influences dominate then macroeconomic centred approaches *viz.* targeted monetary and fiscal policies may be preferable.

The data analysed are ideally suited to address these issues. Although largely unexplored by economists, they contain a wealth of information on individual characteristics pertaining to the risk of unemployment and imply a considerably expanded set of regressors than those incorporated by previous authors [see, for example, Nickell, (1979) and Pissarides and Wadsworth (1990)]. Moreover they cover a period (1985-91) which, despite being of particular interest given the effects on the labour market of the structural reforms of the early 1980s, has yet to be addressed by studies of this type.

The Chapter is set out as follows: Section II outlines the data and methodology; Section III and IV set outs the results of the empirical analysis into the unemployment incidence and duration respectively. Section V explores the

relative importance of regional influences on unemployment risk in more detail whilst some conclusive comments are collected in Section VI.

II.   Data, Definitions and Methodology

II.1   Data

The data analysed in this Chapter are derived from the British Social Attitudes (BSA) Survey. These are an annual series of surveys started by the Social and Community Planning Research in 1983 and core funded by the Monument Trust. Additional contributions are also made by the Department of the Environment, Countryside Commission, the Nuffield Foundation, the ESRC, Marks and Spencer Plc and Shell UK Ltd. The data are derived from a cross-sectional sample of adults aged 18 and over living in private households whose addresses were included in the electoral registrar. The sampling was facilitated by selecting 114 Parliamentary constituencies from among all those in Great Britain on the basis of the Registrar General's Standard Regions.

From each parliamentary constituency a polling district was randomly identified and selected. Addresses were chosen from these polling districts by treating the listed electors as circular with a fixed interval and marking the name of the individual on which the sampling interval landed. This method ensured a probability proportionate to the number of listed electors. Where possible these electors were chosen for the survey. Where there was a difference between the register entry and the current members of the household, the interviewer selected one respondent by means of a random selection grid.

Traditionally the BSA survey has two sections. The main part involves a questionnaire administered by interviewers and lasting approximately one hour. The second section is a self completed section only. Our sample covered the

period 1985-91 and comprised 15,519 individuals of whom 1224 were unemployed.[3]

II.2   Unemployment Definition

The definition of unemployment that is used in the analysis is derived from the questions in the survey relating to the respondent's economic activity during the week before the interview. The Chapter classifies as unemployed all those respondents who reported that in the week preceding the interview they were: (a) unemployed and registered at a benefit office; (b) unemployed, not registered, but actively looking for a job; or (c) waiting to take up paid work already accepted. This definition of unemployment is very close to the Labour Force Survey (LFS) definition, which is used by the Central Statistical Office of the European Communities for the calculation of unemployment rates in member countries and which is reported regularly in the Department of Employment Gazette. The LFS definition is itself closely related to that recommended by the International Labour Office and adopted by the OECD, the Bureau of Labor Statistics in the United States and by several other countries.

A person is counted as unemployed on the LFS definition if he/she satisfies three criteria: First, if the person did not work during the survey reference week (usually the week prior to interview); second, if he/she is available to start work immediately; and third, if he/she looked for work during the reference week or was waiting to start work in a job already found.

Although the LFS definition is gaining increasing use in Britain, it is still not the most widely used definition of unemployment. The definition in use is the monthly 'claimant count' - that is, a count of all persons who are without work and in receipt of unemployment benefit. Persons without a job need to satisfy certain conditions to be entitled to unemployment benefit, and these conditions, at

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[3] There were no questions relating to unemployment in the first two surveys whilst no survey was conducted in 1988.

least up until 1989, did not include that of actively looking for work. Thus there are individuals out of work who are not job seekers but who satisfy all the conditions for receipt of unemployment benefit; and conversely, there are individuals who are job seekers but who are not entitled to benefit. The two definitions need not, and in general, do not, coincide.

Amongst males, the claimant count generally exceeds the LFS rate because men who lose their jobs are almost automatically entitled to unemployment benefit, even if they are not looking for work. For women the reverse is true, since women normally have lower benefit entitlements than men.

Further differences between the two definitions are revealed when one considers the over lap between them - namely those persons who are counted as unemployed by the LFS and who are also in the claimant count. Up to 90 per cent of males unemployed according to the LFS definition claim benefit, because of the high benefit entitlement of male job losers. The remaining 10 per cent omitted from the claimant count are mostly new entrants. In contrast, only about 40 per cent of unemployed females are claimants. The high number of female re-entrants, who are not entitled to benefit, partly explains this, though female job losers are also less likely to be entitled to benefit than their male counterparts.

This Chapter adopts as far a possible the LFS definition because it is far closer to the economic concept of unemployment than the alternative, and because, like the LFS definition itself, the analysis is based on survey information.

II.3   Methodology

The general methodology is to calculate sub-sample unemployment rates for various key groups within the population. These rates denote the proportion of the respondents with a particular attribute who reported themselves as unemployed at the time of survey. Logistic regressions are then estimated to determine the relationship between the probability of being unemployed and a set of regressors containing the various attributes, thereby allowing a break down unemployment

differentials *vis a' vis* some reference group. The regressions do not say anything about causality. Instead they offer a compact method of cross-tabulating unemployment incidence against personal characteristics. Given the Chapter's limited objective of simply identifying the unemployed, as opposed to the more ambitious task of explaining unemployment differentials, such regressions are more than adequate.

The study is similar to those by Nickell (1979) and Pissarides and Wadsworth (1990) - hereafter PW). Nickell produced estimates of unemployment incidence for unemployed males utilising General Household Survey data for 1972 whilst PW produced estimates of both short-term and long-term incidence for males and females utilising LFS data for 1979 and 1986. Due to limitations in the LFS surveys, PW were unable, unlike Nickell, to incorporate any information on unearned income. The richness of the BSA data enables a considerably expanded set of regressors than those used in both of the aforementioned studies, in particular, permitting incorporation of a variable for an individual's unearned income as well as separating out the short- and long-term unemployment incidence of both males and females.

III.   Unemployment Incidence

The following Section considers the effects of a number characteristics which can be broadly divided into demographic and regional influences.[4] Table I below sets out the sub-sample unemployment rates and full logistic regressions for males and females separately. The reference category for the logistic regressions is that of a single, white, unskilled non-union manual worker, aged between 35-44 years, who has no formal educational qualifications or children, and who has privately rented his/her residence in the South-East for 2-5 years. The estimated coefficients

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[4] An attempt was also made to investigate the effects of industrial affiliation. The data, however, were found to be heavily co-linear with those of regional location and to be characterised by poor response rates.

therefore indicate the nature of the relationship between the probability of unemployment and a particular attribute relative to the reference category. A positive (negative) coefficient indicates that an individual with that characteristic is *ceteris paribus* more (less) likely to be unemployed than individuals without it. Moreover, the larger the estimated coefficient on a particular attribute the greater is its contribution to the incidence of unemployment.

III.1   Demographic Influences

Demographic influences were divided into the following groups: education, occupation and union membership; age, family structure, income and race; and residence.

III.1a Education, Occupation and Union Membership

Education

Researchers have generally found an inverse relationship between educational attainment and unemployment [Nickell (1980), McCormick (1983), Osberg *et al* (1986), Payne (1987), PW]. One possible reason for such a relationship may be framed in terms of human capital. Consider, for example, the behaviour of an employer who must lay-off some proportion of his/her workforce. Once the lay-off decision has been made, the next question concerns who goes. According to human capital theory, firms will be reluctant to lay-off employees within whom they have made a significant investment in firm-specific human capital [Oi (1962)]. Mincer (1974) argues that, for a variety of reasons, firm-specific and general human capital are positively related such that educational attainment generally may have a negative effect on the probability of unemployment.

The following analysis distinguishes between six categories of *highest* educational attainment; degree, teacher-training, BTEC Higher, GCE 'A' level, GCE 'O' level, and 'no educational qualifications'. Occupations are categorised into five groups; professional, clerical, other non-manual, skilled manual and

unskilled manual. It is appropriate to discuss the effect of educational attainment and occupation together on account of the high degree of correlation between them. University graduates, for example, are mostly professionals, whilst unskilled manual workers usually have few, if any, qualifications.

The relationship between a respondent's educational attainment, occupational status and unemployment risk may be inferred from the sub-sample unemployment rates set out in Table I. It is apparent that, in general, higher educational qualifications are associated with a lower risk of unemployment.[5] Male (female) graduates, for example, have a sub-sample unemployment rate of 1.9 (3.6) per cent as compared to 18.2 (6.5) per cent for respondents with no educational qualifications implying an average unemployment differential between the two groups of 16.3 (2.9) per cent. Now this differential could be attributable to a number of factors. For example, graduates are more likely to be employed in professional occupations than respondents with no educational qualifications, and professional workers *irrespective of education* might be less prone to unemployment. Similarly, other influences such as age, race, and family background might also differ across the two groups. To isolate the relative effect of education on unemployment risk *ceteris paribus* one must turn to the logistic regression analysis.[6]

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[5] A notable exception being the sub-sample unemployment rate for female BTEC holders.

[6] We cannot, of course, dismiss the possibility that any relationship between the probability of unemployment and education works the other way, with unemployed individuals finding it relatively more difficult to attain a given level of education.

Table I: Probability of Unemployment

Variable Name	Males			Females		
	Sub-Sample Unp.%	Estimate	T-Statistic	Sub-Sample Unp.%	Estimate	T-Statistic
'O' Levels	5.397	-0.694	-6.346	4.749	-0.420	-3.458
'A' Levels	4.055	-0.389	-2.849	4.501	-0.172	-1.060
Teacher Training	1.724	-0.362	-0.593	3.769	0.374	1.283
Degree	1.849	-0.857	-2.832	3.638	-0.173	-0.850
BTEC Higher	1.768	-0.966	-2.410	6.579	0.376	0.770
No Education Qualifications	18.198	-	-	6.539	-	-
Professional	3.578	-0.277	-3.758	4.106	-0.355	-2.990
Clerical	9.287	-0.042	-0.220	4.316	-0.488	-4.030
Other Non-Manual	8.058	-0.258	-2.765	5.066	-0.108	-1.458
Skilled Manual	12.717	-0.081	-2.751	6.122	-0.354	-2.843
Unskilled Manual	18.704	-	-	8.857	-	-
Union Member	8.734	-0.502	-5.047	5.063	-0.072	-0.699
Non Union Member	13.249	-	-	6.560	-	-
Aged 18-24	15.536	0.609	3.530	11.452	0.179	1.950
Aged 25-34	10.124	0.142	2.951	7.290	0.196	1.261
Aged 35-44	7.010	-	-	4.579	-	-
Aged 45-54	8.961	0.227	1.508	4.501	-0.114	-0.669
Aged 55-59	10.558	0.173	0.935	4.783	-0.305	-1.341
Aged 60-65	12.303	0.298	2.609	-	-	-
Single	16.274	-	-	10.366	-	-
Married	7.681	-0.683	-4.703	3.785	-0.980	-6.502
Separated/Divorced/Widowed	20.179	0.203	1.146	8.326	-0.240	-1.426
Spouse Works	3.317	-	-	3.624	-	-
Spouse Does Not Work	14.867	-	-	8.667	-	-
Unearned Income	-	0.218^{E-03}	9.287	-	0.311^{E-04}	1.555
Unearned Income Squared	-	-0.101^{E-07}	-7.332	-	-0.107^{E-08}	-1.355
0 Non-Dependent Children	12.463	-	-	5.858	-	-
1 Non-Dependent Children	7.829	-0.281	-1.830	7.063	-0.039	-0.258
2 Non-Dependent Children	6.333	-0.362	-2.237	5.120	-0.321	-1.931
3 Non-Dependent Children	9.634	-0.204	-0.986	5.442	-0.517	-2.311
4+ Non-Dependent Children	16.588	0.039	0.156	4.074	-1.058	-2.953
Dependent Child	10.409	0.589	3.576	8.820	0.462	2.986
No Dependent Child	10.264	-	-	5.192	-	-
Non-White	14.356	0.358	2.520	7.111	0.184	0.654
White	10.167	-	-	5.810	-	-
Residence: 0-1 Year	13.528	0.270	1.570	9.132	0.010	0.058
Residence: 1-2 Years	9.780	-0.158	-0.957	6.420	-0.226	-1.287
Residence: 2-5 Years	9.942	-	-	7.036	-	-
Residence: 5-10 Years	10.796	0.048	0.354	5.363	-0.131	-0.868
Residence: 10-20 Years	9.688	-0.136	-0.996	4.811	-0.205	-1.351
Residence: 20+ Years	9.134	-0.393	-2.536	3.483	-0.314	-1.626
Owner Occupier	5.090	-0.761	-4.489	3.761	-0.491	-2.629
Council Tenant	27.559	0.669	3.993	11.015	0.233	1.215
Private Tenant	12.798	-	-	8.352	-	-
Scotland	10.190	0.129	0.660	6.191	0.060	0.291
Northern Ireland	16.102	0.859	5.058	7.254	0.351	2.072
Wales	14.191	0.774	3.541	4.683	-0.118	-0.412
North East	15.278	0.600	2.738	6.150	-0.078	-0.302
North West	14.010	0.710	4.197	8.486	0.399	2.240
Yorks/Humberside	8.519	0.290	1.426	6.471	0.304	1.447
West Midlands	12.014	0.654	3.489	5.105	0.010	0.046
East Midlands	8.551	0.134	0.596	4.545	-0.117	-0.447
East Anglia	5.534	-0.453	-1.431	3.833	-0.210	-0.618
South West	5.370	-0.265	-1.122	3.932	-0.120	-0.477
London	10.638	0.150	0.209	6.557	0.010	0.045
South East	5.728	-	-	4.545	-	-
1985	12.286	0.170	1.018	7.417	0.373	2.0202
1986	10.418	0.044	0.280	7.132	0.335	1.989
1987	11.302	0.273	1.816	5.322	0.129	0.736
1989	8.235	-0.427	-2.988	5.310	-0.042	-0.265
1990	9.499	-0.228	-1.608	4.901	-0.101	-0.625
1991	11.287	-	-	5.879	-	-
Constant	10.181	-1.633	-5.812	5.850	-1.577	-5.153
Number of Observations	7136			8383		
Likelihood Ratio Test (DF)	1003.02 (48)			427.824 (48)		
% of Correct Predictions	89.798			94.155		
Cragg-Uhler R^2 Square	0.27064			0.13843		

Considering the male results first. It can be seen from Table I that the coefficients

on all aspects of educational attainment are, with the exception of teacher-training,

well defined.[7] It is clear from the estimated coefficients that the key relationships

are between unemployment and either 'high' education (i.e. degree/BTEC) or

'low' education (i.e. GCE 'O' level). There would, however, appear to be some

form of diminishing returns to education with the largest reduction in risk

occurring as one moves from those respondents possessing no qualifications to

those with minimal qualifications (i.e. GCE 'O' levels). The distinguishing

educational feature of male workers appears to be whether or not they posses

some qualifications, rather than the actual level of those qualifications. A similar

result has been found by other researchers (see, for example, PW) and would seem

to relate to the signalling properties of education, with the key separating

equilibrium centring on the acquisition of some minimal level of education. Finally,

a particular finding of note is the relatively large coefficient on the BTEC

qualification. The BTEC course is four years in duration and includes 12 months

work experience in industry. It would appear that this combination of academic

and vocational education emits a particularly desirable signal to employers.

The importance of 'O' levels is reinforced in the female results. The female

sub-sample rates suggest that, with the exception of the BTEC qualification,

higher education is again associated with lower unemployment risk, although the

differentials are somewhat smaller than those for males.[8] More significantly, once

the influence of occupation and other variables is controlled for, it is only the 'O'

level qualification that appears to exert any significant effect on the probability on

female unemployment.

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[7] The dissatisfaction within the teaching profession over the early 1980's which culminated in the 1985 teachers strike has been well documented. Hewton (1986), for example, attributes the strike to low pay and inadequate resources. Indeed, despite the widespread shortages of teachers reported throughout the country, there were over 38,000 trained and qualified teachers without teaching posts in 1985, many of whom subsequently quit the profession [see Fidler *et al* (1993)].

[8] The obvious exception is that of female BTEC holders who are marginally more likely to be unemployed than females with no educational qualifications.

It would thus appear that, *ceteris paribus*, higher (i.e. post 'O-Level') educational qualifications are only able to insulate against excessive *male* unemployment risk. Higher qualifications are associated with a lower average risk of female unemployment, but any such relationship disappears once other factors are controlled for. One explanation for this may be that higher qualifications make it easier for females to obtain more secure jobs (PW), a point which emerges more clearly when the occupational unemployment rates and differentials are examined.

Occupation

The theory of human capital would suggest that those workers with less firm specific human capital will suffer more from any downturn in demand, being the first to be laid off. Such workers, however, may be amongst the first to exit unemployment, having lower reservation wages and being more widely appreciated than their more specifically skilled counterparts since they impose lower recruitment, severance and training costs. It would appear then that increased skill is inversely associated with unemployment incidence but positively related to unemployment duration.[9]

In terms of the BSA sample, it is clear that average unemployment rates do fall as one moves up the occupational scale, although the differentials are somewhat less marked for women than for men. Professional males (females), for example, face 500 (200) per cent less unemployment risk than their unskilled manual counterparts. Logistic analysis confirms the occupational specificity of unemployment incidence. With the exception of male clerical workers and female non-manual workers, occupational affiliation is associated with a significantly lower probability of unemployment relative to that of unskilled manual workers

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[9] The theory of labour market segmentation emphasises the role of 'internal labour markets' in promoting on-the-job training in the 'primary' labour market, whilst the 'secondary' labour market offers relatively unskilled, informal and unstable employment. Thus unskilled workers face a higher risk of unemployment since they are more likely to be members of the secondary labour market [Doeringer and Piore (1971), Wilkingson (1981)]. The ranking models of unemployment, on the other hand, maintain that firms rank job applicants according to the latter's current duration of unemployment [Blanchard and Diamond (1990)].

ceteris paribus. Thus over the period of the sample, blue collar workers appear to face a higher risk of unemployment than similarly qualified white collar workers

Union Membership

The other key finding in this area is that men, but not women, may be able to insulate themselves against unemployment risk by membership of a trade union. Although membership is associated with lower average unemployment for both men and women, it is only the former for whom it exerts a significant effect once the influences of other variables are controlled for.

The relationship between unemployment and union status has been noted by a number of researchers. According to the well known Freeman and Medoff (1984) 'exit-voice' hypothesis, trade unions serve to reduce quit rates and, therefore, the unemployment experience of union members. Osberg *et al* (1986), however, argue that there are two opposing forces at work: First, as highlighted by Ham (1982) and Medoff (1979), unions may act to increase the probability of unemployment by bargaining for higher wages and so increasing the chance of layoff. Second, unions may choose to bargain for job security rather than high wages, thereby reducing the probability of unemployment for their members. The preceding analysis suggest that, at least for men, it is the latter effect which dominates.

III.1b Age, Family Structure, Income and Race

Age

The relatively high incidence of unemployment amongst younger workers is a world-wide phenomenon with the recession of the early 1980's impacting heavily on 'young' (i.e. less than 25 years of age) people throughout the US, Western Europe and Japan [Moy (1985)]. Indeed, even during relatively prosperous years young workers appear to experience significantly higher rates of unemployment than their elder counterparts [Layard *et al* 1991)]. This has been attributed to a

number of factors. In terms of search theory, relatively inexperienced, younger workers are more likely to engage in 'job-hopping' in an attempt to find their most preferred match. Although on-the-job search is certainly feasible, it may be rather more problematic for younger, less tenured workers [Layard *et al* (1991)]. Moreover, it has been argued that the individuals most likely to conduct off-the-job search are those, such as the relatively low paid young, with relatively high replacement ratios [Joll *et al* (1983)]. Indeed, the costs of searching for such workers will be generally small, with low foregone wages and long potential income streams to successful matches. Thus although voluntary moves into unemployment may only account for a small proportion of the total unemployed, the majority of these will comprise young people shopping around for their first job.

An alternative explanation focuses on the inability of young workers to acquire significant stocks of firm specific human capital by the time of a down-turn in demand. Older, more skilled workers imply larger hiring and firing costs than younger workers such that firms will be more willing to let the latter go when demand contracts. This effect is accentuated since young people, by definition, lack seniority and hence are less protected against dismissal.

Workers at the other end of the spectrum may also face problems. If productivity declines with age then older workers may be the first to be laid off as union bargained wages exceed their marginal revenue products, especially if redundancy payments are obligatory. Indeed, as Rones (1983) has suggested, even if such workers are not characterised by particularly high rates of unemployment, once unemployed they are far less likely to secure a new job. Although senior employees are more likely to be protected by 'last in-first out' collective agreements and less likely to quit voluntarily to engage in job search, they are more expensive to retrain than younger workers. Results from other researchers have generally confirmed this U-shaped relationship between age and unemployment, with unemployment incidence (duration) declining (increasing)

with age [(Jolly *et al* (1978), Osberg *et al* (1986), Hughes and Hutchinson (1988), PW)].[10]

The sub-sample male unemployment rates do suggest some form of U-shaped relationship, with the highest unemployment rates being experienced by the youngest (i.e. 18-24) and oldest (58-64) age range. For women the picture is less clear, with unemployment rates falling monotonically with age. The logistic analysis confirms the age-specificity of male unemployment, with both 'young' and 'old' workers facing significantly higher unemployment risk than prime age males *ceteris paribus*. The results for female respondents would suggest that age discrimination is less prevalent, with the observed age-specific unemployment differentials being attributable to other factors.

Family Structure and Income

Table I suggests that there is a significant relationship between martial status and unemployment risk amongst both men and women, with married individuals of both sexes being associated with the lowest risk of unemployment ceteris paribus. Single women (men) are on average more (less) likely to be unemployed than their widowed/separated/divorced counterparts, although this differential is largely attributable to other factors. Such findings accord with those of other researchers [PW, McCormick (1983)].[11]

Table I also shows that respondents with a working spouse are associated with a significantly lower risk of unemployment. This would seem to contradict basic labour supply theory, although similar results have been found by other researchers. Payne (1987), for example, shows that unemployment is 'contagious' within families, with one unemployed family member increasing the risk of

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[10] In the US, the duration of unemployment rises with age with the mean spell of current unemployment for males aged between 55-64 in 1981 being 18.3 weeks, as compared to 9.2 weeks for males aged between 16-19. In the UK, 136.7 thousand individuals aged between 18 and 24 in January 1989 had been unemployed for over 52 weeks as compared to 267.6 thousand for individuals aged 50 and over (*Department of Employment Gazette*).

[11] The issue of causality is particularly pertinent here. Unemployed individuals may find it relatively more difficult to obtain and/or retain a spousal relationship.

unemployment for every family member. Similarly, Moylan and Davies (1980) and Osberg *et al* (1986) show that unemployment risk is significantly positively correlated across spouses. Wadsworth (1991) argues that individuals living in households with other unemployed members are more likely to be discouraged and therefore undertake less intensive search than those living in 'fully employed' households. Conversely, households linked to the labour market may generate a flow of labour market information into the household which may increase the expected benefits to search and therefore stimulate search intensity. In terms of the analysis this idea is proxied through the incorporation of a variable representing an individual's 'unearned' income.[12]

The results suggest that this variable is particularly significant with increases in unearned income impacting positively yet concavley upon unemployment risk with the coefficients suggesting a turning point in the relationship at £10792 (£14533) for males (females). Thus increases in unearned income up to (beyond) these values are associated with a marginal increase (decrease) in the risk of unemployment. It should be acknowledged, however, that unearned income is a difficult concept to measure and the definition adopted is clearly deficient in some areas. Ideally, for example, one would like to have information on transfer payments and income from asset holdings. Thus the results here should be treated with caution.

It has been argued that family size and/or the presence of dependent (i.e. pre-school) children will also influence the incidence of unemployment. Although family commitments may discourage voluntary quits, they may impact positively on unemployment duration given the relatively high welfare benefits, and so higher replacement ratios, associated with them. Indeed, Daniel and Stilgoe (1977) and

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[12] The unearned income proxy was constructed by subtracting the individual's earnings from household income which is defined in the BSA survey as the summation of income across all household members. The working spouse dummy was dropped from the regression on account of the high correlation between it and unearned income.

Nickel, (1980) show that unemployment risk is significantly higher for men with four or more dependent children.[13]

In terms of the data children are classified as either 'dependent' (i.e. pre-school) or 'non-dependent'. Employing a general-to-specific methodology, the most parsimonious logistic specification was found to be when the *presence* of a dependent child and the *number* of non-dependent children were included as explanatory regressors.

The sub-sample results suggest that for *both* men and women the presence of a dependent child is associated with an enhanced risk of unemployment *ceteris paribus*. The direction of causality is particularly uncertain here. It may be the case that there is a correlation between having a dependant child and other unemployment enhancing attributes such as age and residential mobility. Conversely, it may be the case that unemployed individuals are more likely to have children on account of, for example, the increased leisure time available.

Males with either one or two non-dependent children are characterised by lower sub-sample rates of unemployment than males with either no or 'three-plus' such children. The logistic results confirm this relationship with the estimated coefficients suggesting that males with either one or two non-dependent children experience the lowest risk of unemployment *ceteris paribus*. In particular, the relatively high unemployment rates of men with 'large' families (i.e. three or more non-dependent children) can be explained almost entirely by other factors. The relationship between female unemployment risk and the number of non-dependent children does not appear to be so clear cut, although it does appear to be the case that females with two or more non-dependent children are characterised by lower sub-sample unemployment rates than those with less than two children. Once again the logistic results lend support to such a relationship.

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[13] Imbeds and Lynch (1993), however, show that female, but not male, unemployment outflow rates are positively related to the number of children within the household.

Race

Ethnicity has a large effect on unemployment with non-white males (females) being exposed to approximately 40 (22) per cent more unemployment risk than whites. The results set out in Table I suggest, however, that it is only non-white males for whom the risk of unemployment is significantly higher *ceteris paribus*. This confirms similar findings by PW, Payne (1987) and Imbeds and Lynch (1993).

III.1c Residence

The relationship in the sample between residential mobility, residential tenure and unemployment may also be inferred from the sub-sample unemployment rates and logistic coefficients set out in Table I.

Residential Mobility

I classify the residential mobility of respondents in terms of the length of time that they have lived at their current residence. The sub-sample unemployment rates suggest that average male unemployment is critically related to whether or not occupancy has been at the current residence for more than one year, with rates falling by approximately 3.5-4.5 per cent beyond that threshold. For females, the data suggests a more uniform relationship, with average unemployment rates falling continuously with successively longer occupations. Such figures would appear to concur with *a priori* expectations. Shorter termed occupations are unlikely to be attractive to potential employers looking for some sign of stability in their work force, whilst unemployed workers are more likely to migrate to areas where their skills are in demand [Pissarides and Wadsworth (1989), Hughes and McCormick (1991)]. Isolating the effects of other influences, however, the logistic analysis implies that there is virtually no *ceteris paribus* relationship between residential mobility and overall unemployment risk. Only males who have occupied

their current residence for twenty years or more appear to experience any significant fall in unemployment incidence once other variables are controlled for.[14]

Residential Tenure

It has long been suspected that residential tenure has important implications for both the location and level of unemployment. Hughes and McCormick (1981) and Muelbauer and Murphy (1991), for example, have shown that the British housing market has substantially reduced the inter-regional mobility of labour. More particularly, Nickell (1980) and McCormick (1983) have found that council tenants are between 60-70 per cent more likely to be unemployed than the average worker in other tenures holding constant various personal and occupational characteristics.

There are a number of possible reasons for the apparent relationship between council tenure and unemployment: First, the building of council homes may encourage an inward migration of labour, attracted by the general fall in housing costs.[15] Second, council housing implies a particularly localised form of housing subsidy, again leading to inward migration of labour. Third, council housing is generally concentrated in inner city areas and outer estates where job prospects are limited. Fourth, the financial constraints of unemployment are less likely to bite council tenures, given the generally subsidised rents and more stringent benefit rules for mortgagees.[16] Fifth, non council tenants are more likely to have taken security of employment into account when accepting job offers.

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[14] It is apparent that there will be a high degree of correlation between residential mobility so defined and age. Excluding the age categories from the regressions, however, had no material affect on the significance of the mobility categories.

[15] McCormick (1983) dismisses this argument, pointing out that: (i) the construction of council housing has been to a large extent accomplished by the demolition of old housing so that the effect of council construction on slackness in local housing markets is less than would otherwise be the case; and (ii) because an increased availability of council housing leads to a chain reaction of households moving between tenures.

[16] Although private rental accommodation also tends to be concentrated in urban areas, its tenure is generally more mobile, and so more receptive, to job search, than council tenants. Moreover, private landlords are more likely to behave in a summary fashion than public landlords, thereby giving an added impetus to job search.

The sub-sample unemployment rates reported in Table I show that amongst males, private and council tenants were respectively about 2.5 and 5.4 more times likely to be unemployed as owner occupiers, with a staggering one-in-four council tenants unemployed over the period of the data. For females the differentials are somewhat less pronounced at 2.2 and 2.9 times. Even after controlling for other influences I still find that, especially amongst males, owner occupiers are significantly less likely to be unemployed, and council tenants significantly more likely to be unemployed, than persons in private rental accommodation.[17]

III.2   Regional Influences

It is well documented that unemployment is concentrated within certain geographical areas of the economy. Demand conditions are not uniform and those areas in which demand is expanding will be experiencing increasing job opportunities. Individuals living in areas where this is not the case may have lower reservation wages, but the lack of job openings and the strong competition for them will imply longer durations of unemployment. Alternatively these individuals may have been relatively highly paid in their previous employment and may choose to search for a similarly well paid job. Their skills, however, may be out-dated, particularly if the predominant industries in the region are declining, and the likelihood of finding such employment may be very low. Thus unemployment incidence and the state of demand will be related. If markets operated freely one would expect to observe firms moving towards these depressed regions to take advantage of the abundant labour supply and/or low reservations wages. In reality markets do not operate so freely and in Britain regional unemployment differentials have persisted throughout most of the twentieth century.

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[17] These findings are not particularly surprising. The expansion of the owner occupied sector over the 1980s has lead to an increasingly 'residualised' council sector [Doling (1993), Forrest and Murie (1988)].

Attention has increasingly focused upon the apparent emergence of a 'North-South' divide [see, for example, Hughes and McCormick (1991), Jones and Hyclack (1989)]. The Northern regions of Britain, hit by the double blow of falling relative manufacturing prices and rising relative transport costs, have witnessed an enormous decline in (unskilled) manual employment.[18] It has been argued that within the competitive parts of the economy the share of manufacturing will be set by the supply of unskilled labour relative to that of land, since manufacturing uses around twice as much manual labour, and considerably less land per unit of output than services [Minford and Stoney (1991)]. Thus even with high unemployment reducing the supply of manual labour, as manual wages drop relative to benefits, the North has tended to remain the preferred location for manufacturing. Moreover, any measures to bring back these unemployed into supply will enhance this comparative advantage [Minford et al (1994)].

Throughout the 1980's it did, indeed, appear that the North-South divide was widening. Between 1979 and 1990 the total number of employees in employment in the four Southern regions (i.e. South East, East Anglia, South West, East Midlands) increased by some 1.3 million as compared to a decline of some 0.2 million in the rest of the country. It has been argued that the key reason for this job gap stems from the structural shift away from production industries towards service activities that took place over this period (Martin, 1993).

In sharp contrast, the early 1990's have witnessed a marked reversal in these trends. As national unemployment rates declined following the boom of the late 1980s, regional disparities began to narrow in line with the customary pro-cyclical movement in unemployment differentials. The behaviour of these

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[18] Two other factors that might be considered to have played a role in the North's decline are trade unions and local authorities. Local authority taxation falls partially on the cost of skilled labour, thereby acting like a tax on the value-added for unskilled labour. Trade unions tend to operate successfully in sectors where foreign competition faces some natural or artificial barrier. With limited competition, monopoly unions are able to hike up wages, the only limit to any hike being the fall in employment as the industry contracts. Northern local authorities and trade unions have tended to adopt relatively more aggressive rating and wage policies than their Southern counterparts [Minford et al (1988)].

disparities during the subsequent recession of the early 1990s, however, contrasted sharply to that of previous recessions. The downturn was concentrated primarily in services, and, thus, impacted primarily upon the South. As a consequence, unemployment differentials between the Northern and Southern regions continued to narrow, rather than widening in accordance with the usual pro-cynical pattern [see Martin (1993)].

Some form of divide is evident in the average regional unemployment rates reported in Table I, with unemployment rates in the Northern regions generally exceeding those in the Southern regions. The logistic results, however, although confirming that regional location does in certain cases impact significantly impact upon the probability of unemployment *ceteris paribus*, do not support a simplistic North-South divide. Controlling for other influences, Northern Ireland, Wales, the North East, the West Midlands and the North East have, in turn, the largest unemployment risks relative to the South East. The higher relative incidence in Scotland, the West Midlands, Yorkshire and Humberside and London, and the lower relative incidence in the South West and East Anglia, is attributable to other related factors.

IV.   Unemployment Duration

It has been found that the chance of obtaining employment falls dramatically as individuals pass the threshold into long-term unemployment , that is, spells of one year or more [Jackman and Layard (1991), Layard *et al* (1991), Budd *et al* (1988)]. There is considerable debate, however, as to the factors underlying this differential. The key issue pertains to the characteristics of the long term employed; are they different in some way from other unemployed workers? If they are different, then is this on account of some pure heterogeneity between the two groups; or is it instead a result of some form of duration dependence in the sense of unemployment *changing* the characteristics of the unemployed. The distinction has crucial implications for policy: if the former applies policy should be directed at

preventing particular groups of workers from becoming unemployed; if the latter is the case, then policy should be concentrated on minimising unemployment durations for all workers.

There is growing evidence, particularly from the social-psychology literature, that prolonged spells of unemployment do impact adversely upon motivation and morale [see Banks and Jackson (1982), Warr (198), Heady and Smyth (1989), Burchell (1990), Layard *et al* (1991)]. An alternative view, however, argues that the primary explanation for individual long term unemployment lies in changes in industrial structure rather than changes in the personal disadvantages of the unemployed [White (1983)]. Structural changes redefine the amount and type of labour demand and hence implicitly define the group of individuals facing the most difficulties in securing employment within the given labour market. Furthermore, it is argued that any such structural changes are likely to bear a disproportionate burden on older workers who have frequently invested in particularly outmoded skills, industries or firms [Payne (1987)].

In this section I examine the incidence of long term unemployment in the sample. Given the limitations of the data I am, unfortunately, unable to cast any light on the issue of duration dependence *versus* pure heterogeneity. I can, however, highlight the characteristics of the long term unemployed, in particular addressing the issue as to whether these characteristics are endogenous or exogenous to the individual.

The sub-sample unemployment rates and logistic regression results are set out in Table II below and generally reinforce those of Table I. For brevity I comment on some of the more significant findings only.

Table II: Probability of Long Term Unemployment

Variable Name	Males			Females		
	Sb-Smp U%	Estimate	T-Statistic	Sb-Smp U%	Estimate	T-Statistic
'O' Levels	1.965	-0.758	-4.766	1.484	-0.870	-4.496
'A' Levels	1.407	-0.422	-1.957	1.501	-0.325	-1.171
Teacher Training	1.724	0.644	0.998	2.217	1.286	3.140
Degree	0.661	-0.874	-1.749	1.180	-0.201	-0.588
BTEC Higher	0.505	-1.159	-1.584	3.947	1.289	2.070
No Education Qualifications	11.276	-	-	3.643	-	-
Professional	1.359	-0.577	-2.447	1.603	-0.286	-1.028
Clerical	4.320	-0.082	-0.311	1.950	-0.282	-1.631
Other Non Manual	3.398	-0.586	-2.834	1.762	-0.279	-0.729
Skilled Manual	6.119	-0.168	-1.188	3.061	-0.277	-1.038
Unskilled Manual	11.289	-	-	4.157	-	-
Union Member	4.805	-0.544	-3.997	2.180	-0.161	-1.073
Non Union Member	6.319	-	-	3.231	-	-
Aged 18-24	5.408	-0.570	-2.388	4.730	0.125	0.457
Aged 25-34	4.720	-0.133	-0.669	3.082	0.102	0.441
Aged 35-44	4.254	-	-	2.094	-	-
Aged 45-54	4.803	0.132	0.673	2.311	0.025	0.105
Aged 55-59	7.240	0.371	1.627	3.333	0.092	0.317
Aged 60-64	8.675	0.553	2.408	-	-	-
Single	8.137	-	-	5.526	-	-
Married	4.102	-0.745	-3.839	1.406	-1.273	-5.903
Separated/Divorced/Widowed	13.229	0.212	0.960	5.267	-0.311	-1.417
Spouse Works	1.177	-	-	1.087	-	-
Spouse Does Not Work	8.010	-	-	4.740	-	-
Unearned Income	-	0.273^{E-03}	6.916	-	0.162^{E-04}	0.495
Unearned Income Squared	-	-0.161^{E-07}	-5.545	-	-0.150^{E-08}	-1.008
0 Non-Dependent Children	6.218	-	-	2.443	-	-
1 Non-Dependent Child	3.632	-0.360	-1.738	3.643	0.218	1.055
2 Non-Dependent Children	3.067	-0.334	-1.529	2.209	-0.098	-0.405
3 Non-Dependent Children	6.551	0.114	0.445	3.129	-0.003	-0.011
4+ Non-Dependent Children	12.796	0.389	1.328	2.222	-0.634	-1.296
Dependent Child	5.297	0.547	2.509	4.111	0.402	1.796
No Dependent Child	5.330	-	-	2.385	-	-
Non-White	8.416	0.571	1.871	2.222	-0.078	-0.164
White	5.235	-	-	2.709	-	-
Residence: 0-1 Year	6.216	0.358	1.523	4.414	-0.024	-0.989
Residence: 1-2 Years	4.132	-0.316	-1.342	2.469	-0.549	-2.015
Residence: 2-5 Years	4.971	-	-	3.487	-	-
Residence: 5-10 Years	6.541	0.224	1.266	2.240	-0.273	-1.207
Residence: 10-20 Years	4.876	-0.079	-0.433	2.187	-0.252	-1.146
Residence: 20+ Years	4.520	-0.476	-2.267	2.322	-0.044	-0.173
Owner Occupier	2.048	-0.771	-3.069	1.277	-0.887	-3.288
Council Tenant	16.722	0.764	3.199	6.329	0.139	0.524
Private Tenant	5.206	-	-	4.176	-	-
Scotland	5.181	0.346	1.244	2.153	-0.242	-0.734
Northern Ireland	10.169	1.343	5.465	4.145	0.359	1.341
Wales	7.591	0.937	3.059	3.030	0.289	0.771
North East	9.375	0.925	3.146	3.476	0.125	0.350
North West	6.744	0.808	3.248	4.189	0.465	1.779
Yorks/Humberside	5.281	0.737	2.646	2.928	0.342	1.096
West Midlands	5.477	0.708	2.557	1.702	-0.333	-0.958
East Midlands	4.751	0.458	1.465	2.165	-0.020	-0.051
East Anglia	3.162	-0.093	-0.219	1.394	-0.349	-0.636
South West	1.852	-0.421	-1.102	1.880	0.090	0.245
London	4.468	0.129	0.408	2.550	-0.183	-0.529
South East	2.192	-	-	1.845	-	-
1985	6.714	0.564	2.463	3.090	-0.071	-0.271
1986	6.071	0.567	2.627	2.574	-0.184	-0.752
1987	5.244	0.487	2.261	2.145	-0.243	-0.960
1989	3.875	-0.320	-1.572	2.506	-0.292	-1.355
1990	5.984	0.220	1.152	2.419	-0.268	-1.225
1991	4.891	-	-	3.479	-	-
Constant	5.325	-2.742	-6.830	2.696	-1.750	-4.036
Number of Observations	7136			8383		
Likelihood Ratio Test (DF)	740.096 (48)			315.575 (48)		
% of Correct Predictions	94.577			97.304		
Cragg-Uhler R Squared	0.28950			0.16820		

In terms of education the issue of decreasing returns is even more apparent with only the possession of an 'O' level being associated with a reduced risk of long term male unemployment *ceteris paribus*. For females, the surprising results are the significantly higher risks associated with the possession of a teacher training and/or a BTEC higher qualification. There is no apparent relationship between age and long term female unemployment once other contributing factors are controlled for. For males, however, long term unemployment is found to be concentrated amongst the oldest population group, with the youngest group facing a lower *ceteris paribus* risk. In terms of children, the crucial relationship appears to be between unemployment and the age, rather than the number, of any non-dependent children. The number of non-dependent children does not exert an important influence on long term unemployment for either men or women whereas the possession of a dependent child is associated with a higher risk of long term unemployment, especially amongst males. Finally, it is apparent that the regional imbalances in long term male unemployment are even more significant than those relating to male unemployment generally. In contrast, long term female unemployment is not related to regional factors. Thus, males living in the those regions in which unemployment risk is significantly higher relative to the South East (i.e. Northern Ireland, Wales, the North-East, the North-West and the West Midlands) also face a higher relative risk of long term unemployment. Interestingly, even though males living in Yorkshire and Humberside face essentially the same risk of unemployment as males living in the South East, they face a significantly higher risk of long term unemployment.

V.   Regional Effects

V.1   Introduction

Although the results reported in Tables I and II say nothing about causality, they are nethertheless important in highlighting the potential role for future regional

policy in the UK. If it is in fact the case that unemployment incidence and duration are associated primarily with the demographic characteristics of individuals irrespective of region, then macroeconomic based, national policy measures are perhaps the appropriate way forward in combating unemployment. If regional variations are prevalent, but are associated primarily with regional factor endowments, then microeconomic based, industrial policy is perhaps more appropriate. Such issues are important given the current state of UK regional policy. The period since the Conservative party came to office in 1979 has witnessed an extensive rationalisation of regional policy. Industrial development certificates and automatic regional development grants have been abolished, regional aid has become more selective and the balance of regional policy has shifted away from manufacturing towards services. This latter is reflected in the most recent review of regional policy (HM GOVERNMENT, 1993) which reconfigured the 1984 map of areas eligible for assistance. The new map retains the simple two-tier system of assisted area status (development and intermediate) and the same degree of total areal coverage as the 1984 incarnation. Similarly, the broad objectives of regional policy "... to reduce regional imbalances in employment opportunities and to encourage the development of indigenous potential within the Assisted Area on a stable, long term basis..." (HM GOVERNMENT, 1992) remains unchanged. The main purpose of the review was, ostensibly, to reconfigure the map of areas eligible for assistance so as to take account of the various changes in regional economic conditions, and subsequent changes in the geographic incidence of unemployment, since the mid-1980s. The practical results of the revisions have been to shift regional policy towards the south of the country, with several areas in the North and West losing their assisted status completely. The electoral ramifications of this restructuring have not gone unnoticed [see, for example, Martin (1993)]. Whatever the political agenda, however, the question as to the economic validity of such policy-reshaping remains. This Section attempts to shed some light on this issue by decomposing

the differential (log-odds) risk of unemployment into its constituent elements. In so doing it is able to identify how far the regional variations in unemployment can be 'explained' by pure regional effects, as picked up by the regional dummies, and how far they are determined by regional variations in the values of the other independent variables.

V.2   Econometric Specifications

Consider the probability that an individual i resident in region j will be observed in the state of unemployment as a function of a set of personal and environmental characteristics, X_{ij}. In terms of the logistic specification, this estimated probability, $\hat{p}_{ij}$, represents the unemployment rate of all individuals with characteristics X_{ij} and is given by:

$$\hat{p}_{ij} = \frac{1}{1 + \exp^{-\hat{B}_j X_{ij}}} \tag{1}$$

where $\hat{B}_j$ is a column vector of regression coefficients. Taking natural logs:

$$\ln\left(\frac{\hat{p}_{ij}}{1 - \hat{p}_{ij}}\right) = \hat{B}_j X_{ij} \tag{2}$$

The left-hand side of (2) represents the predicted log-odds of an individual i experiencing unemployment in region j. The predicted average log-odds of experiencing unemployment in region j is therefore:

$$\ln\left(\frac{\hat{p}_j}{1 - \hat{p}_j}\right) = \hat{B}_j \overline{X}_j \tag{3}$$

where $\hat{p}_j$ denotes the predicted probability of unemployment in region j and the $\overline{X}_j = (1/N_j)\sum_{i=1}^{N_j} X_{ij}$ are the population (size N_j) average personal and environmental characteristics in region j. If regional location exerts a fixed effect only on the probability of unemployment, then $\hat{B}_j = \hat{B}$, $\forall j$, then (3) may be rewritten as:

$$\ln\left(\frac{\hat{p}_j}{1-\hat{p}_j}\right) = \hat{B}\overline{X}_j \tag{4}$$

such that the differential actual log-odds of experiencing unemployment in region j vis a' vis the default region South East (*SE*) may be expressed as:

$$\ln\left(\frac{\hat{p}_j}{1-\hat{p}_j}\right) - \ln\left(\frac{\hat{p}_{SE}}{1-\hat{p}_{SE}}\right) = \hat{B}\left(\overline{X}_j - \overline{X}_{SE}\right) \tag{5}$$

Given the non-linearity of the logistic specification, it is not possible from (5) to ascertain the actual differential probability of unemployment attributable to particular region. One may, however, achieve some approximation by assuming - as do PW - that individuals are identical across regions except for the regional dummy, x. Under this assumption, equation (5) may be re-written as:

$$\ln\left(\frac{\hat{p}_j}{1-\hat{p}_j}\right) = \ln\left(\frac{\hat{p}_{SE}}{1-\hat{p}_{SE}}\right) + \hat{\beta}x_j \tag{6}$$

where $\hat{\beta}$ is the logistic regression coefficient of the regional dummy variable x_j for region j. Assuming $\hat{p}_{SE} = p_{SE}$, where p_{SE} is taken from the sub-sample unemployment rates in Table I, one can calculate $\hat{p}_j$ from (6) and estimate the specific unemployment differential attributable to region j as:

$$p_j^{diff} = \hat{p}_j - p_{SE} \tag{7}$$

V.3   Results

It is apparent that the above analysis depends crucially upon the assumption that regional location exerts only a fixed effect on the probability of unemployment. This is tantamount to assuming that the formulations of the logistic regressions specified in Tables I and II are correct - specifically, that the regions should be entered as shift rather than slope dummies. To test the validity of this assumption a

series of Wald Tests were performed on the male and female logits, the results of

which are collated in Table III.[19]

Table III Wald Statistic: Unemployment Incidence				
	Male		Female	
	No Constant	Constant	No Constant	Constant
Scotland	32.263	39.665	40.598	53.521
Northern Ireland	41.898	132.63	38.027	59.571
Wales	33.885	72.508	20.438	27.711
North East	27.694	51.095	28.054	40.834
North West	32.394	78.929	27.455	48.190
Yorks/Humberside	37.706	56.986	30.813	48.961
West Midlands	17.199	43.848	35.674	41.834
East Midlands	31.169	39.960	27.746	37.455
East Anglia	12.468	19.548	08.415	21.291
South West	19.606	20.321	23.149	41.262
London	29.344	37.901	28.789	42.110
South East	45.599	88.850	29.077	31.480

Notes:
(i)   Ho: The estimated regression coefficients for each regional regression differ insignificantly from those of the overall regression.
(ii)   37 (38) degrees of freedom with (without) constant. The critical value of the Wald statistic with 37 (38) degrees of freedom is 59.89 (61.16) and 52.19 (53.38) at the 1% and 5% levels respectively.

Table III provides strong support for the econometric priors regarding the

relationship between regional location and the probability of unemployment.

Accordingly, Tables IV and V below set out the results of an analysis based upon

equations (4) and (6) for male and female respondents respectively. To maintain

the clarity of exposition, I report the differential predictions corresponding to a

collection of like variables only, rather than the differential predictions for each

individual variable individually. Accordingly, the rows break down the differential

regional predicted log-odds between twelve groups of variables: *Region,*

Education, Occupation, Union, Age, Family, Income, Race, Residential Mobility,

Residential Tenure, Year and *Constant.* I also report only those results

corresponding to unemployment incidence. Considering the male results first. It is

apparent that a significant regional effect exists for all regions, and especially for

Northern Ireland, Wales, the North East, the North West and the West Midlands.

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[19] For an extensive survey on the appropriate use of the Wald and similar tests see Engle (1984).

Other significant correlates with the differential risk (i.e. log odds) of unemployment are *Education*, *Housing Tenure*, *Income* and *Family*. In contrast, *Housing Mobility*, *Race* and *Age* do not appear to be particularly significant correlates. As regards the extent to which actual (i.e. percentage) unemployment differentials can be attributed specifically to regional location, the results suggest that the latter are prevalent for all regions with the exception of London, the East Midlands and Scotland where differentials are largely attributable to non-regional, demographic effects. Finally, it would appear that the regional effects associated with East Anglia and the South West are 'offset' by countervailing demographic effects - ignoring the latter implies a lower than actual unemployment differential in these regions relative to the South East.

Regional differences in average unemployment risk are less pronounced for females and this is reflected in the somewhat smaller regional and demographic components of the differential log-odds of unemployment. Indeed, significant 'pure' unemployment differentials exist for Yorkshire and Humberside, the North West and Northern Ireland only. Moreover, the relatively higher average risk of unemployment in London, the North East and Scotland may be attributed to non-regional demographic effects.

Finally, particularly large differentials can be observed in both the male and female results as regards *Family* in Wales and *Family* and *Residence* in London. The former is somewhat difficult to rationalise, although the latter may reflect the relatively large number of young, single workers in the capital residing in short-tenured accommodation.

Table IV
Regional Effects: Male Unemployment Incidence

	SE	L	EA	EM	WM	YH	NE	NW	SW	W	NI	S
Region	-	0.150	-0.453	0.134	0.654	0.290	0.600	0.710	-0.265	0.774	0.859	0.129
Education	-	0.029	0.137	0.194	0.135	0.089	0.257	0.107	0.045	0.219	0.258	0.020
Occupation	-	0.021	0.036	0.031	0.030	0.033	0.052	0.042	0.018	0.054	0.032	0.031
Union	-	0.004	-0.011	-0.025	-0.042	-0.047	-0.069	-0.055	-0.010	-0.090	0.001	-0.002
Age	-	0.010	-0.003	0.015	-0.004	0.007	0.019	0.009	-0.016	0.007	-0.008	0.014
Family	-	0.136	0.011	0.011	0.017	0.023	0.049	0.074	0.005	1.295	0.101	0.061
Income	-	0.022	0.088	0.048	0.061	0.002	0.063	0.050	0.075	0.152	0.098	-0.003
Race	-	0.046	-0.002	0.003	0.005	-0.002	-0.007	0.001	0.005	-0.006	-0.008	0.000
Mobility	-	0.002	0.004	0.001	-0.015	-0.014	-0.011	0.006	0.043	-0.041	-0.036	0.005
Tenure	-	0.306	0.074	0.041	0.055	0.016	0.248	0.114	0.006	0.113	0.169	0.275
Year	-	-0.022	0.018	-0.003	-0.002	-0.018	-0.005	-0.003	-0.008	0.002	-0.182	0.007
Constant	-	-0.080	0.003	-0.046	-0.103	-0.046	-0.156	-0.130	0.006	0.070	-0.169	-0.073
$\hat{B}(\bar{X}_j - \bar{X}_{SB})$	-	0.624	-0.098	0.404	0.791	0.333	1.040	0.925	-0.096	2.549	1.115	0.464
$p_j\%$	5.73	10.64	5.53	8.55	12.01	8.52	15.28	14.01	5.37	14.19	16.10	10.19
$(p_j - p_{SB})\%$		4.91	-0.20	2.82	6.28	2.79	9.55	8.28	-0.36	8.46	10.37	4.46
$p_j^{diff}\%$	-	0.87	-2.01	0.77	4.74	1.78	4.23	5.27	-1.27	5.91	6.82	0.74

Table V
Regional Effects: Female Unemployment Incidence

	SE	L	EA	EM	WM	YH	NE	NW	SW	W	NI	S
Region	-	0.010	-0.210	-0.117	0.010	0.304	-0.078	0.399	-0.120	-0.118	0.351	0.060
Education	-	-0.002	0.038	0.017	0.050	0.047	0.068	0.046	-0.007	0.040	0.032	-0.011
Occupation	-	0.018	0.028	0.035	0.050	0.059	0.059	0.057	0.022	0.067	0.063	0.036
Union	-	-0.003	0.000	-0.014	-0.006	-0.008	-0.012	-0.011	-0.001	-0.015	-0.008	-0.007
Age	-	0.011	0.003	0.016	-0.001	0.001	0.011	0.009	0.002	0.001	0.015	0.012
Family	-	0.138	-0.042	0.012	0.007	0.013	0.057	0.092	0.006	1.559	0.078	0.054
Income	-	-0.015	0.021	-0.023	-0.116	-0.002	0.013	0.003	-0.002	-0.008	-0.005	-0.005
Race	-	0.019	-0.005	-0.002	0.001	-0.001	-0.003	0.000	0.000	-0.002	-0.005	0.000
Mobility	-	0.011	-0.014	-0.028	-0.014	-0.012	-0.005	-0.010	-0.009	-0.023	-0.022	-0.006
Tenure	-	0.156	-0.010	0.018	0.036	-0.010	0.097	0.057	-0.022	0.036	0.099	0.124
Year	-	-0.010	-0.003	-0.004	-0.002	-0.011	0.014	0.004	-0.003	-0.009	-0.149	0.006
Constant	-	0.106	0.187	0.081	0.097	0.087	0.148	-0.032	0.148	0.217	-0.048	0.074
$\hat{B}(\bar{X}_j - \bar{X}_{SB})$	-	0.439	-0.007	-0.009	0.112	0.467	0.369	0.614	0.014	1.745	0.401	0.337
$p_j\%$	4.55	6.56	3.83	4.55	5.11	6.47	6.15	8.49	3.93	4.68	7.25	6.19
$(p_j - p_{SB})\%$	-	2.01	-0.71	0.00	0.56	1.93	1.60	3.94	-0.61	0.14	2.71	1.65
$p_j^{diff}\%$	-	0.04	-0.83	-0.48	0.04	1.52	-0.33	2.08	-0.49	-0.49	1.79	0.27

In conclusion, the results reported in Tables IV and V would appear to suggest that the issue of a North-South divide remains even when a battery of demographic characteristics are accounted for. There is without doubt a higher *average* risk of unemployment associated with the Northern regions relative to the South East, and this differential remains to a large extent even when one controls for the differing profiles of individuals resident within the various regions. Indeed, only the differential risk of female unemployment in the North East, and male and female unemployment in London and Scotland, appear to be associated with non-regional influences.

VI.   Conclusion

This Chapter has explored the differential risks of unemployment faced by different labour market groups utilising pooled British data for the period 1985-91. The results indicate that young, unskilled males living in council accommodation suffer the highest risk of unemployment. Regional location is significantly correlated with both short-term and long-term unemployment risk, especially amongst males, even when a plethora of individual demographic characteristics are taken into account. In particular, individuals resident in Northern Ireland, Wales, the North West, the North East, and the West Midlands are found to face a significantly higher risk of unemployment *ceteris paribus*. Aside from *Region*, the results suggest that differential male unemployment risk is particularly correlated with *Education*, *Housing Tenure* and *Income*, and particularly uncorrelated with *Race*, *Housing Mobility* and *Age*.

It is crucial to ascertain the characteristics of the unemployed on account of the potential implications for policy. Essentially, unemployment can be tackled through microeconomic and/or macroeconomic intervention. If unemployment is primarily attributable to the demographic characteristics of the unemployed, then polices aimed at altering those characteristics will help to alleviate unemployment.

This would generally imply micro-based supply-side intervention targeting such issues as education and training, child care and unemployment insurance. Alternatively, if unemployment is primarily a regional issue, then a macroeconomic based approach may be more appropriate. Although the logistic analysis undertaken in this Chapter is used descriptively, identifying correlation rather than causation, the results would suggest that this latter approach remains an important option, especially for Northern Ireland, Wales and the North and West Midlands of England. In these regions the industrial distribution of employment, differences in regional living costs differences, especially housing, and other regional effects are clearly related to the risk of unemployment. In contrast, the higher (relative to the South East) average unemployment rates experienced by individuals elsewhere in the country (i.e. Scotland, the East Midlands and London) appear to be related to the demographic characteristics of the unemployed in those regions.

Chapter Five

Trade and Trade Unions

I.   Introduction

It has long been observed that a substantial portion of world trade occurs in similar products and between similar countries. The United Kingdom (UK), for example, exports and imports cars to and from Sweden. Similarly, the European Community (EC) imports wheat from the United States (US) and exports wheat to Eastern Europe. This Chapter investigates the implications of such *intra-industry* trade on the labour market prospects (i.e. earnings and employment) of a sample of British workers.

Interest in intra-industry trade was largely stimulated by concern with the implications of the formation of the EC on trade flows within member countries. The original study was that by Verdoorn (1960) who investigated the changes in the pattern of trade of the Benelux countries following their union. He found that specialisation and trade between the member countries had taken place within similar product categories rather than between different product categories. Similarly, Balassa (1975), in an analysis of the product composition of trade between each pair of the original EC members over the periods 1958-63 and 1963-70, found that trade was increasingly an exchange of similar goods. Grubel and Lloyd (1975) subsequently estimated that 71 per cent of the increase in trade between the EC countries over the period 1959-67 was intra-industry. The international trading situation at the start of the 1990's and evidence pertaining to the extent of intra-industry trade are detailed in Tables I - III following:

Table I				
World Trade Patterns: % of World Exports (1990)				
	Exports To			% Share of	
Exports From	Industrial Countries	Dev Countries	Ex-Soviet Bloc	World Trade	World Income
Industrial Countries	56.5	12.9	1.6	72.0	72.0
Dev Countries	14.9	6.9	0.2	23.0	15.0
Ex-Soviet Bloc	2.0	0.6	2.3	5.0	13.0

Source: Gatt, International Trade, World Bank, World Development Report

| Table II |||||
| Average Levels of Intra-Industry Trade by Country Type: 1978 |||||
Country Type	Total Trade	Trade with DMEs only	Trade with all LDCs	Trade with NICs only
DMEs	0.59	0.64	0.21	-
NICs	0.42	0.48	0.38	0.31
LDCs	0.15	0.10	0.22	-

Source: Havrylyshyn (1983)

Notes:
DMEs - Developed Market Economies
NICs - Newly Industrialised Countries
LDCs Less Developed Countries

| Table III ||||||
| UK Intra-Industry Trade ||||||
SITC Classification		1964	1970	1977	1980
0	Food and Live Animals	0.22	0.31	0.35	0.38
1	Beverages and Tobacco	0.28	0.27	0.35	0.43
2	Crude Materials	0.19	0.36	0.40	0.34
3	Minerals and Fuels	0.35	0.26	0.58	0.59
4	Animals and Vegetable Oils	0.29	0.25	0.50	0.48
5	Chemicals	0.56	0.59	0.69	0.69
6	Manufactured Goods (Classified by Materials)	0.52	0.56	0.69	0.71
7	Machinery & Transport Equipment	0.51	0.60	0.69	0.68
8	Miscellaneous Manufactures	0.75	0.79	0.80	0.80

Notes:

Grubel-Lloyd Index: $GLI = 1 - \left[\left| X_j - M_j \right| / \left(X_j + M_j \right) \right]$.

$\lim_{\substack{X_j \to 0 \\ M_j \to 0}} GLI = 0$ and $\lim_{X_j \to M_j} GLI = 1$

Early attempts to rationalise intra-industry trade concentrated on transport costs and seasonal differences between countries. For example, it may be economic for France to export a good to Germany at the North of their common border but to import it at the South. Similarly, Australia may import grain from the EC before its own harvest but export grain thereafter.

Although attractive, such explanations would cover only a small proportion of the world volume of intra-industry trade [see Greenaway and Milner (1986)]. Latter attempts to provide a more general explanation - the so called *new trade theories* - have focused instead on the area of imperfect competition. Brander (1981) and Brander and Krugman (1983), for example, have demonstrated that intra-industry trade can be motivated as the reciprocal dumping outcome of oligopolistic rivalry in imperfectly competitive product markets. Brander and Spencer (1988) extended the basic model in various respects, focusing in particular on the case in which wages in one of the economies are, rather than being set exogenously, instead the result of a union-firm bargain. This is an important extension given the international prevalence of union bargaining [see Layard *et al* (1992)].

The Brander and Spencer (1988) model is likely to provide an appropriate framework for the analysis of intra-industry trade between economies with relatively distinct wage determination processes. There are, for example, a number of industries within the North American Free Trade Agreement (NAFTA) for which there is no unionisation in one country but considerable unionisation in another. But there are also many examples of trade between countries each having similarly unionised labour markets and in such situations the Brander and Spencer approach requires further refinement.

This Chapter contributes both theoretically and empirically to this area. I develop a framework engendered by Naylor (1994) in which international trade occurs between economies each having imperfectly competitive product markets *and* unionised labour markets. I examine here how the presence of unions in both

countries affects the strategies of the various players, focusing in particular on the effects of reductions in trade costs on the labour market prospects of workers. The analysis suggests that the impact of a decline in import costs depends crucially upon the extent of union bargaining power to which a worker is subordinate. To be sure, higher (lower) union bargaining power implies that reduced import costs impact relatively more on the wage (employment) prospects of individual workers. The empirical results lend supports this proposition with higher imports impacting significantly negatively on the wage (employment) prospects of (non) unionised workers.

The remainder of the Chapter is set out as follows: Section II presents the theoretical underpinnings to the analysis with the formal model of generally unionised international oligopoly. Sections III and IV describe the data, empirical methodology and results. Final remarks are collected in Section V.

II.   Theoretical Underpinning

II.1   Environment

I follow Naylor (1994) in focusing on two countries (A and B) within each of which there is a single firm (Firm 1 in Country A and Firm 2 in Country B) producing some non-differentiated commodity x. Each firm faces a constant cost of t_j, $j = 1,2$, per unit of export. This may be interpreted as an index of all costs associated with international trade (i.e. transactions, transport and tariffs). Both firms regard each country as a distinct and separate market and choose the profit maximising quantity of output for each market separately on the Cournot assumption that the other firm's output in each market is given.

For ease of exposition I assume a constant marginal product of labour normalised to unity such that output and employment may be discussed interchangeably. The profit functions of the two firms are defined:

$$\pi_1 = \left(p^a - w_1\right)x_1^a + \left(p^b - w_1 - t_1\right)x_1^b \tag{1}$$

$$\pi_2 = \left(p^a - w_2 - t_2\right)x_2^a + \left(p^b - w_2\right)x_2^b \tag{2}$$

where p^i, $i = a,b$ represents the price of commodity x in country i, w_j, $j = 1,2$ represents the wage paid by firm j and t_j, $j = 1,2$ represents an index of trade costs facing firm j. The decomposition of output shares is illustrated in Table II following.

Finally, and again for simplicity, I assume linear product demands of the form:

$$p^i = \alpha^i - \beta^i x^i \tag{3}$$

		Country		
		A	B	
Firm	1	x_1^a	x_1^b	x_1
	2	x_2^a	x_2^b	x_2
		x^a	x^b	x

Table IV
Output De-Composition
x_i^j = quantity of output produced by firm j for consumption in country i.

Each union aims to maximise rents and does not, when bargaining over wages, take into account any implications of the bargained wage for the overall price level. Such an assumption is justified provided that the firm's output does not constitute a significant portion of the workers' consumption bundle. I assume a utilitarian union preference structure with each union having a membership of m_i members and an objective function:

$$u_j = w_j x_j + \left(m_j - x_j\right)\bar{w}_j \tag{4}$$

where $\bar{w}_j$ represents the reservation wage available to members of union j.

II.2   Bargaining

The behaviour of each firm-union pair is modelled as a two stage game. In stage two the firm sets the level of output (and therefore employment) taking the bargained wage from stage one and the level of output of the rival firm as given. Formally:

$$\text{Stage Two: } \max_{x_j} \pi_j\!\left(w_j, x_j\right)$$

I define the (unique) solution to the above $x_j\left(w_j\right)$. In stage one each firm-union pair bargains over the wage, taking as given the wage set by the other rival firm-union pair and taking into account the implications of any wage on labour demand. Formally:

$$\text{Stage One: } \max_{w_j} \Omega_1 = q_j \log\!\left\{u_j\!\left[w_j, x_j\!\left(w_j\right)\right] - \bar{u}_j\right\} + \left(1 - q_j\right)\log\!\left\{\pi_j\!\left[w_j, x_j\!\left(w_j\right)\right] - \bar{\pi}_j\right\}$$

where $\bar{\pi}_j$ and $\bar{u}_j = m_j \bar{w}_j$ represent the firm and union fallbacks respectively. I assume in what follows that $\bar{\pi}_j = 0$ for simplicity.

The model is therefore solved by backward induction. Consider first Stage Two:

Stage Two

Maximising (1) and (2) with respect to the output pairs x_1 and x_2 respectively yields the following first order conditions for profit maximisation:

$$\frac{\partial \pi_1}{\partial x_1^a} = \alpha^a - 2\beta^a x_1^a - \beta^a x_2^a - w_1 = 0$$

$$\Rightarrow \tag{5}$$

$$x_1^a = \frac{\alpha^a - w_1}{2\beta^a} - \frac{1}{2}x_2^a$$

$$\frac{\partial \pi_1}{\partial x_1^b} = \alpha^b - 2\beta^b x_1^b - \beta^b x_2^b - w_1 - t_1 = 0$$

$$\Rightarrow \qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad (6)$$

$$x_1^b = \frac{\alpha^b - w_1 - t_1}{2\beta^b} - \frac{1}{2} x_2^b$$

$$\frac{\partial \pi_2}{\partial x_2^a} = \alpha^a - 2\beta^a x_2^a - \beta^a x_1^a - w_2 - t_2 = 0$$

$$\Rightarrow \qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad (7)$$

$$x_2^a = \frac{\alpha^a - w_2 - t_2}{2\beta^a} - \frac{1}{2} x_1^a$$

$$\frac{\partial \pi_1}{\partial x_2^b} = \alpha^b - 2\beta^b x_2^b - \beta^b x_1^b - w_2 = 0$$

$$\Rightarrow \qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad (8)$$

$$x_2^b = \frac{\alpha^b - w_2}{2\beta^b} - \frac{1}{2} x_1^b$$

Equations (5) - (8) may be interpreted as the two firms' reaction functions with respect to both the rival's output in the relevant product market and with respect to the equilibrium wage resulting from the bargain with the union. Thus (5) - (8) can be solved to obtain equations for output in each market as reaction functions with respect to the bargained wage. These are illustrated in equations (9) - (12) following and represent the labour demand curves facing each union given the bargained wage:

$$x_1^a(w_1; w_2, t_2) = \frac{1}{3\beta^a} \left(\alpha^a - 2w_1 + w_2 + t_2 \right) \qquad\qquad (9)$$

$$x_1^b(w_1; w_2, t_1) = \frac{1}{3\beta^b} \left(\alpha^b - 2w_1 + w_2 - 2t_1 \right) \qquad\qquad (10)$$

$$x_2^a(w_2; w_1, t_2) = \frac{1}{3\beta^a} \left(\alpha^a - 2w_2 + w_1 - 2t_2 \right) \qquad\qquad (11)$$

$$x_2^b(w_2; w_1, t_1) = \frac{1}{3\beta^b} \left(\alpha^b - 2w_2 + w_1 + t_1 \right) \qquad\qquad (12)$$

Equation (9), then, represents Firm 1's demand for labour to produce output for the domestic market (i.e. Country A) whilst equation (10) describes Firm 1's

demand for labour to produce output for export to Country B. In both cases w_2 and t_j are taken as given and, taken together, equations (9) and (10) define the total demand for labour supplied by Union 1.

Without undue loss of generality, I am able to ease the exposition of what follows considerably by assuming $\beta^a = \beta^b = \beta$ such that the two firms' aggregate labour demand functions may be written:

$$x_1^d(w_1;w_2,t_j) = \frac{1}{3\beta}(\alpha^a + \alpha^b - 4w_1 + 2w_2 - 2t_1 + t_2) \tag{13}$$

$$x_2^d(w_2;w_1,t_j) = \frac{1}{3\beta}(\alpha^a + \alpha^b + 2w_1 - 4w_2 + t_1 - 2t_2) \tag{14}$$

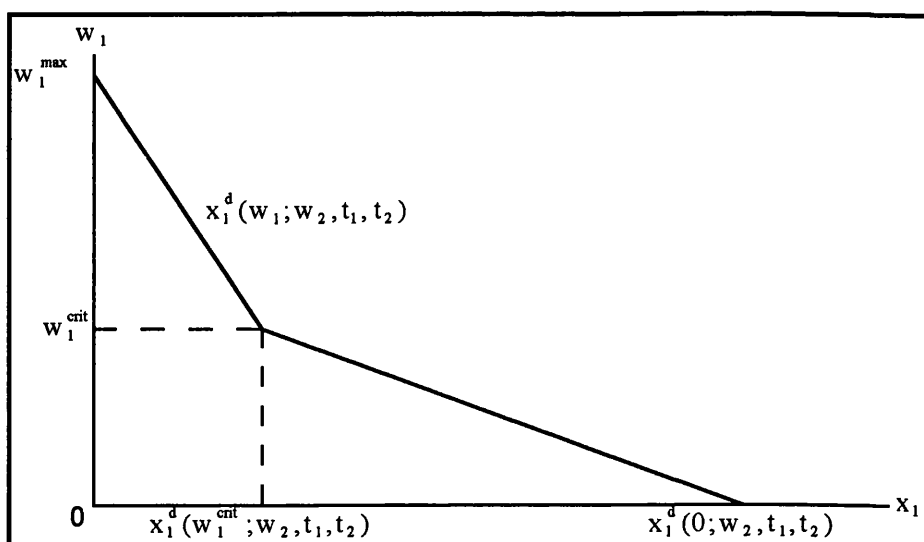The relevant function for Firm 1 is illustrated graphically in Figure I following:

Figure I: Labour Demand

	SR Value	LR Value ($w_1 = w_2$)
w_1^{max}	$(\alpha^a + t_2 + w_2)/2$	$\alpha^a + t_2$
w_1^{crit}	$(\alpha^b - 2t_1 + w_2)/2$	$\alpha^b - 2t_1$
$x_1^d(w_1^{crit};w_2,t_1,t_2)$	$(\alpha^a - \alpha^b + 2t_1 + t_2)/3\beta$	$(\alpha^a - \alpha^b + 2t_1 + t_2)/3\beta$
$x_1^d(0;w_2,t_1,t_2)$	$(\alpha^a + \alpha^b - 2t_1 + t_2 + 2w_2)/3\beta$	$(\alpha^a + \alpha^b - 2t_1 + t_2)/3\beta$

Table V
Labour Demand Legend

On the lower (upper) segment of the kinked labour demand schedule, w_1 is sufficiently low (high) - for given w_2 and t_j - that Firm 1 does (not) export - i.e. $x_1^b > 0$. $(x_1^b = 0)$ An analogous argument applies to Firm 2.

Stage One

In stage one each firm-union pair will bargain over wages taking into account the labour demand schedule of the firm. The generalised Nash Bargain relevant to Firm-Union pair one takes the form:

$$\Omega_1 = q_1 \log\{u_1[w_1, x_1(w_1)] - \overline{u}_j\} + (1 - q_1)\log \pi_1[w_1, x_1(w_1)] \tag{15}$$

where q_1 represents the relative bargaining power of Union 1 *vis a' vis* Firm 1 and $x_1(w_1) = x_1^d(w_1; w_2, t_j)$. Maximising (15) with respect to wages implies:

$$\frac{\partial \Omega_1}{\partial w_1} = \frac{q_1}{u_1} \cdot \frac{\partial u_1}{\partial w_1} + \frac{(1 - q_1)}{\pi_1} \cdot \frac{\partial \pi_1}{\partial w_1} = 0$$
$$\Rightarrow \tag{16}$$

$$w_1^* = \overline{w}_1 \left\{ 1 - \frac{q_1}{q_1 E_{x_1 \overline{w}_1} + (1 - q_1)[E_{\pi_1 \overline{w}_1} + E_{\pi_1 x_1} E_{x_1 \overline{w}_1}]} \right\}$$

where $E_{\pi_1 x_1} = (\partial \pi_1 / \partial x_1) \cdot (x_1 / \pi_1)$ and $E_{k \overline{w}_1} = (\partial k / \partial w_1) \cdot (\overline{w}_1 / k)$, $\forall k = x_1, \pi_1$. An explicit solution to (16) is somewhat intractable. The following extreme cases are therefore reviewed:

$$\lim_{q_1 \to 0} w_1^* = \overline{w}_1 \tag{17a}$$

$$\lim_{q_1 \to 1} w_1^* = \overline{w}_1 \left[1 - \left(E_{x_1 \overline{w}_1} \right)^{-1} \right] \tag{17b}$$

The explicit solution to (17b) implies each firm setting wages of:

$$w_1^* = \frac{1}{8} \left(\alpha^a + \alpha^b + 4\overline{w}_1 + 2w_2^* - 2t_1 + t_2 \right) \tag{18}$$

$$w_2^* = \frac{1}{8} \left(\alpha^a + \alpha^b + 4\overline{w}_2 + 2w_1^* + t_1 - 2t_2 \right) \tag{19}$$

Intuitively, as bargaining power is divested wholly in the firm the equilibrium 'bargained' wage is chosen to maximise the firm's profits subject to the constraint that workers receive at least their reservation wage. Conversely, as bargaining power is divested wholly in the union, the 'bargained' wage is marked up over this reservation wage by some complex relating to the elasticity of labour demand.

II.3   Comparative Statics

The effects of changes in the various model parameters on unionised and non-unionised equilibrium wages are readily apparent from equations (17a) and (19) and are not explored here. Similarly, the effect of changes in the more general case when $q_j \in (0,1)$ is ascertained from an analysis of equation (16) and is also left for future work. I focus instead simply on the impact of a decline in the trade costs of the foreign firm on the level of union and non-union wages thus:

$$\frac{\partial w_1^*}{\partial t_2}\bigg|_{q_1=0} = 0 \tag{20}$$

$$\frac{\partial w_1^*}{\partial t_2}\bigg|_{q_1=1} = 1/8 > 0 \tag{21}$$

The intuition underlying these differentials is illustrated in Figure II below. A fall in the trade costs of firm two shifts the labour demand function of firm one to the left. If the union has no power in the bargain, wages will be set by the firm subject to the reservation constraint that workers receive at least the reservation wage. Thus, all the impact of the shift in labour demand is felt by employment. In the polar opposite case, the union is effectively setting the wage and given that both wages and employment enter into its utility function, the union allows some fall in wages to offset the fall in employment. In general the greater the level of union

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bargaining power, the relatively more (less) will be the impact on wages (employment).[1]
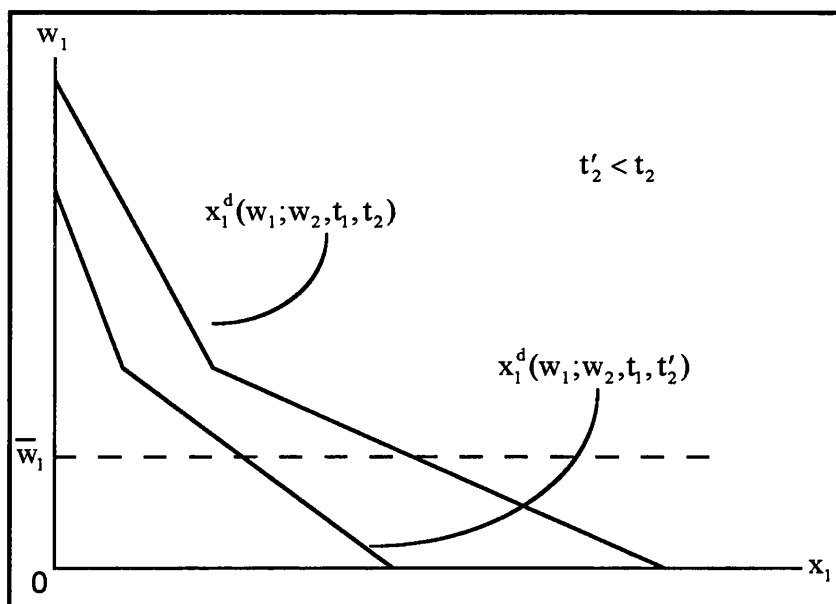

Figure II: Trade Shocks

The proposition that union and non-union wages respond differentially to changes in trade costs accords with the work of other researchers. Gaston and Trefler (1995), for example, conclude their empirical investigations into the issue as follows:

> Thus there is a fundamental difference between union and non-union wage responses to trade and trade policy. One explanation for the asymmetry is that unions face a wage-employment trade-off that is unavailable to non-unions workers. In response to tariffs, union workers may negotiate a low-wage contract in return for implicit or explicit guarantees of higher employment levels. In contrast, non-union workers do not have this option. If the wage is set competitively then it is fixed at the level of the outside option ... and so is independent of the tariff level. [Gaston and Trefler (1995), p. 15].

Gaston and Trefler's conclusions are derived from their empirical analysis which, like that of other researchers, focuses exclusively on the response of union and non-union wage premia to international trade. In what follows I infer *both* the wage *and* employment responses directly from *separate* wage and employment premia regressions.

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[1] The exception here is if the union does not care about employment.

III.   Empirical Methodology and Data

III.1   Methodology

The empirical methodology combines detailed data on trade with detailed micro data on individuals' demographic characteristics, employment records and earnings. I proceed in two stages: First, I determined the portion of an individual's wage and employment probability that is attributable to their industrial affiliation. I then ascertain the extent to which these 'premia' are determined by national and international variables. In detail:

Stage One

To determine the role of industrial characteristics such as international trade on an individual's labour market prospects I adopt the inter-industry wage differentials approach pioneered by Dickens and Katz (1987) and Krueger and Summers (1988). The original thesis to this approach is that an individual's wage depends at least as much on his own human capital, demographic, geographic and occupational characteristics as it does on the characteristics of the individual's industrial affiliation. Thus I begin by postulating a wage equation of the form:

$$\log w_{ij} = \mathbf{X}_i \mathbf{B}_X + D_j w_j^* + \varepsilon_{ij} \qquad (22)$$

where $i = 1,2,...,I$, $J = 1,2,...,J$. w_{ij} is the wage of an individual i employed in industry j, $\mathbf{X}_i$ is a vector of characteristics of individual i, D_j is a vector of mutually exclusive dummy variables indicating industry of affiliation, ε_{ij} is an error term and $\mathbf{B}_X$ and w_j^* are parameter vectors, the latter of which can be interpreted as the inter-industry wage differential (or wage premium) for industry j - that is, the portion of an individual's wage that cannot be explained by his observable individual characteristics $\mathbf{X}_i$, but which may be explained by his/her industry of affiliation.

Suitably modified, a similar approach may be adopted to ascertain industrial employment premia. To be sure, I model the probability that an individual i affiliated with industry j will be observed in the state of employment as a function of a set of personal characteristics, Z_i as well as the industrial affiliation characteristics D_j. In terms of the logistic specification, this estimated probability, p_{ij}, represents the employment probability of an individual i affiliated to industry j and is given by:

$$p_{ij} = \frac{1}{1 + \exp^{-\left(Z_i A_z + D_j p_j^*\right)}}$$ (23)

where A_Z and p_j^* are parameters vectors, the latter of which can be interpreted as the inter-industry employment differential (or employment probability premium) for industry j - that is, the portion of an individual's employment probability that cannot be explained by his/her observable individual characteristics Z_i but which may be explained by his/her industry of affiliation. Taking natural logs yields the estimating equation:

$$\ln \tilde{p}_{ij} = Z_i A_Z + D_j p_j^* + u_{ij}$$ (24)

where $\tilde{p}_{ij} = \lfloor p_{ij} / (1 - p_{ij}) \rfloor$ and u_{ij} is an error term. The left hand side of (26) represents the predicted log-odds of an individual i affiliated to industry j experiencing the state of employment.

Given that the (X_i, Z_i) and (B_X, A_Z) vectors are not the main focus of this inquiry, I comment on them only in passing. The (X_i, Z_i) characteristics were chosen from a conventionally selected set of included variables - see Table VI following - the latter of which have been explored extensively in Brown and Sessions (1996). The estimated coefficients (B_X, A_Z) are similar in size and magnitude to those reported by previous researchers.

X_i	Z_i
Education	Education
Occupation	Occupation
Age, Age^2	Age, Age^2
Race	Race
Gender	Gender
Marital Status	Marital Status
Number of Children	Number of Children
Large Firm	-
Part-Time Employee	-
Housing Tenure	Housing Tenure
Region	Region
Year	Year

Table VI
Personal Characteristics for Stage One Regressions

Stage Two

It is tempting to include industry-level characteristics such as exposure to international trade directly into the wage and employment equations:

$$\log w_{ij} = X_i B_X' + F_j \beta_F' + H_j \beta_H' + \varepsilon_{ij}' \tag{25}$$

$$\ln \tilde{p}_{ij} = Z_i A_Z' + F_j \alpha_F' + H_j \alpha_H' + u_{ij}' \tag{26}$$

where F_j and H_j are vectors of foreign and domestic factors that may influence the inter-industry wage-employment premia. OLS estimation of equations (25) and (26), however, is potentially inefficient with standard errors exaggerating the significance of the included industry-level variables [Moulton (1986)]. The problem is that there may be industry-level error components such that:

$$\varepsilon_{ij}' = b_j + \varepsilon_{ij} \tag{27}$$

$$u_{ij}' = a_j + u_{ij} \tag{28}$$

where (b_j, a_j) represents a 'fixed-effect' or disturbance common to all individuals in industry j. For example, (b_j, a_j) may reflect selectivity issues associated with unobserved worker heterogeneity. Such error components may be estimated by GLS and two-stage Heckit procedures. Alternatively, estimation can proceed in

two stages [see Dickens and Katz (1987)]: (i) Use OLS / logit to estimate the w_j^* and p_j^* in equations (22) and (24) and then; (ii) use OLS to estimate:

$$w_j^* = F_j \beta_F + H_j \beta_H + \varepsilon_j \tag{29}$$

$$\ln p_j^* = F_j \alpha_F + H_j \alpha_H + u_j \tag{30}$$

The simplicity of the two-stage procedure is particularly attractive and allows us to examine a variety of specifications.

III.2   Data

The first stage data are derived from the British Social Attitudes (BSA) Surveys. These are an annual series of surveys started by the Social and Community Planning Research in 1983 and core funded by the Monument Trust. Additional contributions are also made by the Department of the Environment, Countryside Commission, the Nuffield Foundation, the Economic and Social Research Council, Marks and Spencer Plc and Shell UK Ltd. The data are derived from a cross-sectional sample of adults aged 18 and over living in private households whose addresses were included in the electoral registrar. The sampling was facilitated by selecting 114 Parliamentary constituencies from among all those in Great Britain on the basis of the Registrar General's Standard Regions.

From each parliamentary constituency a polling district was randomly identified and selected. Addresses were chosen from these polling districts by treating the listed electors as circular with a fixed interval and marking the name of the individual on which the sampling interval landed. This method ensured a probability proportionate to the number of listed electors. Where possible these electors were chosen for the survey. Where there was a difference between the

register entry and the current members of the household, the interviewer selected one respondent by means of a random selection grid.[2]

The BSA survey has two sections. The main part involves a questionnaire administered by interviewers and lasting approximately one hour. The second section is a self completed section only. Given the impossibility of measuring union power directly, I classified individuals as to whether or not they were either a current union member or covered by a union agreement.

First stage data was derived from a pooling of surveys 1985-91 (excluding 1988 when no survey was carried out). The 'employment' sample comprised 15,519 individuals of whom 5171 (3214 unionised and 1957 non-unionised) were affiliated to the manufacturing sector. The 'wage' sample comprised 10227 (3560) employees (manufacturing employees) of whom 5233 (1739) were unionised. Individuals were classified according to the following industrial affiliations: agriculture, fisheries and food; energy and water; metal manufacture; mechanical engineering; electrical engineering; motor vehicles; textiles; wood, paper and printing; chemical engineering; construction; non-metal and other manufacturing; transport; post and telecommunications; public administration; business services; other services.

Given the first stage 'premia', second stage estimation required the construction of an industrial panel of data for the period 1985-91. For estimation I adopted Kmenta's (1986) procedure for dealing with error structures in pooled cross section / time series data applications.

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[2] The Northern Irish data was derived from the companion Northern Ireland Social Attitudes Survey. Sampling was facilitated by selecting respondents from the ratings list - the most comprehensive and up to date listing of private households within the province - which was first stratified according to region with addresses in Belfast, East Northern Ireland and West Northern Ireland appearing sequentially on the file. Given the small geographic size of the province, addresses were not clustered within areas and the sample was a simple random selection of all households listed on the ratings list. Selection of addresses was made by taking a random starting point and treating the list of addresses as circular, selecting every nth address until the desired number of households had been sampled. Individual respondents were again selected by means of a random selection grid.

The second stage data was derived from a variety of governmental sources *viz*: *Employment Gazette*, *Monthly Digest of Statistics*, *Economic Trends*. The 'international vector' comprised real imports and exports (as a percentage of industrial GDP) and net inward and foreign outward investments.[3] There are two shortcomings here. First, I am unable to decompose the industrial trade data by country of origin - I do not know, for example, whether imports emanate from developed or less developed countries. Second, I am unable to obtain data on nominal and effective tariff barriers. Such data are notoriously difficult to obtain for the UK [see Ennew *et al* (1990)] and the omission of such data could be problematic. On the one hand, it could be argued that controlling for imports and exports would minimise, or even eliminate, any independent effects of such tariffs on wages and employment. If, however, domestic firms adopt focal point pricing (i.e. pricing just below the world price plus tariff) then a rise in the tariff will not affect imports, since such imports are excluded) but will permit the monopolist to alter its output price.[4]

The 'domestic vector' comprised a number of variables designed to proxy the domestic influences on the inter-industry premia. Given my interest in the relative plight of unionised workers, I focused particularly on variables that one would expect to be related to the division of industry rents within a Nash bargaining framework - that is, firm and union fallbacks $\left(\bar{\pi}_j, \bar{u}_j\right)$ and relative 'bargaining power' broadly defined $\left(q_j\right)$. In this vein I obtained data pertaining to

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[3] Net inward foreign investment comprises the total book values of investments made by foreign investors into the relevant domestic industry. Net outward foreign investment comprises the total book values of investments by domestic investors into the relevant foreign industry.

[4] A further difficulty is that the inclusion of import and exports alone may not control for inter-industry differences in firm revenue functions. For example, two industries may have differing demand elasticities but identical levels of imports because of tariff protection. Since the industry with the less elastic demand will have the higher tariff *ceteris paribus*, the tariff level conveys information about revenues, and therefore wage/employment premia, in the two industries even though imports levels are identical.

industrial profits, the industrial four-firm concentration ratio and the industrial capital:labour ratio as proxies for $(\bar{\pi}_j)$.[5]

As regards the union fallback I derived the wage decile for each industry - that is, the tenth percentile of the industry wage after controlling for the occupational mix of the industry [see Abowd and Kramarz (1993)]. Specifically, I define w_{jk}^{10} as the tenth percentile of the wage distribution of occupation k in industry j, and the wage decile as $\sum_k p_{jk} w_{jk}^{10}$ where p_{jk} is the proportion of workers employed in occupation k in industry j. The wage decile is attractive in combining features of the union/non-union wage differential and education, given that a workers alternative wage is largely dependent on his human capital characteristics, of which education arguably the most important component.[6] Finally, I proxied relative bargaining power by the number of redundancies within the industry and the number of working days lost though strikes.

Given the probability that union premia will affect non-union premia through threat, supply and demand effects, I follow Gaston and Trefler (1995) the measures of $(\bar{\pi}_j, \bar{u}_j)$ into both union and non-union premia regressions.[7]

IV.   Results

The empirical results are set out in Tables VII and VIII below.

Given the potential simultaneity issues, in particular as regards imports and exports, aligned with the inability to fully instrument for tariffs, I decided to

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[5] If no agreement is reached then the firm will loose any rents associated with firm-specific investments in physical and intangible capital, which we proxy by the industrial profit rate and the industrial capital labour ratio. The four-firm concentration ratio is included to proxy for the size of labour market rents.

[6] An alternative approach is to calculate the union/non-union wage differential directly by pooling union and non-union workers and estimating a variant of equations (22) and (24) that includes both industry dummies and an interaction of union status with these dummies. Such a variable, however, has the drawback that, by construction, a high level of the union wage premium is associated with a high level of the union-non-union wage differential, thus raising questions about exogeneity.

[7] Hirsch and Addison (1986), for example, show that a higher percentage organised raises non-union wages implying that threat and demand effects dominate any supply effects.

regress current premia on lagged data where appropriate.[8] For illustration, I regressed a standard specification across a variety of premia derived from alternative first stage regressions.[9]

Considering the employment results, the key result in terms of the present analysis is that imports appear to play a significant role in the employment probabilities of non-union individuals only. The employment premia of union members are not significantly related to (lagged) imports. This accords with the argument that non-union wages are being set competitively at their reservation levels with any reduction in demand implying fewer workers being employed at essentially the same wage.

The premia are, however, positively associated to the four firm concentration ratio, the number of working days lost through strikes activity, and the level of total net inward investment. Irrespective of unionisation, employment premia are insignificantly related to the (log) wage decile. This would appear to support Clarke and Oswald's (1989) finding that employment bargaining is not common.

The available empirical evidence indicates a negative relationship between the level of imports share and wages. Orr and Orr (1984), using data from import sensitive SIC industries for the period 1960-78, found that increases in import penetration decreased relative wages (i.e. the average industry wage rate as a percentage of the average manufacturing wage rate). Heywood (1985), using a sample of 94 manufacturing industries for the years 1970 and 1979 found that import share was negatively correlated with the average industry wage rate.

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[8] It is possible that the causation between imports and union wages is not uni-directional with high wages raising the relative share of imports within an industry. Rhoades (1984), however, found that imports are actually more likely in low-wage than high-wage industries.

[9] These specifications for the earnings premia regressions were: (i) all industries-all workers: (ii) all industries-union workers; (ii) all industries-non-union workers; (iv) manufacturing industries-all workers: (v) manufacturing industries-union workers; (vi) manufacturing industries-non-union workers. The form of the BSA data only permitted specifications (i), (iv), (v) and (vi) for the employment premia regressions.

Table VII
Probability of Employment Premia Regressions
(T-statistics Subscripted)

Variable Name	All Industries			Manufacturing Industries		
	All	Union	Non Union	All	Union	Non Union
F: Foreign						
(Lag) Exports	0.357	0.155	0.214	0.296	0.195	0.201
	2.559	0.559	1.559	2.036	0.864	2.323
(Lag) Imports	-0.197	-0.088	-0.112	-0.229	-0.167	-0.323
	-1.499	-0.239	-1.796	-1.513	-0.818	-2.709
(Lag) Net Inward Investment	0.772	0.210	0.452	0.765	0.677	0.798
	2.833	1.842	2.217	2.225	1.661	2.665
(Lag) Net Outward Investment	0.048	0.016	0.242	-0.180	-0.020	-0.109
	0.423	0.081	1.006	-1.339	-0.137	-1.699
H: Domestic						
(Lag) Redundancies	-0.22E-0.5	-0.14E-0.5	-0.18E-0.5	-0.50E-0.5	-0.26E-0.5	-0.40E-0.5
	-1.338	-0.674	-0.892	-1.533	-0.634	-0.540
(Lag) Profit/GDP	-0.16E-0.5	-0.10E-0.5	-0.34E-0.5	-0.72E-0.5	-0.12E-0.4	-0.72E-0.5
	-3.138	-2.003	-2.557	-2.210	-3.254	-2.210
Capital:Labour Ratio	-0.041	-0.132	-0.082	0.256	0.636	0.132
	-2.106	-1.106	-0.954	0.522	1.134	0.097
Log Wage Decile	0.112	0.091	0.054	0.083	0.123	0.033
	4.206	2.122	2.003	1.538	1.799	1.098
Four Firm Concentration Ratio	-	-	-	0.371	0.511	0.431
				2.204	2.106	2.001
(Lag) Working Days Lost	0.27E-0.7	0.23E-0.7	0.30E-0.7	0.27E-0.7	0.25E-0.7	0.29E-0.7
	6.410	4.090	3.228	5.505	3.624	3.997
Constant	0.381	0.109	0.984	0.230	0.115	0.820
	6.629	2.231	1.925	2.080	0.802	2.049
N	90	90	90	60	60	60
Buse (1979) R^2	0.5322	0.4891	0.5012	0.4396	0.3116	0.5246

Table VIII
Earnings Premia Regressions
(T-Statistics Subscripted)

Variable Name	All Industries			Manufacturing Industries		
	All	Union	Non Union	All	Union	Non Union
F: Foreign						
(Lag) Exports	0.058	0.027	0.069	0.038	0.012	0.076
	2.898	1.573	0.992	1.728	0.530	0.600
(Lag) Imports	-0.017	-0.070	-0.063	-0.024	-0.067	-0.086
	-0.799	-3.286	-1.234	-1.285	-3.058	-1.099
(Lag) Net Inward Investment	0.041	-0.074	0.143	0.037	-0.093	0.179
	0.931	-1.718	2.612	0.674	-1.872	3.144
(Lag) Net Outward Investment	0.001	0.030	-0.021	-0.026	0.026	-0.077
	0.020	1.663	-0.854	-1.637	1.248	-4.355
H: Domestic						
(Lag) Redundancies	-0.97E-06	-0.81E-06	-0.19E-05	-0.12E-05	-0.67E-06	-0.18E-05
	-3.411	-4.666	-4.581	-2.865	-1.355	-3.849
(Lag) Profit/GDP	0.39E-07	-0.21E-07	-0.11E-07	-0.20E-05	-0.15E-05	0.13E-05
	0.329	-0.232	-0.075	-2.844	-2.589	1.698
Capital:Labour Ratio	-0.018	-0.007	-0.034	-0.070	-0.129	-0.087
	-2.072	-1.041	-1.809	-0.806	-1.507	-0.533
Log Wage Decile	0.120	0.117	0.105	0.110	0.104	0.097
	21.679	27.375	12.651	12.479	13.392	8.434
Four Firm Concentration Ratio	-	-	-	-0.030	-0.029	-0.042
				-0.888	-1.732	-0.891
(Lag) Working Days Lost	-0.37E-09	0.33-09	0.11-08	-0.47-09	-0.56-09	-0.11-05
	-0.641	0.445	1.156	-0.590	-0.805	1.382
Constant	0.281	0.308	0.304	0.350	0.350	0.396
	26.483	34.539	18.550	19.604	21.090	22.202
N	96	96	96	66	66	66
Buse (1979) R^2	0.8775	0.9001	0.7319	0.9233	0.9270	0.9176

Grossman (1982) measured increased international competition as a decline in the import price of a worker's product rather than an increase in import share using data from 1969 to 1979 on nine industries heavily affected by imports. He reported a consistently small wage decrease in response to increased international competition in eight of the nine industries.

As regards Table VI, it is apparent that imports do appear to play some role in reducing relative union-non-union wage premia - lagged imports significantly reduce the wage premia of union workers but not those of non-union workers. This result accords with the findings of other researchers. MacPhearson and Stewart (1990), for example, find that industrial imports significantly reduce union wage premia but have no affect on non-union premia. Their rationale is that industries with higher import shares should have lower union wages on account of increased competition, whilst non-union wages should be unaffected since they reflect the opportunity cost of labour and have no rents available to be squeezed. Freeman and Katz (1987), similarly, find a significantly negative effect of changes in import shares on union, but not non-union, industry differentials whilst Mishel (1986), using establishment data from 1968 to 1976, found that union wages were negatively correlated with import share. Lawrence and Lawrence (1985), however, employing aggregate industry-level data, found a significantly negative effect of import share on wages for the years 1980 and 1984 but no differential impact across the union and non-union sectors.

The wage premia of both worker types do not appear to be significantly related to exports. Previous work in this area is somewhat mixed. Katz and Summers (1989) found a positive bi-variate correlation between wage premia and exports which they used to make a (limited) case for an active export-oriented policy. Gaston and Trefler (1995, however, vitiated their results for heavily unionised industries, finding an insignificant relationship between exports and wage premia for both union and non-union workers.

Earnings premia are also negatively related to redundancies, industrial profits, and the four firm concentration ratio, whilst being positively related to the capital:labour ratio and the (log) wage decile. There is some evidence that net inward investment assuages the union/non-union wage differential, reducing (raising) (non) union wages, especially in the manufacturing sector. This is an interesting finding that should be investigated more fully.

V.   Conclusion

This Chapter develops Naylor's (1994) model of international oligopoly with generally unionised labour markets. The theoretical analysis proposes that an increased exposure to trade is more likely to impact negatively upon the wage (employment) prospects of unionised workers the greater (lesser) the degree of union bargaining power pertaining to them. The empirical analysis provides some support for this proposition with import penetration affecting the wage, but not employment, prospects of union workers and the employment, but not wage, prospects of non-union workers.

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