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A study of expressive choice and strikes

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Abstract

The conventional explanation for strikes is that they are caused by an asymmetry of information about the profitability of the firm – union members are uninformed whereas management are informed. Instead, this paper builds a model of strikes where a perception of unfairness provides an expressive benefit to vote for a strike. The asymmetry of information is now reversed such that management are uninformed about the emotionality of union members. The model predicts that larger union size increases both wage offers and the incidence of strikes. An empirical test using UK data provides support for the predictions. In particular, union size is positively correlated with the incidence of strikes and other industrial actions, even when asymmetric information regarding profitability is controlled for.

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1 Introduction

There is a general consensus in the literature on strikes that they are caused by asymmetric information. The union overestimates the profitability of their employers and demands too high a wage. This leads to a strike, which lasts until the union settles for a lower wage. The strike serves an economic function because if the union were never to strike, the employer would always offer the lowest possible wage. This consensus view is reflected in the dictionary review of the topic by Kennan (2008), and it is also the prevailing explanation given in the brief textbook discussion by Borjas (2006) and the survey by Cramton and Tracy (2002).

The literature that these surveys refer to tends to be much older and started to fade in the early 1990s (key references are Ashenfelter and Johnson, 1969; Kennan, 1986; Card, 1990). Two reasons could be posited for the decline in interest in strikes. First, they are rare events and have become increasingly rare from the 1990s onwards.[1] Second, asymmetric information seemed to provide the clearest answer to the Hicks paradox (i.e., the paradox of inefficient lost surplus) so that the theoretical debate appeared settled. The work on the origins of strikes can also be tied to more general work on the causes of conflict. Fearon (1995) famously argued that (if we ignore irrationality) there are only three factors which can bring about inefficient conflict: commitment problems, indivisibilities, and asymmetric information. The first two potential explanations are not really plausible as features of strikes, which leaves asymmetric information as an explanation.

This paper takes a fresh look at strikes theoretically and empirically by incorporating developments in behavioural and political economics that have taken place since the 1990s. These developments are the theory of expressive choice in political economics, and the theory of fairness within behavioural economics. We believe that the literature on strikes was dying before the emergence of these theories, and that it is now time to revisit strikes in the light that they provide. These concepts broaden the traditional, narrow view of rationality and thus could be viewed as rationalising a possible fourth explanation for conflict given by Fearon, namely irrationality. We still argue that asymmetric information is crucial in causing strikes, but in a very different way to the standard explanation: in our approach, *the employer* is not fully informed about the level of emotionality or *expressiveness* among union members.

Expressive voting acknowledges the fact that when voting in elections (and a union ballot is, of course, in effect an election), the probability of being decisive in determining the outcome is less than one, and as the size of the electorate becomes larger the probability of being decisive approaches zero. This matters because it may undermine the standard idea that union members vote purely out of indirect instrumental interest. Union members may in fact receive a greater *direct expressive* benefit of voting for a strike. This direct expressive benefit

[1] See e.g., Simms and Charlwood (2010) on unions and industrial action in the UK, and Bennett and Kaufman (2007) for the United States.

can outweigh the potentially significant costs of strikes occurring, because these costs are discounted by the very low probability of being decisive in determining the outcome.[2] The link between expressiveness and strikes was recognised by Glazer (1992) in a paper that clearly influences the analysis conducted here. He argued that if union members are emotional, they may vote for a strike on emotional grounds, even though they would not have done so if they were choosing purely instrumentally. They are free to choose emotionally because their vote is highly unlikely to determine the outcome of a ballot.

While Glazer bases his expressive theory of voting for strikes on emotional payoffs, he does not provide a formal foundation for them. The analysis presented here aims to do that by tying the emotional payoff from voting for a strike to the theory of fairness developed by Rabin (1993).[3] In Rabin's theory, as long as the costs are not too high, individuals will be willing to hurt individuals that hurt them or, more positively, make sacrifices for individuals that make sacrifices for them. This can explain cooperation in a one-shot prisoners' dilemma, but also, from a negative welfare perspective, the failure to coordinate in the Battle of the Sexes.

A key feature of Rabin's theory is that the stakes must be low. As soon as they become high, 'psychological' payoffs will be swamped by material payoffs and the standard predictions would apply. Decisions made by voting (or collective action more generally) turn high material stakes into low material stakes. Therefore, it could be that a collective decision leads to a highly inefficient decision being made (for example a strike) because *ex ante* the union members correctly perceive that their probability of determining the outcome of the election is very small. Thus, for each individual union member the decision in the ballot concerns low material stakes, although *ex post* the material stakes may be extremely high in terms of lost income and other effects. The material stakes *ex ante* will become smaller the larger the size of the union, as this further reduces the probability of being decisive, and fairness concerns will play a larger relative role in the calculus of voting.[4]

[2] The literature on expressive voting spans several decades and is both theoretically and empirically rich. An early and influential contribution was made by Tullock (1971) and his depiction of the 'charity of the uncharitable' where voters choose higher levels of redistribution because they are not decisive in determining the outcome. Kliemt (1986) described expressive choice as a 'veil of insignificance'. The significance for democratic decision-making was given a detailed examination in Brennan and Lomasky (1994). For a discussion and comprehensive survey of the expressive choice literature, see Hamlin and Jennings (2011). Hillman (2010) identifies the possibility of *expressive policy traps* where individuals expressively choose policies that make them worse off which they would not have chosen were they decisive. In the analysis presented here, strikes occur because of expressive choice by union members, and as they are inefficient choices, union members could be viewed as having fallen for an expressive trap.

[3] Godard (1992) informally also makes the point that strikes can be due to perceptions of unfairness.

[4] It should be noted that there are multiple possible sources of expressive benefit dependent on the context in which expressiveness might operate. The survey of expressive choice in Hamlin and Jennings (2011) emphasises this. Here we pick out one potential source, perception of unfairness, as we believe it is is especially relevant in the context of strikes.

In our theoretical model combining fairness concerns (following Rabin) and expressiveness, we demonstrate how fairness concerns are incorporated into two-person employer/employee bargaining over a wage. We see that the equilibrium wage will be higher than if the fairness concerns were absent. That is, the employee would be willing to hurt him or herself to hurt the employer through a strike, but only if the wage offered by the employer is close to the employee's reservation wage. At higher wage offers, although the employee may find the offer unfair, the costs of striking are too high and a strike will therefore not occur. We then extend the analysis to group voting on whether to strike or not. As the union size becomes larger and psychological payoffs receive greater weight relative to material payoffs, the model makes two predictions. First, wages will grow with union size. Second, strikes are more likely with increasing union size.

As stated earlier, in this model asymmetric information still lies at the heart of the explanation for strikes, but it now acts in the opposite direction: from the employer towards the employees. If the employer had full knowledge about the exact level of emotionality within the union, she would set the wage at the lowest level that would avoid a strike. However, she is not likely to have this knowledge, and as a result may underestimate emotionality and offer a wage which is too low, such that union members vote for strike action. This can happen even though there is no asymmetric information regarding the profitability of the firm, as is the case for example for publicly listed companies.

We provide supporting evidence for our two theoretical predictions using UK data gathered in the Workplace Employment Relations Survey 2004 (Department of Trade and Industry, 2005a). We find that even when controlling for "classical" asymmetric information regarding profitability, union size is positively and significantly associated with higher average wages in a firm and increased industrial action incidence. While the former result could arguably also be explained by the effects of union (bargaining) power due to increased size,[5] the latter is a novel finding. There is no theoretical reason to believe that increased bargaining power – i.e., increased union size – in itself should lead to more industrial actions once we have taken the conventional asymmetric-information hypothesis into account. We therefore believe that our finding strongly suggests that expressive behaviour can help us understand the occurrence of strikes and other types of industrial action.

As mentioned above, strikes and industrial actions in general are relatively rare events. However, it does not follow that the analysis of their origins has become irrelevant: when strikes happen, they are often very big news. In recent times there have been very high profile strikes such as the British Airways (BA) dispute between 2009 and 2011 and the Chicago Teacher Union dispute in 2012. In cases such as these, it is hard to see how the conventional explanation for strikes holds as the profitability of BA and the size of the Chicago city budget

[5] See e.g., Simms and Charlwood (2010), who also offer a critique of the use of union size as an effective measure of union power.

were common knowledge. Anecdotal evidence provided by the news coverage suggests that these were disputes driven by high emotions. The model presented here provides a rationale for strikes based on emotions, where the standard explanation based on asymmetric information regarding profitability is absent.

The rest of the paper is organised as follows. Section 2 presents the model and its main predictions; Section 3 describes the data, methodology and results from the empirical analysis; and Section 4 concludes.

2 The model

Let us consider a firm and union that undergo negotiations over a union wage. We simplify the analysis by assuming the firm to be of a fixed size in terms of the number of workers and its revenue is fixed at p per worker. The employer's profits are given by $p - w$ per worker where w is the wage paid out to each worker. The negotiation over a wage offer involves a firm selecting a wage within the interval $w \in [0, p]$, which a subset of the workers who are members of the union decide to either accept or reject through a vote to (not) strike. If a strike does not occur, payoffs are w and $p - w$, for each worker and the firm, respectively. In the event of a strike, payoffs for all actors are normalised to zero. While we hold the size of the workforce to be fixed, we allow the number of workers that are unionised to be variable. As union size becomes larger, the probability of any single union member determining whether there is a strike or not becomes smaller. This would increase the weight on expressive concerns relative to instrumental concerns, provided that expressive concerns exist. The extent to which union members are expressive is known to the members, but is not known to the employer. Union members will, in general, interact with each other to a much greater extent than they will with management. In addition, we will see that it would be in the interest of union members to try and convince management that they are extreme in their expressiveness. For this reason, management would be unlikely to trust signals of expressiveness that they receive from union members.

The model presented in this section advances the work by Glazer (1992) in a major way by being precise about the content of an expressive choice. We do this by grounding it in Rabin's (1993) theory of fairness. As an application in his paper, Rabin discusses the extent to which concerns with fairness prevent a monopolist from being able to extract the full surplus from the consumer. Above a certain price, the consumer would prefer to punish the monopolist (and herself) by not purchasing a good that would have generated positive material benefits, both for the consumer and the monopolist. We adapt this application to the setting of wage negotiations between an employer and a union.

We show how the inclusion of concerns about fairness affects wage determination in negotiations between an employer and the union, such that wage demands are higher than if there

were no concern for fairness, and that the employer will agree to these higher demands. We then introduce expressiveness and demonstrate that this may amplify the concern for fairness, which in turn further increases wage demands. If the employer cannot perfectly predict the expressiveness of the union members, she may underestimate its realised value and offer too low a wage and thus cause a strike, which arises out of a sense of unfairness. When union size is small and wage demands are small, the firm is more likely to set the wage at the level demanded by potentially highly expressive union members, thus avoiding the possibility of a strike. As union size becomes larger and wage demands rise, the employer is likely to set the wage at a level that would be demanded by a more moderately expressive union. In doing so, however, the employer is more likely to incur a strike. The model gives two main predictions that can be tested empirically. First, as union size increases the average wage increases. Second, as union size increases the probability of a strike increases.

2.1 A theory of fairness

We first summarise the Rabin approach to modelling fairness.[6] From a material two-player game, a psychological game is derived which will determine each player's psychological utility. This will depend on three factors. The union's strategy (a_u) depends on her belief about the strategy of the employers (b_e), and her belief about the employer's belief regarding her strategy (c_u) . A similar description applies to the employer.

We derive a kindness function for the union, $f_u(a_u, b_e)$ and the union's perception of the employer's kindness $\widetilde{f}_e(b_e, c_u)$. These are expressed as follows

$$f_u(a_u, b_e) = \frac{\pi_e(a_u, b_e) - \pi_e^{fair}(b_e)}{\pi_e^{\max}(b_e) - \pi_e^{\min}(b_e)} \tag{1}$$

and

$$\widetilde{f}_e(b_e, c_u) = \frac{\pi_u(c_u, b_e) - \pi_u^{fair}(c_u)}{\pi_u^{\max}(c_u) - \pi_u^{\min}(c_u)} \tag{2}$$

where $\pi_e(a_u, b_e)$ is the payoff received by the employer given that he chooses strategy b_e and the union chooses strategy a_u. $\pi_e^{fair}(b_e)$ is defined as $\frac{\left[\pi_e^h(b_e)+\pi_e^l(b_e)\right]}{2}$ and refers to the mid-point between the highest and lowest (Pareto efficient) payoffs the union could give to the employer given that the employer plays strategy b_e. If the numerator is positive, the union is being kind to the employer. If it is negative, the union is being unkind, and if it is zero the union's behaviour is neutral in terms of kindness. The function f_u is weighted by the maximum payoff the union could give the employer, minus the lowest possible payoff (now including possibly

[6] Other well-known models of fairness are presented in Fehr and Schmidt (1999), Bolton and Ockenfels (2000), Dufwenberg and Kirchsteiger (2004) and Falk and Fischbacher (2006). These are less preferable to use as a basis for the approach presented here because the main concern of the participants in this paper is with the intentions of the other group rather than equality, and modelling the game as simultaneous rather than sequential makes it considerably more tractable without any loss in essential insight.

Pareto inefficient payoffs) that the union could give the employer given their choice of b_e. A Pareto inefficient payoff obviously means playing a strategy that will make both parties worse off compared to an alternative available strategy open to the union. The function $\widetilde{f_e}$ is analogous to f_u and measures the union's perception of the employer's kindness towards her, given her belief that the employer believes she is playing strategy c_u. Analogous functions f_e and $\widetilde{f_u}$ are derived in the same way for the employer. It will become clear below how these payoffs are depicted for the game we are analysing.

The following utility function for the union is assumed, which incorporates material and psychological payoffs

$$U_u\left(a_u, b_e, c_u\right) = \pi_u\left(a_u, b_e\right) + \widetilde{f}_e\left(b_e, c_u\right)\left[1 + f_u\left(a_u, b_e\right)\right] \tag{3}$$

and similarly for $U_e\left(a_e, b_u, c_e\right)$. π_u refers to the material payoff and $\widetilde{f}_e\left[1 + f_u\right]$ refers to the psychological payoff. We can see from the psychological payoff that if the union believes that the employer is unkind $\left(\widetilde{f}_e < 0\right)$, then the psychological payoff would be maximised by choosing to be unkind towards the employer ($f_u < 0$). The reverse is true if the employer is perceived as being kind. If the employer is perceived as being neutral $\left(\widetilde{f}_e = 0\right)$ then the psychological payoff is irrelevant. Note though that the possibility of the psychological payoff altering behaviour is dependent upon the material payoff being relatively small. A contribution of this paper is to demonstrate how a high-stakes material game such as a strike can be converted into a game in which these stakes are reduced and psychological payoffs can change behaviour.

2.2 Equilibrium without psychological payoffs

We now apply the Rabin model to a setting of wage negotiations between an employer and a union. Assume initially that the union is represented by only one member so that he or she is completely decisive in negotiations with the employer and there is no expressiveness. The employer picks $w \in [0, p]$ and the union representative simultaneously picks $r \in [0, p]$. If $r > w$ then there is a strike and the payoff is zero for both parties. If $r \leq w$ the payoffs are w and $p - w$ for the workers and firm, respectively. First, let us consider what would happen in a world without fairness concerns where workers and employers are purely materially motivated. Although any wage between 0 and p is a Nash equilibrium, elimination of weakly dominated strategies means that $w = 0$ is the predicted outcome of the game. To see this, note that since the wage is determined by the offer made by the employer (so long as it is greater than or equal to the wage requested by the union) then a best response to any offer by the employer is for the union to ask for $r = 0$. Any request for $r > 0$ may mean demanding a wage greater than the employer offers, thus resulting in a payoff of zero; whereas if $r = 0$ had been requested, the union members would have received the offer of w made by the employer. Depicting the employer as having the power to set the wage goes against the standard approach to

modelling wage setting with a union, where the opposite is frequently assumed and the union is depicted as having the power to set the wage subject to their concerns about the trade-off with employment. We take this approach so that we can isolate the effect of fairness concerns and expressive logic from other possible sources of union bargaining power.

2.3 Fairness equilibrium

We assume that non-union members are also bound by the wage negotiated by the union and employer. If a strike is called, non-union members would not be able to work. What is the lowest wage consistent with a fairness equilibrium? Given the employer sets w, she can get $p - w$ or 0. If $r \leq w$ then the union representative maximises both his and the employer's payoff, and from (1) we can see that $f_u = 0$. By choosing any $r \leq w$ the employer receives a payoff of $p - w$. Thus there is only one efficient payoff for the employer, namely $p - w$. If $r > w$ then the union representative minimises the payoff of both parties to zero (thus choosing a Pareto inefficient payoff, given that an efficient payoff would have been available if $r \leq w$ had been chosen), so $f_u = -1$. The employer will never feel positively towards the employee, because even if the union asks for a wage lower than the one that the firm offers, they will still receive w and thus all offers of $r \leq w$ are in the material interest of the union as well as the employer. For this reason the employer will never offer $w > r$. So in a fairness equilibrium $w = r$. Would the union representative wish to deviate and choose $r > w$? If so,

$$U_u = 0 + \widetilde{f}_e \left[1 - 1\right] = 0, \tag{4}$$

and by choosing $r = w$

$$U_u = w + \widetilde{f}_e \left[1 + 0\right]. \tag{5}$$

To solve we need first to solve for $\widetilde{f}_e$ (how kind the firm is perceived to be by the worker, from (2)):

$$\widetilde{f}_e = \frac{w - \frac{1}{2}(w + p)}{p} = \frac{w - p}{2p}. \tag{6}$$

$\widetilde{f}_e$ is clearly negative because the employer offers the lowest possible wage that she can that avoids a strike. Plugging (6) into (5) and setting equal to (4), we see that

$$w = \frac{p}{2p + 1} > 0. \tag{7}$$

This is the lowest wage the firm could offer that would avoid a strike. Clearly the wage in the fairness equilibrium is higher than in the Nash equilibrium, reflecting the concern for fairness. Note though that in this limited case where we assume only one union representative, so that she is completely decisive when determining whether there is a strike or not, the wage agreed is still very small as a proportion of p, as p becomes large. This makes sense: it tells us that

when revenues are very high, an individual representative would find it too costly materially to fight for the same share of the revenue as when revenues are low.

We now extend the analysis to a ballot of union members where the number of union members balloted is greater than one.[7] An immediate implication of a collective ballot is that a single individual will not be decisive in determining the outcome. As the number of union members balloted increases, the probability of being decisive becomes smaller.[8] In this environment, if expressive preferences exist, their effect will be magnified the larger the union and thus the lower the probability of being decisive. We include expressiveness as being driven by the psychological payoff in such a way that union members experience a psychological payoff from their decision, even if that decision is not the one that is reached by the union overall. In other words, they may receive direct expressive utility from their choice, as well as indirect instrumental utility from the outcome. Assume there is a vote on whether to strike or not. We assume that each member's expressiveness is given by a parameter $\theta \in [0, 1]$. When $\theta = 0$ the members are not expressive, but purely instrumental in their outlook towards any wage offer. In this case, for an individual to obtain utility from choosing to hurt the employer, the employer must actually be hurt. In contrast, at the extreme $\theta = 1$, the members are fully expressive. In this case, a member will receive utility from their choice to hurt the employer even if the employer is not actually hurt.

Let us denote w^0 as the wage offer proposed by the firm. The individual worker has to decide whether to vote "yes" or "no" for a strike. Given the union member's level of expressiveness, θ, the expected payoff for the member if she votes for a strike, is given by

$$\underbrace{\pi_S \cdot 0 + \pi_N w^0 + \pi_D \cdot 0}_{\text{Material payoffs}} + \underbrace{\pi_S \cdot 0 + \pi_D \cdot 0 + \pi_N \left(\left[\frac{w^0 - p}{2p} \right] (1 - \theta) \right) + \pi_N \cdot 0\theta}_{\text{psychological payoffs}} \tag{8}$$

where π_S and π_N are the probabilities of a strike occurring and not occurring, respectively, and π_D is the probability of being decisive in the voting decision, $\pi_N + \pi_S + \pi_D = 1$. Note that for tractability, π_D is presented as exogenous. The reality of collective action is that as group size increases, the probability of being decisive decreases. This is what is depicted here.

The first component illustrates the material payoffs the individual will gain: it is only positive for the case where a strike does not occur and the worker receives w^0. The second component captures the psychological payoffs and is subject to the level of expressiveness. If $\theta = 0$ the union member fully absorbs the psychological payoff associated with the group decision. In this case expressiveness is not present. In the event that the union decides not to strike, the member receives the psychological utility associated with that decision even though she chose to strike. She receives the negative psychological payoff $\left(\frac{w^0 - p}{2p} \right)$ associated

[7] The reader should not interpret the ballot too literally. The analysis we present could apply to any sort of collective action in which a threshold level of support is required to induce action.

[8] On the probability of being decisive, see Gelman, Silver and Edlin (2012).

with choosing not to retaliate to the perceived unkindness of the employer. If $\theta = 1$ the union member receives the psychological payoff associated with his own decision even in the event that it does not actually come about. This means that the member enjoys the psychological benefit (a zero payoff as opposed to $\frac{w^0-p}{2p}$) of retaliating to perceived unkindness on the part of the employer by choosing to strike, even though the union decides not to strike. This is an expressive payoff because it is a choice that generates a payoff that is unrelated to the actual outcome of the ballot. Equation (8) can be simplified to:

$$\pi_N w^0 + \pi_N \left(\frac{w^0 - p}{2p} \right) (1 - \theta). \tag{9}$$

When a union member decides to vote against a strike, her expected payoff is given by:

$$\pi_S \cdot 0 + \pi_N w^0 + \pi_D w^0 + \pi_S \cdot 0(1 - \theta) + \frac{w^0 - p}{2p} \left(\pi_S \theta + \pi_D + \pi_N \right), \tag{10}$$

which can be simplified to:

$$\pi_D w^0 + \pi_N w^0 + \left(\frac{w^0 - p}{2p} \right) \left(\pi_S \theta + \pi_D + \pi_N \right). \tag{11}$$

A member will be indifferent between voting "yes" and "no", when the expected payoffs from (9) and (11) are equal. Combining (9) and (11), using that $\pi_N + \pi_S + \pi_D = 1$, and solving for the "fairness" wage offer w^0, we obtain

$$w^0 = \frac{p \left(\theta(1 - \pi_D) + \pi_D \right)}{2p\pi_D + \theta(1 - \pi_D) + \pi_D}. \tag{12}$$

We can see that

$$\frac{p \left(\theta(1 - \pi_D) + \pi_D \right)}{2p\pi_D + \theta(1 - \pi_D) + \pi_D} > \frac{p}{2p + 1},$$

if $\theta > 0$ and $\pi_D < 1$. This means that if there is expressiveness ($\theta > 0$) due to the decision being made by a group, the wage claim is higher because the union members need not be as concerned that their decision to vote for a strike will actually determine whether a strike occurs or not.[9]

From above, (12) shows the minimum wage offer union members will accept from the firm. Note that this depends on the probability of being decisive as well as on the level of expressiveness. In particular, it is straightforward to show:

[9] Note that if $\theta = 0$ or $\pi_D = 1$, the wage is the same as when we analysed the case for one union member. The model could thus have been presented with multiple workers from the beginning. However, we believe it is more insightful to start with the special case of one union member because the standard approach to modelling wage negotiations between employers and unions implicitly assumes that the union is a single agent rather than a collective of agents. The approach we take helps us to more sharply illuminate that distinction in the presence of multiple union members with expressive preferences.

$$\frac{\partial w^0}{\partial \theta} = \frac{2p^2(1-\pi_D)\pi_D}{(\pi_D + 2p\pi_D + \theta(1-\pi_D))^2} > 0. \tag{13}$$

As expressiveness increases, then so too does the minimum level of wage offer that the union will accept. We also can show that (where n is the number of union members)

$$\frac{\partial w^0}{\partial n} = \frac{-2p^2 \frac{d\pi_D}{dn}\theta}{(2p\pi_D + \theta(1-\pi_D) + \pi_D)^2} > 0, \tag{14}$$

which is positive because the change in the probability of being decisive with respect to the number of union members $\frac{d\pi_D}{dn}$ is decreasing.

These simple findings provide the framework for one of our testable predictions: increased union size leads to higher wages. This argument is not based on the idea that increased union size means that the union is stronger; rather, we identify a different process such that the role of expressive preferences is enhanced in a strike ballot. We make one other key empirical prediction, based on the theoretical findings: larger union size leads to more strikes.

If expressiveness were known not to exist, so that $\theta = 0$, then $w^0 = \frac{p}{2p+1}$ and there will never be a strike regardless of union size. For strikes to exist, expressiveness must exist, and there must be uncertainty on the part of the employer as to the value of θ. Again, note that the asymmetric information (management uncertainty regarding expressiveness) presented here predicts the possibility of strikes which could not exist according to the conventional model of asymmetric information (union uncertainty over profits). When $\pi_D = 1$ such that there is only one union member, θ is irrelevant to the wage offer, which is again $w^0 = \frac{p}{2p+1}$, and there will never be a strike. As the union size becomes larger and π_D becomes smaller, w^0 increases so long as $\theta > 0$. If all values of θ are assumed possible, the only way to prevent any possibility of a strike is for the employer to set w such that $\theta = 1$, that is

$$w^0 = \frac{p}{2p\pi_D + 1}. \tag{15}$$

Profits per worker in this case would equal

$$p - \frac{p}{2p\pi_D + 1} = \frac{2p^2\pi_D}{2p\pi_D + 1}. \tag{16}$$

If the employer were to set the wage at a value of θ such that $\overline{\theta} < 1$ and this wage offer were acceptable to the union, the realised profits per worker would be higher:

$$\frac{2p^2\pi_D}{2p\pi_D + \overline{\theta}\,(1-\pi_D) + \pi_D} > \frac{2p^2\pi_D}{2p\pi_D + 1} \tag{17}$$

for $0 < \theta < 1$ and $0 < \pi_D < 1$.

The issue then is whether the higher profit per worker in the event that there is no strike compensates for the risk that the realisation of θ is higher than $\overline{\theta}$ and the incurrence of zero

profits as a result, that is

$$pr\left(\theta \leq \overline{\theta}\right)\left(\frac{2p^2\pi_D}{2p\pi_D + \overline{\theta}\left(1-\pi_D\right)+\pi_D}\right) + pr\left(\theta > \overline{\theta}\right)0 > \frac{2p^2\pi_D}{2p\pi_D+1}. \tag{18}$$

This can be rewritten as follows

$$pr\left(\theta \leq \overline{\theta}\right) - \overline{\theta} > \pi_D\left(2p\left(1-pr\left(\theta \leq \overline{\theta}\right)\right)+\left(1-\overline{\theta}\right)\right). \tag{19}$$

For (19) to hold, $pr\left(\theta \leq \overline{\theta}\right) > \overline{\theta}$. This will not hold for a distribution of θ that is uniform, but it would be the case for a distribution which is normal (supposing that $\overline{\theta}$ is set at a relatively high level), for example. It is also more likely to hold the smaller is π_D (the larger the union membership). Assuming that (19) holds, if we differentiate the net expected profit per worker from setting $\overline{\theta} < 1$ rather than $\theta = 1$, we obtain

$$\frac{dpr\left(\theta \leq \overline{\theta}\right)}{d\overline{\theta}} - 1 + \pi_D\left(2p\frac{dpr\left(\theta \leq \overline{\theta}\right)}{d\overline{\theta}} + 1\right). \tag{20}$$

As union membership increases and π_D approaches zero, this expression is more likely to be negative since $0 < \frac{dpr\left(\theta \leq \overline{\theta}\right)}{d\overline{\theta}} < 1$. This implies that higher expected profit per worker will be generated if $\overline{\theta}$ is reduced. Clearly this increases the probability of a strike occurring.

3 Empirical analysis

Below we provide supportive evidence for the two main points from the theoretical model. First, we test whether larger unions are correlated with higher average wages (Question 1); and second, whether greater union size is correlated with more industrial actions (Question 2). We begin by briefly describing the survey dataset and the main variables, and then discuss our methodology and present the results.

3.1 The workplace employee relations survey

The dataset used in our analysis is based on the Workplace Employee Relations Survey 2004 (WERS2004), collected by the Department of Trade and Industry (2005a) in Great Britain. This is a large, nationally representative sample survey of workplaces with five or more employees. The WERS2004 is the fifth in a series of surveys, and the first to include firms with less than ten employees (the 1998 survey included firms with ten or more employees, while the previous surveys only included firms with at least 25 employees). The firm size distribution in Great Britain is highly skewed towards smaller-sized establishments: in order to ensure a sufficient number of firms in each size category for potential analysis by firm size, larger firms were therefore over-sampled. In addition, the sample was stratified by Standard Industrial Classification 2003 (SIC, 2003), where Sections A to C (Agriculture, hunting and forestry;

Fishing; and Mining and Quarrying), P (Private households with employed persons) and Q (Extra territorial bodies), as well as Northern Irish firms were excluded. The Department of Trade and Industry (DTI) provides researchers with appropriate weights in order to ensure unbiased estimations when using the WERS dataset.

The WERS2004 dataset includes the main, cross-section survey, as well as a small time-series dataset for a subset of questions and firms that have been linked with previous surveys. We employ the larger, representative cross-sectional dataset: this contains more information relevant for our purpose. The cross-section WERS2004 includes a Survey of Employees, a Survey of Management, and a Survey of Worker Representatives. We mainly rely on the information in the Management Questionnaire (MQ). For part of our analysis, we link the MQ and the Survey of Employees (SE), for which 25 employees from each firm were randomly chosen to respond to a short questionnaire (all employees were surveyed in firms with fewer than 25 workers). Employees from all 2295 firms included in the cross-section survey were asked to fill out the questionnaire.

3.2 Union size and industrial actions

For our analysis, we are most interested in the information on union membership at a workplace and in the incidence of strikes and other industrial actions. According to the theoretical model, the increasing size of the bargaining unit or union size reduces the probability of being decisive and increases the emphasis on expressiveness, and is therefore a proxy for the expressiveness of employees.

For union membership, we rely on the question in the MQ which asks "How many employees at this establishment are members of a trade union or independent staff association - whether recognized by management or not?" We construct two different measures of union size based on this question. First, we relate the information to the data on total employees to get a measure in percent (from 0 to 100) of relative union size within each firm (*union size in percent*). This is the commonly used proxy for union size in the literature. Moreover, in the theoretical model, union size varies while firm size remains fixed: as this is not true in our multi-firm empirical setting, we believe that dividing the number of union members by total employees in each firm is a reasonable proxy for union size in our context. However, we also use the absolute size of union or staff association membership (*absolute union size*) to test the robustness of our predictions.[10] This proxy reflects the model's focus on absolute union membership, though it doesn't consider varying firm size. This second measure adds to the literature on union size effects as this is the first time, to our knowledge, that absolute numbers are used.

Unfortunately, the question above also includes non-union staff organizations,[11] which is

[10] We thank an anonymous reviewer for this suggestion.

[11] The WRQ has a similar question ("wbpropme"), which however only considers membership in the largest

likely to slightly inflate the membership numbers. We also acknowledge that union size may be endogenous. For example, there could be a reverse causality effect. A firm which has witnessed some form of industrial action in the past may not be willing to recognise unionisation, though employees' legal right to unionise in the UK, together with the wording of the survey question to include both recognised and un-recognised staff associations, should limit the importance of this effect. An instrumental variables approach could potentially address both measurement error and endogeneity issues, but we do not know of any instrument for union size in our cross-sectional context.[12] Our findings are therefore limited to correlations, without any claim of causality.

We have two possible measures of industrial actions: *strike* is a zero-one dummy for whether or not a firm witnessed strikes of less than one day to a week or more; the dummy variable for industrial action (*indaction*) is more general and includes not only strikes, but also overtime bans or restrictions by employees; work to rule; lock outs; go slow; backing of work; work-ins and sit-ins; and other, non-specified actions. The information in the WERS 2004 relates to all industrial actions that occurred during the 12 months preceding the interview (question "gactio" in the MQ).

[Table 1]

Table 1 shows the descriptive statistics for the main variables used in the analysis. Table 2 gives the weighted proportions (in percent) of strikes and more general industrial actions by firm size and by private and public sector (the majority of firms – around 87 percent – in the sample come from the private sector). Table 2 shows that the smallest-sized firms with less than ten employees had no incidence of strikes in the 12 months preceding the interview, although they did witness other forms of industrial action. Strikes are less frequent than industrial actions in general, and both strikes in particular and all industrial actions in general are found less frequently in the private than in the public sector.

[Table 2]

All types of industrial action clearly remain rare events in both private and public sector and in firms of all sizes, with only around two percent of the firms having witnessed any industrial action over the previous year. This low incidence of industrial actions revealed by the survey is in line with a more general trend towards less industrial action that started in

union, disregarding possible smaller unions present in a firm. In addition, using the WRQ information substantially reduces the sample size. Results are similar, though statistically weaker (available upon request).

[12] Askildsen and Nilsen (2002) use an instrumental variables (IV) approach with a panel dataset to estimate the effect of unionisation on wages, employing lagged values as instruments. They find that the coefficient on union size in fact tends to be even larger in the IV estimations with respect to the estimation results without an IV approach.

the 1980s. Both the number of strikes and other forms of industrial action, as well as trade union ballots, have been going down, though the incidence varies across industries and regions in the UK, and there have been several short-lived positive peaks in labour disputes (i.e., in 1996, 2002 and 2007). The year 2004 however did not prove to be exceptional, but rather confirmed the decline: it had the lowest number of stoppages (130) on record at the time, though 2005 and 2009 have seen even fewer stoppages, with 116 and 98, respectively. The total of working days lost to strikes in 2004 (905 000) was however above the 1990s average of 660 000, but still considerably lower than the averages for the 1980s (7.2 million) and the 1970s (12.9 million) (Hale, 2010).

This observation of a decreasing trend in industrial actions is echoed in the trade union membership numbers. Union membership in the United Kingdom peaked in 1979 and has been on the decline ever since, though the tendency has been less severe since the mid-1990s and varies between industries and genders (note that trade union membership among women has been increasing and recently surpassed male membership numbers). Between 2000 and 2010, trade union membership decreased by around 3 percent in England, Scotland and Northern Ireland, and by 5 percent in Wales (Achur, 2010).

3.3 Empirical methodology and results

Question 1. The first theoretical point to be explored is whether larger unions, i.e., workplaces with a larger union membership among their employees and therefore higher expressiveness, are able to generate higher wages for union members. Unfortunately, the WERS 2004 does not provide detailed wage data for all employees, but only for the 25 (or less) employees surveyed in the SE in the form of weekly wage brackets.[13] We link the SE to the MQ, take the mid-point of the weekly wage brackets, and aggregate the information from separate employee questionnaires from one single firm to arrive at two different firm-level average wage measures: the mean and median weekly wages within each firm. We show results from OLS regressions for both dependent variables according to the following model:

$$W_i = \gamma \cdot unionsize_i + \delta \cdot V_i + \theta_i, \tag{21}$$

where W_i indicates the (natural logarithm of) average (i.e., mean or median) weekly wages in firm i. As described above, we construct two variables for union size – one in percent and one in absolute terms – based on information in the MQ. V_i is a vector of control variables. The first set of controls includes firm characteristics such as Standard Industrial Classification (SIC, 2003) and firm size dummies,[14] the share of women in the total workforce (*percent women*),

[13] The weekly wage brackets are as follows: £50 or less; £51-£80; £81-£110; £111-£140: £141-£180; £181-£220; £221-£260; £261-£310; £311-£360; £361-£430; £431-£540; £541-£680; £681-£870; and £871 or more.

[14] Firm sizes range from 5-9 employees; 10-24; 25-49; 50-99; 100-199; 200-499; 500-999; 1000-1999; and 2000 and over. The SIC 2003 codes include Manufacturing (D); Electricity, Gas and Water Supply (E); Construction

and the share of managers and senior officials (*percent managers*) as a rough proxy for the number of the most highly-qualified – and likely most highly-paid – workers. We also include the share of employees made redundant during the past 12 months (*redundancies*), which points towards possible (financial) difficulties the firm may be undergoing and the tensions these may cause among employees. Such difficulties may negatively affect the average wage levels. We also add dummy variables for private sector (*private sector*) and stock-market listing (*listed*). θ is the error term.

The main results, using the relative measure of union size, are shown in Table 3. Both measures of average wages have the expected positive relationship with union size, with the association being particularly robust for median wages (Panel B). As relative union size goes up, the average wage in a firm increases, as well. The economic impact fluctuates from relatively large when we consider the parsimonious specifications in column (1), to relatively small: the beta coefficients for an increase of one standard deviation in union size (around 33.7 percent) on mean wages lie between 0.07 and 0.22.[15] For median wages, they range from 0.06 to 0.19.[16]

[Table 3]

Looking at the control variables in Table 3, a higher percentage of managers in the total workforce is associated with higher average weekly wages, while a higher percentage of women is linked to lower average wages. Both findings are highly significant and consistent with expectations. Interestingly, a large number of redundancies over the previous 12 months is robustly associated with higher rather than lower average wages, while private sector firms and those with a stock-market listing tend to have lower average wages.

These first results support the theoretical prediction of a positive link between union size and wages. Based on the model above, we argue that at least part of this relationship is due to the effect of expressive behaviour, and not only to the traditional union (bargaining) power effect. However, we acknowledge that it is difficult to exclude the latter effect given the analogous measures of union size used in that literature. Table 4 therefore provides a robustness test using absolute union membership data. Results are similar to Table 3 in the first three columns: though the positive link between absolute union size and mean wages is less significant in Panel A, Panel B shows more encouraging findings for median wages, with the coefficient on absolute union size being positive and highly significant.

(F); Wholesale and Retail Trade, Repair of Motor Vehicles, Motorcycles and Personal and Household Goods (G); Hotels and Restaurants (H); Transport, Storage and Communication (I); Financial Intermediation (J); Real Estate, Renting and Business Activities (K); Public Administration and Defence, Compulsory Social Security (L); Education (M); Health and Social Work (N), and Other Community, Social and Personal Service Activities (O).

[15] Calculated from $(33.7 \cdot 0.001)/0.46$ and $(33.7 \cdot 0.003)/0.46$, respectively.

[16] Calculated from $(33.7 \cdot 0.001)/0.52$ and $(33.7 \cdot 0.003)/0.52$, respectively.

[Table 4]

In column 4, however, the relationship becomes negative with both wage measures, and even significantly negative for the case of mean wages in Panel A. Why should this be so? The results appear not to be robust to the inclusion of controls for private sector and stock-market listing. In fact, some further investigation shows that this puzzling finding originates in industry-specific effects. In column 5, we show the results excluding industry dummies and including only firm size dummies. The theoretical model predicts positive union size effects given firm size, and these are confirmed. The results suggest, however, that industry-specific idiosyncrasies can bias the effect in the opposite direction.

Question 2. The second point regards the theoretical prediction that larger unions (and therefore potentially greater expressiveness among union members) will be associated with more strikes and other forms of industrial actions. In the absence of the standard source of asymmetric information (namely regarding firm profitability), we would *not* expect union size – our measure for expressiveness – to be linked to the incidence of industrial actions. If, however, union size is significantly related to the incidence of strikes and general industrial actions even once we control for the standard type of asymmetric information, then we would have evidence that "expressiveness matters."

To test the second question, we rely on the information provided by the MQ. Table 5 shows a comparison in the mean union size – using both measures – for firms by type of industrial action. We note a remarkably clear difference: the mean union size is indeed significantly larger both in firms that have witnessed strikes and in firms that have seen industrial actions in general during the previous twelve months. In firms that have seen a strike, relative union size is more than five times larger than in firms that have not seen any strike, while there is a ten-fold difference in absolute union size. Relative union size in firms that have experienced any type of industrial action is around four times larger, while absolute union size is over seven times larger.

[Table 5]

In order to further investigate this point and control for other possible causes of industrial action, we perform logit estimations according to the following model:

$$Y_i = \alpha \cdot unionsize_i + \beta \cdot X_i + \epsilon_i, \tag{22}$$

where Y_i is either strike or general industrial action in firm i. *union size* is again the proportion – or alternatively the absolute size – of union membership among the firm's employees as described above, and X_i is a vector of control variables, including several variables conventionally used in the strike literature. These can be divided into three categories: workplace characteristics, measures of asymmetric information, and information on previous industrial disputes.

In the first category we have a dummy variable for whether a firm is formally private or public; the proportion of women in the total workforce; and controls for firm size and industrial sector (SIC, 2003) of the firm. The second category includes several variables that aim to control for the possible impact of asymmetric information on the profitability of a firm; this is the alternative explanation to the one proposed in the present paper for the incidence of strikes and other forms of industrial action. These variables include a dummy for whether a firm is part of a larger organisation with several plants in Great Britain (*multiplant*), under the commonly made assumption that multi-plant organisations have less information exchange than organisations with only one plant (see e.g., Godard, 1992; Ingram et al., 1993). We also include a dummy variable for whether a firm is listed on a stock exchange, following the reasoning that listed companies are required to publish more information on their financial situation and should therefore be less likely to see industrial actions; and, finally, a dummy for whether senior managers meet with the entire workforce, for example to communicate workplace changes (*meetings*), which takes advantage of the rich dataset we are using and provides an interesting further test of the asymmetric-information hypothesis. The third category on information on previous disputes includes a dummy for whether the firm witnessed any collective disputes over pay or conditions with any group of workers during the previous year (*collective disputes*); a dummy for significant disruptions suffered because of industrial actions in another organisation (i.e., a contagion effect termed *disruptions*); and the share of employees made redundant during the past 12 months (*redundancies*). ϵ_i is the error term.

The main results for the relative union size measure are shown in Table 6. The first and most striking finding from columns 1 and 3-6 is that union size is positively and significantly related to both the likelihood of observing a strike (Panel A) and of witnessing any type of industrial action (Panel B). This confirms the results from the simple means comparison in Table 5. It is a remarkable finding in light of the fact that we control for the conventional asymmetric-information explanation of industrial actions in columns 3-6. In economic terms, a one unit (i.e., one percentage point) increase in union size is associated with an increase in the odds of witnessing a strike by a factor of 1.042, and in the odds of seeing any type of industrial action by a factor of 1.031 (from column (1)). In terms of marginal effects, the mean predicted probability of a strike if ten percent of the workforce is unionised is 0.003 and steadily increases to 0.105 if all employees are union members (taking the base estimation in column (1), Panel A as a starting point). For all types of industrial actions, the probabilities are 0.011 for a ten-percent workforce unionisation, and 0.142 for a 100-percent unionisation (from column (1) in Panel B).

[Table 6]

Most interestingly, our proxies for the asymmetric information hypothesis suggest that this

conventional explanation still holds, but that it coexists with the expressive behaviour-based hypothesis proposed in the present paper. First, in column 2 of Table 6 we test whether our proxies for asymmetric information have the expected effects without adding our expressiveness measure. This is confirmed for two out of the three variables: our dummy for workplace meetings is clearly insignificant and even has the wrong sign in Panel A (though it has the predicted negative link with strikes and industrial actions in all other columns). We see that firms that are listed on a stock market tend to witness fewer strikes and less industrial action in general. And being part of an organisation with multiple plants is linked to more strike activity and industrial action in general, which confirms the findings of previous literature. In short, these results confirm the expectation that better information flows reduce the incidence of strikes and other industrial actions. Importantly, however, including both relative union size and asymmetric information in columns 3-6 clearly shows that asymmetric information does *not* affect the impact of our expressiveness proxy. Instead, we see that the magnitude of the coefficient for multiplant firms is drastically reduced, and both stock-market listing and the multiplant dummy are not as robust as our expressiveness proxy to the inclusion of more control variables. This lends support to the idea that the conventional story of asymmetric information is not the sole explanation for the occurrence of industrial action, and that expressive behaviour is also a relevant and complementary explanatory factor.

Regarding the other control variables in Table 6, a higher percentage of women in the workforce and being in the private sector are both less likely to be associated with any form of industrial action, though the effect is not significant. A recent history of collective disputes and work disruptions in other nearby organisations tend to coincide with a large increase in the incidence of strikes and other industrial actions in a firm, while a large number of redundancies has a weak negative link with strikes, but a highly significant positive link with industrial action in general.

Results from robustness tests using the alternative, absolute measure of union size are shown in Table 7. The main findings from Table 6 are largely confirmed using absolute union membership, with the exception of the final column 5 where we control for firm size. In these last specifications, absolute union size is still positively linked to the incidence of strikes (Panel A) and all industrial actions (Panel B), but significance drops below conventional levels (p-values of 0.25 and 0.16, respectively).

[Table 7]

In summary, the empirical findings support the main predictions from the theoretical model: most importantly, they show that expressive behaviour, captured by union size, can help explain the incidence of strikes and all industrial actions, even when we consider the influence of other possible factors such as asymmetric information on the profitability of the firm.

4 Discussion and conclusions

The study of strikes has been a classical topic in labour economics. Recently however, interest in the research area has waned, on the one hand because asymmetric information theory appeared to offer a compelling explanation for strike incidence, and on the other because the number of strikes and industrial actions in general has been on a downward trend for the past two to three decades, at least in the UK and the United States. We contend that strikes and other forms of industrial action are still important, albeit rare, occurrences, and draw on developments in behavioural and political economics to offer an explanation of why they occur that expands significantly on Glazer's (1992) study of strikes. They can be interpreted as a manifestation of expressive behaviour where a foundation for expressive behaviour can be located in fairness concerns. We argue both theoretically and empirically that a union member may gain a non-instrumental, expressive benefit from voting for a strike, and that this benefit becomes more important the larger the union (i.e., the voting group) and therefore the smaller the probability of a single vote being decisive. We argue that expressive behaviour is not an alternative explanation for why strikes occur, to the exclusion of the standard theory of asymmetric information: the two approaches are rather complementary. In our argument, asymmetric information also lies at the root of the explanation. However, instead of workers being uninformed and the employers informed about profit levels, now the workers are informed and the employer is uninformed about the degree to which the workforce is expressive. We believe that this finding offers an interesting new twist to explaining the phenomenon of industrial action, which – in the current difficult economic environment in many industrialised countries – is far from being an issue of the past.

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Tables

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Tables

Table 1: Descriptive statistics of main variables

	Observations	Mean	Std. Dev.	Min.	Max.
strike	2295	0.045	0.207	0	1
indaction	2295	0.067	0.249	0	1
union size, percent	2160	27.448	32.982	0	100
union size, absolute	2160	157.838	478.323	0	5657
percent managers	2279	10.786	11.653	0	100
percent women	2285	50.980	29.369	0	100
private sector	2295	0.743	0.437	0	1
listed	2295	0.197	0.398	0	1
multiplant	2295	0.752	0.432	0	1
meetings	2294	0.772	0.42	0	1
collective disputes	2291	0.098	0.297	0	1
disruptions	2294	0.041	0.199	0	1
redundancies	2164	1.553	5.775	0	84.344
lnmeanwage	22449	5.785	0 .459	3.219	6.857
lnmedianwage	22449	5.69	0.525	3.219	6.856

Notes: Descriptive statistics for mean and median wages refer to a different dataset from the other variables (see text for details).

Table 2: Weighted proportions of strikes and general industrial actions by firm size and sector

		strike	industrial action
firm size	5-9	0	0.721
	10-24	0.8646	1.356
	25-49	1.601	3.259
	50-99	3.696	6.52
	100-199	4.072	7.997
	200-499	6.515	9.561
	500-999	4.603	6.644
	1000-1999	6.859	12.6
	2000-	15.48	17.67
firm type	private	0.2088	1.054
	public	6.073	8.418
	total percent	0.972	2.013
	obs	2295	2295

Table 3: OLS estimations of union size (percent) and average weekly wages

	(1)	(2)	(3)	(4)
Panel A	lnmeanwage	lnmeanwage	lnmeanwage	lnmeanwage
union size, percent	0.003	0.001	0.001	0.0002
	(18.85)***	(6.09)***	(6.21)***	(1.18)
percent managers		0.008	0.008	0.008
		(14.73)***	(14.33)***	(14.47)***
percent women		-0.008	-0.008	-0.008
		(31.01)***	(30.74)***	(31.45)***
redundancies			0.006	0.006
			(7.25)***	(7.35)***
private sector				-0.155
				(7.80)***
listed				-0.027
				(1.79)*
Constant	5.537	5.783	5.774	5.946
	(687.78)***	(256.22)***	(253.21)***	(187.78)***
R-squared	0.03	0.48	0.48	0.48
Panel B	lnmedianwage	lnmedianwage	lnmedianwage	lnmedianwage
union size, percent	0.003	0.002	0.002	0.001
	(17.90)***	(9.37)***	(9.60)***	(4.38)***
percent managers		0.009	0.009	0.009
		(15.49)***	(15.11)***	(15.43)***
percent women		-0.009	-0.009	-0.009
		(32.44)***	(31.89)***	(32.52)***
redundancies			0.008	0.008
			(9.91)***	(10.42)***
private sector				-0.170
				(7.02)***
listed				-0.073
				(4.22)***
Constant	5.422	5.726	5.707	5.897
	(589.92)***	(223.17)***	(218.97)***	(163.24)***
R-squared	0.03	0.45	0.45	0.46
SIC 2003 dummies	no	yes	yes	yes
Firm size dummies	no	yes	yes	yes
Observations	21,102	21,021	20,009	20,009

Notes: t-statistics in parentheses. *, **, *** statistically significant at 10, 5, and 1 percent levels, respectively.

Table 4: OLS estimations of (absolute) union size and average weekly wages

	(1)	(2)	(3)	(4)	(5)
Panel A	lnmeanwage	lnmeanwage	lnmeanwage	lnmeanwage	lnmeanwage
union size, absolute	0.001	0.00002	0.00003	-0.0001	0.00002
	(28.54)***	(0.764)	(1.468)	(-2.904)***	(0.970)
percent managers		0.008	0.008	0.008	0.011
		(14.43)***	(14.01)***	(14.45)***	(18.39)***
percent women		-0.008	-0.008	-0.008	-0.007
		(-31.13)***	(-30.88)***	(-31.32)***	(-38.39)***
redundancies			0.006	0.006	0.007
			(7.195)***	(7.313)***	(8.009)***
private sector				-0.166	-0.320
				(-10.50)***	(-26.05)***
listed				-0.025	-0.01
				(-1.667)*	(-0.602)
Constant	5.585	5.800	5.793	5.962	5.962
	(912.6)***	(262.2)***	(259.5)***	(223.7)***	(222.9)***
R-squared	0.009	0.474	0.473	0.481	0.317
Panel B	lnmedianwage	lnmedianwage	lnmedianwage	lnmedianwage	lnmedianwage
union size, absolute	0.001	0.0001	0.0001	-0.00001	0.0001
	(28.36)***	(3.664)***	(4.354)***	(-0.576)	(3.934)***
percent managers		0.009	0.009	0.009	0.012
		(14.83)***	(14.41)***	(15.14)***	(18.95)***
percent women		-0.009	-0.009	-0.009	-0.008
		(-32.54)***	(-32.00)***	(-32.60)***	(-40.90)***
redundancies			0.008	0.008	0.009
			(9.890)***	(10.33)***	(9.892)***
private sector				-0.211	-0.340
				(-10.63)***	(-23.50)***
listed				-0.066	-0.034
				(-3.821)***	(-1.911)*
Constant	5.476	5.758	5.742	5.958	5.948
	(773.4)***	(229.4)***	(225.3)***	(195.8)***	(193.4)***
R-squared	0.008	0.446	0.446	0.458	0.319
SIC 2003 dummies	no	yes	yes	yes	no
Firm size dummies	no	yes	yes	yes	yes
Observations	21,102	21,021	20,009	20,009	20,009

Notes: t-statistics in parentheses. *, **, *** statistically significant at 10, 5, and 1 percent levels, respectively.

Table 5: Mean estimates of union size and type of industrial action

	union size percent	union size absolute
strike	71.426	76.502
no strike	13.909	7.227
difference	57.517***	69.275***
industrial action	54.323	54.404
no industrial action	13.642	6.936
difference	40.681***	47.468***

Notes: 2160 observations. *, **, *** statistically significant at 10, 5, and 1 percent levels, respectively.

Table 6: Logit estimations of union size (percent) and type of industrial action

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A	strike	strike	strike	strike	strike	strike
union size, percent	1.042		1.039	1.024	1.022	1.024
	(7.132)***		(5.970)***	(2.215)**	(1.692)*	(1.725)*
percent women				0.993	1.007	1.006
				(-0.839)	(0.733)	(0.637)
private sector				0.586	0.817	0.973
				(-0.519)	(-0.183)	(-0.0233)
listed		0.161	0.143	1.185	1.129	1.247
		(-2.211)**	(-2.218)**	(0.136)	(0.0993)	(0.222)
multiplant		22.65	8.071	6.833	6.180	4.136
		(6.562)***	(3.433)***	(2.666)***	(1.986)**	(1.635)
meetings		1.266	0.950	0.760	0.786	0.616
		(0.481)	(-0.094)	(-0.441)	(-0.303)	(-0.774)
collective disputes					16.61	16.28
					(4.892)***	(4.834)***
disruptions					5.338	4.535
					(2.719)***	(2.402)**
redundancies					0.987	0.920
					(-0.213)	(-0.775)
Constant	0.002	0.001	0.0004	0.00003	0.00002	0
	(-14.78)***	(-13.56)***	(-12.93)***	(-6.853)***	(-7.366)***	(-11.07)***
Panel B	indaction	indaction	indaction	indaction	indaction	indaction
union size, percent	1.031		1.028	1.021	1.017	1.017
	(6.496)***		(5.500)***	(2.748)***	(1.903)*	(1.758)*
percent women				0.985	0.993	0.997
				(-1.400)	(-0.597)	(-0.270)
private sector				0.760	0.788	0.954
				(-0.386)	(-0.296)	(-0.0570)
listed		0.198	0.182	0.314	0.179	0.176
		(-2.908)***	(-2.932)***	(-1.290)	(-2.215)**	(-2.205)**
multiplant		9.777	5.045	6.595	7.572	6.633
		(2.997)***	(2.032)**	(2.576)**	(4.210)***	(3.613)***
meetings		0.728	0.591	0.543	0.738	0.654
		(-0.648)	(-1.003)	(-0.951)	(-0.516)	(-0.884)
collective disputes					39.89	38.13
					(6.623)***	(6.300)***
disruptions					5.341	5.066
					(2.526)**	(2.473)**
redundancies					1.077	1.077
					(3.518)***	(3.144)***
Constant	0.008	0.005	0.004	0.01	0.002	0.001
	(-14.09)***	(-5.932)***	(-6.064)***	(-4.369)***	(-5.008)***	(-4.946)***
SIC 2003 dummies	no	no	no	yes	yes	yes
Firm size dummies	no	no	no	no	no	yes
Observations	2,160	2,294	2,159	2,151	2,044	2,044

Notes: Odds ratios for logistic regressions shown. Values below one denote a negative impact on the probability of witnessing a strike or general industrial action, while values above one denote a positive impact. t-statistics in parentheses. *, **, *** statistically significant at 10, 5, and 1 percent levels, respectively.

Table 7: Logit estimations of (absolute) union size and type of industrial action

	(1)	(2)	(3)	(4)	(5)
Panel A	strike	strike	strike	strike	strike
union size, absolute	1.003	1.003	1.001	1.002	1.001
	(6.569)***	(6.455)***	(4.617)***	(4.376)***	(1.156)
percent women			0.989	0.999	1.001
			(-1.264)	(-0.0503)	(0.106)
private			0.209	0.310	0.428
			(-1.827)*	(-1.486)	(-0.959)
listed		0.160	1.146	0.972	1.026
		(-2.150)**	(0.111)	(-0.0242)	(0.0275)
multiplant		29.86	12.54	16.16	6.290
		(6.014)***	(3.775)***	(3.054)***	(2.219)**
meetings		1.277	0.772	0.773	0.624
		(0.484)	(-0.427)	(-0.332)	(-0.774)
collective disputes				16.13	17.54
				(5.051)***	(5.167)***
disruptions				5.422	5.153
				(2.624)***	(2.559)**
redundancies				0.966	0.908
				(-0.405)	(-0.780)
Constant	0.01	0.001	0.0001	2.11e-05	0
	(-22.02)***	(-12.27)***	(-6.889)***	(-6.894)***	(-14.20)***
Panel B	indaction	indaction	indaction	indaction	indaction
union size, absolute	1.003	1.003	1.002	1.002	1.001
	(5.523)***	(5.226)***	(4.513)***	(3.566)***	(1.404)
percent women			0.982	0.991	0.994
			(-1.629)	(-0.809)	(-0.515)
private			0.282	0.364	0.434
			(-2.245)**	(-1.579)	(-1.350)
listed		0.195	0.437	0.165	0.174
		(-2.843)***	(-1.106)	(-2.142)**	(-2.098)**
multiplant		10.18	8.664	11.43	8.914
		(2.877)***	(2.925)***	(4.614)***	(3.717)***
meetings		0.724	0.549	0.645	0.590
		(-0.647)	(-0.980)	(-0.719)	(-1.045)
collective disputes				43.16	41.95
				(6.494)***	(6.202)***
disruptions				5.620	5.334
				(2.656)***	(2.632)***
redundancies				1.078	1.077
				(3.432)***	(3.120)***
Constant	0.02	0.005	0.03	0.005	0.003
	(-20.28)***	(-5.686)***	(-3.936)***	(-5.269)***	(-5.693)***
SIC 2003 dummies	no	no	yes	yes	yes
Firm size dummies	no	no	no	no	yes
Observations	2,160	2,159	2,151	2,044	2,044

Notes: Odds ratios for logistic regressions shown. Values below one denote a negative impact on the probability of witnessing a strike or general industrial action, while values above one denote a positive impact. Constant term included but not shown. t-statistics in parentheses. *, **, *** statistically significant at 10, 5, and 1 percent levels, respectively.