

U.K. STRIKES IN THEORY AND PRACTICE

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Abstract

This paper is a survey of some aspects of U.K. strikes, particularly for the late 1960s - early 1970s period, and a survey of bargaining theory and the theory of strikes. Both theory and evidence combine to present a distinction between "noisy" strikes, and more substantive strikes which play a role in the resolution of issues through collective bargaining processes.

This paper is circulated for discussion purposes only and its contents should be considered preliminary.

I. INTRODUCTION:

This paper is occasioned by our perception of a somewhat strange discordance between observed strike activity and theories of strike behaviour, particularly as they appear in the economics literature. Not only does it seem to be the case that "strike theory" (such as it is) has not been extended to account for a number of the more obvious features of reality, but it also seems that the purpose of strikes - the role they are hypothesized to play in the bargaining process - as envisioned by some of these theories is difficult to reconcile with that reality. We wish to examine both theory and practice and, in as far as the nature and character of an action can be inferred from the context in which it occurs, we wish to critically examine the questions: "Why are there strikes?", "Do they play a role in a bargaining process?" and, if so, "What role is that?".

It is worth being clear from the outset on what we do not propose to do. We are not interested in the prediction of strikes econometrically using a given set of exogeneous variables. Of course, alternative hypotheses about the causes of strikes differ to some extent in both the set of exogeneous variables used, and in the impact that those variables are hypothesized to have on strike activity, but we have neither the information necessary for such an exercise here, nor the confidence that sharp enough distinctions can be made to identify and so test the various hypotheses.^{1/} We are also not interested in using information on strike activity to test various competing bargaining theories underlying the explanation of strikes, and this for perhaps three reasons. First, the comparison of most of the theories will require information on within

strike activity^{2/} and this we do not have; second, such an exercise presupposes that all (or nearly all) strikes are related to some particular ongoing bargaining process, and this begs an interesting question; and, third, since not all bargaining processes involve a strike, then to use strikes to test bargaining theories is to use a fatally biased sample of observed bargaining processes to discriminate amongst alternative bargaining theories.^{3/}

Our point of view is that a strike must be defined in terms of a minimum of no less than four dimensions: incidence, duration or length, intensity of participation, and official status. The reason is that there are a minimum of four important decisions which define a strike: the decision to commence, the decision to terminate, the decision to participate and the decision to make it official. They are important to distinguish because they are made by different agents, and the contexts in which they are made create different costs and benefits to the decision makers involved. The decision to initiate a strike is a collective one, and one largely taken by the workers involved en masse. The decision to continue is, in fact, a sequence of decisions not, in general, independent of the events that have occurred since initiation. By contrast, the participation decision, though subject to important collective pressures, is essentially an individual one and one that is also, in fact, a sequence of decisions. A further decision which will assume some importance in what follows is the decision to make a dispute official, and this is a decision reached by negotiation between the workers involved and their union leaders. This distinction is necessary to understand various interrelated facets of the causes of strikes; for example, the decision to stop an activity after so many days (or to prolong

it for a few more) is quite independent of the fixed costs of initiation, which play an important role in the decision made about whether or not to commence a strike. Similarly, the myriad of divergences between private and group benefits leave more than enough room for individuals to vote collectively in favour of a strike, but to choose individually not to participate if that vote is decisive.

Several implications follow immediately from this point of view. First, bargaining theory and the theory of strikes is only satisfactory to the extent that it treats the whole group of decisions which determine (obviously in an interdependent manner) the observed features of every strike; viz. its occurrence, its length, its participation and its status. Second, since these dimensions are interdependent, it is clear that one must think in terms of the distribution of strike activity by length and participation, and that one cannot be content with thinking in single or mixed dimensions such as strike frequency, mandays lost, and so on.^{4/} Third, since it appears that the major real economic costs of a strike are duration related,^{5/} and since there is very little reason why (and, as we shall see more clearly below, there is every reason why not) frequent striking should be a sign of intensive striking, it follows that "strike-proneness" is not necessarily a cause for major worry. That is, "strike proneness" cannot be taken to signal the incurring of substantial strike costs.

Our purpose, then, is to try to infer something about the nature and role of strikes (and the several decisions that define them) from the observed context in which they occur, and from the characteristics of the strikes themselves. We commence with a look at recent strike

patterns in the U.K., and then turn to the various roles strikes have been hypothesized to play in bargaining theories and in the theory of strikes.

II. U.K. STRIKES IN PRACTICE

We commence with a look at the record of recent strike activity in the U.K. The period for which we have the most information is 1966-1973, and we discuss it in broad terms in II.2 below.^{6/} Before coming to this period however, it is worth taking a broad historical perspective, and this is done briefly in II.1; in II.3, II.4, and II.5, we look at time series, inter-industry, and occupational variations in striking patterns during the period 1966-73 which collates information complementary to that contained in Smith et al (1978).

II.1 A Broad Historical View

In terms of strike frequency, there appear to have been three major strike waves in U.K. history^{7/} which have occurred within the context of a general upward drift in incidence since the turn of the century: the late 1880s-1900, 1910-1920, and the unparalleled boom of 1955-75 (whose peak was 1966-73). However, in terms of working days lost (i.e. duration and participation considered jointly), a somewhat different picture emerges. The series on working days lost shows a series of relatively short eruptions (1893, 1911-14, 1919-24, 1926, and, somewhat less, 1897, 1908, 1929, 1957, and 1970-4) in an otherwise fairly low, and untrended series (Smith et al, 1978, Figs. 1 and 2, pp. 16-17; Table I, pp.91-3). Quite clearly, those time periods which were

particularly prone to collective decisions to withdraw labour were by no means the time periods which saw large groups of individuals choosing to participate, or to prolong an action already initiated. Indeed, it seems clear that official status and the cause of the dispute were important intervening variables, since: "... the upward movement in stoppage frequency from the mid-1950s has been due almost entirely to an increase in pay stoppages ...", and "... the major feature of years in which large numbrs of working days have been lost is the occurrence of large scale official disputes ..." (Smith et al, 1978, pp. 44 and 15 respectively).

II.2 The 1966-1973 Period

Table I summarizes the salient features of the 1966-1973 period. While only about 4.6% of all strikes were official, they appeared to last about 5 times as long as unofficial strikes (their median length is 7 times that of unofficial strikes), involved on average 11.5 times as many workers directly, and more than twice as many indirectly.^{8/} To put the matter a slightly different way, while 90% of unofficial strikes lasted 12 days or less, about 65% of official strikes lasted 12 days or more. From rows 13-16 of Table I, it is clear that the high average participation rates of official strikes arose because of a small number of very large scale official disputes; clearly strikes that have already been in process for several days and are given an official status have a much lower probability of ending given that they have lasted as long as they have than unofficial strikes.

While there was little difference in the distribution of pay and

TABLE I: THE CHARACTER OF STRIKES 1966-1973

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Number of Disputes	21030	971	19932	11113	9917	524	447	9400	10532
<u>Duration (days)</u>									
Mean	6.600	28.26	5.549	7.180	5.949	28.42	28.081	4.893	6.134
Median	2.953	19.25	2.798	3.351	2.494	22.00	16.583	2.393	3.201
Variance	145.62	828.18	88.644	140.13	150.98	667.08	1018.8	85.222	90.981
Skewness	6.427	2.273	7.683	5.717	7.195	1.830	2.500	8.521	7.079
% 1 days	26%	4%	27%	22%	30%	5%	4%	32%	22%
% 3 days or less	57%	10%	59%	52%	62%	10%	9%	65%	54%
% 5 days or less	72%	17%	74%	68%	76%	18%	17%	79%	70%
% 10 days or less	85%	31%	88%	83%	88%	29%	35%	90%	86%
<u>Persons Directly Involved</u>									
Mean	443.23	343.31	299.07	582.4	287.2	5999	424.9	281.4	314.7
Median	79.876	79.92	79.94	80.27	78.35	100.14	65.75	79.64	80.20
Variance	10912	49948	1937.7	14935	1575.7	67885	2263.3	1540.4	2233.3
Skewness	125	28.08	60.16	92.24	49.83	20.66	12.44	54.38	58.43
% Involving 25 men or less	20%	23%	20%	19%	21%	23%	23%	21%	19%
% Involving 100 men or less	57%	57%	57%	57%	58%	51%	63%	57%	57%
% Involving 500 men or less	89%	83%	89%	88%	89%	78%	89%	89%	89%
% Involving 1000 men or less	95%	89%	95%	94%	95%	84%	94%	95%	95%

non-pay strikes by length, and while somewhat more than 50% of all strikes were concerned with pay, pay disputes tended to involve roughly twice as many men directly (and about 66% again as many indirectly). That is, the nature of the decision made by an individual to participate in a strike when once it has been called appears different for pay issues, for which there is a higher participation probability than for non-pay issues.

Official pay disputes were about 18 times less frequent, 7 times longer and involved 1.5 and 4.5 times as many workers directly and indirectly as unofficial pay disputes. By contrast, official non-pay disputes were 23 times less numerous, 4.5 times longer and involved slightly more and less (135% and 75%) workers directly and indirectly as unofficial non-pay disputes. While unofficial pay and unofficial non-pay disputes were not too dissimilar in terms of frequency, duration and participation, the difference between official pay and official non-pay disputes is interesting mainly because direct participation rates were about 14 times larger in the former than in the latter (which were much larger than unofficial non-pay disputes).

It seems to follow from all of this that the cause of the strike (pay or non-pay) affects above all participation, while the official or not status of the strike affects mainly the duration of activity, but also participation to some extent. Since relatively few strikes are declared official, it seems clear that that decision is of major importance in explaining strike activity. This view, of course, conflicts with the current conventional wisdom of some industrial relations specialists. Edwards (1982), for example, argues that the distinction between official and unofficial action is irrelevant. In part this is justified by the fact that since most strikes are short

they are over before the relevant union officer knows about them. Our data confirm the preponderance of short strikes but also reveals that 77% of all strikes lasting more than ten days remain unofficial. This suggests the duration of a strike is not a simple indicator of its status and a good many long strikes remain unofficial even after the union officer knows about them. Our data ends in 1973 and it might be argued that since then the growing importance of the shop steward and his/her incorporation into the formal union machinery makes the distinction less important now. However, the data presented by Edwards (1982) shows no upward trend in the proportion of disputes declared official. So these institutional changes have not affected the status decision, though, of course they may have reduced its importance, although the evidence for this is a little unconvincing.

II.3 The Temporal Variation in Strike Activity

Tables II and III chart some of the more interesting year by year variations in striking patterns, 1966-1973. Within the period, there was a clear rise in incidence until 1970, followed by a falling off to 1968 levels; however, both length and intensity increased fairly steadily throughout the period. The high incidence years were 1969 and 1970, while the high length years were 1971-73; participation was highest in 1968 and 1972. These years saw a shift in the entire distribution of incidence by length, so that duration decisions in almost all strikes, taken at almost all points within each strike, involved a lower probability of ending the given strike by the end of the period. There was a tendency for official and for pay disputes to experience the same changes in incidence, length and intensity as other types of strikes;

TABLE II: STRIKES EACH YEAR, 1966-1973

	1966	1967	1968	1969	1970	1971	1972	1973
Number of Strikes	1937	2116	2378	3116	3906	2228	2497	2873
Mean length (days)	4.525	5.213	5.925	5.765	6.551	7.805	9.218	7.336
Maximum length (days)	168	118	240	187	107	191	255	254
Median (days)	2.265	2.382	2.585	2.537	3.147	3.445	3.702	3.623
Standard Deviation (days)	8.895	9.876	12.841	11.641	10.131	13.879	15.016	12.674
Skewness	7.977	6.286	8.820	7.151	4.164	5.340	5.024	6.876
% 1 day	33%	29%	28%	30%	25%	21%	23%	20%
% 5 days or less	82%	79%	75%	76%	70%	68%	62%	66%
% more than 10 days	8%	10%	12%	11%	16%	18%	23%	17%
Workers directly involved (Mean)	214	261	872	452	374	382	581	384
Workers directly involved (Median)	57	74	80	100	85	78	80	80
Workers indirectly involved (Mean)	60	85	77	74	85	140	110	142
Workers indirectly involved (Median)	.05	.06	.07	.08	.08	.70	.70	.73

TABLE III: SOME CHARACTERISTICS EACH YEAR, 1966-73

Official Disputes	1966	1967	1968	1969	1970	1971	1972	1973
Number	60	105	93	96	163	161	161	132
Mean Length	32	24	24	29	24	30	33	29
Median Length	19	15	13	19	17	19	29	23
Mean Directly Involved Workers	699	308	16564	3570	1585	883	3759	2807
Median " " "	67	80	70	90	70	75	110	84
Pay Disputes								
Number	845	949	1234	1765	2426	1138	1397	1359
Mean Length	4	6	6	6	7	8	11	8
Median Length	2	2	3	3	3	4	5	4
Mean Directly Involved Workers	185	284	1470	506	427	532	705	524
Median " " "	52	80	86	100	85	78	80	78
Official Pay Disputes								
Number	12	50	50	59	93	77	108	75
Mean Length	25	24	21	26	24	30	37	30
Median Length	15	13	13	19	17	21	33	25
Mean Directly Involved Workers	267	329	30587	5594	2583	1656	5075	4650
Median " " "	31	125	70	170	60	90	143	132
% All Strikes Official	3%	5%	4%	3%	4%	7%	7%	5%
% All Strikes Pay	44%	45%	52%	57%	62%	51%	56%	47%
Ratio Average Length Official/All Disputes	707%	465%	400%	496%	371%	381%	363%	401%
Ratio Average Length Pay/All Disputes	90%	106%	100%	102%	109%	109%	119%	112%

the percentage of strikes concerned with pay and which were official kept fairly constant (although the number of official strikes concerned with pay rose from 20% in 1966 to 57% in 1973), and, while there was very little trend in length in either pay or official strikes, there was some tendency for pay strikes to increasingly involve more men and for official disputes to do so erratically.

Thus, the early 1970s saw important changes particularly in decisions regarding the prolongation of and participation in strikes. It does not seem obviously the case that this was due to differences in the issues faced or in differences in the decisions made regarding union status. Our data confirm the view that those (Hyman (1977)) who argue the increased duration of disputes in the 1970s is due to an increase in official strike activity are wrong. Not only has there been no upward trend in the proportion of strikes declared official but also the change in duration is common to all types of dispute. The increased duration revealed by our data continues beyond the end of our data period until the present as Edwards (1982) has shown. How can this trend be explained? Edwards offers an explanation that emphasises the part played by institutional changes in the U.K. industrial relations systems against the backdrop of a macroeconomic environment that favoured longer strikes. He argues that 'reform' in plant bargaining procedures has led to the resolution of a great many issues which resulted in a strike in the sixties without a strike taking place. Only the more difficult matters are resolved by strikes and the average duration of these have always been greater. One of the more obvious sources of such change may lie in the overall state of the economy. Much times series work has revealed that strike incidence is pro-cyclic in character, being negatively

associated with unemployment and positively associated with increased inflationary pressures and declines in real wages.^{10/} Much less is known about the cyclic variability (if any) in either duration or participation, but some evidence suggests that length may move counter-cyclically, with unofficial and pay disputes being rather longer in slump years relative to book years.^{11/} During the period after 1973 Edwards (1982) also shows a restoration of the upward trend in the proportion of all disputes which are over pay which had begun a decade earlier which he advances as a further explanation of the movement in the aggregate duration. This seems to be consistent with the following set of hypotheses: the decision to initiate a strike seems more easily taken when the economy is in a healthy state,^{12/} but the sequence of decisions concerned at each point within the strike with the question of its prolongation are less likely to terminate it when times are relatively bad. This suggests a reluctance to initiate strikes during recessions which has a national counterpart in a determination to find a satisfactory resolution of such issues as are deemed important enough to cause a strike in the first place. This is also argued by Edwards (1982) who suggests that in recession

'workers will be forced into defensive struggles which will tend to be both large and long while employers eager to win back concessions which they were forced to make during the preceding boom' (p.13)

Other kinds of structural change have also taken place in the U.K. and these will reinforce the tendency towards longer strikes. Of particular importance is the merger wave of the sixties and seventies that led to major increases in the degree of monopolisation of product markets. There are good grounds, both theoretical and empirical for believing that this monopolisation of product markets will strengthen the relative power of

employers in labour markets. ^{12a/} The effect of this is to increase strike duration ^{13/} and strengthens the upward trend observed in the U.K.

II.4: The Inter-industry Variation in Strike Activity

The five most strike prone industries (Coal, Vehicles, Shipbuilding, the Docks, and Iron and Steel) have always accounted for a very large proportion of U.K. strike incidence, but the upsurge in activity during 1966-73 saw their share drop dramatically, mainly due to a fall off in strike incidence in Coal (see Smith et al, 1978, chapter 3). Table IV contains an Order-level industry breakdown which shows how much more widespread the making of strike decisions had become through the period.

Far and away the most obvious feature of Table IV is that ranking industries by the different dimensions of striking produces wildly different orderings. Thus, Coal, Vehicles, Transportation and Communication, Construction, Mechanical Engineering and Metal Manufacture had a heavy incidence of strikes, but Insurance, Professional Services and Instrument Engineering had the longest strikes, while Mechanical Engineering, Insurance, Professional Services and Public Administration had the largest average participation. The rank correlation between industries ranked by incidence and length is: $-.126$, that between length and workers directly involved is $-.115$, and that between workers directly involved and incidence is: $-.019$, suggesting that none of the three rankings is at all related to any other. This underlines with some force the notion that those who choose collectively to strike frequently do not necessarily individually choose to participate in great numbers, and are not necessarily more inclined to prolong a strike when once it is started. As we have seen temporally, so it also appears

sectorally that it is a great mistake to presume that the forces affecting the taking of one type of decision also have similar effects on the two other types of strike decision.

This conclusion is reinforced by a certain amount of cross section work ^{14/} seeking to associate the often observed wage premium received by workers in highly concentrated industries to strike behaviour. A fairly clear negative association between strike frequency and the level of product market concentration is mirrored by an equally clear positive association between strike duration and product market concentration. This is consistent with the view that the existence of countervailing power structures (heavy unionization and tight oligopoly) alters the character of strike decisions, increasing the resolve to maintain a dispute once it is initiated, but also ^{15/} weakening the desire or need to initiate it in the first place.

A second feature of Table IV commands attention, and this is the apparent distinction between manufacturing and non-manufacturing sectors. The latter appear to be subject to two thirds as many strikes, and the strikes that do not occur in non-manufacturing seem to be a little shorter than their counterparts in manufacturing. What is different, however, is the much higher percentage of non-manufacturing strikes which are official, and their generally higher participation rates. This is suggestive of rather different leadership-membership relations in what must be presumed to be white collar or public sector unions, and perhaps different sets of collective pressures put upon the individual worker's participation decision.

A final observation that Table IV suggests is the extraordinary inter-industry variability in strike behaviour, even over broadly defined

Employment expressed in 100's.

	(1) Number	(2) Median Length	(3) Mean Length	(4) Std. Dev. of Length	(5) Skew of Length	(7) # lasting 1 day	(8) # lasting 5 days or less	(9) Workers Directly Involved Mean	(10) Workers Directly Involved Median	(11) Workers Directly Involved as % 1968 Employment	(13) Workers Indirectly Involved Mean	(14) Workers Indirectly Involved Mean	% Official
Food, Drink, Tobacco	663	2.9	5.4	9.2	7.4	25%	75%	263.4	100.1	.03	58.8	.54	5.9%
Coal and Petroleum	40	4.3	6.4	7.2	2.6	17%	70%	388.3	151.5	.94	.5	.24	3.1%
Chemicals	369	2.7	6.3	11.7	5.2	28%	46%	281.3	109	.07	7.0	.03	5.4%
Metal Mfg	1484	3.6	7.0	10.1	3.8	16%	68%	238.3	90	.04	118.7	.15	4.2%
Mechanical Eng.	2578	3.9	8.9	15.1	4.8	18%	63%	812.6	79.9	.08	30.8	.06	6.7%
Instrument Eng.	157	4.5	11.8	18.7	3.2	18%	59%	350.2	115	.20	46.3	.15	10.8%
Electrical Engineering	1306	3.4	8.5	14.4	4.0	23%	65%	421.5	120.4	.05	134.7	.12	7.9%
Shipbuilding	732	3.8	8.4	14.0	4.4	15%	63%	314.7	97	.17	83.0	.12	2.3%
Vehicles	2587	2.7	5.7	10.5	5.9	26%	76%	509	120.4	.06	432.6	.26	3.5%
Metal Goods N.E.S.	883	4.2	9.07	16.9	7.0	16%	61%	157.8	69.8	.03	34.0	.07	7.1%
Textiles	510	3.5	6.0	7.3	3.3	14%	71%	193.1	79.7	.03	58.0	.12	5.5%
Leather and Fur	18	1.8	8.2	20.2	3.8	44%	83%	90.5	50.5	.19	5.0	.62	2.9%
Clothing and Footwear	182	2.8	4.4	4.9	3.4	20%	80%	336.3	115.5	.08	60.4	.17	2.0%
Bricks, Pottery, Glass	377	3.5	6.1	8.2	4.1	17%	69%	212.7	70.4	.07	18.0	.05	3.7%
Timber, Furniture	244	3.7	7.3	10.0	3.3	13%	66%	121.7	45.2	.05	17.7	.06	6.9%
Paper, Printing, Publishing	315	3.4	7.5	13.1	6.5	19%	68%	288.9	99.5	.05	35.4	.09	8.9%
Other Mfg	497	3.1	6.0	9.0	4.6	20%	69%	290.1	120	.09	167.5	.11	6.0%
All Mfg	12845	3.4	7.3	12.6	5.5	20%	68%	428.0	98.1	NA	96.6	.01	-
Construction	2104	4.9	9.5	16.3	6.8	12%	55%	215.2	59.6	.001	10.4	.04	3.0%
Gas, Elec., Water	118	2.3	4.2	5.8	4.4	33%	82%	515	119.8	.13	4.9	.98	3.5%
Transport and Communication	2849	1.9	4.3	8.0	6.4	41%	83%	627.7	114.1	NA	42.1	.05	4.7%
Dist. Trades	342	2.8	6.0	8.8	3.7	24%	70%	88.4	40.2	NA	5.3	.02	7.1%
Insurance, Banking	21	5.3	12	13.1	.9	29%	52%	1070.1	100	NA	0	0	36.4%
Professional and Life Services	123	2.3	10.3	19.6	3.3	38%	69%	3048.8	100.4	NA	9.4	.74	14.1%
Misc. Services	178	3.2	8.6	19.9	7.3	26%	66%	132.6	40.4	NA	2.2	.10	9.8%
Public Administration, Defence	308	3.3	5.8	7.1	2.9	29%	65%	1264.9	68	NA	54.5	.06	5.8%
Agriculture, Forestry	30	1.7	5.4	11.2	3.4	47%	87%	230.6	70.5	NA	16.6	.40	5.2%
All Non-Mfg	8085	2.9	5.4	11.0	8.6	35%	77%	514.9	75.5	NA	96.6	.08	-
Mining and Quarrying	2212	1.4	2.2	3.3	19.6	53%	97%	341.7	28.5	.08	18.5	.05	.1%

industries. In general, cross section work has been a good deal less successful in accounting for what certainly appears to be a more complex pattern of variation than times series analysis, and the obvious moral to draw is that this is a lacuna worth filling.

II.5: The Occupational Variation in Strike Activity

The simplest occupational distinction to be made is between manual and non-workers, and information on this is presented for 1966-73 in Table V.

Despite a long term decline in the number of strikes initiated by manual workers, they were involved in about 12.5 times as many strikes as non-manual workers; these strikes were, on average, about half the length of those involving non-manual workers (the probability of a strike lasting more than 10 days is nearly twice as great when non-manual workers are involved) but involved twice as many workers. What is more, it was also the case that a much lower fraction of manual workers strikes were official (4% compared to 14%), despite much the same percentage being concerned with pay issues. Making a dispute official had, however, a particularly large effect on the resulting length of manual workers strikes, whether they concerned pay or not; it was only for official pay disputes that large participation rates were recorded for non-manual workers.

Manual workers are thus far more likely to come out on strike and to do so in mass, but it requires official status to substantially reduce their probability of ending a strike on any given date during its occurrence. Non-manual workers call far fewer strikes and participate less (save when officially sanctioned strikes concerning pay are called), but are also less likely to call

MANUAL

TABLE V : STRIKES BY OCCUPATION

	Number	Mean Length (Days)	Medium Length (Days)	Std. Deviation (Days)	% 1 Day	% 5 Days or Less	% More than 10 days	Skewness (Days)	Workers Directly Involved (Mean)	Workers Directly Involved (Median)	Workers Indirectly Involved (Mean)	Workers Indirect (Median)
All Dispute	18090	6.248	2.951	11.309	26%	72%	14%	7.306	739	84.4	110.9	.06
Official Disputes	706	26.860	17.682	28.870	41%	18%	67%	2.644	2527	66.0	93.6	.19
Unofficial Disputes	17276	5.409	2.823	9.021	26%	75%	12%	8.448	453.6	89.7	114.8	.06
Pay Disputes	9525	6.764	3.342	10.867	21%	68%	16%	6.494	1045.3	94.5	113.2	.07
Non-Pay Disputes	8565	5.674	2.494	11.756	30%	77%	12%	8.058	309.1	74.6	107.6	.04
Official Pay Disputes	372	26.707	20.50	24.691	4%	19%	70%	2.063	4034.7	99.6	137.1	.22
Official Non-Pay Disputes	334	27.03	15.64	32.95	4%	17%	64%	2.803	412.4	50.5	32.9	.31
Unofficial Pay Disputes	8172	4.8	2.406	8.969	32%	79%	10%	9.146	567.1	93.5	110.1	.07
Unofficial Non-Pay Disputes	9104	5.956	3.222	9.032	22%	70%	14%	7.931	293.1	80	121.3	.04

NON-MANUAL

All Disputes	1149	11.692	3.378	19.776	26%	62%	26%	3.062	355.5	72.0	96.4	.09
Official Disputes	201	33.31	25.25	29.75	5%	14%	73%	1.309	2978.9	75.3	225.2	.10
Unofficial Disputes	1236	8.186	2.679	14.899	30%	69%	19%	4.041	249.2	72.4	91.3	.09
Pay Disputes	846	11.830	3.520	19.537	25%	61%	28%	3.059	459.5	75.2	119.6	.11
Non-Pay Disputes	603	11.499	3.202	20.122	26%	63%	25%	3.074	239.8	69.9	70.6	.07
Official Pay Disputes	117	33.03	25.37	29.22	6%	15%	76%	1.485	5263.3	90	343.2	.12
Official Non-Pay Disputes	84	33.70	25.0	30.658	5%	14%	69%	1.113	434.7	65.5	93.2	.07
Unofficial Pay Disputes	512	7.818	2.520	14.790	32%	70%	18%	4.381	264.4	75.2	110.2	.11
Unofficial Non-Pay Disputes	724	8.446	2.803	14.98	28%	68%	20%	3.821	232.2	70.1	70.1	.06

off a strike when once it is made, official or not. As within the results noted earlier regarding the differences between manufacturing and non-manufacturing sectors, this result suggests that differences in membership decisions and leader-member relations are to be found between white collar and other unions. In particular, it is not obvious that the latter do not impose real strike costs out of proportion to their size or their inclination to resort to the strike weapon in the first place.

II.6 A Summing Up

Strikes in practice involve four types of decision: to initiate, to participate, and to continue and to make it official, and it is clear from what we have seen that the underlying determinants of these decisions vary in rather different ways over time and, perhaps more importantly, across industries. Thus, for example, it seems that the decisions to initiate a strike and to terminate it when once it has started may be inversely associated over the trade cycle, across industries, and between broad occupational groups. The interaction between union leadership and membership centering on whether or not a strike ought to be made official seems of crucial importance to the sequence of decisions regarding the continuation of a strike already started, while participation seems a question of issue, status, and, perhaps, occupational group.

III. Strikes in Theory

Strikes in theory can be thought of either as an integral part of an ongoing formal bargaining process, or as largely irrelevant to it; they can never be imagined, however, to be "the" solution to a bargaining process, since

the problem in the bargaining is never "whether to agree" but rather "when to agree, and on what terms". ^{16/} Hence, any bargaining theory which has as a final solution the occurrence (or not) of a strike is fundamentally incomplete, and any bargaining theory that allows for the logical possibility of a strike occurring must contain within it the seeds of a theory of strike duration.

Strikes thus are a part of the bargaining process in the sense that they are a strategic but temporary disagreement, or they are largely irrelevant to it in the sense that they have no particular strategic goal in mind and would be liable to occur whatever the issue under consideration is. From the first point of view, strikes could play three rather different roles: they may be errors or accidents, pointing out to all parties that an impasse has occurred during a particular bargaining round, and signalling the need for a rethink of tactics; they may also be a learning process during which mutually inconsistent expectations are given time to adjust to realities; and, finally, they may represent credible commitments underlying some current or future threat. Strikes that are irrelevant to any particular bargaining process are those whose occurrence is largely independent of the issue under dispute, and can arise either because they are a profitable activity for the firm, or as a vent for frustration on the part of the workforce. Each of these five roles would, if true, throw up strikes of a certain character, and the task we have set ourselves here is to make inferences from observed character to supposed role. Clearly, some limited inference will also be possible from supposed roles to bargaining theories and, as this last step is of great interest, we shall confine our discussion of roles to those of each type as observed in one or two well known bargaining models. ^{17/}

III.1 Strikes as Errors or Accidents

Economists have, for quite some time, harboured the deep suspicion that there is no satisfactory reason at all for strikes to occur. While one can think of many examples of this point of view, Hicks is a good place to start (1968; the first edition was 1932). In his models, the pre-strike expectations of management and the union are embodied in the well known "employers concession curve" and "unions resistance curve", the intersection between which: "... is the highest wage which skillful negotiation can extract from the employer." (pp. 144) The 'strike' implied at that intersection is that which, if threatened by the union, would make the employer willing to concede the wage at the intersection; that wage, in turn, is such that the union would be willing to stay out for a strike of the threatened length. These are both ex ante (or, pre-strike) views; since it is clearly less costly for both parties to settle for that wage in the absence of a strike than incur strike costs, it follows that: "... the majority of actual strikes are doubtless the result of faulty negotiation ... " (pp. 146) and, in particular, "... the general presumption is that a strike is a sign of failure on the part of union officials ..."^{18/} (pp. 146).

This "sign of failure" need not arise from irrationality or calculation errors, for rational decision making can involve the deliberate taking of risks which lead to "accidents" when there is uncertainty. Since there are costs in terms of outlays and time to become informed, decisions about incomplete information collection may be made in full appreciation of the possible consequence that this may occasion a temporary disagreement or strike (Addison and Siebert, 1981). Alternatively, and abstracting from such information costs, "... it can be rational for bargainers to take actions that

imply a positive probability of disagreement, an outcome ex ante inferior for both to outcomes feasible through negotiation" (Crawford, 1982, pp. 608; the arguments here derive from Schelling, 1960). The key to this second argument is that rational agents, if they credibly commit themselves to certain positions, can gain a bargaining advantage at the cost of some likelihood of impasse. Such credible commitments must be irreversible (or relatively so), during (relative to the bargaining period) and they serve to convert the bargaining process into something of a race to make such commitments. Having both committed themselves to incompatible positions from which movement is restricted, an impasse is reached which cannot be quickly resolved; a rational commitment decision takes the risk of this "accident" into account so that, while it is unfortunate, a strike can hardly be called an error.

While they are somewhat different, the two notions of "strikes as errors" and "strikes as accidents" can be considered broadly as one view. The question that arises is: who is making the decisions, taking the risks, making the errors, or creating the accidents in this 'model'? Since these are all terms that do not lend themselves to easy application to collective decisions, the principal agent bargaining with management in this model must be viewed as the union official (albeit under pressure from his workforce). Given this, however, the participation decision is strangely neglected, since it is by no means clear some or most of the workforce involved will naturally choose to sustain an error of judgement, or an accidental outcome of the union leaderships taking of risks. But, the most problematic aspect of the view of strikes as errors or accidents is that it has almost nothing to say on strike duration, for there is nothing in this model to suggest that strikes would play a substantive role in the complete bargaining

process which culminates in an agreement. That is, the occurrence of strikes is seen to play no role in altering the strategic positioning of either side, and so cannot affect the outcome. Finally, return to the question of strike initiation when strikes are errors or accidents. Bargaining is essentially a repeated game, and it is more than clear that environments which generate accidents will include basic institutional or protocol changes involving the agents who make such mistakes (see Neuman and Reder, 1980) to minimize the future occurrence of such costly accidents or errors. It follows that the view of strikes as accidents or errors implies the prediction that strikes will be random, and certainly rather short. The latter follows from the idea that a strike, being a ghastly and costly error, ought to induce rapid correction by rational, reasonably informed individuals; such correction can and will be rapid because the only function of a strike is to make plain to all the existence of a disagreement. Strikes ought to be random in the sense that a marked persistence of striking in particular establishments or industries is inconsistent with reasonable accident prevention behaviour.

The vast majority of UK strikes are very short affairs, but there are three reasons for not taking this as a sign that these strikes are errors or accidents. First, it is clear that strike incidence is not random, being noticeably cyclical, industry specific, intensive in large plants, and particular to manual occupations. It is also usually unofficial, although for small groups this may not present a major problem to this model. While one need not insist on complete randomness, it is hard to believe that such systematic variation is consistent with costly accidents and their prevention. ^{19/} There are also a reasonable number of rather long strikes that occur (many of which with official

status) and this presents a second problem. Since long strikes are not consistent with this view of the bargaining process, it is hard to imagine this theory successfully describing such official strikes despite the fact that this is its obvious domaine of applications. If we insist on applying it to unofficial strikes (which are both more frequent and shorter) it becomes difficult to identify who is taking the risk of generating an accident, or who is making the error which leads to a strike. Moreover since a significant minority of unofficial strikes are long and a majority of long strikes are unofficial (or quasi-official?) it also seems inapplicable to these occurrences. The third problem concerns the question of issues. Pay bargaining is very much a repeated game, and, although the environment within which it occurs can change markedly, this regularity stands in marked contrast with non-pay issues which are more often one-off. The regularity of pay bargaining ought to insure the erection of accident minimizing institutions and this, in turn, suggests that if strikes really were accidents, there would be a much lower, much more random incidence of pay related strikes. This is clearly inconsistent with what we have observed.

The conclusion would seem to be that the view of strikes as "accidents" or of "strikes as errors" is basically untenable. Of course, strikes are accidental in the sense that everything has a stochastic element, and in the sense that bargainers take risks, make incompatible commitments, and call strikes for mistaken reasons, but this is hardly the point. The line of argument we have examined assigns to strikes absolutely no role more important than that of signalling that an impasse has been reached, and this seems to be inconsistent with the patterns of strike behaviour observed.

III.2 Strikes as a Learning Process

The justly celebrated model of Ashenfelter and Johnson, (1969), has popularized the notion that strikes may play an essential role in the bargaining process by assisting the modification of mutually inconsistent expectations.^{20/} The model distinguishes three agents: managers, union leaders, and the rank and file. Union leaders are hypothesized to exercise a moderating influence, assisting to reduce rank and file demands to reasonable levels, and presumably seeking to influence management.^{21/} Workers, in a manner unspecified in the model, generate expectations which, through the pure passage of time, moderate themselves according to a "learning function" (pp.39, footnote 11) towards presumably reasonable levels: "...the basic function of a strike is as an equilibrating mechanism to square up the union membership's wage expectations with what the firm may be prepared to pay..." (pp.39).^{22/} Management, the only party that: "...can reasonably vary its wage offer" (pp.39) faces the choice between acceding to the last pre-strike union demand, or "taking a strike" in the hopes of obtaining agreement on a wage after a strike of "optimal" length, S^* ^{23/} This latter is determined by factors collectively X , including the wage that would be acceptable to workers after a strike of infinite length, the initial union demand, discount rates and bargaining horizons, the rate of learning by workers, the parameters of cost and demand functions, fixed costs, inventories and so on (not all of these are explicit in Ashenfelter and Johnson). Given the function $S^* = S(X)$, Ashenfelter and Johnson argue that the probability of a strike, p , is determined by these same factors (i.e. a strike occurs where or when there is the most need for learning), so that $p = p(X)$, $p'(X) \geq 0$ and $S'(X) \geq 0$.^{24/}

They also argue (in a slightly more ad hoc fashion) that "internal union dissention" will follow a series of less than satisfactory (vis-a-vis workers expectations) settlements signed by union leaders; these are, presumably, unofficial strikes.

The basic heart of this model is the role played by the pure passage of time and the tension between workers and union leaders, the algebra is essentially a determination of $S^* = S(X)$, and a further characteristic feature of the model is the use of this relation to argue that $p = p(X)$. This last stage seems clearly at odds with the data, for it predicts a high frequency of long strikes since those are the most probable. One could try to salvage this point by developing the argument that: "...the outbreak of a strike...has the effect of lowering the rank and file's expectations due to the shock effect of the firm's resistance" (pp.37) into the proposition that workers learning is instantaneous given that a strike occurs (or nearly so), but this clearly brings us back very close to the view of strikes as accidents. The role of learning suggested by this model is inconsistent with the empirical observation of the high frequency of short strikes which seem to point to a lack of very substantive learning occurring in the overwhelming majority of strikes. Further, if one recalls the repeated game framework of bargaining, it is clear within any one bargaining round learning occurs which is germane to future rounds. It follows immediately that a model like that of Ashenfelter and Johnson which considers bargaining rounds taken in isolation is bound to over-stress the "within round learning" relative to the "between round learning". Hence, empirically and theoretically, it seems impossible to see learning playing an important role in most strikes.

The Ashenfelter and Johnson model with the US institutional perspective perhaps ought to be applied only to official strikes in the U.K. and here it looks rather better (this is consistent with the remarks of Knight, (1972), pp.281 and Mayhew, (1979), pp.6). Such strikes are generally of reasonable length and there is a positive association between strike length and strike incidence. This restriction of application is an important limitation, of course, for the vast majority of unofficial strikes simply cannot be attributed to "internal union dissension", but it is still important to understand official strikes. To explore this point more thoroughly, it is necessary to consider "strikes as a credible commitment".

III.3: Strikes as Credible Commitments

In focussing attention on official strikes, one is concentrating on the relationship between workers and their union leaders, upon the status decision and its effect on the other strike decisions. In Ashenfelter and Johnson, such strikes occur because there is a 'need' for learning. As union leaders are rather better informed and realistic than their members; their role is to modify and mollify, and one supposes that disagreements become official when these officials perceive or are persuaded that a given complaint needs to be taken seriously in this manner. One could, however, view leaders as playing no moderating influence at all. Rather than entering disputes where workers expectations need to be reconciled with reality, one could view their intervention as recognizing and legitimizing the position taken by workers, thus raising and hardening their expectations. This alternative scenario occurs if union leaders use strikes as credible

commitments to underlie current and especially future threats.

The argument hinges on the recognition that bargaining is an ongoing, repeated game, process. Clearly, intervention by union leaders to solidify and harden workers resolve increases the costs to employers of any given dispute and, no doubt, serves to modify both sets of positions during the course of that particular process. However, a strike called and successfully executed in the current bargaining process gives credibility to threats in subsequent bargaining rounds. ^{25/} It is, as it were, an investment from the point of view of future bargaining rounds and the role of union leaders in hardening resolve is crucial, for it is their credibility that is at stake. In such cases, the driving force behind initiation, continuation, and participation decisions is liable to be union leaders and this stands in marked contrast to what might be expected to occur if strikes occurred merely to allow learning to occur. Thus, the initiation decision arises from the interest felt by workers in the issue concerned, and its strategic potential for revealing the true strength of union officials. Participation is thus a consequence of peer group and union leader pressure, and reflects the extent to which leaders are able to persuade members, and create a leader-rank and file harmony of views. The continuation decision (from both the point of view of management and the union) is a decision which hinges on reception by one side or the other of a clearly perceived signal. That signal is, of course, a recognition of the importance of the particular issue and, more importantly, a recognition of the commitments made. Notice that long strikes do not necessarily represent more substantial commitments made (they could represent a belated recognition of failure to have successfully done so); however, since a

commitment once made need not be repeated soon, one expects an inverse association between official strikes of some length and all strikes. This latter is a weak contrast with the "strikes as learning" model in which a long strike represents a large change in workers aspirations during a strike, and hence disappointment is liable to be manifested in a sequence of subsequent, largely unofficial, strikes reflecting "internal dissension".

Even so, it is difficult indeed to discriminate between the view of official strikes as "learning" or as "credible commitments" and more or less impossible to do so with our data. However, it does seem that on purely theoretical grounds there are reasons to prefer the latter view, and the issue is bound up with the fact that most bargaining processes are ongoing, repeated game, discussions. As remarked earlier, this is what gives rise to the possibility of credible commitments, and it naturally changes the emphasis of theorizing from intra-strike to intra-bargain learning to inter-bargain learning. That is, the learning done during a current strike is germane to the position taken in future bargaining rounds and the unrealistic expectations which create the current need for learning arise largely from the outcome of past bargains. While we are thus inclined to stress the view of strikes as strategic investments one must not, of course, lose sight of the fact that strikes are also germane to the particular issue under consideration --- issues are not cynically chosen for official intervention simply for their investment value. From the point of view of the particular issue in question, a strike will clearly serve to reveal and modify views about the costs and benefits to both sides of selecting particular strategic positions, but that is not the

same as saying that the various dimensions of strikes are determined by the need for, and facilitate the occurrence of learning.

III.4 : Strikes as Profitable Activities and Strikes as Vents for Frustration

We have thus made some progress in understanding something like 5% of U.K. strikes. No doubt there are also a significant number of unofficial strikes which, because of tensions between union members and union leaders, are not made official for one reason or another, but which serve to occasion some learning or provide a basis for future strike threats.^{26/} This leaves, however, the vast majority of strikes (around 90% according to our data) more or less unexplained.

Implicit in the type of reasoning thus far used are the notions that strikes belong to some particularly bargaining process concerned with the resolution of some particular issue, and that something must account for the reason why apparently rational and reasonable agents would be willing to incur such costly activity. Let us cast aside these two presumptions and explore the notion that strikes are more or less irrelevant to bargaining, and that quite frequently they incur absolutely no substantial real costs for the agents who initiate them.

We commence with the view that management may choose to deliberately provoke a strike at some particular time (by inducing a large disagreement over what ever issue happens to be most handy at the time) in order to increase its profits. One argument along these lines (Thompson, 1980; Maloney et al, 1979) is that, in industries where there is appreciable intertemporal substitutability in demand, strikes are a device for cartelizing a market:

"... strikes persist for the benefit of the unionized industry ... by initially offering sufficiently low payments to labour, (it) induces a strike decision by the union. The lower level of industry output during the strike may easily induce a greater industry capital value through higher prices for the outputs produced in non-strike locations or time periods" (Thompson, 1980, pp. 641.)^{28/} Somewhat less fancifully, direct inspection of the likely costs of strike activity supports the notion that it is not always in the interests of an employer to avoid a strike. In this context, it is worth recalling the costs of strikes to the parties involved. The costs of calling a strike are largely borne by workers (and the union if it is official), increase with participation rates, balloting costs and so on. The cost to a worker during a strike are financial, are generally borne by his or her household (and not the state or the union), but appear to be sufficiently light that: "... workers are prepared to return to work when they become convinced that they cannot get an improved offer from the employer. This situation becomes apparent to strikers long before acute financial pressures force them into the necessity of returning to work" (Gennard, 1981, pp. 343).^{29/} For the firms, costs incurred during a strike arise from revenue foregone and the need to cover fixed costs; they are mitigated by intertemporal substitution by consumers and the run down of inventories; there are also certain direct costs incurred by the firm (publicity, warehousing costs, security costs). Notice that these costs are almost all duration related and that there are no real costs to the firm inducing a strike (save, perhaps some short run disruption of production runs). Therefore, as an outlet for excessively high inventories, and as an alternative to short term working and other labour capacity adjustments, one can see some substance to the argument that relatively short strikes are (or can be) profitable for the employer. Since there are very systematic differences between industries (and over time) in

inventory buildup, the costs of short run labour adjustment, and so on, then it is clear that (unlike "accidental" strikes) such "profitable" strikes will not necessarily be randomly distributed over time or across the economy.

There is an analogous role which strikes can play from the point of view of the workforce. Since small groups of workers have very little costs of calling a strike and incur rather minor costs during short strikes, then one can easily imagine short strikes allowing such workers to release tensions inherent in the work environment.^{30/} With such strikes, initiation decisions are the only ones of importance, for participation follows immediately from the need to vent frustration; duration is naturally limited by the lack of association of such "noisy" strikes to particular issues (although this could change by the mere occurrence of such a strike, by managerialists reaction to it, or by events in it's early stages). Clearly there are systematic variations across industries in work environment and systematic differences over time in the willingness of workers to vent such frustrations, and so such short strikes need not be randomly distributed across industries. Unlike the "strikes as accidents" view, such strikes, being "profitable" in some wider sense, need not occasion the construction of "accident preventing" institutions and protocols, and so may persist in certain industries over great periods of time. Since by far the most obvious environment creating the need for a vent for surplus are those created by large plants and their need for regimentation (e.g. Scherer, 1974, plus the literature mentioned in footnote 14 above), it is clear that there is some sound basis in the data for this interpretation.

III.5: A Summing Up.

One thing is clear, and that is that strikes cannot reasonably

be considered as "accidents" or "errors". The vast majority of strikes appear to be simply "noise", unconnected in any fundamental sense with ongoing bargaining processes, and either substituting for costly inventory or labour adjustment, or just venting steam in a particularly loud manner (this is the "voice" option; see Hirschman, 1973, and discussions of other uses of the "voice" option by Freeman, 1976 and 1980). A relatively small number of strikes are bound up in the intricate intertemporal process of bargaining and logrolling that collective regulation of the workplace involves; such strikes are "real" in the sense that they play a fundamental role in the resolution of particular issues. It follows immediately that the role of bargaining theory in understanding strike patterns is limited to a relatively small class of events.

IV. Some Reflections.

As with any social event, strikes present an interesting subject of study for social scientists. In stressing the types of decisions made by different agents and in identifying and underlining two different types of strike phenomena, we have here contributed something to the simple understanding of such phenomena. There are, needless to say, many interesting questions to be answered and much hard work to be done before such a task is completed, but we think the routes to be followed have been fairly clearly identified in what has gone above. Hence, in this concluding section we propose to make a number of wider reflections.

A first issue is rather easy to dispense with. Since there is no reasonable way in which one can view strikes as a solution to a bargaining problem, there is simply no way that they can be labelled as either "inefficient" or "Pareto-suboptimal". Further, since they cannot be reasonably

perceived as accidents or errors, they also cannot be considered as "bargaining failures". One hopes that application of such pejorative labels will soon disappear from professional discourse, and that the welfare analysis of strikes will take cognis of their purely instrumental role in the distributional issues which are the heart of worker-management relations.

A second issue is more substantial, and concern modelling wage bargaining, and the wage-price spiral. It is not infrequent to find strike frequency variables or even strike frequency equations in such models, and this raises an interesting problem. In particular, if, as we have claimed, there are really two type of strikes, then clearly those relevent to such models are the "real", not the "noisy" strikes. This, in turn, presents the interesting problem of separating the two empirically in a manner such as to facilitate their input into wage-price models. Similarly the use of strike data to test bargaining theories must confront not only the problem that not all bargaining processes involve strikes, but also the problem that not all strikes pertain to ongoing bargaining processes. Once again, resolution of the problem involves distinguishing "noisy" strikes from the rest.

Finally, there is the vexed question of trade unions and their effect on productivity. In general, one must expect that any association between strikes and productivity is but a pale shadow of the true effect trade unions have on productivity, ignoring as it does all their contributions in organizing the workforce and the process of production, and concentrating only on disputes. But, more fundamentally, one must consider the counterfactual very carefully. "Noisy" strikes - those of interest in this context - can be productivity enhancing relative to a situation in which workers are forced to use other "voice" options (such as quits, absenteeism working to rule, and so on), or relative to situations

in which firms are forced to use other methods of adjusting labour capacity or excessively high inventories. It is just not clear that a noisy shop is unproductive relative to what it would be were it to be remodelled along the lines of a Trappist monastery, and manned by robots.

Notes

1. However, for a recent effort along these lines, see Addison and Siebert, 1981, pp. 398-402.
2. For example, some work in the US seems to show that unions make later but larger concessions than management; see Comay & Melnik (1972) and Comay et al, (1974). Attempts to 'test' the Ashenfelter and Johnson bargaining model by February (1978) and Nash, bargaining theory by Hamermesh (1973), Brognanno and Dworkin (1975), and Bowlby and Schriver (1978), (see also the remarks by Svejnar (1980) (on these three papers) must be considered a little speculative.
3. A further problem is that it is frequently unclear whether a particular bargaining theory is positive or normative (that is, a theory of arbitration). For various opinions on the status of Nash's theory, see Wagner (1957, 1958), Harsanyi (1958) and Bishop (1963), pp. 374-7.
4. The only empirical study which we found that explicitly considers the distribution of strikes by length (and so tries to estimate hazard probabilities) is Lancaster (1972); the problem has come to be viewed this way in the literature on unemployment, and Lancaster (1979), Nickell (1979a, 1979b), and Lancaster and Nickell (1980), have all made inferences about the distribution of unemployment by spell length.
5. This issue has been discussed by Fisher (1973) and Creigh (1978), Neuman (1980), claims that stock market investors do not seem to be persuaded of this point. See the discussion in Section III.4 below.
6. The main data base we have used here is described in Smith et al., (1978), who present further detailed information on strike patterns for this period. Brown (1981), pp. 97-101, contains a useful discussion of the limitations of official U.K. strike statistics and the rule of thumb that may be derived from their work is that the incidence of short stoppages is severely under-recorded but that working days lost figures are, on the whole, rather more reliable.
7. These are fairly closely times with waves of corporate mergers, stock market booms, and, a little less clearly, waves of union mergers; see Hannah (1974), Geroski (1982), Buchanan (1974), and Geroski and Knight (1984).
8. The mean, 3433.1 is swollen by one strike involving about 1,500,000 workers; neglecting it reduces the mean to about 1890.
9. The common practice in bargaining models of assuming that non-wage issues "... have monetary equivalents and are imputed to the contracted wage" (Ashenfelter and Johnson (1969), p. 27, footnote 9), thus seems a little suspect. Moreover, non-wage issues affect individuals in a given workforce even more unevenly than wage issues, and so can be expected to complicate the official status decision even more.

10. For example, see Knight (1972), Shorey (1977), Pencavel (197), Davies (1979), Mayhew (1979) and Smith (1980), contain overviews of the subject.
11. Measuring by looking at deviations of log GNP from its trend, 1968 and 1973, are 'boom' years for our sample, and 1966 and 1972 are 'slump' years. The average length of all disputes for the two pairs of years are (40.2 and 63.4) respectively; for official disputes the figures are (76.5 and 56.8); for pay disputes (49.6 and 106.8); for unofficial disputes (38.9 and 53.8); and for non-pay disputes (32.6 and 21.2).
12. One can go somewhat further by developing the result by Pencavel, (1970) that the time series strike frequency equation is unstable as between the 1950's and 1960's, and thus that there are important 'structural shifts' in the underlying determinants of strike behaviour. Pencavel's own interpretation concerns aggregation bias, but we are inclined to suspect cyclical factors.

- 12a. For a full statement of these arguments see Geroski and Knight (1984).
- 12b. Empirical evidence in support of this argument is contained in Geroski and Knight (1983).
13. For example, see Shorey (1976), Geroski et al., (1982), and Geroski and Knight (1983).
14. There is, it appears, an extremely important source of intra-industry variation in strike incidence; viz. that large plants are subject to many more strikes than small ones. See George et al., (1977), Edwards (1981), Shorey (1975), Ingham (1970), Prais (1978), Edwards (1980), Churnside and Creigh (1981), Smith et al., (1978), Chapter 8; Turner et al., (1977), contains interesting work on management conduct and strikes and Brown (1981), Chapter 5, on bargaining structure and strikes.
15. Bishop (1963), pp. 560, contains the kind of argument we are addressing: "... the essence of a bargaining situation is that, although the parties have conflicting preferences as among the various eligible points on their utility frontier, they will both be better off if they can agree, as compared with the consequences of non-agreement". Part of the problem seems to have arisen from the overriding concern of bargaining theory (and particularly Nash bargaining theory) with determining a solution, rather than with describing a process; see Trifon and Landon (1974), the behavioural work of McKersie and Walton (1965), and also the remarks of Coddington (1968), on Pen's (1952) theory.
16. The distinction between the several types of decision which we have argued define a strike is not utilized in this literature, and the relationship between the incidence, the length and the participation of a strike is poorly felt in the many models which concentrate on discussing only strike frequency, or duration.
17. Nash's bargaining theory is frequently alleged to lead to the view that strikes are irrational, but this is surely not the correct way to interpret the theory. In Nash (1950), the symmetry axiom suggests an equal bargaining ability between players and so must be taken to imply

that a strike would accomplish nothing; asymmetry, on the contrary, is caused by exactly those 'real factors' which determine who 'wins', and so would determine who would 'win' the strike. Hence, if anything, strikes are irrelevant or accidental in Nash theory, being subsumed in the solution. Hicks and Nash are often lumped together as a similar strike theory, and it is worth remarking that the Hicks model is rather superior because of its sense of the passage of time (for a more comprehensive view, see Cross, (1965) and its sense that the consequence of a temporary disagreement is a strike of a certain length. (Such notions were taken up by Bishop (1964) and Foldes (1964)). Another advantage of this Hicks model is that it foresakes the full information rationality of Nash, stressing the ex ante nature of pre-strike views and paving the way for later work on learning, expectations revision and so on; for a general discussion, see Coddington (1968) and for recent work on Nash bargaining theory, see Roth (1979).

18. Some environments are obviously intrinsically more accident prone than others, and so are bound to be slightly more accident prone even after all reasonable accident prevention measures have been taken. Even still, it is hard to believe that long term systematic associations between accidents and certain environments do not lead to alterations in behaviour; as a matter of interpretation the heavy strike incidence in certain environments must be due to the factors which make accident prevention costly, and calling them accidents is not particularly useful.
19. Models in which persuasion through waiting occurs include Bental and Comay (1977), Triffon and Landon (1974), Oswald (1980), Kraus and Melnik (1972), and Rabinovitch and Swary (1976).
20. A certain amount of ink has been devoted to the idea that workers are irrational in this model, either because of strategic asymmetry (see footnote 22 below), or because of the learning function. This latter can easily be given a "medium voter" interpretation (for a sketch, see Johnston (1972), pp. 844; see also Cross (1965), pp. 76 and Triffon and Landon (1974), for more work on concession rates and their change), and this is a natural way to introduce participation into the model.
21. It is difficult to see continual partial moderation of positions occurring in non-wage strikes; one imagines that this will have to occur through the adding or subtracting of a number of peripheral issues to the main bone of contention. That, in turn, suggests that non-wage 'learning functions' will define the group of issues to be agreed upon during the strike as much as they will trace modifications of points of view on any particular issue.
22. The strategic asymmetry underlying the model is that the firm is basically a 'Stackelberg leader', maximizing subject to the 'reaction function' (in this case, the learning function) of workers. A variety of opinions have been delivered on this subject, not all of which are directed at its possible game theoretic foundations, and the Stackelberg leadership case would seem to be a reasonable game structure if management is the only party which can reasonably alter its offer, as Ashenfelter and Johnston assert.

23. Johnston (1972) discusses this probability function in a somewhat more explicit and formal manner without altering the general point that it depends (more or less exactly) on the same factors which determine S^* .
24. This is recognised as far back as Hicks, who wrote "... some strikes were more or less inevitable for this reason" (pp. 146). The argument in the text contrasts with that of Crawford who seems to view strikes as the impasse created by other credible commitments, and not as the commitment itself (see also Schelling ((1960), pp. 27)).
25. We have said little about non-strike disruption, or unorganized conflict which seems generally correlated to strike activity (Edwards (1979) Bean (1975)). One naturally thinks of a continuum of expressions of discontent, some of which erupt into strikes, and some which, in turn, attract union leader intervention and official strike status.
26. This argument would seem applicable only to industry wide bargaining; firm by firm bargaining requires the kind of firm cooperation whose absence creates the need for a strike in this theory. It is also less clear how the unions gain from all of this.
27. See Gennard (1981, 1977), Cole (1975), Gennard and Lasko (1974, 1975), Duncan and McCarthy (1974), and Hunter (1974). These studies lay to rest the notion that strikes are state supported through supplementary benefits (although this may be the case in a very small number of very long strikes). Eaton (1972), produces some evidence for Canada suggesting that strikes may be profitable when due allowance for intertemporal effects are made.
28. The literature here is voluminous and includes discussions of "Union dissension" which have often appeared in analysis of the two tiers of UK industrial relations (HMSO, (1968), Brown (1981), Batstone et. al., (1977)); workplace organisation covers payment systems as well as strains arising from the struggle for shop floor control; see also the references cited in footnote 14.

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