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THE UNEMPLOYMENT IMPLICATIONS OF MANDATORY FIRING COSTS

Alison L Booth

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Centre for Economic Policy Research
25–28 Old Burlington Street
London W1X 1LB
Tel: (44 71) 734 9110

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ABSTRACT

The Unemployment Implications of Mandatory Firing Costs*

The model developed in this paper examines the relationship between firing costs and unemployment in a simple two-period model with uncertainty. Where there are long-term employment relationships, and where risk-averse workers and risk-neutral firms bargain over wages and firing costs, average unemployment is unlikely to be affected by statutory firing costs, although firms' profits will decline if the statutory level exceeds the bargained level. In a unionised sector with no bargaining over firing costs, the presence of statutory firing costs reduces employment distortions associated with trade unions. However, where there are no gains to employers to long-term labour relationships, the introduction of mandated firing costs will be associated with a higher incidence of temporary employment contracts and short-term jobs.

JEL Classification: J32, J33, J51, J65
Keywords: employment protection, contracts, firing costs, unions

Alison L Booth
ESRC Research Centre on Micro-social Change
University of Essex
Wivenhoe Park
Colchester
CO4 3SQ
UK
Tel: (44 206) 872 957

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NON-TECHNICAL SUMMARY

Mandatory firing costs were introduced in many European countries from the late 1950s through to the early 1970s. These firing restrictions have been blamed by some commentators for the high levels of European unemployment since the first oil-price shock of 1973. The fact that employment in the United States has been relatively less protected by state regulation, and US unemployment since 1973 has been lower than in Europe, has reinforced the popular view that firing costs contribute to the high levels of European unemployment.

A number of recent empirical and theoretical studies have, therefore, investigated the extent to which European unemployment and unemployment persistence can be explained by employment protection provisions. With the exception of Lazear (1990), these studies suggest that firing costs cannot be blamed for increasing European unemployment, although they are likely to have reduced employment variation. A conclusion is that firing costs affect employment dynamics more than the average level of employment.

In most of the literature on firing costs, wage determination has been assumed exogenous, and the models have focused primarily on modelling labour demand in a dynamic framework. Where wages have been determined within the model, workers have been assumed to be risk-neutral. The purpose of this paper is therefore to model both labour demand and labour supply in a model that captures elements of the real world that are missing from models focusing only on labour demand. In particular, the model developed here aims to capture the fact that redundancy payments are only made to workers with some minimum period of continuous service with the firm. For this reason it makes sense to think of redundancy pay in terms of a longer-term contractual relationship – explicit or implicit – between workers and firms. Where there are no long-term employment contracts, the redundancy payment need not ever be made. The model also allows for workers to be risk-averse, and the redundancy payment or firing cost can therefore be regarded as a means of providing the worker with some form of insurance against random fluctuations in product demand in the industry in which the individual is working. Since typically most of workers' incomes derives from employment, and it is difficult for workers to diversify across jobs, it seems plausible to assume that workers are risk-averse rather than risk-neutral.

There is evidence that, in some sectors, firms and workers do bargain over the amount of non-statutory firing costs. For example, in the United States, 39.2%

of union workers covered by major collective bargaining contracts in 1980 were covered by severance payment clauses (Pencavel (1991)). By the mid-1960s, 25% of all US wage earners were eligible for severance pay and 43% were employed in firms having formalized dismissal rules (Buechtemann (1991)). In Britain some 51% of workplaces bargaining with a union over wages also bargain over the size of non-manual non-statutory redundancy pay, while 42% bargain over the size of manual redundancy pay (Millward, Steven, Smart and Hawes (1992)).

It is in the nature of firing costs that workers are eligible only after an initial period of continuous service with a single firm. In a competitive spot labour market where there are no advantages to long-term employment relationships, the introduction of mandated redundancy pay will have no other impact on the labour market than that of increasing the incidence of short-term employment contracts. In a two-period model in which it is in firms' interests to have continuing employment relationships, firing costs will reduce the variance of labour demand across the business cycle. An implication of this well-known result is that risk-averse workers may prefer a contract with redundancy pay, since it stabilizes employment over time, and risk-neutral firms may be willing to offer such a contract. This paper develops a simple model in which wages and firing costs are determined as part of a bargaining process. A striking result is that the wage corresponding to the level of *ex-post* employment is equal to the opportunity cost of labour (a necessary and sufficient condition for the bargaining surplus to be maximized). Thus firing costs bargained over by the union and the firm have a stabilizing impact on employment in bad times and reduce hiring in good times. In this framework mandated firing costs will typically result in a welfare loss, unless by chance the state sets the firing cost to be equal to that determined through voluntary bargaining. An implication is that the determination of the level of firing costs is best left to individual or collective bargaining.

A further striking result of the model, however, is that in a unionized economy the presence of firing costs increases average employment across the business cycle and reduces employment distortions associated with unions. Hence where the union sector does not bargain over the level of firing costs, the imposition of statutory firing costs may actually increase average employment.

Of course, there are other reasons for state-mandated redundancy pay that are not captured by the model. These reasons relate predominatly to market failure. For example, statutory redundancy pay might protect workers against firm bankruptcy should an unanticipated demand shock drive the firm out of

business and prevent the firm paying the bargained firing cost. Here the notion that statutory firing costs may provide a second-best solution relates to the missing markets view whereby firms are unable to insure against bankruptcy due to moral hazard. Mandated redundancy pay allows for the payment of firing costs when firms are made bankrupt, and are unable to meet their negotiated redundancy obligations. A related argument arises because of the fact that, in the model, redundancy pay is a form of insurance that is conditional on the model of worker separation, about which there may be asymmetric information. Such conditional insurance may therefore require intervention by a third-party to intervene in disputes.

I. INTRODUCTION

Mandatory firing costs were introduced in many European countries from the late 1950s through to the early 1970s.[1] These firing restrictions have been blamed by some commentators for the high levels of European unemployment since the first oil-price shock of 1973. The fact that employment in the USA has been relatively less protected by state regulation, and US unemployment since 1973 has been lower than in Europe, has reinforced the popular view that firing costs contribute to the high levels of European unemployment.

A number of recent empirical and theoretical studies have therefore investigated the extent to which European unemployment and unemployment persistence can be explained by employment protection provisions. With the exception of Lazear (1990), these studies suggest that firing costs cannot be blamed for increasing European unemployment, although they are likely to have reduced employment variation (see for example Nickell (1978), Bertola (1990, 1992), and Bentolila and Bertola (1990)). A conclusion is that firing costs affect employment dynamics more than the average level of employment. The fact that unemployment has been found to be more persistent in countries characterised by high job security provisions is argued by Bertola (1990, 1992) to reflect the stabilising effects of mandatory firing costs on aggregate employment. Since firing costs reduce the variance of employment over the business cycle, in a way that is spelt out simply in Section II of this paper, those workers who are laid off are likely to face a lower re-employment probability.[2]

In most of the literature on firing costs, wage determination has been assumed exogenous, and the models have focused primarily on modelling labour demand in a dynamic framework. Where wages have

[1] Statutory reundancy pay was introduced in Britain with the passage of the 1965 Redundancy Payments Act, and re-enacted in the Employment Protection (Consolidation) Act of 1978.

[2] Bentolila and Saint-Paul (1994) provide a dissenting voice, in that they find that a rise in firing costs reduces average steady-state labour demand when these costs are low, but raises such demand when they are high.

been determined within the model, workers have been assumed to be risk-neutral (see for example Bertola (1990) and Burda (1992)). The purpose of this paper is therefore to model both labour demand and labour supply in a model that captures elements of the real world that are missing from models focusing only on labour demand. In particular, the model developed in this paper aims to capture the fact that redundancy payments are only made to workers with some minimum period of continuous service with the firm. For this reason, it makes sense to think of redundancy pay in terms of some longer term contractual relationship - explicit or implicit - between workers and firms. Where there are no long-term employment contracts, the redundancy payment need not ever be made. The model developed in this paper also allows for workers to be risk-averse, and the redundancy payment or firing cost can therefore be regarded as a means of providing to the worker some form of insurance against random fluctuations in product demand in the industry in which the individual is working.[3] Since typically most of workers' incomes derives from employment, and it is difficult for workers to diversify across jobs, it seems plausible to assume that workers are risk-averse rather than risk-neutral.[4] The model developed in the paper examines the relationship between a particular form of firing cost - redundancy pay - and unemployment, in a simple two-period model with uncertainty. With discounting, firms' hiring decisions will be less affected by redundancy pay than their firing decisions. Redundancy pay reduces cyclical fluctuations in labour demand, a finding common to all models of firing costs (see for example Nickell (1978); Bertola (1990, 1992); Bentolila and Bertola (1990)). But the novel prediction of the paper is that, where workers and firms bargain over wages and redundancy pay, the wage corresponding to the ex post level of employment is equal to the opportunity cost

[3] The model thus forms part of the small literature modelling why negotiated redundancy pay is observed in some circumstances in the absence of statutory provisions (see Lazear (1979) and Booth and Chatterji (1989).

[4] In contrast, firms comprise many shareholders who are able to diversify their portfolio of shares. Hence it is reasonable to assume that firms are risk-neutral.

of labour. The findings of the model accord with those of Bertolila and Bertola (1990) and Bertola (1990, 1992) that average unemployment is likely to fall in sectors covered by firing cost rules. However, where there are no gains to employers to long-term labour relationships, the introduction of mandated firing costs will be associated with a higher incidence of temporary employment contracts and short-term jobs. A second important finding of the paper is that, in a unionised sector, the presence of firing costss reduces the employment distortions associated with trade unions.

There is evidence that in some sectors firms and workers do bargain over the amount of non-statutory pay. For example, empirical evidence shows that, in many US and UK collective agreements, workers and firms bargain about both wages and the size of redundancy payments. In the US, 39.2 per cent of union workers covered by major collective bargaining contracts in 1980 were covered by severance payment clauses (Pencavel, 1991: 64).[5] By the mid-1960s, 25% of all US wage earners were eligible for severance pay and 43% were employed in firms having formalised dismissal rules (Buechtemann (1991:31)). In Britain, there are many instances of extra-statutory redundancy payment schemes typically negotiated by firms and unions, and sometimes by firms and individuals. Some 51% of workplaces bargaining with a union over wages also bargain over the size of non-manual non-statutory redundancy pay, while 42% bargain over the size of manual redundancy pay (Millward, Stevens, Smart and Hawes (1992:251-2)).

The remainder of this paper is set out as follows. Section II considers the competitive labour market paradigm - a simple spot market for labour - and examines the impact of mandated firing costs on employment. Section III considers labour demand with longer-term contracts, and shows that firing costs reduce labour demand fluctuations in the face of anticipated fluctuations in product demand. An implication is that state-mandated redundancy pay lowers the variance of output and employment in sectors of the economy

[5] Coverage varies considerably: 53.6 per cent of union workers in manufacturing were covered, compared with 27 per cent in non-manufacturing.

where it is in employers' interests to have long-term labour contracts. This finding suggests that risk-averse workers will prefer a contract with redundancy pay, since it irons out fluctuations in employment across time. We therefore consider in Section IV the nature of equilibrium employment in a labour market with contracts. The behaviour of risk-averse workers is explicitly incorporated into the model. The employment (and unemployment) predictions of this model are compared with other union models in Section V. To examine the impact of state mandated redundancy pay, we initially suppose for expositional ease that the optimal level of redundancy pay is determined by the firm and workers. We then examine the impact of mandated redundancy pay. The optimal employment outcome is then compared with the outcome under state intervention, in Section VI. The final section summarises and makes some suggestions for future research.

Throughout the paper, it is assumed that firms bear the cost of redundancy payments, and that redundancy payments are only made to workers after a period of continuous service with the firm. This mirrors the situation for statutory redundancy pay in Britain and many European countries.[6] It is also assumed that workers receive all of any redundancy payment made by firms to workers.[7]

[6] In Britain solvent firms finance the entire redundancy payment. If the firm has serious cash flow problems, workers can be paid direct from the National Insurance (NI) Fund, and the firm pays back the amount later. If the firm is insolvent, the payment is again made from the NI Fund, and the debt is recovered from the firm's assets. Originally, the financing of state-mandated redundancy payments was through a supplement to firms' national insurance contributions, paid into the Redundancy Fund, from which firms could claim a rebate when making payments to redundant workers. From 1982 a supplement to workers' national insurance contributions was also introduced. With the passage of the 1986 Wages Act, rebates from the Redundancy Fund were abolished for all but the smallest firms. Under the provisions of the 1989 Employment Act, rebates were no longer available for any firms, and the Redundancy Fund was subsumed within the National Insurance Fund.

[7] While this applies to most European countries, it does not apply to Spain for example, where there is a wedge between what firms pay and what workers receive owing to complex bureaucratic procedures (see Bentolila and Dolado (1994)).

II. A COMPETITIVE SPOT LABOUR MARKET

In this section, we consider the impact on employment of state-mandated redundancy pay in a perfectly competitive spot labour market. Suppose that all workers are identical, and there are no hiring costs. In each period, perfectly competitive firms hire workers at random from the pool of available workers, at the exogenously given market wage rate w. At the end of each period, workers return to the labour pool, and the whole process is repeated at the start of the next period. Some workers may get hired by one firm in two consecutive periods simply through the laws of probability, but there is no advantage to firms from implementing long term contracts.

Now suppose that the state introduces a mandatory redundancy pay scheme. Following the institutional model for the UK and many other European countries, assume that the firm has to make the redundancy payment of an amount set by the state, to workers made involuntarily redundant after a minimum period of continuous service with the firm. Suppose that this minimum is one period. The implication of such a scheme is obvious: firms will ensure that they do not hire workers for more than one consecutive period, in order to avoid the firing cost. A mechanism for achieving this might be a temporary employment contract, stipulating a maximum period of employment of just less than one period.

In summary, the implications of the introduction of state-mandated redundancy pay in a competitive spot labour market are as follows. First, in sectors of the economy where there are no gains to the firm from long-term contracts, there is likely to be an increase in temporary contracts following the introduction of statutory severance pay schemes. Secondly, demand shocks in this sector of the economy are immediately translated into employment and output fluctuations, and state-mandated redundancy pay has no impact on this outcome. Of course, the spot labour market is a plausible characterisation of the labour market only where there are no gains to the firm from having longer term contracts. We now consider labour demand under longer term contracts; this is relevant to analysis of redundancy payments since these are based on length of

service with a particular firm.

III. LABOUR DEMAND IN A COMPETITIVE LABOUR MARKET WITH CONTRACTS

This section considers labour demand in a simple two-period model, in which the firm is free to determine ex post employment and dismissals unilaterally, given exogenously determined levels of w and r. The purpose of the section is to show the well-known result that firing costs are associated with reductions in the variance of labour demand across the business cycle (see for example Nickell (1978)). This result will then be used in the following sections where the supply behaviour of workers is explicitly incorporated into the analysis.

Assumptions

ASSUMPTION 1: Consider a sector of the economy comprising a number of perfectly competitive firms employing identical workers for up to two periods. In the initial period, the firm makes its decision about how many workers to hire, taking into account known labour demand in the first period and uncertain labour demand in the second period. Since second period demand is unknown ex ante, the firm making hiring decisions in the first period takes into account the fact that it may have to make some workers redundant in the future. Workers made redundant receive a redundancy payment r, of an amount determined by the state but paid for by the firm. Since workers are assumed identical, second period layoffs are random.

ASSUMPTION 2: Agents' ex ante uncertainty about second period product demand (affecting second period labour demand) is captured by the assumption that the firm's period 2 output price θ_i fluctuates across the υ possible states of nature. The probability of each price occurring is given by τ_i, $i=1,\ldots,\upsilon$, and $\sum_{i=1}^{\upsilon} \tau_i = 1$.

ASSUMPTION 3: The firm is free to determine ex post employment and dismissals unilaterally, for given levels of w and r. Denote the number of workers hired in the initial period by m, and denote actual ex post employment in period 2 by n_i, $i=1,\ldots,v$. Assume $n_i \leq m$ in order to focus attention on redundancy. This requires that the state of nature in the first period is at its highest level so that employment is at a maximum.[8] If there is a bad state of nature or "slump" in period 2, $(m-n_i)$ incumbent workers will be dismissed, and receive a redundancy payment r.

Labour Demand

For a given level of wages, the firm's first period certain profits are given by

$$\hat{\Pi}_1 = \theta f(m) - wm \qquad (1)$$

where f(m) is the firm's production function, $f(0)=0$, $f'(m)>0$, and $f''(m)<0$. The firm's output price, known with certainty in period 1, is given by θ. Ex ante, for the same given level of wages, period 2 expected profits are given by

$$E\hat{\Pi}_2 = \delta \sum_{i=1}^{v} \pi_i \{\theta_i f(n_i) - wn_i - r[m-n_i]\} \qquad n_i \leq m \qquad (2)$$

where $f(n_i)$ is the firm's second period production function, $f(0)=0$, $f'(n_i)>0$; $f''(n_i)<0$. Output price θ_i is assumed to vary across states in period 2, and δ represents the firm's discount factor, $0 \leq \delta \leq 1$.

PROPOSITION 1: *Redundancy pay is associated with reduced labour demand in a boom and increased labour demand in a slump, relative to the situation with no redundancy pay.*

[8] If $n_i > m$, the firm would hire new workers in Period 2, which complicates the analysis without adding any extra insights about redundancy pay. We therefore restrict our attention here to $n_i \leq m$.

Proof of Proposition 1:

The firm's problem in the initial period is to choose m (for a given w and r) to maximise ex ante profits given by

$$\max_m E\Pi = \hat{\Pi}_1 + E\hat{\Pi}_2$$

$$= \theta f(m) - wm + \delta \left\{ \sum_{i=1}^{U} \tau_i \{\theta_i f(n_i) - wn_i - r[m-n_i]\} \right\} \quad n_i \leq m \qquad (3)$$

where δ denotes the firm's discount factor. The first order condition from (3) is

$$\theta f'(m) = w + \delta r \qquad (4)$$

Thus with redundancy payments in a competitive labour market with contracts, fewer workers are hired in the first period as compared with the usual labour demand function defined through $\theta f'(m)=w$. As $\delta \to 0$, period 1 employment $m \to m^*$, where m^* satisfies $\theta f'(m^*)=w$.

Now consider employment determination in the second period. At the start of period 2, the firm has an inherited workforce of m workers. For $n_i \leq m$, some workers must be laid off. The firm determines ex post employment n_i (once the state of nature is revealed) by maximisation of period 2 profits given by equation (2), yielding

$$\theta_i f'(n_i) = w - r \qquad (5)$$

From (5), period 2 labour demand can be written as $n_i = n((w-r)/\theta_i)$. From differentiation of (5), $\partial n_i/\partial w_i = 1/\theta_i f''(n_i)$ and $\partial n_i/\partial r_i = -1/\theta_i f''(n_i)$. Thus

$$\partial n_i/\partial w_i = - (\partial n_i/\partial r_i) \qquad \forall\ \theta_i \qquad (6)$$

This result will be used in the proof of Proposition 2 below.

Note that the variation in labour demand in a two period model with redundancy pay is less than that of a two period model with no redundancy pay. This is illustrated in Figure 1. The more myopic

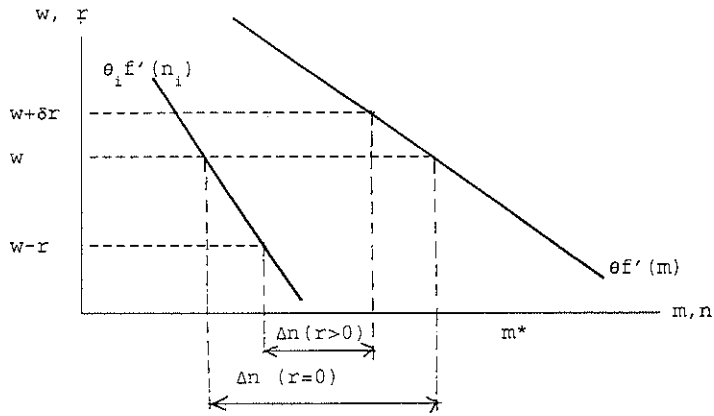

Figure 1: Labour Demand Variations with and without Redundancy Pay for a Fixed Wage Rate w

the firm ($\delta \to 0$), the closer will period 1 employment be to m^*.[9]

[insert Figure 1 near here]

This simple analysis has shown that firing costs are associated with reduced labour demand in a boom, and increased labour demand in a slump, relative to the situation with no firing costs. While the firing cost or redundancy pay stops workers losing their jobs, it discourages new hires.[10] An implication is that the introduction of experience-linked state-mandated redundancy pay will lower the variance of output and employment in sectors of the economy where there are it is in employers' interests to have long term employment contracts.[11] To the extent that long term contracts emerge where there are specific training investments, this reduced variance in employment may prevent the loss of firm-specific human capital. The finding that redundancy pay lowers the variance of employment suggests that, when we come to consider the behaviour of workers, risk averse workers will prefer a contract with redundancy pay, since redundancy pay irons out employment fluctuations across time. Risk-neutral employers may be prepared to offer a contract with insurance against employment fluctuations. The model in the next section therefore considers the behaviour of both firms and workers when it is in the interests of both parties to have long term employment contracts.

[9] For more complex models of the dynamic impact of firing costs on labour demand, see Bentolila and Bertola (1990) and Bentolila and Saint Paul (1994).

[10] Lazear (1990) notes that, if workers were to make a private transfer fee ex ante to the firm of an amount equal to the severance payment, this distortion could be overcome. But should this not be possible (and such payments are typically not observed), labour demand will not be at its efficient level. Lazear (1990) gives credit constraints as a reason why private transfer fees are not made.

[11] If we label such sectors as primary sectors, and denote sectors characterised by spot labour contracts as secondary sectors, then inter-sectoral empirical work should show that the introduction of state-mandated severance pay is associated with lower employment and output fluctuations in the primary sector than in the secondary sector.

IV. EQUILIBRIUM EMPLOYMENT WITH LONG-TERM CONTRACTS AND VOLUNTARY REDUNDANCY PAY

In this section, the supply behaviour of risk-averse workers is explicitly incorporated into the two-period model. We initially suppose for expositional ease that $r \geq 0$ (applicable only to layoffs in period 2) is determined optimally by the firm and the workforce at the start of period 2 before the realisation of the state of demand. In Section V, the outcome of this model is compared with orthodox union models. In Section VI, we then examine the impact of government intervention through setting $r=\bar{r}$, where $\bar{r}$ denotes the state-mandated level of redundancy pay. The optimal period 2 employment outcome is then compared with the outcome under state intervention.

Continuing contracts involving more than one period of employment generally exist because the long-term contract generates some surplus to the firm. Therefore even in the absence of trade unions, the worker may be in a position to extract some of this surplus, since he or she can impose a cost on the firm by threatening to quit. This gives the worker some bargaining power. It might therefore be expected that, with long term employment contracts, workers and the firm bargain over the share of any surplus even in a perfectly competitive labour market. While in what follows we refer (for expositional ease) to workers being in a union, the model is also applicable to any situation where non-union workers have some bargaining power.

The structure of the model is that, at the start of period 2 before the state of the world is known, the firm and the workforce together bargain over period 2 wages and the level of redundancy payments should any layoffs be necessary. After the realisation of the demand state, the firm then determines period 2 ex post employment unilaterally.[12] (As noted in the Introduction, this

[12] When workers have no power in the bargain, the firm determines w, r and employment unilaterally, which is the perfectly competitive model.

pattern of bargaining reflects the structure of many collective bargaining arrangements in the UK.[13] Bargaining does not occur over the size of the unemployment benefit level, which is determined by the state in practice in the UK and many European countries, and which is exogenous in this model.) The outcome of the period 2 bargain is then inserted into the period 1 bargain, which is over period 1 wages alone. Redundancy payments are not made in period 1, since the workforce is eligible for payments only after one period of continuous experience with the firm, and anyway no-one is laid off in period 1. Both parties perfectly anticipate the outcome of the period 2 bargain, and incorporate this into their period 1 maximand. An alternative (and simpler) modelling strategy would be to suppose that in period 1 the workforce is non-unionised, and that the period 1 wage is therefore exogenously given to both parties. During period 1 the workforce becomes unionised, and then bargaining occurs at the start of period 2. Such an approach makes little difference to the outcome.

We now consider the second stage of the model, and some additional assumptions.

The Second Period Outcome

ASSUMPTION 4: At the start of period 2, there exists a pool of m identical incumbent workers, who have signed a contract with the firm before output in period 2 is known. The size of the pool of workers is determined in period 1. The m workers each have a continuous twice differentiable strictly concave (indirect) utility of income function, denoted by $u(w_2)$ when employed, and by $u(r+\beta)$ when involuntarily laid off, where β denotes unemployment benefits, and $r \geq 0$.[14] To ensure that labour is

[13] In the UK, bargaining typically occurs at a level higher than that of the establishment (Millward, Stevens, Smart and Hawes (1992)), and follows a formula related to pay. Hence changes in pay awards automatically change redundancy pay amounts, since these are based on pay.

[14] More completely, we can write that utility in work is denoted by $v(w,h)$, where w is the wage rate, h denotes hours of work, and $v_w > 0$

supplied, $w_2 > \beta$. Let $\tilde{w}$ denote the wage at which workers are just indifferent between work and unemployment. In order to have a labour force, clearly firms can never employ workers for whom $\theta f(n_i) < \tilde{w}$. The utilitarian union objective function can be written as

$$\hat{EV}_2 = \sum_{i=1}^{U} \tau_i \{n_i.u(w_2) + (m - n_i).u(r+\beta)\} \qquad (7)$$

ASSUMPTION 5: The firm and the union through the generalised Nash bargaining process, determine w_2 and r by maximisation of the product of each party's gains from reaching a bargain, weighted by their respective bargaining strengths. . The firm is free to make layoff decisions unilaterally, for given bargained levels of w_2 and r. Employment is determined from equation (5) above.[15]

Equilibrium in the Model

At the start of period 2, workers and the firm bargain over any surplus in order to determine optimal w_2 and r. The firm then determines ex post employment (and therefore dismissals, $(m-n_i)$) once w_2 and r are set. We focus on $n_i < m$; this assumption can be rationalised by regarding the inherited workforce as being set in the best possible state of nature. Define a status quo or fall-back position for each agent if no bargain is reached. For the firm, the status quo position is zero; if it does not reach a bargain with the striking unionised workforce, it does not have to pay these striking workers a severance payment. If it does not reach a bargain with incumbents, it cannot obtain any other workers. Therefore the firm's net gain from reaching a bargain in the second period is

and $v_h < 0$ (where the subscripts denote the partial derivatives). But to keep the analysis simple, suppose that hours are unity if employed and zero otherwise. Thus a typical worker's utility can now be written as by $u(w) = v(w,1)$ when employed, and by $u(\beta) = v(\beta,0)$ when unemployed.

[15]This "right-to-manage" model is widely used in the literature, on the grounds that it reflects actual bargaining situations.

simply its expected profits function, given below.

$$E\Pi_2 = \sum_{i=1}^{U} \tau_i \{\theta_i f[n_i(w_2, r)] - w n_i(w_2, r) - r[m - n_i(w_2, r)]\} \qquad (8)$$

The status quo position for a representative worker is $u(\beta)$, since that is what an incumbent receives if no bargain is reached. (Redundancy pay does not appear in the threat point for the union, since if negotiations break down workers are not entitled to a redundancy payment, which is received only if workers are made involuntarily redundant.) But if there is a bargain, union utility is given by $\hat{Ev}_2$ in equation (7). The net gain to the union can thus be written as Ev, defined as

$$Ev_2 \equiv \hat{Ev}_2 - mu(\beta) = \sum_{i=1}^{U} \tau_i \{n_i(w_2, r).u(w_2) + [(m - n_i(w_2, r)].u(r+\beta)\} - u(\beta) \qquad (9)$$

The generalised Nash bargain is given by

$$\max_{w_2, r} \; B_2(w_2, r) = Ev_2^{\alpha} \, E\Pi_2^{1-\alpha} \qquad (10)$$

where Ev_2 and $E\Pi_2$ are given by (9) and (8) respectively, and $0 \leq \alpha \leq 1$ is the bargaining strength of the union. As noted, the threat points for both parties are independent of r and w_2.

PROPOSITION 2:

(i) Ex post employment in a labour market where the firm unilaterally sets w_2, r and n is determined such that $\theta_i f'(n_i) = \beta$.

(ii) Ex post employment in a unionised labour market (where the union and the firm bargain at the start of each period about wages and redundancy pay) is efficient, and is given by $\theta_i f'(n_i) = \beta$.

Proof of Proposition 2.

The first order conditions of (10) are given by the following, where the second period subscripts have been omitted for expositional ease:

$$B_w: \qquad \frac{Ev_w}{E\Pi_w} = -\frac{(1-\alpha)Ev}{\alpha . E\Pi} \tag{11}$$

$$B_r: \qquad \frac{Ev_r}{E\Pi_r} = -\frac{(1-\alpha)Ev}{\alpha . E\Pi} \tag{12}$$

Equate (11) to (12) and rearrange to obtain the equilibrium condition

$$\frac{E\Pi_w}{E\Pi_r} = \frac{Ev_w}{Ev_r} \tag{13}$$

Partial differentiation of (8) and (9) with respect to w_2 and r respectively produces

$$E\Pi_w = \sum_{i=1}^{v} \tau_i \{ -n_i + \frac{\partial n_i}{\partial w_i}[\theta_i f'[n_i(w_2, r)] - w_2 + r]\} \tag{14}$$

$$E\Pi_r = \sum_{i=1}^{v} \tau_i \{ -(m-n_i) + \frac{\partial n_i}{\partial r_i}[\theta_i f'[n_i(w_2, r)] - w_2 + r]\} \tag{15}$$

$$Ev_w = \sum_{i=1}^{v} \tau_i \{ n_i u'(w) + \frac{\partial n_i}{\partial w_i}[u(w_2) - u(r+\beta)]\}/m \tag{16}$$

$$Ev_r = \sum_{i=1}^{v} \tau_i \{ (m-n_i)u'(r+\beta) + \frac{\partial n_i}{\partial r_i}[u(w_2) - u(r+\beta)]\}/m \tag{17}$$

Insert (14) to (17) into (13), and use the result in (6) (that $\partial n_i/\partial w_2 = -(\partial n_i/\partial r)\ \forall\ \theta_i$) to obtain

$$\frac{\sum_{i=1}^{v} \tau_i n_i}{\sum_{i=1}^{v} \tau_i (m-n_i)} = \frac{\sum_{i=1}^{v} \tau_i \{n_i u'(w_2) - \frac{\partial n_i}{\partial r_i}[u(w_2) - u(r+\beta)]\}}{\sum_{i=1}^{v} \tau_i \{(m-n_i)u'(r+\beta) + \frac{\partial n_i}{\partial r_i}[u(w_2) - u(r+\beta)]\}} \tag{18}$$

By inspection, $w_2 = r+\beta$ solves the expression in (18). Workers' incomes are invariant to their employment status. Since from (5) $\theta_i f'(n_i) = w_2 - r$, then it is also the case that $\theta_i f'(n_i) = \beta$. ■

Interpretation of Proposition 2

Proposition 2(ii) shows that, where incumbent workers and firms bargain over wages and redundancy pay, the outcome is efficient.[16] In the conventional right-to-manage union model where unions and firms bargain only over wages (and not redundancy pay), there is no mechanism for ex post redistribution; while the outcome is on the labour demand curve, efficiency is "constrained" in the sense that the surplus is not maximised. However, Proposition 2(ii) shows that, with an ex post redistribution scheme involving severance pay, period 2 employment will be characterised by "full efficiency" where the bargaining surplus is maximised.[17] The intuition underlying this result is that w_2 and r are set to maximise the bargaining surplus; if this were not the case, there would remain ex post gains to be exploited. The equality of ex post marginal productivity to the opportunity cost of labour guarantees maximisation of the bargaining surplus. The union and the firm share the maximised surplus: the lower is the relative power of the union, then the smaller its share of the surplus in the form of wages and severance pay. But employment remains unaffected by the union's relative bargaining power. These arguments are captured in Proposition 3.

PROPOSITION 3. *In the right-to-manage bargaining model with severance pay on the bargaining agenda, an increase in union power α increases optimal w_2^* and r^*, but leaves ex post employment unaffected.*

[16] This result holds whether the problem is initially set up with w and r fixed across states as above, or with contingent w and r. The result also holds in both the "efficient bargaining" union model, where the union bargains over wages, redundancy pay and employment (see Booth, 1994), and in the implicit contract literature (see Rosen, 1985, and Manning, 1991, for surveys).

[17] If β were increasing in (w,n) space, the opportunity cost of labour would in general differ across states of nature, and the efficiency result in Proposition 2 would be unlikely to hold.

Proof of Proposition 3.

This is given in the Appendix. Notice that an implication of Proposition 3 is that as α approaches zero, we approach the perfectly competitive situation, where the share of the surplus going to workers is zero. This can be seen by setting $\alpha=0$ in (10), and observing that if the firm is free to determine wages, severance pay and employment unilaterally it will always set "effective" wages at the competitive level, given by $w_2-r=\beta$. (Intuitively, this is because the firm shifts to a lower iso-expected-profits curve in (w,n) space, representing higher profits, as (w_2-r) declines.) This proves Propostion 2(i).

The bargaining model presented in this section has both efficiency and distributional implications. Period 2 labour allocation is efficient: the union and firm set wages and severance pay so that social surplus is maximised. This efficiency has been achieved through the introduction of an extra instrument onto the bargaining agenda - severance pay. Distribution among incumbent workers is also affected, in the sense that workers' incomes are now invariant to their employment status.

The First Period Outcome

It is straightforward to show that period 1 employment, m, will be inefficient. This is because, in the initial period when m is determined, the firm and workforce cannot use the instrument of redundancy pay, which is available only for workers with continuous experience with the firm (that is, only in the second period).

In period 1, firms and workers together bargain over the first period wage denoted by w_1, while the firm unilaterally determines the number of workers to hire, m. The expected gain to the firm from reaching a bargain over w_1 are given by equation (3), reproduced here for convenience:

$$\max_m E\Pi = \theta f(m) - w_1 m + \delta \left\{ \sum_{i=1}^{U} \tau_i \{\theta_i f(n_i) - w_2 n_i - r[m-n_i]\} \right\} \qquad n_i \leq m \qquad (3)$$

The utilitarian union's utility gain from reaching a bargain over w_1 (assuming the union has the same discount factor as the firm) is

$$Ev(w_1) = m(w_1)[u(w_1)-u(\beta)] + \delta\left\{\sum_{i=1}^{v}\tau_i(n_i u(w_2) + [m(w_1)-n_1]u(r+\beta)\} - u(\beta)\right\}$$

$$= m(w_1).[u(w_1)-u(\beta)] + \delta m(w_1)[u(r+\beta) - u(\beta)] \qquad (19)$$

where the result from the period 2 bargain that $w_2=r+\beta$ has been used to simplify the equation. The generalised Nash bargain over w_1 is given as

$$B(w_1) = Ev^{\alpha}\, E\Pi^{1-\alpha} \qquad (20)$$

It is straightforward to show that, at the optimum,

$$\alpha\left\{\frac{m'(w_1)[u(w_1)-u(\beta)] + m(w_1)u'(w_1)]}{Ev}\right. = \frac{(1-\alpha)m}{E\Pi} \qquad (21)$$

This is clearly an inefficient outcome for period 1 employment.

This simple two-period model with firing costs has several interesting predictions. First, there is inefficent employment in period 1, a standard result in any right-to-manage model of worker-firm bargaining over wages. But ex post employment in period 2 is efficient. This result is not found in the two-period union model without redundancy pay, as we shall see below. Secondly, with redundancy pay on the bargaining agenda, there is less cyclical fluctuation in employment.[18] The next section compares the

[18] Redundancy pay is applicable only where there are long-term employment contracts; there is a positive correlation between specific human capital investments and long-term employment relationships or job tenure. It might therefore be expected that reductions in the cyclical variation of employment will have important implications for the stock of specific human capital (see Booth and Zoega, 1994).

unemployment implications of this union model with other union models in the literature.

V. A COMPARISON OF THE UNEMPLOYMENT PREDICTIONS OF THE TWO-PERIOD REDUNDANCY PAY MODEL WITH OTHER UNION MODELS

To facilitate the comparison of the unemployment implications of the two-period redundancy pay model with other union models in the literature, the monopoly union framework will be used (The monopoly union model is a special case of the generalised Nash framework employed above, where α=1.) In this section three models will be compared. First, we shall examine the "hiring hall" (HH) model. This is the orthodox single period union model with no redundancy pay, which is applicable to a union "hiring hall" where each period workers are hired at random and return to the hiring hall at the end of the period. Secondly, we shall examine a two period insider-outsider model of the form examined above, but without redundancy pay - what will be termed the IO model. Finally, we shall return to the insider-outsider model with redundancy pay that has been developed in this paper, which we term the IOR model. In order to compare precisely the wage and employment predictions of each model, constant elasticity functional forms will be used for individual worker utility and for the firm's labour demand function. Worker utility is given by

$$u(w) = \frac{1}{\sigma} w^{\sigma} \qquad \sigma<1; \quad u'>0; \; u''<0 \qquad (22)$$

where the degree of relative risk aversion is given by $(1-\sigma)=-[u''(w)w]/u'(w)$. The marginal revenue product of labour is given by

$$n(w) = \theta w^{-e} \qquad e>1; \; n'<0, \; n''>0 \qquad (23)$$

PROPOSITION 4. In a unionised economy, the presence of firing costs on the bargaining agenda increases average employment across the

business cycle and reduces deadweight welfare losses associated with unions.

Proof of Proposition 4.

This is given in the remainder of this section.

1. The Hiring Hall (HH) Model

This model is applicable to a union hiring hall, where each period workers are selected at random from the pool of available workers in the sector, given by p. For each period, the objective function of the utilitarian union is given by

$$\hat{Ev} = \sum_{i=1}^{U} \tau_i \{m(w).u(w) + [p - m(w)].u(\beta)\} \qquad m<p \qquad (24)$$

where m denotes employment. When the union executive sets wages w by maximisation of (24) subject to the firm's labour demand curve, the first order condition (FOC) multiplied through by w and rearranged yields

$$\frac{u'(w).w}{[u(w) - u(b)]} = - \frac{m'(w).w}{m(w)} = e \qquad (25)$$

where e denotes the wage elasticity of labour demand. Insertion of the constant elasticity specific functional forms into this equation yields equilibrium wages as [19]

$$w^{*HH} = \left[\frac{e}{(e-\sigma)}\right]^{1/\sigma}.\beta \qquad (26)$$

where the superscript HH denotes hiring hall. Union wages are increasing in alternative wages β, and declining with relative risk aversion $(1-\sigma)$ or with the elasticity of labour demand e. This optimal wage level can be substituted into the labour demand

[19] Substitution of the constant elasticity functions into (25) yields

$$e = \frac{w^{\sigma}.w}{[w^{\sigma} - \beta^{\sigma}]/\sigma}$$

which can be rearranged to give (26) in the text.

$$w^{*HH} = \left[\frac{e}{(e-\sigma)}\right]^{1/\sigma} . \beta$$

$$w^{*IO} = \left[\frac{e(1-\delta)}{(e-\sigma)}\right]^{1/\sigma} . \beta$$

$$w^{*IOR} = \left[\frac{e}{e-\sigma}\right]^{1/\sigma} \left[\beta^{\sigma} - \delta(r+\beta)^{\sigma}\right]^{1/\sigma}$$

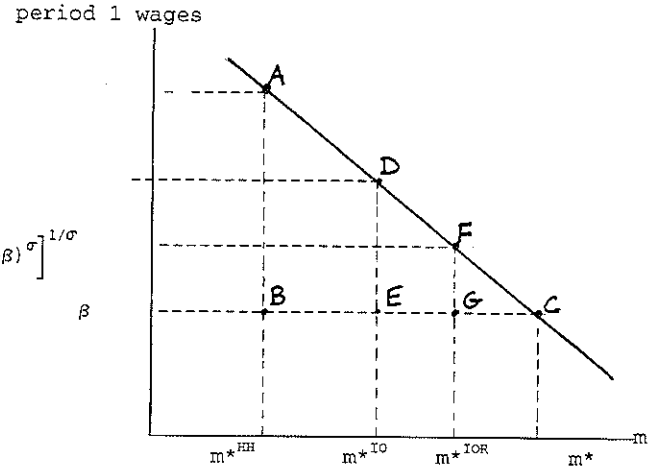

Figure 2(a): Period 1 Employment m

$$w^{*} = \left[\frac{e}{(e-\sigma)}\right]^{1/\sigma} . \beta$$

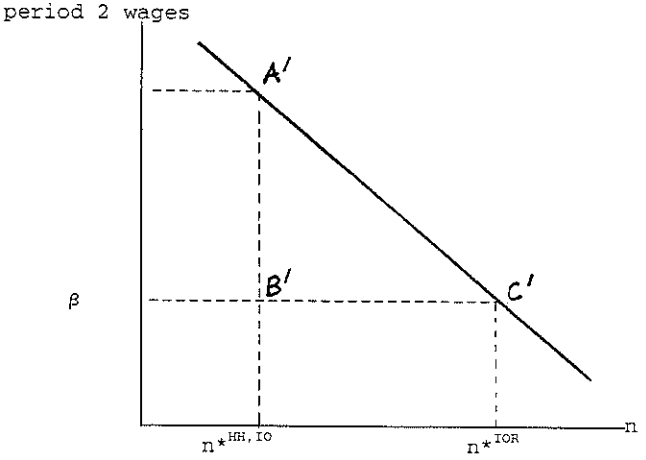

Figure 2(b): Period 2 Employment n

Figure 2: A Comparison of Welfare Losses of Three Union Models

Deadweight Loss HH Model = ABC + A'B'C'

Deadweight Loss IO Model = DEC + A'B'C'

Deadweight Loss IOR Model = FGC + zero

schedule to give the associated level of employment (and unemployment) as illustrated in Figure 2.

[Insert Figure 2 near here]

2. The Insider-Outsider (IO) Model

This model differs from the static hiring hall model above, because now workers who are hired in the initial period stay with the firm to become insiders by the start of period 2. Using backward induction, we initially examine wage determination in period 2, where n denotes period 2 employment and m is the pool of incumbent workers inherited from period 1.

Period 2

$$\max_{w_2} \hat{Ev}_2 = \sum_{i=1}^{U} \tau_i \{n_i(w_2).u(w_2) + [m - n_i(w_2)].u(\beta)\} \qquad n_i<m \qquad (27)$$

The FOC is given by

$$n_i(w_2).u'(w_2) + n_i'(w_2).[u(w_2) - u(\beta)] = 0 \qquad (28)$$

which yields an optimal period 2 wage rate identical to (26) above (the hiring hall model wage rate), on the assumption that the elasticity of labour demand does not change across periods.

Period 1

Now consider wage determination in period 1. The union's wage-setting behaviour in period 1 determines the size of current employment (and next period's incumbents) denoted by m. This two-period behaviour is captured in the following period 1 union maximand

$$\hat{Ev}_1 = m(w_1)u(w_1) + [p-m(w_1)]u(\beta) + \delta \sum_{i=1}^{U} \tau_i \{n_i u(w_2) + [m(w_1) - n_i]u(\beta)\} \qquad (29)$$

When the union sets w_1 by maximisation of (29) subject to the firm's period 1 labour demand curve, rearrangement of the FOC yields

$$\frac{u(w_1).w_1}{[u(w_1)-(1-\delta)u(\beta)]} = -\frac{m'(w_1).w_1}{m(w_1)} = e_1 \qquad (30)$$

Insertion of constant elasticity specific functional forms into this equation yields equilibrium wages as

$$w_1^{*IO} = \left[\frac{e(1-\delta)}{(e-\sigma)}\right]^{1/\sigma}.\beta \qquad (31)$$

If the union is myopic (δ=0), (31) reduces to (26). If the union is not myopic, then the period 1 optimal wage is negatively related to the discount factor δ. For $0<\delta<1$, the period 1 wage will be lower than the union wage in the HH model, and therefore period 1 employment will be relatively higher. However, period 2 employment will be identical in the HH and IO models, as shown in Figure 2. The net result is that average employment is higher in the IO model than in the HH model. We now see how the insider-outsider model with redundancy pay (IOR) compares.

3. The Insider-Outsider Model with Endogenous Redundancy Pay (IOR)

This model was developed in Section IV, where it was shown that period 2 employment is characterised by the equality of marginal productivity to the opportunity cost of labour. This contrasts with period 2 employment in the IO and HH models, as shown in Figure 2(b). However, period 1 employment was shown to be inefficient in the IOR model. An obvious question is how average employment in this IOR model compares with average employment in the HH and IO models outlined above. This question is answered below, again in the monopoly union framework.

From Proposition 2, we know that, for the right-to-manage model, $w_2^*=r^*+\beta$. This result also holds for the monopoly union model. Now consider the determination of wages in period 1. The utilitarian monopoly union maximises its objective function given by

$$\hat{Ev}_1 = m(w_1)u(w_1) + [p-m(w_1)]u(\beta) + \delta\sum_{i=1}^{U}\tau_i\{n_i u(w_2)+[m(w_1)-n_i]u(r+\beta)\} \qquad (32)$$

Redundancy pay appears in the last term on the RHS of (32), since incumbent workers laid off in period 2 are entitled to a redundancy payment. Use the result from Proposition 2 in the text that $w_2^*=r^*+\beta$ to simplify (32), giving

$$\hat{Ev}_1 = m(w_1)u(w_1) + [p-m(w_1)]u(\beta) + \delta m(w_1).u(r+\beta) \qquad (33)$$

The first order condition is

$$m'(w_1)u(w_1)[u(w_1)-u(\beta)] - pu(\beta) + \delta m(w_1)u(r+\beta) = 0 \qquad (34)$$

which upon multiplication through by $(-w_1/m)$ and rearrangement yields

$$\frac{u(w_1).w_1}{u(w_1)-[u(\beta)-\delta u(r+\beta)]} = -\frac{m'(w_1).w_1}{m(w_1)} = e \qquad (35)$$

Substitute into (35) the constant elasticity specific functional forms of (22) and (23) to obtain

$$w_1^{*IOR} = \left[\frac{e}{e-\sigma}\right]^{1/\sigma}.\left[\beta^{\sigma}-\delta(r+\beta)^{\sigma}\right]^{1/\sigma} \qquad (36)$$

If $r=0$, (36) collapses to (31), and if $r=\delta=0$, (36) collapses to (26). Inspection of (36), (31) and (36) shows that $w^{*HH}>w^{*IO}>w^{*IOR}$. Therefore period 1 employment is greatest in the 2-period model with redundancy pay (the IOR model), and lowest in the hiring-hall model. This comparison is shown in Figure 2(a). Moreover, since in the IOR model period 2 employment is characterised by the equality of marginal productivity to the opportunity cost of labour, there is no deadweight loss in period 2, as Figure 2(b) shows. Hence <u>average</u> employment is greatest in the IOR model, and lowest in the HH model, with the IO model being somewhere in between. Thus the model with redundancy pay has a smaller average welfare loss than the insider-outsider model without redundancy pay, which in turn has a smaller average welfare loss than the repeated hiring hall model, as

Figure 2 illustrates.■

This comparison illustrates an important result of the IOR model, viz. that firing costs bargained over by the union and the firm have a stabilising impact on employment in bad times, and reduce hiring in good times by an amount that depends in part on the discount factor. This outcome can also be compared with the predictions of the fixed-wage and fixed-firing costs model of Bentolila and Bertola (1990). But the crucial point of difference between the two approaches is that the result in this paper derives from a model in which wages and firing costs are determined by a bargaining process, in which employment stabilisation is desired by risk-averse workers.[20]

VI. THE UNEMPLOYMENT IMPLICATIONS OF STATUTORY REDUNDANCY PAY

We now consider the implications of statutory firing costs on unemployment. In Section II of the paper it was argued that, in the perfectly competitive spot labour market, there is likely to be an increase in temporary contracts following the introduction of statutory redundancy pay schemes. Demand shocks in a spot labour market are immediately translated into employment and output fluctuations, and state-mandated redundancy pay has no impact on this outcome. It was also argued that the spot labour market is a plausible characterisation of the labour market only where there are no gains to the firm from having longer term contracts, and that in longer term employment relationships, bargaining models of wage determination are more appropriate. In this section, we shall examine, in VI.1, the impact of mandated redundancy pay on the outcome of the bargaining model developed in Section IV. It will be demonstrated that the imposition of statutory redundancy pay will not affect employment in such a situation, but will reduce profits

[20]The model is also similar to the well-known implicit contract result with redundancy pay, in which competitive forces lead to an efficient outcome (see Rosen (1985)). However, the model in this paper derives from a labour market where the workforce has some bargaining power, and which can be thought of as imperfectly competitive.

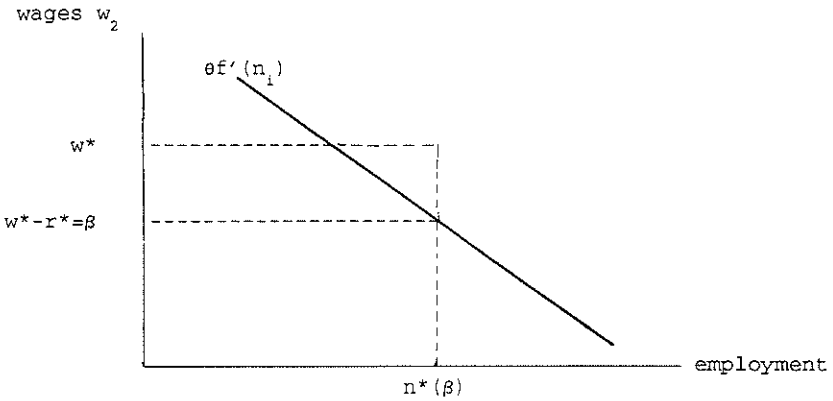

Figure 3: Imposition of Mandated Redundancy Pay

if statutory firing costs are too high. Then we shall examine, in VI.2, the employment implications of imposing mandated redundancy pay in a unionised economy with no redundancy pay, and it will be argued that such a policy would actually increase employment.

VI.1 The Bargaining Model with State-mandated Firing Costs

We now examine the period 2 unemployment implications of the bargaining model (with optimally-set redundancy pay) when the state intervenes to impose a level of redundancy payment.

PROPOSITION 5. *In labour markets where the workforce has some bargaining power and redundancy pay is on the bargaining agenda, the imposition of state-mandated redundancy pay* $\bar{r}$ *will result in an efficiency loss unless* $\bar{r} \leq r^*$. *If* $\bar{r} > r^*$, *ex post employment is unaffected in the neighbourhood of the equilibrium, but profits are reduced.*

The implications of state-mandated redundancy pay can be seen by inspection of Figure 3(b). Denote by $\bar{r}$ the state-mandated level of redundancy pay, and let r^* be the efficient level of redundancy pay. There are three possible cases: $\bar{r}<r^*$, $\bar{r}=r^*$, and $\bar{r}>r^*$.

Case (i): $\bar{r} < r^*$.

If the firm and union can effectively negotiate to "top-up" the state-given level of severance pay, *ex post* employment should continue to be efficient. If the redundancy payment cannot be topped up, then ex post unemployment will result.

Case (ii): $\bar{r} = r^*$.

Here ex post employment will be at its efficient level.

Case (iii): $\bar{r} > r^*$.

Here the state-mandated redundancy pay has the effect of reducing the firm's share of any surplus. To see this, recall from the proof of Proposition 2 (ii) that

$$w_2 = r + \beta \qquad (37)$$

To determine the sign of dw_2^*/dr, notice that the constraint of (19) must still hold for small perturbations about the optimum. Therefore from (37) $dw_2^*/dr>0$. Note further that, since ex post employment is determined so that marginal productivity is equal to the opportunity cost of labour (that is, where $\theta_i f'(n_i)=\beta$), a small increase in r above its optimum does not affect ex post employment. Therefore an exogenously imposed increase in r above the optimum of r* is associated with an increase in w_2^*, and thus the impact of this change is equivalent to an increase in union power. As a result, the firm's share of any surplus declines.■

VI.2 The Orthodox Union Model with State-mandated Firing Costs

Since only a part of the unionised sector in Britain bargains over the size of redundancy payments, it is worth considering the impact of state-mandated redundancy pay $\bar{r}$ on the standard union model with no bargaining over redundancy pay. In this situation, because $\bar{r}$ is imposed on the union and firm, $\bar{r}$ enters the generalised Nash bargain in a similar fashion to the model with bargaining over redundancy, given by equation (10). The difference between the two models lies in the fact that the severance payment is now exogenously given. Although there is a payment, the union-firm pair cannot use this as an instrument with which to achieve period 2 efficiency. We can write the (only) first order condition from maximisation of the modified equation (10) with respect to w_2 as

$$u'(w_2) + \frac{[u(w_2) - u(\bar{r}+\beta)]}{n_i \theta_i f''(n_i)} = \frac{(1-\alpha)Ev}{\alpha.E\Pi} \qquad (38)$$

Inspection of (38) and comparison with our earlier results (in Proposition 2 and equation (11)) reveals that ex post employment is fully efficient only if, by chance, the state sets $\bar{r}$ such that $w_2=\bar{r}+\beta$. If this is the case, then the mandated severance payment mimics the union model with bargaining over w_2 and r, and the same efficiency result holds. (Recall that in these models a necessary and sufficient condition for full efficiency is the equality of

marginal productivity with the opportunity cost of labour.) However if, as seems more plausible, $w_2 > \bar{r}+\beta$ or $w_2 < \bar{r}+\beta$, then ex post employment will be inefficient, although it will be greater than in the case where r=0.

How does this inefficiency compares with that of the union model with no redundancy pay, statutory or non-statutory? Further insights about the period 1 employment implications of mandated firing costs can be gained by returning to the specific functional forms and the monopoly union special case. The imposition of mandated firing costs on a union-firm pair that does not bargain over redundancy pay will actually increase average employment. This is because in period 1 the wage rate will now be given by (36) (with $\bar{r}$ replacing bargained r), and in period 2 as $\bar{r} \rightarrow r^*$, ex post employment approaches the situation that marginal productivity is equal to the opportunity cost of labour.

VII CONCLUSION

It is in the nature of firing costs that workers are eligible only after an initial period of continuous service with a single firm. In a competitive spot labour market where there are no advantages to long-term employment relationships, the introduction of mandated redundancy pay will have no other impact on the labour market than that of increasing the incidence of short-term employment contracts. However, in a two-period model in which it is in firms' interests to have continuing employment relationships, firing costs will reduce the variance of labour demand across the business cycle. An implication of this well-known result is that risk-averse workers may prefer a contract with redundancy pay, since it stabilises employment over time, and risk-neutral firms may be willing to offer such a contract. This paper develops a simple model in which wages and firing costs are determined as part of a bargaining process. A striking result of this model is that the wage corresponding to the level of ex post employment is equal to the opportunity cost of labour (a necessary and sufficient condition for the bargaining surplus to be maximised). Thus firing costs bargained over by the union and the firm have a stabilising impact on employment in bad times and reduce hiring in good times. In this

framework, mandated firing costs will typically result in a welfare loss, unless by chance the state sets the firing cost to be equal to that determined through voluntary bargaining. An implication is that the determination of the level of firing costs is best left to individual or collective bargaining.

However, a further striking result of the model developed in the paper is that, in a unionised economy, the presence of firing costs increases average employment across the business cycle, and reduces employment distortions associated with unions. Hence where the union sector does not bargain over the level of firing costs, the imposition of statutory firing costs may actually increase average employment.

Of course, there are other reasons for state-mandated redundancy pay that are not captured by the model in this paper. These reasons relate predominantly to market failure. For example, statutory redundancy pay might protect workers against firm bankruptcy should an unanticipated demand shock drive the firm out of business and prevent the firm paying the bargained firing cost. Here the notion that statutory firing costs may provide a second-best solution relates to the missing markets view whereby firms are unable to insure against bankruptcy due to moral hazard. Mandated redundancy pay allows for the payment of firing costs when firms are made bankrupt, and are unable to meet their negotiated redundancy obligations. A related argument arises because of the fact that in the model redundancy pay is a form of insurance that is conditional on the mode of worker separation. about which there may be asymmetric information. Such conditional insurance may therefore require intervention by a third party to intervene in disputes. The optimal form of third party intervention is beyond the scope of this paper.

There are also a number of other hypotheses aiming to explain the existence of statutory firing costs. For example, it has been argued that firing costs reduce the moral hazard problems associated with state unemployment benefit systems, since they prevent firms laying off workers too readily to take advantage of statutory unemployment insurance (Buechtemann (1992)). Another hypothesis is that mandated firing costs give workers some bargaining power, and

therefore redress the perceived imbalance between capital and labour. Saint-Paul (1994) views the introduction of firing costs in terms of political economy, involving a redistribution between skilled and unskilled labour, or between employed and unemployed workers. Bentolila and Bertola (1990:399) suggest that, where demand fluctuations arise because of Keynesian coordination failures rather than through the operation of competitive markets, firing costs might improve workers' welfare due to an aggregate demand externality. Finally, Booth and Zoega (1994) in a formal model investigate the possibility that mandated firing costs might be a second-best response to market failures arising through the combination of quitting externalities, irreversible investments in human capital, and repeated demand shocks. In their model, statutory firing costs are a second-best remedy to overcome the problem of loss of human capital over the business cycle. All of these hypotheses warrant further investigation.

APPENDIX

Proof of Proposition 2.

From the Proof of Proposition 2, we know that $w=r+\beta$. This suggests that the bargaining problem can be reduced to a bargain over w, subject to the constraint that

$$r = w - \beta \tag{A1}$$

The generalised Nash bargain of (10) can now be rewritten as

$$\max_{w} \tilde{B}(w) = E\tilde{v}^{\alpha}\, E\tilde{\Pi}^{1-\alpha} \tag{A2}$$

where, using (A1), $E\tilde{v}$ and $E\tilde{\Pi}$ are given by

$$E\tilde{v} = \sum_{i=1}^{U} \tau_i \{ n_i u(w) + [m-n_i].u(w)\}/m - u(\beta)$$

$$= [u(w) - u(\beta)] \tag{A3}$$

and

$$E\tilde{\Pi} = \sum_{i=1}^{U} \tau_i \{ f[n_i(\beta/\theta_i)] - wm + [m-n_i(\beta/\theta_i)].\beta \} \tag{A4}$$

The first order condition from maximisation of (A2) is

$$\tilde{B}_w = \frac{\alpha \tilde{E}v_w}{E\tilde{v}} + \frac{(1-\alpha)E\tilde{\Pi}_w}{E\tilde{\Pi}} = 0 \qquad (A5)$$

Total differentiation of (A5) with respect to w and α and rearrangement yields:

$$dw^*/d\alpha = - \tilde{B}_{w\alpha} / \tilde{B}_{ww} \qquad (A6)$$

For the generalised Nash maximand to be concave, $\tilde{B}_{ww}<0$. Therefore

$$\text{sign } \{dw^*/d\alpha = \text{sign } \{\tilde{B}_{w\alpha}\} \qquad (A7)$$

Differentiation of (A5) with respect to α yields

$$\tilde{B}_{w\alpha} = E\tilde{v}_w/E\tilde{v} - E\tilde{\Pi}_w/E\tilde{\Pi} > 0 \qquad (A8)$$

From differentiation with respect to w of (A3) and (A4) respectively, $E\tilde{v}_w=u'(w) > 0$ and $E\tilde{\Pi}_w=-m < 0$. Hence $\tilde{B}_{w\alpha} > 0$.

To determine the sign of $dr^*/d\alpha$, return to the constraint (A1), which must still hold for perturbations about the optimum. Therefore

$$dw/d\alpha = dr/d\alpha \qquad (A9)$$

and since $dw/d\alpha > 0$, $dr/d\alpha > 0$ also.

Finally, note that since ex post employment is determined so that marginal productivity is equal to the opportunity cost of labour (that is, where $\theta_i f'(n_i)=\beta$), union power does not affect ex post employment. ■

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