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Strikes, Inventories, and Union Legislation*

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Abstract

The paper develops a theory in which the probability that a strike occurs is increasing in the level of inventories held by the firm, but decreasing in the workers' cost of the strike. We use recent industrial relations legislation to identify a change in the conditions under which striking workers could successfully picket. Before the legislation, if unions have a high level of optimism in their ability to maintain a picket line and prevent the firm from selling out of inventory stock, the union calls a strike. Using a panel of firms for the 1976-84 period, where we have knowledge of the pay strikes that occurred, the firm's inevntory of finished goods, an industry measure for the workers cost of strike, we find some evidence to support the theoretical predictions.

JEL Classification: J52, J58

1 Introduction

For a strike to be successful for a union, the union must be able to restrict the firms operations while its members are undertaking industrial action. In the U.K., during the 1970's, this took the form of picketing and secondary action. Running battles between striking miners and police were well publicized during the latter part of the 1970's (See Kessler and Bayliss, 1992). If this involves the simple restriction of labour supply, then the probability of success for a strike depends simply on the monopsony power of the union. If no such monopsony power exists, or is limited, then other means of restricting the firms operations are required. Although picketing and secondary action (picketing the place where the inventories were to be delivered) were illegal, the law was not sufficiently defined for legal action to have much effect. The Employment Acts in 1980 and 1982 provided the police and courts with wide ranging legal powers to break picketing and secondary action by striking union workers. In effect, the ability of a union to strike was limited to with-holding their labour supply.

Strike behaviour in Britain differs from the US by virtue of the fact that strikes can be called over all conditions of employment at any time. Pay strikes in the US and Canada usually occur at 2 or 3 year intervals when contracts are being re-negotiated. In contrast, strikes in Britain relating to pay negotiation usually occur at the time of contract renewal. However, this need not be the case. Strikes can be called concerning manning ratios, hires, dismissals, even the length of tea breaks. We restrict our analysis to the strikes declared as being over pay.

Even though only a few wage negotiations break down into a strike it is still important to understand strike behaviour as it is a departure from either rational behaviour by agents or a complete information world. Assuming that agents are rational, why would rational individuals choose to diminish the joint product to be shared when agreement would result in a larger share for at least one or both? If both parties are perfectly informed it is difficult to see how strikes are generated. One line of approach that has become popular is to assume that unions or firms possess imperfect information about some aspect of the others ability to concede the bargaining position. Models by Hayes (1984), Tracy (1987), Hart (1989), and Card (1990) all assume some form of informational asymmetry. In these particular models the asymmetry concerns the firms profits.

In this model we concentrate on the role of inventories in the determination of a strike. Further, we can use recent industrial labour relations legislation to identify if the inventory accumulation did affect the strike probability. Inventories are only useful to a firm if it can sell from them during a strike. Although illegal in Britain for the period under consideration, picketing and secondary action were used in strikes in the latter part of the 1970's to consolidate the workers ability to win the strike. They used the pickets and secondary pickets to prevent firms moving inventory. The first industrial relations legislation that the new conservative government introduced in 1980 was the Employment Act that gave the police far reaching powers to break and detain picketing workers who were preventing the free movement of goods. The legislation helps identify the effects of inventories on strike incidence. Before the legislation firms were restricted in the movement of finished good inventories. After the legislation, firms were free to sell out of stock should a strike occur.

The idea that inventories, or that the change in legislation (that affects picketing and secondary action) will also affect strikes is not new. Christenson (1953) wrote on the passing of the Taft-Hartly Act and the ability of coal miners to stockpile coal before a strike, so that during a strike the steel and power industries were unaffected. Christenson (1953) called this intertemporal substitution of production the time-shift offset factor. Other empirical pieces have also examined the role of inventories in strike incidence and found generally that inventories reduced the cost of a strike to the firm and therefore increased the probability of a strike occurring (Reder and Neumann (1980), Gunderson and Molino (1987), and Paarsch (1990)). Any effects from strikes, especially in the long run, were considered very small or negligible.

The model developed in Section II is a two-stage game. In the first stage there is a possible picket battle. The second stage depends on who won the picket battle. If the union won the picket battle, lorries are unable to deliver out of the stock of finished good inventories. If the firm wins the picket battle, the firm will be able to sell out of finished good inventories. The uncertainty in the model surrounds the first stage of the game. Rather than assume the union has some informational deficiency on the state of the firms product demand, all state variables in the second stage of the game are known by both sides. In Section III, we use firm data matched to pay strikes to determine if the basic prediction of the model is verified by events. The econometric issues present an interesting problem. First is the possibility that there is state dependence. That certain firm-union pairs will have a propensity to strike each year. This would introduce a lagged dependent variable into the model. Second, we are concerned with the role of inventories as an endogenous variable to the strike process. Using a simple probit or logit procedure is not sufficient; it would result in biased estimates.

We test for state dependence and reject it for the two sub-periods separately. To counter both the incidental parameter problem and endogeneity bias from inventories, we extend a GMM method suggested by Arellano and Carrasco (1996). The main hypothesis to be tested is that the level of finished good inventories have a positive effect on the probability of a strike occurring when the union wins the picket battle. If the firm wins the picket battle, then the union accepts the reservation wage offer. We find that there is some evidence to suggest that this was the case.

2 Framework

The bargaining model is described by a two stage game. In the first stage there is a possible 'picket battle'. The structure of the bargaining game played in the second stage depends on who wins that picket battle. If the union wins the picket battle, lorries are unable to cross the picket lines during a strike and the firm will not be able to sell out of its inventory of finished goods. Conversely, if the firm wins the picket battle, the firm will be able to sell out of its inventory stock during a strike.

The second stage considers the equilibrium wage outcome in a strategic bargaining game with random alternating offers, where that outcome depends on who won the picket battle.

Throughout we assume that the firm and union are both risk neutral and have the same discount rate $r > 0$. Both choose trading strategies to maximise their expected discounted utility.

Stage 1 (the picket battle)

The outcome to the picket battle is uncertain - it depends on how motivated the union members are at maintaining a 24-hour picket line to stop lorries from crossing those lines, and how motivated the local police force is in keeping the factory gates open. Let $\pi \in [0, 1]$ denote the probability that the firm wins the picket battle if one occurs. Assume that ex-ante, π is distributed according to F, but when the union and firm begin negotiations over the wage, the union knows how motivated its union members are at manning the picket lines, and hence knows the true value of π.[1] However, the firm does not know this information and hence its best information is that π is distributed according to F.

Given these beliefs, we assume the firm makes a take-it-or-leave-it wage offer w. If the union accepts that wage offer there is no picket battle and

[1] The outcome remains uncertain as nobody knows how determined the local police force might be to clear the picket line.

the union returns to work at that negotiated wage. A contract is written which implies the wage level is fixed at w for the entire future and there are no future renegotiatons.

If the union rejects that wage offer, the union has two further options. Its first option is to have a picket battle - there is a strike, where the union tries to keep the factory gates closed. The picket battle is costly to the union – the union members lose utility c_u. For simplicity, we assume the picket battle does not impose direct costs on the firm - though it will be costly to the firm if it loses the battle. Depending on the outcome of the picket battle, where the firm wins with probability π, stage 2 describes how wages are subsequently determined. For simplicity, we do not model the duration of the picket battle.

The union's other option if it rejects the wage offer is to concede the picket battle, and so avoid the cost c_u.

Stage 2 - The Extended Bargaining Game

There are two different bargaining games, depending on who won the picket battle. If the firm won the picket battle and so sells out of its inventory stock while the union is on strike, we assume the terms of trade are determined by strategic bargaining with alternating offers. In particular, we assume the game takes the form as described by Coles and Hildreth (1996), where the firm chooses an optimal sales policy during the strike. They show that in the unique Markov perfect equilibrium, in the limit as the time between counteroffers goes to zero, there is immediate agreement (no strike) and the equilibrium negotiated wage is

$$w = (1 - \alpha)[V(I) - d(I)]$$

where $V(I)$ is the firm's expected discounted revenues by using its optimal inventory strategy when the union returns to work, $d(I)$ is the firm's expected discounted profits by using its optimal inventory strategy should the union never return to work, and α is the probability that 'Nature' chooses the firm to make the next wage offer. Coles and Hildreth (1996) establish that $d(0) = 0, d'(I) > V'(I)$ for all $I \geq 0$ and $lim_{I\to\infty} d(I) = \lim_{I\to\infty} V(I)$.

If instead the firm loses the picket battle and so cannot sell out of its inventory during a strike, then assuming strategic bargaining with random alternating offers, there is immediate agreement and the equilibrium wage outcome is

$$w = (1 - \alpha)V(I)$$

which corresponds to the standard Rubinstein solution.[2] Hence in this

[2] Note that in both cases, we assume the outside options of the firm and union are not

framework, a strike is said to occur only if the union decides to hold a picket battle.

The following section shall establish the following perfect equilibrium to this game.

Theorem 1 : Assuming the distibution function F is convex, there is a unique perfect equilibrium. In that equilibrium, given I :

(i) the firm always offers wage $w = (1-\alpha)[V(I) - d(I)]$,

(ii) the union rejects that wage and calls a picket battle if and only if its belief π satisfies $\pi \leq \pi^*$, where

$$\pi^* = 1 - \frac{c_u}{(1-\alpha)d(I)}$$

and accepts the wage offer otherwise.

The equilibrium has a simple interpretation. The firm offers a wage consistent with the bargaining outcome when the union loses the picket battle. In order to get a higher wage, the union must be willing to enter the picket battle knowing that it is costly to do so. It will only do this if it is sufficiently optimistic about the outcome of that battle, where $F(\pi^*)$ is the probability that this occurs. Hence $F(\pi^*)$ describes strike incidence.

Obviously π^*, the reservation optimism level of the union, is strictly increasing in I. As the inventory level increases, the value of winning the picket battle increases, which gives the union a greater incentive to fight. Strike incidence increases with the firm's inventory.

It is also obvious that π^* is decreasing in c_u. The more costly the picket battle to the union, the more optimistic the union has to be about the final outcome to be willing to call such a battle. Strike incidence decreases as the worker cost of mounting a picket battle increases.

Of course assuming that F is convex is restrictive. Perhaps the most natural example of such a distribution is the uniform distribution. Assuming F is convex much simplifies the analysis as it ensures that the firm's choice of wage w in a perfect equilibrium is a concave programming problem, and we do not have to worry about whether local maxima fail to describe global maxima. Nonetheless, strict convexity of F does have an economic interpretation. It implies that the firm's priors are skewed towards believing it is more likely to win the picket battle. It is this skewness that ensures the firm requires the union to prove it can win the picket battle in order to negotiate a higher wage.

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binding on the wage agreement.

3 Determining Equilibrium Picket Battle Strategies

As is standard, we shall construct the perfect equilibrium to this game using backward induction. Before doing this, notice that the union will always reject a wage offer $w < (1-\alpha)[V(I) - d(I)]$ as by costlessly conceding the picket battle, it can guarantee a negotiated wage settlement of $(1-\alpha)[V(I) - d(I)]$. In what follows, there is no loss of generality in requiring that the firm's initial offer w satisfies $w \geq (1-\alpha)[V(I) - d(I)]$, where the union has to invoke a picket battle to negotiate a better wage settlement.

3.1 The union's picket battle strategy.

Suppose the firm offers wage $w \geq (1-\alpha)[V(I) - d(I)]$. The expected payoff to the union by accepting the wage is w. By rejecting the wage offer and entering the picket battle, the union's expected payoff is

$$-c_u + \pi[(1-\alpha)(V(I) - d(I))] + (1-\pi)[(1-\alpha)V(I)]$$

which reduces to

$$-c_u + (1-\alpha)V(I) - \pi(1-\alpha)d(I)$$

given their belief π and the level of inventory I.

Lemma 1 :

If I is small enough, where

$$(1-\alpha)d(I) \leq c_u$$

the union always concedes the picket battle.

Proof in Appendix

Lemma 1 establishes the nature of a picket battle - the union and firm are fighting to establish the value of the firm's threatpoint during wage negotiations. If the union wins the picket battle and can stop the firm from selling out of its inventory, the value of the firm's sales strategy during a strike falls from $d(I) \geq 0$ to zero. The difference in payoff to the union between winning and losing the picket battle is $(1-\alpha)d(I)$. Of course, the union will only engage in such a battle if that return exceeds the cost of mounting the battle. Lemma 1 shows that if the inventory is small, there is no point to such a battle and so in equilibrium, no battle occurs.

We now consider I where $(1-\alpha)d(I) > c_u$. In that case, it follows that if the union is sufficiently optimistic about winning the picket battle, it may choose to mount picket lines. Of course, the firm can offer a sufficiently generous wage w which reduces the union's incentive to invoke the picket battle.

Lemma 2 : Given w and I, where $(1-\alpha)d(I) > c_u$, then the union will reject the wage offer and mount a picket battle if and only if $\pi \leq \pi^c(w, I)$ given by

$$\pi^c = \frac{(1-\alpha)V(I) - w - c_u}{(1-\alpha)d(I)}$$

Proof is trivial by comparing the expected payoff of the picket battle, to accepting wage w.

The firm can avoid any risk of a picket battle by offering wage $w \geq (1-\alpha)V(I) - c_u$. The restriction $c_u \leq (1-\alpha)d(I)$ implies that such a wage is above $(1-\alpha)[V(I) - d(I)]$, and the union will accept such a wage rather than enter a picket battle. However, if the wage offer $w \in [(1-\alpha)[V(I) - d(I)], (1-\alpha)V(I) - c_u)$, which is a non-empty interval, the union will call a picket battle if it is sufficiently optimistic about winning it. Let $\Omega(I)$ denote this set of wages.

The next section now considers the firm's optimal wage offer.

3.2 The Firm's Optimal Wage Offer

The previous section implies we need to consider the firm's optimal wage strategy for two separate cases.

(i) **Case 1 :** $(1-\alpha)d(I) \leq c_u$ [the small inventory case]

Lemma 1 implies that the union's optimal battle strategy in this case, given the firm offers $w \geq (1-\alpha)[V(I) - d(I)]$, is to accept that wage offer. Clearly the firm's optimal wage strategy is to offer $w = (1-\alpha)[V(I) - d(I)]$.[3]

(ii) **Case 2 :** $(1-\alpha)d(I) > c_u$ [the large inventory case]

Given the strike strategy of the union described by lemma 2, it immediately follows that the firm will not offer a wage greater than $(1-\alpha)V(I) - c_u$ as the union will accept all such offers with probability one. Hence, we restrict attention to wage offers $w \in \Omega(I)$, which is a non-empty interval for $c_u \leq (1-\alpha)d(I)$.

Let $Z(w; I)$ denotes the firm's expected payoff by offering wage w given inventory I. Then for $w \in \Omega(I)$;

$$Z(w, I) \quad = \quad \int_0^{\pi^c} [\pi[\alpha V(I) + (1-\alpha)d(I)] + (1-\pi)\alpha V(I)] dF(\pi)$$

[3]Recall that if the firm offers a lower wage, the union rejects it but concedes the picket battle, thus guaranteeing this payment.

$$+(1-F(\pi^c))[V(I)-w]$$

where the integral term is the expected payoff should the union call a picket battle, and the second is the payoff should the union accept the wage. Finding the optimal wage requires solving the programming problem

$$Q(I)=\max_{w\in\Omega(I)} Z(w,I)$$

Convexity of F implies that the left and right derivatives of F exist. However for expositional purposes, assume for now that F is continuously differentiable. Simple algebra establishes that Z must then be continuously differentiable with respect to w where

$$\frac{\partial Z}{\partial w}=\frac{c_u F'(\pi^c)}{(1-\alpha)d(I)}-[1-F(\pi^c)].$$

As w increases, π_c decreases - the probability of a picket battle declines. The first term reflects the gain by offering a slightly higher wage. The union is less likely to call a strike and there is a joint saving of c_u by avoiding that battle. The loss to the firm by offering a higher wage is that the union would not have called a strike in the first place.

A sufficient condition which guarantees that (.) describes a concave programming problem is that F is convex. To see this, notice this assumption implies that $\partial Z/\partial w$ defined above decreases as w increases for all $w\in\Omega(I)$, which implies Z is concave in w. [4].

Lemma 3 : If F is convex and $(1-\alpha)d(I)>c_u$, an optimal strategy for the firm is to announce $w=(1-\alpha)[V(I)-d(I)]$.

Proof in Appendix

Lemma 3 (and case 1 above) complete the proof of the Theorem. Given the firm announces the wage described in lemma 3, the firm's reservation belief π^c equals π^* as defined in the Theorem.

4 Empirical Results on Strikes and Inventories

The theory essentially has 2 predictions. The first is that the probability that a strike occurring is increasing in the level of inventories when the union feels it can win the picket battle. We can identify the effect inventories have on the probability of a strike by using the break in conditions under which

[4] Of course, it is sufficient to establish concavity by arguing that the right derivative of Z is decreasing with w.

the union could successfully prevent the firm from selling out of stock should a strike occur. Before the legislation, legal restrictions were weak on unions mounting a picket that blockaded the firm and prevented the movement of finished goods. Unions would have a high level of optimism regarding their ability to win the picket battle. After the legislation, unions optimism on winning a picket battle would be diminished as the legislation had improved the chances of the firm (or police) winning the picket battle. Appendix C contains further details of the legislation. The theory also predicts that the probability of a strike is decreasing in the cost of a strike to the workers. This cost element is independent of the value of the firm (defined on inventories) and it is difficult to predict *a priori* if the cost to the workers will vary in accordance with the legislation.

4.1 Data

The starting point for the data collection is the annual record of strikes published by the Department of Employment in the *Employment Gazette*. Each June (1977-78), July (1979, 1981-85) and August (1980), the Department of Employment publishes details of strikes in the previous calendar year by industry, location, start date and stop date, the number of workers directly and indirectly involved (in some cases), and the reason for the strike. The industry and location details, along with the start and the stop dates of the strike, are the means by which the firm can be identified. As the Department of Employment only publishes details of strikes that involve 5000 worker days lost, the firms involved are likely to be large; or if they are small firms then the strike has lasted a long time. Either way, the strike is likely to be significant enough to be reported in the daily financial press. We restricted our sample to manufacturing industry, not including the coal industry. Using the start date records and location, cross checked with the industry code, the *Financial Times* for the relevant days on or after the strike started were consulted to establish the name of the firm at which the strike took place.[5] The firm name was then used to match the company accounts data from *Datastream*. Further details of the strike and company account data are given in the Appendix.

This matching process is a random 'hit and miss' method that tends to over sample the large and prominent employers. While some representative-

[5] In most cases it was not reported that a picket was actually in place. However, the threat of a picket, or secondary picket, would have had a the same effect. What matters is the likelihood of firms selling out on inventory in the event of a strike. This was substantially lower in the period 1976-79 compared to the period 1980-84.

ness is lost in terms of the sample, it does mean that firms with a number of strikes over time are represented. Problems occurred in matching a strike and the firm data to a particular year. The firms tended to declare their accounts in terms of financial years (April to March). Obviously, some attention is paid to the official state of the firm (as declared in its profit and loss account) by the union when it renegotiates its wage with the firm, but the wage deal does not necessarily coincide with the publication of the firms accounts. Strikes were assigned to a year by their start date. Firms were given a year by the date of declaring their accounts. The majority of strikes started in the latter half of the year, although there is a spike actually in March (Table A2 shows the seasonal pattern of strikes within the data).

Despite these problems with the data this is the first time such data are available for the UK and the end result does give a complete record for 184 union firms over the 1976-84 time period, of strikes that occurred, their duration, and the performance of firms. We needed to obtain data on firms that existed either side of the legislative break to avoid any endogenous attrition problems. Firms could potentially be put out of business by a strike through successful picketing, influencing the result on inventories. The panel is unbalanced, and 109 pay strikes occurred in only 48 of the firms. Table A1 in the Appendix presents the summary statistics for the sample. It should be noted that the sample is a collection of large firms, the mean size being almost 21000 employees. Furthermore, because of the 1982 Company Act, a number of observations are omitted on employment and the wage bill before 1982. This severely limits any analysis on wage effects. The analysis is also limited to the extent that we are using annual variables to detect a singular event in the firm's financial year. Any effects that might be found are likely to be small, on average. Even when using detailed daily data around a strike, Paarsch (1990) found the effects were small once the time period became aggregated at the monthly level.

Table 1 reports the mean incidence of pay strikes. The peak of strike incidence was 1978 and 1980. From 1980, the incidence of strikes declined as new legislation was introduced to limit strike action by unions. The slight increase in the incidence and duration of strikes in 1984 was probably due to increased unrest at the introduction of the 1984 Trades Union Act and the coal miners strike of the same year. The pattern of pay strikes for this sample of firms runs counter-cyclical.[6] Also on Table 1, the mean level of

[6] The figures for strike incidence over pay are similar to those given in Ingram, Metcalf and Wadsworth (1993). Their figures tend to indicate that pay strikes in manufacturing in Britain do run counter-cyclically.

finished good inventories is also given for the firms in the sample. In terms of a time-series pattern, there seems little relation between the mean incidence of pay strikes and the mean level of inventories across the sample of firms.

To give some representation to the across firm variability in inventories around a strike, Table 2 shows the average growth in inventories around a pay strike.[7] We divided the time period into two parts: before the legislation (1976-79) and after the legislation (1980-84). The pattern shown on Table 2 accords with the predictions from the theory. For the whole time period the pattern shows that one year before a strike, firms store finished good inventories to run them down during a strike. This overall pattern is the result of different forces during the two parts to the time period. For the 1976-79 time period, firms built up inventories both a year before and during the strike year. Unable to sell out of inventories during a strike, inventories show positive growth. The opposite is true for the subsequent period: 1980-84. Both for the year before and during the strike year, inventories were being run down. At first glance, there is evidence to show that at the firm level, inventories may have had a differential effect on strike success before and after the legislation.

4.2 Estimation and Results

Estimating strike incidence to test the above theoretical propositions is not as straightforward as it would be in linear models. In linear models there are known techniques that allow for both the unobserved heterogeneity and the endogeneity of the explanatory variables (see Coles and Hildreth, 1996). There are essentially two distinct problems with estimation in discrete choice panel models. The first concerns the incidental parameter problem. It would be reasonable to expect that union-firm bargaining pairs will have specific unobserved factors that are particular to their situation. The second concern is that there are variables that are not strictly exogenous to the strike process. One factor is state dependence. The idea is that once a union-firm bargaining pair has experienced a strike, they are more likely to do so in future time periods. This lagged endogenous variable problem is further complicated by the fact that we would expect the inventory term to be endogenous too. If the firm is aware that inventories will shape the probability of a strike (and the wage agreement), under either legislative regime, then they will adapt their inventory policy accordingly. A method is required to account for the endogeneity of these two terms, while also

[7] The figures on Table 2 were calculated by regressing the growth rate on a constant, an indicator for the strike year and for the two lead and lag years.

conditioning on the unobserved heterogeneity. As there is no single 'best method' to follow we present a range of estimates using different techniques to get a handle on the importance of unobserved heterogeneity. We then examine if state dependence occurs in pay strikes across firms. Finally we present estimates that allow for the fact that inventories are not strictly exogenous.

4.2.1 The incidental parameter problem

We consider 3 different estimation methods to examine the importance of the incidental parameter problem. The first is to simply include a set of industry specific dummy variables. The second technique is to use Chamberlain's (1980) conditional logit approach. The third estimation method assumes a linear probability model and simply use first-differences to control for fixed effects.

We require estimates of the effects of inventories on pay strikes while allowing for other firm characterisitics. In particular, there may be unobservable firm and time effects that may make some firms or years more strike prone than others. In this instance, as some firms only experienced one pay strike in one year due to a renegotiation of the wage at the firm, the indicator of a strike is a binary variable that takes the value of unity if a strike occurred and zero otherwise. This variable is observed at various instances throughout the period.

We consider the simple model:

$$s_{it} = x'_{it}\beta + \mu_i + \nu_{it} \tag{1}$$

$i = 1, ..., N; t = 1, ..., T$; and

$$\Pr[s_{it} = 1] = L(x'_{it}\beta + \mu_i) \tag{2}$$

where s_{it} indicates the occurrence of a strike over pay, x is an observable time varying and time invariant vector of regressors that influence s, β is the vector of associated coefficients with x (which for the moment are assumed to be strictly exogenous), μ_i denotes a firm specific unobservable effect, and ν_{it} a random error term. We assume that $\nu_{it} \sim IN(0, \sigma_\nu^2)$ and the ν_{it} are independent of the x_{it}. L denotes the logistic distribution function. Unobservable firm effects are taken account of by industry specific dummies. Year effects (or outside business cycle factors) are controlled for with year specific dummies. The technique assumes that there are time and industry specific factors that affect strikes independently of the role of inventories and other firm variables. The model can be estimated by standard logit techniques.

The problem with using industry wide dummy variables is that they may not capture the firm specific heterogeneity that produce strikes between firm-union bargaining pairs. We present two models that allow for firm specific heterogeneity. First, a conditional logit model for strike incidence can be written as before:

$$s_{it} = x_{it}'\beta + \mu_i + \nu_{it}$$

but where $\sum_t s_{it}$ is a sufficient statistic for μ_i. Following Chamberlain (1980), if we define a variable d where $d_i = 1$ if $\sum_t s_{it} = 1$, and $d_i = 0$ otherwise. For general T, the conditional log-likelihood function can be written as:

$$L = \sum_i \ln \left[\frac{\exp\left(\beta' \sum_t x_{it} s_{it}\right)}{\sum_{\mathbf{d} \in G_i} \exp\left(\beta' \sum_t x_{it} d_t\right)} \right]$$

where $G_i = \{\mathbf{d} = (d_1, ..., d_T) | d_t = 0 \text{ or } 1 \text{ and } \sum_t d_t = \sum_t s_{it}\}$. The firm fixed effects are conditioned out of the likelihood. The likelihood permits estimation of the parameters associated with the time varying characterisitics of the model. As the definition of the d_i variable indicates, firms that never have a strike, or firms that strike every year contribute nothing to the likelihood. As the number of strikes are concentrated in a small number of firms, the number of observations available are restrictive.[8] Further, the conditional logit estimation relies heavily on the form of the logistic distribution. As a means of checking on the results we use a linear probability model.

The linear probability model is also restrictive in the sense that the predicted probabilities for strike incidence are assumed to lie in the unit interval. However, the fixed effect can be differenced out of equation 1 above to give the linear regression equation:

$$\Delta s_{it} = \Delta x_{it}'\beta + \zeta_{it}$$

where Δs_{it} represents the the change in strike outcomes between t and $t-1$, Δx_{it} represents the first difference in the covariate terms, and ζ_{it} can be counted as a residual. The coefficients were scaled up using the same method as Card (1988).

Table 3 presents the results from estimating the determinants of strikes over pay accounting for unobserved heterogeneity. Previous results included unexpected profits and wage deviation terms. Unexpected profits were the

[8] See Table A3 in the Appendix for a breakdown of the number of strikes per firm over the respective time periods.

difference between actual profits and profits predicted as a firm specific AR(2) equation. However, including these terms removed too many observations for well determined results. By including only 3 firm specific time varying variables in the model we subsume all other effects into the unobserved heterogeneity and year dummy terms. The inventory variables are the contemporaneous value. This is effectively the lag as it refers to the firms financial performance in the previous year. The results on Table 3 show a broadly consistent pattern irrespective of the model or the method of estimation. Inventories before the legislation are positively correlated with strike probability. While allowing for firm specific fixed effects serves to weaken the statistical significance of the coefficient on inventories, they nonetheless indicate that the higher the level of inventories, the more likely a strike when the union might successfully win the picket battle.

The worker cost of strike, once some attention is paid to unobserved heterogeneity, is negative but poorly determined in any of the sub periods.[9] For the whole period (1976-84), the worker cost has a negative effect on the probability of a strike occurring. In general, accounting for unobserved heterogeneity across firms is important. Industry dummies were significant showing that pay strikes do have a sectoral pattern. Once the probability of a strike occurring is modeled in fixed effects form, the significance on inventories is diminished to some degree, but the coefficient on employment changes both sign and statistical significance. The coefficient switches from being positive and well determined to negative and not significant at a 5 percent level. Unobserved heterogeneity appears correlated with the size of firm. The larger the size of the firm the less likely a pay strike occurring. This was not a size factor, but factors specific to the individual firms. The possibility that there may be firm specific factors relating to strike incidence equally implies that there may be state dependence on strikes at the same firms.

While the coefficients on Table 3 indicate the sign and significance of an effect, we do not know the scale of the effect without further calculations. To obtain an estimate of the scale of the effect of inventories on the strike probability we have to deal in the derivative. If we define the logit model as $\Pr[y_j = 1|\mathbf{x}_j] = L(\mathbf{x}_j' b)$ then the change in the probability for a given change in x_1 for example, is: $\frac{\partial L}{\partial x_1} = \frac{\exp(\overline{x}' b)}{[1+\exp(\overline{x}' b)]^2} b_1$ (see Maddala, 1983). The coefficients calculated in this manner give some indication on the size and magnitude of inventories. Once this calculation is made for the coefficients in the logit model with industry and year dummies, the effect of inventories

[9] Appendix B provides further details on how the worker cost of strike was calculated.

on the probability of a pay strike are small. If we take the coefficient on inventories on Table 3 as an indication of how small the effects are, calculating the effect of a 1 percent change in the level of inventories at the mean level (for the whole sample), the change in the probability of a strike occurring would only be 0.04.[10]

4.2.2 Endogeneity concerns

There are two possible endogeneous variables in this model. The first is a lagged dependent variable. We might expect that some firm-union pairs have a propensity to strike. Second, inventories are likely to be endogenous. A firm may very well build up inventories to stave off a strike. Unions would then restrict work by their members to limit inventory accumulation. As there is no convenient way of including both terms in the model we examine each problem separately. Even if we used a linear probability model, with a lagged endogenous variable and endogenous inventories, the problem is then selecting an appropriate instrument set. Variables would have to be found to instrument for both effects independently. Rather than try such a methodological approach, we examine the effect of state dependence and the exogeneity of inventories separately.

State dependence Previous studies have differed on the issue of whether or not, at the micro level, strikes in firm-union bargaining pairs are state dependent. Schnell and Gramm (1987) presented evidence in favour of state dependence; Card (1988) presented results favouring the opposite view. Using the same methods as Card and Sullivan (1988) and Card (1988), we test for state dependence in strikes. Including a lagged dependent variable in a discrete choice non-linear model requires assumptions on the correlation of the incidental parameter, here assumed to be random in nature, and on the initial conditions. We take the initial conditions in each sub-period (1976-79 and 1980-84) as fixed and non-stochastic. Although this should provide biased coefficients, there is no other method that readily suggests itself as producing starting values. Heckman (1981) provides a discussion of this problem. However, Card (1987) undertook a number of experiments on initial conditions. He found very little difference between coefficient estimates despite the implied bias. It is possible that there is bias in the results, but as the number of time-series observations for the sub-periods is small there was little else that could be done.

[10] This finding that the effect of strikes on inventory accumulation was small is in keeping with other papers, e.g. see Paarsch (1990).

The model to be estimated was

$$s_{it} = \gamma s_{i(t-1)} + x_{it}'\beta + \mu_i + \nu_{it}$$

where the vector of exogenous regressors x_{it} does not include inventories as these may be endogenous to the strike process. The random effects are approximated by a two mass-point distribution. The parameters (γ, β's), along with the mass points can be estimated by conventional maximum likelihood with s_{it} as a log normal distribution. Taking the years 1976 and 1980 as the respective initial conditions under which the firms are in equilibrium, the sample of all firms was then 1977-84 and for the subsamples was 1977-79 and 1981-84. The likelihood for estimation, conditional on the outcome of the pre-sample negotiation, is given by:

$$\ell = \sum_{i=1}^{N} \left\{ \prod_{t>1976,1980} p_{it}(\mu_i)^{s_t} [1 - p_{it}(\mu_i)]^{1-s_t} \right\}$$

Table 4 provides the results and indicates that there is little indication of state dependence. The first part of the Table provides the raw within firm probabilities that a strike in the current period has followed a strike in the preceding period. The probability of a strike, conditional on a strike in the previous time period, is low. The probabilities for the two sub-periods lie below that for the period as a whole. Dividing the time period in half removed some of the state dependence inherent in the whole sample. Once state dependence was modeled conditional on other factors, including unobserved heterogeneity, the indication of strike dependence declines even further for the sub-periods. For the whole time period (1976-84) there is some indication that there is state dependence. The coefficient on the lagged dependent variable would be statistically significant at a 10 percent level. The inclusion of a lagged dependent variable complicates modeling considerably, and for this reason we will restrict the estimation of the effects of inventories on strike probabilities to the two sub-periods.

Continuous pre-determined variables Given that there is no evidence to support the existence of state dependence of strikes at the firm level (for the two sub-periods separately) we concentrate on modeling strike incidence in the presence of a pre-determined regressor. Inventories are counted as pre-determined in the sense that the error term is mean independent of past values of inventories, but not future values. Arellano and Carrasco (1996) suggest a generalised method of moments (GMM) estimator, that relies on the creation of a conditioning variable for the endogenous regressor and the incidental parameter. For the model given in equation (1), we denote some variable z_{it} that will act as the conditioning variable on the random effect μ_i. The variable z_{it} depends on the endogenous (pre-determined) continuous variable (inventories) contained in the vector x_{it}: $z_{it} = (x_{it})$; $z_i^t = (z_{i1}, ..., z_{it})$. The dependence between the random effect and the explanatory variables is incorporated as a sequence of conditional means linked by the law of iterated expectations. More formally, for the sequence of conditional means $E(\mu_i|z_i^s), s = 1, ..., T$, we can state $E(\mu_i|z_i^t) = E((\mu_i|z_i^{t+1})|z_i^t)$. The model specifies x as pre-determined in the sense that while it does not depend on current or future values of the error ν_{it}, there may be correlation between lagged values of the error and x_{it}.

The conditional probabilities for the model are:

$$\Pr(s_{it} = 1|z_{it}) = \Phi\left(\frac{x_{it}'\beta + E(\mu_i|z_i^t)}{\sigma_t}\right) \tag{3}$$

where $\Phi(.)$ is the standard normal cdf. Note that the composite error: $\xi_{it} = \mu_i + \nu_{it}$ is assumed normally distributed with the form (given z_i^t) of: $\xi_{it}|z_i^t \sim N(E(\mu_i|z_i^t), \sigma_t^2)$. By inverting equation (3) we can write:

$$\sigma_t \Phi^{-1}[h_t(z_i^t)] = x_{it}'\beta + E(\mu_i|z_i^t)$$

where $h_t(z_i^t)$ is a reduced form probability based on the conditional expectation statements. If the endogenous variables are continuous, the reduced form probabilities are estimated by nonparametric means.[11]

In this instance, for the inventory terms we construct the nonparametric means using simple cell averages by industry (at the one digit level) for strikes by quarter of the year. To coincide with the declaration of the firms accounts during the year we number the April to June quarter as one, with the January to March quarter numbered as four. The argument behind the instrument set are as follows. Strikes will be avoided at certain times of year by certain industries if at all possible. In consumer industries, strikes around the final quarter of a calendar year will be avoided if at all possible; workers would be unwilling to forego earnings and firm would possibily be running down inventories. The problem was that the number of observations were too small to use industries disaggregated at anything below the one digit

[11] If the endogenous variables are binary, these expectation statements are constructed on the basis of cell sample frequencies (see Arellano and Carrasco, 1996).

level (using the 1980 Standard Industrial Classification).[12]

To exploit the moment conditions: $E(z_i^{t-1}\xi_{it}) = 0$ we define what essentially is a first-difference as in a linear model:

$$\widetilde{\psi}_{it}(\theta) = z_i^{t-1}\left\{\sigma_t\Phi^{-1}[h_t(z_i^t)] - \sigma_{t-1}\Phi^{-1}[h_{t-1}(z_i^{t-1})] - \Delta x_{it}'\beta\right\}$$

where $\theta = (\beta, \sigma_2, ..., \sigma_T)$. The sample orthogonality conditions are given by

$$\widetilde{b}_N(\theta) = \frac{1}{N}\sum_{i=1}^{N}\left(\widetilde{\psi}_{i2}(\theta)', ..., \widetilde{\psi}_{iT}(\theta)'\right)'$$

A semi-parametric two-step GMM estimator of θ solves

$$\widetilde{\theta} = \arg\min_{\theta}\widetilde{b}_N(\theta)'A_N\widetilde{b}_N(\theta)$$

where A_N is a weighting matrix. The efficiency conditions are given in Arellano and Carrasco (1996).

Once again, as a test against the non-linear estimation, we use a linear probability model with the same variables as used for the non-linear model. The linear probability model was estimated (using a standard GMM estimator for linear models - see Arellano, 1995) as a fixed effects model, with pre-determined variables as instruments. The instruments used were the seasonal variation in strikes by industry. The other variables were instrumented with own lagged values. First-differencing conditioned out the fixed effects from the model. The sample was also reduced because of the need to use a balanced panel with the random effects estimator. In the top half of Table 5 the results from the linear probability model show that the evidence is in favour of the theoretical proposition that inventories have a positive effect on strike incidence when the union can limit the firm's ability to sell out of stock.

Estimating the model using the random effects estimator, and allowing inventories to be pre-determined, shows an inventories coefficient that increases both in magnitude and the probablility of rejecting the null that the

[12] We used a second nonparametric estimate for a conditioning variable as the ratio of foreign prices. The use of foreign prices as instruments can be justified as a cost of strike argument. An unexpected fortuitous shift in the price of domestic goods will cause inventories to fall and will correlate against the probability of a strike. Strikes in the U.K. do vary counter-cyclically on average (see Table 1) and as the inventories tend to vary procycically (see Ramey and West, 1997), the argument runs against a positive coefficient. Estimation with this instrument set in the first difference linear probability model resulted in very poorly determined estimates.

coefficient is no different from zero. If once again we re-scale the parameter on inventories in the probit model as $\Pr[y_j = 1|\mathbf{x}_j] = \Phi(\mathbf{x}_j b)$ then the change in the probability for a given change in x_1 for example: $\frac{\partial \Phi}{\partial x_1} = f(\overline{x}b)b_1$ derives the scale of the effect of inventories on the strike probability. Undertaking this calculation at the mean level of inventories for the whole sample gives a figure of 0.182. This figure is considerably larger than when no account was taken of the potential endogeneity of inventories. The jump in the inventory effect on the probability of a strike before the legislation reflects the ignored effects that inventories have on both the strike probability and the wage agreement. In the event of a union successfully picketing, the wage agreement is increasing in the level of inventories. Unions time their wage negotiations for when inventories are likely to be high. This is reflected in the quarter of year by industry dummies. The estimates presented on Table 3 are downward biased because the use of annual data does not isolate these seasonal and industry specific effects.

5 Conclusions

We present a theoretical model in which a union chooses to strike and picket, or not, depending on the wage offer the firm makes and the belief the union has on the ability of its membership to maintain the picket. Two results were given. As the inventory level increases, the value of winning the picket battle and the probability that a strike occurs also increases. If the union has a low level of optimism on its ability to win the picket battle, then the probability that a strike occurs is very low. This general relationship was examined using a panel of firms to which information on strikes over pay was available. To identify the change in conditions over which the union might have differing levels of optimism regarding its ability to win the picket battle, we used recent industrial relations legislation that addressed the unions ability to blockade an employer and prevent the movement of finished goods from stock. Before the legislation, the union was able to prevent an employer selling from inventory. The union would have had a high level of optimism about winning the picket battle and securing a high wage agreement. Despite a number of problems in estimating a model where the dependent variable is a discrete event indicator, where we were concerned with the problems of unobserved heterogeneity, state dependence, and the potential endogeneity of inventories, we found that there was general evidence to suggest that the probability of a strike occurring is increasing in the level of inventories providing the union can successfully picket.

Table 1: Mean Incidence and Duration of Pay Strikes and Finished Good Inventories by Year, 1976-84.

Year	*Pay Strikes (Incidence)*	*Inventories*	*N*
1976	0.053	130.517	167
1977	0.047	126.315	169
1978	0.070	126.196	169
1979	0.069	132.970	172
1980	0.070	125.961	171
1981	0.041	127.978	169
1982	0.053	126.706	168
1983	0.019	124.629	161
1984	0.064	134.820	156

Notes.
Inventories in real magnitudes in £000.

Table 2: Average Growth in Finished Good Inventories Around Pay Strikes, 1976-84.

Time	*1976-84*	*1976-79*	*1980-84*
2 years before a strike	-5.120	-11.578	0.956
1 year before a strike	0.147	10.640	-6.535
Strike year	-1.577	5.143	-4.993
1 year after a strike	-1.041	-0.949	-0.690
2 years after a strike	-4.652	-0.274	-7.660
N	1018	351	667

Notes
Figures are percentages.

Table 3: Estimates for the Determinants of Strikes Over Pay Accounting for Unobserved Heterogeneity.

	[1976-79]	[1980-84]	[1976-84]
Logit			
Inventories	0.453	-0.187	-0.352
	[3.58]	[0.54]	[1.29]
Worker cost	0.001	0.001	0.003
	[0.12]	[0.10]	[0.90]
Employment	1.930	0.749	1.188
	[3.56]	[1.936	[3.86]
N	402	582	984
Log-likelihood	-80.454	-119.981	-204.950
Logit with time & industry dummies			
Inventories	0.706	-0.344	-0.562
	[4.78]	[0.84]	[1.65]
Worker cost	-0.074	-0.196	-0.175
	[0.49]	[1.28]	[2.69]
Employment	2.309	0.882	1.388
	[3.11]	[1.96]	[3.636]
N	402	582	984
Log-likelihood	-106.123	-106.250	-183.287
χ^2 test on industry effects	94.52	61.03	174.47
[p-value]	[0.000]	[0.000]	[0.000]
χ^2 test on year dummies	0.21	10.54	16.38
[p-value]	[0.976]	[0.032]	[0.037]

First-Difference Linear Probability model

Inventories	0.823	-0.387	-0.946
	[1.46]	[0.39]	[2.13]
Worker cost	-0.137	-0.119	-0.138
	[0.94]	[1.38]	[1.87]
Employment	-0.732	-1.718	-0.784
	[1.24]	[1.48]	[1.88]
N	235	413	817
Log-likelihood	-123.113	-154.108	-281.438
χ^2 test on year dummies	1.16	5.30	7.53
[p-value]	[0.590]	[0.256]	[0.376]

Conditional Logit

Inventories	0.711	-0.126	-0.392
	[1.26]	[0.88]	[0.54]
Worker cost	-0.017	-0.032	-0.061
	[1.13]	[0.96]	[1.19]
Employment	-0.231	-0.035	-0.496
	[1.17]	[0.96]	[0.98]
N	43	38	62
Log-likelihood	-13.32	-9.16	-20.54
χ^2 test on year dummies	1.19	12.00	12.18
[p-value]	[0.551]	[0.020]	[0.095]

Notes

t-ratios are in parentheses. All variables in real terms. Inventories = log finished good inventories; Employment = log employment. Industry dummies are at the 2 digit (Standard Industrial Classification 1980) level.

Table 4: Estimates of Preceding Strikes on the Probability of Strikes Occurring.

	[1977-79]	[1981-84]	[1977-84]
Given a strike in the present period what is the probability of			
No strike last period	0.722	0.667	0.615
Strike last period	0.278	0.333	0.385
Random Effects Model			
$Strike_{(t-1)}$	0.052 [0.11]	0.526 [1.30]	0.575 [1.92]
N	235	413	817
Log-likelihood	-70.707	-106.918	-181.311

Notes

t-ratios are in parentheses. All random effects models had log employment, worker cost of strike, and a set of time dummies included in the specification. Random effects were two-mass point distribution.

Table 5: Estimates for the Determinants of Strikes over Pay Accounting for Unobserved Heterogeneity and the Endogeneity of Inventories.

	[1976-79]	[1980-84]
Linear Probability Fixed Effects Model		
Inventories	0.672 [1.89]	0.330 [0.98]
Worker cost of strike	-0.048 [1.23]	0.002 [0.08]
Employment	-0.099 [0.18]	-0.177 [0.71]
N	144	288
χ^2 test on year dummies	2.661	4.912
[p-value]	[0.45]	[0.18]
χ^2 test on instruments	6.591	14.834
[p-value]	[0.68]	[0.83]
Random Effects Model		
Inventories	3.351 [2.14]	-3.310 [1.08]
Worker cost of strike	0.044 [1.46]	0.021 [0.90]
Employment	0.716 [1.71]	0.513 [1.09]
Year dummy 1977		
Year dummy 1978	1.291 [1.01]	
Year dummy 1979	1.116 [1.71]	
Year dummy 1981		
Year dummy 1982		5.901 [0.99]
Year dummy 1983		6.534 [0.98]
Year dummy 1984		7.145 [0.90]
N	144	288

Notes
t-ratios are in parentheses. Inventories and Employment were in logs. Inventories were instrumented using quarter of year and industry. All other variables were instrumented with own lagged values.

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6 Appendix A.

Proof of Lemma 1 : If the union rejects wage w and has belief π, the union will concede the picket battle if and only if

$$-c_u + (1-\alpha)V(I) - \pi(1-\alpha)d(I) \leq (1-\alpha)[V(I) - d(I)]$$

where the expected value of the picket battle is dominated by conceding it. The condition $c_u \geq (1-\alpha)d(I)$ implies this condition is satisfied for all possible beliefs $\pi \in [0,1]$. The union will therefore concede the picket battle.
Proof of Lemma 3.

As the programming problem is concave, we establish that the corner solution $w = (1-\alpha)[V-d]$ satisfies the Kuhn-Tucker conditions for a maximum. For such a wage offer, $\pi^c = \pi^*$ as defined in the Theorem. Assuming right differentiation of Z at this wage level implies

$$\frac{\partial Z}{\partial w} = \frac{c_u F'(\pi^*)}{(1-\alpha)d(I)} - [1 - F(\pi^*)].$$

Using the definition of π^* given in the Theorem to substitute out c_u, this expresssion becomes

$$\frac{\partial Z}{\partial w} = (1-\pi^*)F'(\pi^*) - [1 - F(\pi^*)].$$

But F convex implies this expression must be negative for all $\pi^* \in [0,1]$. Hence this corner solution describes a global maximum.

7 Appendix B: Data Appendix.

7.1 DATASTREAM Company Account Data

Once a match had been made to the firm name the following Datastream Company account variables were appended to the file: Finished Goods: Item 365; Operating profits: Item 993; Wage bill: Items 113 and 117; No of employees: Items 219, 216, 218, and 217. Part of the problem in providing consistent information on the number of employees and the average wage for the firm stems from the 1982 Company Act that changed the amount of information firms had to declare on the number they employed. A constructed variable for both employment and the wage bill was made up of the items listed. Despite this, no wage information was available on the firms in this sample before 1980.

The descriptive statistics for the variables, before and after the legislation, for firms with and without pay strikes are given on Table A1 below.

7.2 Family Expenditure Survey (FES) & Calculating a Cost of Strike for Workers

The FES is a continuous budget survey that is carried out on a sample of 7000 households each year during the month of June. There is no panel element. Each year a new cross-section is drawn. As it is a budget survey, it contains detailed information on individual expenditure and income. Although the survey lasts the complete year, any one selected household only records their expenditure and income for a two week period. This method of recording payment by household implies that the only union payment of strike benefit would be a 1 in 26 chance of recording someone being paid.

The method of calculating a crude measure for the cost of a strike to workers across industries was done in the following manner. The variable to indicate whether or not someone was on strike was taken from the personal income record and gave reasons for being absent from work. Being on strike was one of the reasons for being absent. However, recovering a figure for the amount of strike pay received was hindered by the definition of strike pay. The variable recorded in the FES was listed as 'Benefits from Trade Unions, Friendly Societies, etc'. This may or may not be the total amount of strike pay to individuals. The compilation of a figure for strike pay was restricted further by the small number of observations in any one year (except 1984). Table A4 below gives details of the number of striking workers in a year found in manufacturing in the FES, the average strike pay, the number of workers in manufacturing in the FES, and the average pay the worker would have received if they had been at work. The loss to the worker, from being on strike, was calculated as the pay they would have received minus the industry specific average wage. The wage being defined as normal gross pay.

The figures for pay that the worker would have received were given in the data at the industry level. The degree of disaggregation was restricted because the of the industry disaggregation in the FES. The industry classification code contained 33 different industries, of which manufacturing comprised classes 4 to 17. This level of disaggregation approximated to the 2 digit level of the 1980 SIC (Standard Industrial Classification) system. The details of the mapping are as follows: FES 4 (Metal manufacture) = SIC22/31; FES 5 (Mineral extraction) = SIC 23/24; FES 6 (Chemicals) =

SIC 25/26; FES 7 (Mechanical engineering) = SIC 32/33; FES 8 (Electrical engineering) = SIC 34; FES 9 (Vehicles) = SIC35/36; FES 10 (Instrument engineering) = FES 11 (Food, drink, tobacco) = SIC 41/42; FES 12 (Textiles) = SIC 43; FES 13 (Leather) = SIC 44; FES 14 (Clothing) = SIC 45; FES 15 (Timber products) = SIC 46; FES 16 (Paper) = SIC 47; FES 17 (Rubber/ plastics) = SIC 48.

Table A1: Descriptive Statistics for the Firms in the Sample: 1976-84.

	NT	Mean	Standard Deviation
Whole Sample 1976-84			
Inventories	1502	128424.40	327148.00
Operating Profits	1502	51691.26	203983.40
Employment	1374	19336.66	29702.47
Average Wage	414	8726.22	3118.67
Strike Firms 1976-84			
Inventories	109	373041.40	561530.00
Operating Profits	109	109544.20	321636.10
Employment	104	55288.08	53547.48
Average Wage	28	9728.12	2993.75
Sample 1976-79			
Inventories	677	129013.00	302903.10
Operating Profits	677	54708.98	205796.30
Employment	556	19484.57	30576.09
Strike Firms 1976-79			
Inventories	52	389024.30	527912.20
Operating Profits	52	120593.30	267718.90
Employment	47	62682.38	56043.41
Sample 1980-84			
Inventories	825	127941.40	345958.10
Operating Profits	825	49214.91	202575.10
Employment	818	19236.13	29112.16
Average Wage	414	8726.22	3118.68
Strike Firms 1980-84			
Inventories	57	357899.60	595927.50
Operating Profits	57	99076.65	367616.50
Employment	57	49191.02	51089.35
Average Wage	28	9728.12	2993.75

Notes.
All variables in real magnitudes.

Table A2: Seasonal Incidence of Pay Strikes: 1976-84.

Strike Began	*Number*
January	10
February	10
March	14
April	11
May	8
June	7
July	6
August	12
September	10
October	9
November	9
December	3

Table A3: Longitudinal Patterns for Strikes Across Firms: 1976-84.

No of Strikes	*Incidence 1976-84*	*Incidence 1976-79*	*Incidence 1980-84*
1	26	15	20
2	6	7	6
3	6	5	4
4	5	2	2
5	1		1
6	2		
7	1		
8			
9	1		
Total (No of strikes*Incidence)	109	52	57
No of observations	1502	677	825

Table A4: Mean Strike Pay and Wages in Manufacturing, FES 1976-84.

Year	*No on Strike*	*Mean strike pay(£)*	*No in Manufacturing*	*Mean pay(£)*
1976	7	14.97	2244	68.15
1977	9	11.14	2343	75.26
1978	11	0.33	2243	86.66
1979	11	19.14	1982	99.98
1980	14	0.16	2169	118.47
1981	6	5.87	2038	131.90
1982	4	0.93	2683	146.65
1983	3	0.39	1040	160.11
1984	54	0.45	2254	174.55

Notes.

Manufacturing defined as Divisions 2 to 4 of the 1980 SIC. Links to FES industrial classification are described in the text.

8 Appendix C: The Employment Acts: 1980 and 1982.

The Trade Union and Labour Relations Acts of 1974 and 1976 allowed industrial action by the Trades Unions which tended not to be the subject of legal restraint. Emphasis was placed on using arbitration and concilliation services set up by Government. Employers had no readily available legal framework by which they could prevent ancillary industrial action on the part of striking workers. The Employment Acts of 1980 and 1982 addressed the issues of picketing and secondary action. The 1980 Employment Act limited picketing to the workers' own place of work, and secondary action was made unlawful except in certain limited circumstances. The 1982 Act placed further restriction on the association of workers regarding the prevention of goods being moved or other workers entering the factory. If a union acted illegally during a trade dispute, firms could now sue for damages. Although the fines were not heavy, the real threat was the use of court injunctions, which if not adhered to could lead to unlimited fines for contempt of court and the sequestration of the unions' assets. The new legislation proved highly successful in restraining Trade Union power.

Evans (1985, 1987) records the number of injunctions. In 1980 (the first year of the legislation) only 1 injunction was sought and granted. In 1981 the figure was 10. Once the strict financial penalties from the 1982 legislation were implemented, the number of injunctions sought and granted rose to 37 a year in 1986. Thereafter, the use of injunctions continued as a way of removing picketing workers. Over the entire period only three injunctions were not upheld. The impact of the new legislation was seen as immediate. Not only were employers willing to use the new legislation, but the legislation proved highly successful in curbing union power on secondary action. It was made known by the Courts that if injunctions were sought they would be quickly granted (Evans, 1987; Kessler and Bayliss, 1992).