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CLOSED SHOPS AND RELATIVE PAY*

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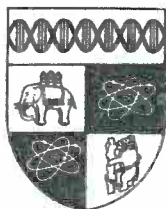
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It is usually felt that workers in the union sector of the economy earn more than they would if they worked in the non-union sector; and similarly that on average unionised plants pay higher wages than comparable non-unionised plants. Recent evidence suggests that the average union/non-union ceteris paribus wage differential in Britain may in fact be quite small, but that there is considerable variation around this average and that some groups of workers may obtain considerably larger differentials. Stewart (1983a) estimated a mean individual union membership differential for the manufacturing sector of around 8%, but found considerable variation with individual characteristics and across industries. Mulvey (1976), using aggregate industry-level data on coverage by collective agreements, found variation in the differential according to the level of bargaining and Geroski and Stewart (1986) found some evidence of difference in the differential according to the extent of coverage itself. The cummulated evidence clearly indicates that contancy of the differential is not an appropriate maintained hypothesis.

The early literature on the estimation of union/non-union wage differentials for Britain used industry-level data and suffers from a number of drawbacks as a result. Prominent among these are the problems of aggregation bias and of inadequate control for other relevant factors. The estimates lack stability and the evidence presented by Geroski and Stewart (1986) leads them to conclude that as a result of this instability little if anything can be usefully deduced from such aggregate-level studies.[1] More recent studies have utilised micro-data at either the individual level (Stewart, 1983a, Shah, 1984) or the establishment-level (Blanchflower, 1984) and have thus to some degree overcome these problems. These studies have all tended to find rather lower estimates of the average differentials as a result.

The existing micro-level studies still only represent a first step however and in some cases their evidence is hard to interpret. In the light of the evidence of considerable variation in the differential (Stewart, 1983a), models with separate union and non-union wage equations, allowing the differential to vary with characteristics of the individual or plant, are clearly required as a minimum. However the simple model with matching wage equations seems in turn likely to be over-restricted in an unsatisfactory way, since it implicitly assumes that the various bargaining procedures and arrangements present in British industry result in the same differential for an individual with a given set of personal and job characteristics. This is unavoidable with the available individual-level data. This paper utilises establishment-level data, from the 1980 Workplace Industrial Relations Survey[2], to examine the impact on the differential of the industrial relations setting in which the bargaining, from which the differential results, takes place. Given the diversity of industrial relations institutional settings in which the bargaining takes place and the plethora of collective bargaining arrangements across plants, it seems unrealistic to expect all to result in the same magnitude of wage differential. Indeed, if some variant of the monopoly model of union activities were used to underpin the analysis, pre-entry closed shops would be predicted to give rise to larger differentials ceteris paribus than union recognition in a plant without any form of closed shop arrangement. The impact of closed shops provides the first theme of the paper. The second theme of the paper allows that a significant differential may only be received by some subgroup of workers in the very heterogeneous "union sector". This division is viewed as rising from the differences in institutional settings in which the bargaining takes place. The paper attempts to identify the appropriate classification of plants into those where a differential results and those that are in the "union sector" but where average pay is not above the "non-union wage".

Whilst empirical investigation of union wage differentials is of interest in its own right, it is also part of a broader question of what factors effect the wage structure and how important they are. Since the wages of the majority of manual workers in Britain are determined by some form of collective bargaining, it is clear that examination of the impact of the variety of institutional settings in which this bargaining takes place is important to an understanding of the wage-determination process. The next section of the paper describes some of the more important features of the range of collective bargaining arrangements to be found in British industry and considers appropriate ways to capture them in the empirical model to beestimated. Section II of the paper describes the estimation procedure that is necessitated by certain features of the data used and then considers the derivation of estimated pay differentials in the generalised form of model used together with the construction of standard errors for them. Section III presents the results of the investigation and some tests of the appropriateness of the specifications used. The modelling strategy adopted there may be characterised as a search for the parsimonions taxonomy of the variation in the differential with respect to bargaining characteristics. The conclusions of the study are presented in the final section.

I.   Collective Bargaining Arrangements in British Industry

Whilst this paper examines the impact on the wage differential of a number of characteristics of the collective bargaining arrangements involved, one of the prime focuses is on closed shops and on the differences between establishments where they are present and similar establishments where unions are recognised for bargaining purposes but no closed shop arrangements exist. The closed shop is an important feature of the industrial relations landscape in Britain. The survey by Dunn and Gennard (1984) indicates that at least 5.2

million employees (23% of the workforce) were covered by some form of closed shop arrangement in 1978. This compares with a figure of $3^3/4$ million (16%) calculated by McCarthy (1964) for the early 1960's. In the early 60's McCarthy found the closed shop to be highly concentrated. Five industries - coal-mining, iron and steel, engineering, shipbuilding and printing - accounted for almost two-thirds of the closed shop population. By 1978 however they accounted for less than one third. A particular growth area had been the nationalised industries, but significant contributions to the growth were also made by such diverse manufacturing industries as food, clothing and chemicals.

Theoretically one might expect the bargaining power of trade unions to be greater in closed shops than elsewhere and hence the observed wage differential to be greater.[3] However this expected increase in bargaining power should not be overstated. In the Warwick survey of manufacturing industry (see Brown, 1981) only 14% of the managers with experience of the closed shop saw the closed shop as increasing the strength of the manual unions to the disadvantage of management. More generally half of the managers saw no disadvantage in the presence of a closed shop and three quarters saw advantages in the practice. They may see benefit, for example, in the formalisation of agreements and procedures. Since withdrawal of union card means loss of job this increases the authority of union representatives and makes it easier for them to take hard decisions on for example rationalisation.

About 16% of those in closed shops in 1978 were in pre-entry closed shops. That is to say situations where the individual has to be accepted as a union member before being considered for employment. Such arrangements apply particularly to dockers and merchant seamen, to certain parts of industries as diverse as chemicals, textiles and shipbuilding and most notably to the national newspaper industry. The essential feature of the pre-entry closed

shop is that the union has control over the supply of labour to the firm at the point of hiring. Whether as a result of this or as a result of increased bargaining power (through, for example, the strike threat), one might expect any relative wage effect to be heightened in pre-entry closed shops.[4]

The evidence from the Workplace Industrial Relations Survey indicates that establishments in which there is some form of closed shop arrangement for manual workers typically pay more than establishments without closed shop arrangements but where there is union recognition, which in turn typically pay more than those where there is no union recognition. Of course establishments in which there are closed shop arrangements differ in a number of ways from those in which there are not and likewise establishments where there is union recognition differ in a number of ways from those where there is not. Notable amongst these are the sizes of the establishments involved. Whilst in establishments with 500 or more employees there is union recognition for the manual workers in over 90% of those in the sample, in those with less than 100 employees this is so in less than a half. Similarly whilst over a half of the "500+" establishments have some form of closed shop arrangement for at least some of the manual workers, less than a quarter of the "below 100" establishments do. Since larger establishments tend to pay more than smaller ones, establishment size is clearly an important characteristic to control for when considering ceteris paribus pay differentials.

A subsidiary issue addressed in this paper is the impact of establishment size on average pay and its interaction with the collective bargaining arrangements. Several studies have provided evidence that larger plants pay more than smaller ones ceteris paribus.[5] There are a number of possible explanations for these observed differences. Employers may share the benefits of increased efficiency with their workforce. The difference may represent compensation for the increased regimentation required in larger plants. It may be a premium paid to recruit more dependable workers, or

workers more able to slot into regimented production processes. Large plants may have to pay more as a result of having to draw their workers from a wider catchment area than small plants. Or it may be due to differences in collective bargaining arrangements or product market structure. In the case of a number of these potential explanations we might expect the magnitude of any differential associated with plant size to vary between the unionised and non-unionised sectors. Hence union wage differentials might be expected to vary with plant size.[6] In considering the potential explanations for a plant size pay differential instanced above it is worth noting that investigation of the interaction with collective bargaining may throw some light on this as well. If the difference results from workers extracting a share of the benefits to the firm, then we might expect unions to be able to increase this share, particularly in a closed shop situation. If on the other hand the premium is a compensating differential required by the market, then since trade unions tend to compress such differentials we might expect the opposite.

In addition to the closed shop discussed earlier in this section, there are many other features of the collective bargaining arrangements in an establishment that are potentially relevant to the magnitude of any pay differential. The impacts of a number of these are also investigated in this paper. Plants with a single recognised union for bargaining over the pay of manual workers are distinguished from plants with more than one recognised union. On the one hand one might argue that being the only union recognised by the employer strengthens the union's hand in the bargaining process. On the other hand this may mean compromise between different groups within the union and it might be that for some groups their possition is strengthened if they are represented by a separate union. This raises a related issue. A second distinction is made where there is more than one union recognised, according to whether there is joint or separate negotiating by these unions. Again similar arguments suggest that joint negotiating could either strengthen

or weaken the unions'• position. Another characteristic of interest is the
levels at which the bargaining takes place. Brown (1981) shows the movement
over the 1960's and 70's away from multi-employer toward single-employer
bargaining. It is interesting to enquire what the implications of this may be
for the wage structure. Are the differentials that result from
single-employer bargaining different, ceteris paribus, from those that result
from multi-employer bargaining? Mulvey (1976) and others using aggregate
industry-level data for the early 70's from the New Earnings Survey have found
that wages were higher when there was bargaining at the plant or local level.
Caveats concerning such aggregate evidence have been mentioned above and
elsewhere. It is therefore of interest to reconsider the issue.

II.   Estimation Methods and Pay Differentials

Whilst the many strengths of this data set for current purposes are
clear, a potential problem arises with the pay variable which is grouped.[7]
The respondent at the establishment is asked to place the gross weekly pay
(over the last month) of a "typical employee" in certain skill categories into
a number of groups. This is a common procedure in individual-level surveys
also. It is believed to result in a larger number of correct classifications
and a smaller number of non-respondents. This feature was also present in the
individual-level data used by Stewart (1983a). Suitable estimation methods
for such situations are described in Stewart (1983b). Inserting midpoints (or
any other arbitrary representative value) and using OLS will not provide a
consistent estimator. A consistent Maximum Likelihood estimator is described
below. The pay data on the Workplace Industrial Relations Survey is grouped
into 11 bands of width £10 (expect at the top) and there are open-ended
intervals for "up to £50" and for "£160 and over". An additional complication
not present in the individual-level data used in Stewart (1983a) is that

respondents were allowed to indicate more than one (adjacent) interval if this was thought appropriate.[8] This requires minor modifications to the likelihood function but complicates the estimation procedure only slightly.

The latent structure of the equation to be estimated may be assumed to be given by

$$y_i = \underset{\sim}{X}'_i \underset{\sim}{\beta} + \varepsilon_i \qquad\qquad (i=1,\ldots,N)$$

where y_i is the unobserved dependent variable (in this case the logarithm of average pay), $\underset{\sim}{X}_i$ a vector of non-stochastic regressors and $\underset{\sim}{\beta}$ a vector of parameters. The ε_i are assumed i.i.d. $N(0,\sigma^2)$. Hence the distribution of the unobserved dependent variable is given by

$$y_i \sim N(\underset{\sim}{X}'_i \underset{\sim}{\beta}, \sigma^2) \qquad\qquad (i=1,\ldots,N).$$

The observed information concerning the dependent variable is that it falls into a certain range

$$y_i^{LB} \leqq y_i < y_i^{UB} \qquad\qquad (i=1,\ldots,N).$$

y_i^{LB} may equal $-\infty$ or y_i^{UB} equal $+\infty$ if the observation is identified as falling in an open-ended interval. The likelihood of the observed sample is given by

$$L = \prod_{i=1}^{N} \left\{ \Phi\left(\frac{y_i^{UB} - \underset{\sim}{X}'_i \underset{\sim}{\beta}}{\sigma}\right) - \Phi\left(\frac{y_i^{LB} - \underset{\sim}{X}'_i \underset{\sim}{\beta}}{\sigma}\right) \right\}$$

where Φ is the cumultive distribution of the standard normal. Maximisation of L by some suitable algorithm provides consitent estimates of β and σ . Asymptotic standard errors are provided by inversion of the estimated information matrix.[9]

To understand the estimation within a least squares framwork consider constructing a "dependent variable" to provide consistent estimates of the parameters. This variable would need to be a consistent estimate of the conditional expectation $E(y_i| y_i^{LB} \leq y_i < y_i^{UB})$ .. Given the latent structure this is given by

$$E(y_i| y_i^{LB} \leq y_i < y_i^{UB}) = \underset{\sim}{X_i'}\beta + \sigma \left\{ \frac{\phi(Z_i^{LB}) - \phi(Z_i^{UB})}{\Phi(Z_i^{UB}) - \Phi(Z_i^{LB})} \right\}$$

where $Z_i^{LB} = (y_i^{LB} - \underset{\sim}{X_i'}\beta)/\sigma$, $Z_i^{UB} = (y_i^{UB} - \underset{\sim}{X_i'}\beta)/\sigma$ and ϕ is the standard normal density. Hence estimation of β and σ (by least squares) requires estimation of the conditional expectations and vice versa. The Maximum Likelihood estimator estimates these jointly and iterative estimation between the two (with a suitable correction to the least squares estimate of σ at each iteration) can be shown to converge monotonically to the Maximium Likelihood estimates.

Having estimated a suitable set of equations we wish to calculate pay differentials for different configurations of bargaining arrangements. A set of bargaining differentials may be defined for the i-th establishment as

$$\Delta_i^j = \frac{Y_i^j - Y_i^N}{Y_i^N} \qquad\qquad (j = 0, 1 \ldots, J)$$

where Y_i^N is what the average pay of this category of worker would be in the i-th establishment if there were no union recognition there, and Y_i^j is what it would be in the presence of union recognition and configuration j of bargaining arrangements. The pay-determination processes in the union-recognition and non-union sectors are assumed to be given respectively by

$$LnY_i^U = \underline{X}_i' \underline{\beta}^U + \underline{D}_i' \underline{\gamma}^U + \varepsilon_{1i}$$

$$LnY_i^N = \underline{X}_i' \underline{\beta}^N + \varepsilon_{2i}$$

where $\underline{X}_i$ is a vector of (non-bargaining) characteristics of the establishment; $\underline{D}_i$ is a vector of bargaining characteristics (largely binary variables) encapsulating the different configurations of bargaining arrangements; $\underline{\beta}^U$, $\underline{\gamma}^U$ and $\underline{\beta}^N$ are vectors of unknown parameters; and ε_{1i} , ε_{2i} are error terms. Y_i^j is taken to be given by Y_i^U with $\underline{D}_i$ set equal to $\underline{D}_*^j$, those values that represent configuration j of bargaining arrangements.

A convenient transformation of the differentials to consider is $\lambda_i^j = Ln(1 + \Delta_i^j)$, which is then given by

$$\lambda_i^j = LnY_i^j - LnY_i^N$$

$$= \underline{X}_i' (\underline{\beta}^U - \underline{\beta}^N) + \underline{D}_*^{j'} \underline{\gamma}^U + (\varepsilon_{1i} - \varepsilon_{2i})$$

$$= \underline{X}'_i \Delta \underline{\beta} + \underline{D}^{\bullet j}_* {}' \underline{\gamma}^U + \Delta \varepsilon_i$$

Thus its expected value is given by

$$E(\lambda^j_i) = \underline{X}'_i \Delta \underline{\beta} + \underline{D}^{j}_* {}' \underline{\gamma}^U$$

and the natural consistent estimator is given by

$$\lambda^j_i = \underline{X}'_i \widehat{\Delta \underline{\beta}} + \underline{D}^{j}_* {}' \widehat{\underline{\gamma}}^U$$

The average differential associated with the j-th configuration of bargaining arrangments is then given by

$$\widehat{\bar{\lambda}}^j = \underline{\bar{X}}^{U}{}' \widehat{\Delta \underline{\beta}} + \underline{D}^{j}_* {}' \widehat{\underline{\gamma}}^U$$

and the overall average union-recognition/non-union differential experienced by the establishments in the union sector by

$$\widehat{\bar{\lambda}} = \underline{\bar{X}}^{U}{}' \widehat{\Delta \underline{\beta}} + \underline{\bar{D}}^{U}{}' \widehat{\underline{\gamma}}^U$$

where $\underline{\bar{X}}^U$, $\underline{\bar{D}}^U$ are the vectors of means across the unionised establishments in the sample.

Asymptotic standard errors for these differentials are calculated as follows. Write the overall mean, for example, as

$$\hat{\bar{\lambda}} = \underset{\sim}{\bar{X}}'_{+} \, (\hat{\underset{\sim}{\beta}}^{U}_{+} - \hat{\underset{\sim}{\beta}}^{N}_{+})$$

where $\hat{\underset{\sim}{\beta}}^{U'}_{+} = (\hat{\underset{\sim}{\beta}}^{U'} , \hat{\underset{\sim}{\gamma}}^{U'})$, $\hat{\underset{\sim}{\beta}}^{N'}_{+} = (\hat{\underset{\sim}{\beta}}^{N'} , \underset{\sim}{o})$ and $\underset{\sim}{\bar{X}}'_{+} = (\underset{\sim}{\bar{X}}^{U'} , \underset{\sim}{\bar{D}}^{U'})$. Then its variance is given by

$$\text{Var} \, (\hat{\bar{\lambda}}) = \underset{\sim}{\bar{X}}'_{+} V \underset{\sim}{\bar{X}}_{+}$$

where $V = \text{Var} \, (\underset{\sim}{\beta}^{U}_{+} - \underset{\sim}{\beta}^{N}_{+}) = \text{Var} \, (\underset{\sim}{\beta}^{U}_{+}) + \text{Var} \, (\underset{\sim}{\beta}^{N})$, since $\underset{\sim}{\beta}^{U}_{+}$ and $\underset{\sim}{\beta}^{N}_{+}$ are estimated from separate non-overlapping independent subsamples implying a zero sample covariance between them. Hence V is consistently estimated by the sum of the estimated asymptotic covariance matrices from the two equations and the asyptotic standard error of the mean differential is given by

$$\text{ase} \, (\hat{\bar{\lambda}}) = \sqrt{(\underset{\sim}{\bar{X}}'_{+} V \underset{\sim}{\bar{X}}_{+})} \, .$$

For the individual establishment differentials the asymptotic standard errors are given by

$$\text{ase} \, (\hat{\bar{\lambda}}_{i}) = \sqrt{(\underset{\sim}{X}'_{i+} V \underset{\sim}{X}_{i+})} \, ,$$

where $\underset{\sim}{X}'_{i+} = (\underset{\sim}{X}'_{i} , \underset{\sim}{D}'_{i})$.

III. Results

In the main set of results presented, two binary variables are used to indicate the presence of closed shop arrangements. CSPRE indicates establishments where at least some of the manual workforce are covered by a pre-entry closed shop arrangement. CSPOST indicates establishments were none of the manual workers are in a pre-entry closed shop but some are in a post-entry closed shop. Alternative representations of the closed shop arrangements that take account of other aspects will be considered below. The only other bargaining characteristics considered at this stage concern multiple union recognition. The variables MRJT and MRSP indicate establishments where there is more than one union recognised by the management for negotiating pay and conditions for the manual workforce. MRJT indicates establishments where all the recognised manual unions negotiate jointly with management and MRSP indicates establishments where there are separate negotiations with different unions or groups of unions. Other potentially important bargaining characteristics, such as the levels at which bargaining takes place or the concentration of union membership, are examined below but, since found not to have a significant impact, are not included in the main set of results presented.

The objective of the empirical work presented in this paper is to provide a parsimonious description of the way in which the average collective bargaining differential varies with the institutional framework in which the bargaining takes place. A general model containing suitable more detailed classifications of closed shop arrangements, multiple recognition and the levels at which bargaining takes place, together with the potential interactions considered below would contain in excess of 3000 additional variables. Clearly some sort of modelling strategy is required. With even one-hundredth of these the model is likely to be too dense in parameters for

the data to be very informative about the underlying structure. The modelling

strategy adopted here is to test the basic model with the bargaining variables

described above (and without interactions within the union sector equation)

against various specific generalisations separately with a view to finding an

acceptable representation of the relevant bargaining characteristics within

this framework. The acceptable model is then tested against various potential

interactions with these bargaining characteristics and generalised if

necessary.

Maximum likelihood estimates of the model for the weekly pay of

semi-skilled manual workers and for the weekly pay of skilled workers are

presented in table 1. Definitions of the variables (and their means) are

given in the appendix. Considering the results for semi-skilled pay first,

the coefficients on the establishment size variables are not monotonically

increasing but do generally indicate that larger plants pay more ceteris

paribus in both the union and non-union sectors. The coefficients on the

manufacturing and public sector variables and that indicating single

independent establishments are all insignificant in both union and non-union

equations. U.K.-owned firms pay significantly less in both the union and

non-union sectors. The differential is higher in the non-union sector and

compressed in the union sector. Average pay is higher in the presence of

payment-by-results schemes in both sectors, but shift working only appears to

carry a significant premium in the union sector. Establishments with higher

proportions of manual workers and those with fewer part-timers and/or women

workers pay their semi-skilled manual workers more on average in both sectors,

ceteris paribus, although this effect is very poorly determined in the

non-union sector.

Turning to the results for the pay of skilled manual workers, there

are some interesting differences from those for semi-skilled workers. Public

sector pay in the union sector is significantly below that in comparable

TABLE 1 : Maximum Likelihood Estimates of Wage Equations for the Union and Non-Union Sectors for Semi-Skilled and Skilled Manual Workers

| | Semi-Skilled Manual Workers | | | Skilled Manual Workers | | |
	Union Sector	Nonunion Sector	$\Delta\hat{\beta}$	Union Sector	Nonunion Sector	$\Delta\hat{\beta}$
Constant	4.4189 (.0374)	4.3676 (.0482)	.0513	4.5233 (.0377)	4.6971 (.0625)	-.1738
E2	.0611 (.0250)	.0311 (.0306)	.0300	.1058 (.0247)	-.0128 (.0345)	.1186
E3	.0293 (.0243)	.0871 (.0352)	-.0578	.0710 (.0239)	.0012 (.0404)	.0698
E4	.0519 (.0247)	.1459 (.0399)	-.0940	.1187 (.0243)	.0694 (.0464)	.0493
E5	.0965 (.0271)	.1678 (.0613)	-.0713	.1487 (.0262)	.1244 (.0704)	.0243
E6	.1113 (.0279)	.1212 (.1055)	-.0099	.1764 (.0272)	.0599 (.0934)	.1165
MANUF	-.0082 (.0172)	.0285 (.0320)	-.0367	.0050 (.0159)	.0111 (.0338)	-.0061
SINGLE	.0104 (.0203)	-.0180 (.0275)	.0284	.0452 (.0186)	.0067 (.0296)	.0385
UKNOWN	-.0509 (.0211)	-.0916 (.0390)	.0407	-.0184 (.0197)	-.1030 (.0437)	.0846
PUBLIC	-.0280 (.0169)	-.0432 (.0409)	.0152	-.0528 (.0165)	.0132 (.0518)	-.0660
EA	-.0199 (.0131)	-.0050 (.0321)	-.0149	-.0341 (.0122)	-.1071 (.0374)	.0730
PBR	.0398 (.0125)	.0569 (.0312)	-.0171	.0008 (.0124)	.0302 (.0339)	-.0284
SHIFT	.0344 (.0142)	-.0216 (.0261)	.0560	.0409 (.0138)	-.0570 (.0294)	.0979
MPROP	.0552 (.0275)	.1254 (.0492)	-.0702	.0425 (.0273)	.1619 (.0602)	-.1194
PPROP	-.1738 (.0510)	-.4056 (.0653)	.2318	-.0453 (.0509)	-.2105 (.0794)	.1652
FPROP	-.3879 (.0261)	-.3123 (.0425)	-.0756	-.2972 (.0262)	-.2999 (.0540)	.0027
SKPROP	-.0726 (.0241)	-.0698 (.0458)	-.0028	.0032 (.0227)	-.0953 (.0469)	.0921
CSPRE	.0986 (.0193)			.0798 (.0177)		
CSPOST	.0456 (.0134)			.0391 (.0129)		
MRJT	.0187 (.0174)			.0100 (.0168)		
MRSP	.0313 (.0150)			.0517 (.0143)		
σ	.1877	.1914		.1727	.2012	
R^2	.500	.534		.410	.321	
Log L	-1987.2	-476.2		-1909.2	-481.5	
N	1141	314		1050	250	
Dep.var.: mean	4.3630	4.1548		4.6085	4.4868	
s.d.	.2577	.2634		.2196	.2399	

Note: Asymptotic standard errors in parentheses.

private sector establishments for skilled workers. Unlike in the case of semi-skilled workers' pay, a firm's membership of an employer's association results in significantly lower pay in both union and non-union establishments. It reduces the average pay of skilled workers by about 10% in the non-union sector. The presence of a recognised union decreases this difference to about 3% in the union sector. In the non-union sector the average pay of skilled workers is lower the greater the proportion of the manual workforce they are. This effect is however absent in the union sector.

The raw difference in log-pay for the semi-skilled between the sectors is ·2082. Almost two-thirds of this is due to differences in the characteristics of the establishments in the two sectors, leaving just over a third of it for the estimated ceteris paribus differential. This breakdown is similar to that found elsewhere for British individual-level data (Stewart, 1983a). The unconditional variance in pay and that conditional on the characteristics included in the equations are both lower in the union sector, as found with individual-level data (across all skill-categories of manual workers in that case). This is usually attributed to the impact of union wage policies. The estimated ceteris paribus wage differentials relative to the non-union sector together with their standard errors calculated as outlined in section III are presented in table 2.[10] The mean differential for the pay of semi-skilled workers is estimated at 7.8% and is significantly greater than zero.[11] The test against a single pay equation with a union recognition dummy variable gives a χ^2 (20) - statistic of 65.39 and hence constancy of the differential is rejected.[12] The four additional bargaining variables are jointly significant, giving a χ^2 (4) - statistic of 36.23. The estimated differential in the presence of a post-entry closed shop is about 9%. In the absence of closed shop arrangements the estimated differentials are lower. A single recognised union gives rise to an insignificant differential of about 4%. More than one recognised union, all negotiating jointly, gives about 6%

TABLE 2 : Ceteris Paribus Wage Differentials Associated with Various
Bargaining Structures

	Semi-Skilled Manual Workers	Skilled Manual Workers
Mean differential	.0754 (.0223)	.0296 (.0241)
No closed shop; single union recognised	.0407 (.0235)	-.0071 (.0253)
At least some workers in plant in Pre-entry closed shop	.1393 (.0288)	.0727 (.0293)
None in Pre-Entry, but at least some in Post-entry closed shop	.0863 (.0246)	.0320 (.0263)
More than one recognised union; joint negotiations	.0594 (.0265)	.0029 (.0275)
More than one recognised union; separate negotiations groups	.0720 (.0251)	.0446 (.0264)

Notes: 1. evaluated at weighted means for union sector.

2. asymptotic standard errors in parentheses.

and separate negotiating groups results in about 7%. In the case of skilled workers' pay the mean differential is not significantly different from zero. If, however, at least some of the manual workers in the establishment are in a pre-entry closed shop the estimated differential is significant at 7.5%. the remaining differentials presented in table 2 are insignificant.

Likelihood ratio statistics for tests against a number of generalised models are presented in table 3. Firstly the absence of interactions in table 1 between the closed shop and multiple recognition variable is tested and accepted for both groups. As well as producing low test statistics the interaction coefficients are numerically very small. Thus the coefficients can be summed to produce estimated differentials for composite groups. For example 48% of establishments with pre-entry closed shop arrangements have more than one recognised union and separate negotiating groups. The estimated bargaining differentials for semi-skilled pay in this group is about 18%. Turning to the impact of the levels at which bargaining takes place, three alternative representations are considered. In all cases the role of bargaining level is found to be negligible for both groups. In the first specification establishments where the most important level of bargaining is considered to be at some level within the organisation are distinguished from those where it is considered to be at a level involving more than one employer, such as national or industry-wide. No significant difference is found. The same is true in the second specification when single independent establishments are distinguished in this first group and establishment-level from organisation-level within the establishments that are part of a larger organisation. None of these distinctions are found to result in significantly higher pay. The third specification considers the levels at which any bargaining takes place rather than just that regarded at being the most important. Four levels are distinguished from the national or industry-wide, but the differences are not found to be significant. Whilst it is the case

TABLE 3 : Likelihood-Ratio Statistics for Tests against Alternative
Specifications

Additional Variable(s):	Semi-Skilled Manual Workers $\chi^2(d)$	Skilled Manual Workers $\chi^2(d)$	d	5% critical point
Interactions between closed shop and multiple recognition variables	0.26	3.09	4	9.49
Most important level of bargaining identified as within firm	0.01	0.32	1	3.84
Most important level of bargaining: firm level – single plant, firm level – multi-plant firm, plant firm – multi-plant firm	3.38	5.46	3	7.82
Binary variables indicating levels at which any bargaining takes place	4.77	7.52	4	9.49
Proportion of union members in largest union	2.59	0.02	1	3.84
Number of recognised unions	2.70	0.01	1	3.84
Number of negotiating groups	0.35	0.66	1	3.84

that establishments with single-employer bargaining do pay more, this is
entirely due to the other factors controlled for in table 1. Finally a number
of other characteristics of the bargaining set-up in the establishment which
might be thought to be potentially relevant factors are considered in the
final three rows of the table. None of them is found to be significant on top
of the model specified in table 1, which given the results of these various
tests is taken as the basic model.

The question of the adequacy of the specification of the closed shop
variables is addressed next. There are some potentially important features
not captured in the variables used in the main specification above. No
account is taken there of the proportion of the manual workforce that is
covered by the closed shop arrangements. This variable, together with the
proportion of those in the establishment covered by a closed shop agreement
who are in a pre-entry closed shop, was added. In about 2% of the sample
missing information prevents calculation of one or other of these variables.
Two dummy variables were utilised to indicate these cases. These four
variables, included together, are individually and jointly insignificant. The
closed shop variables used also take no account of which groups of workers it
is that are covered by the closed shop arrangements. Although it is the pay
of the semi-skilled being considered, it may only be the skilled workers who
are in the pre-entry closed shop. In fact when only some of the manual
workers are covered by a pre-entry closed shop arrangement, it is usually the
skilled workers to whom it applies. However when the proportion of
semi-skilled workers who are in a pre-entry closed shop, the proportion of
semi-skilled in a post-entry closed shop and a dummy for missing information
are included as additional variables, they are individually and jointly
insignificant and leave the estimated effects of CSPRE and CSPOST unchanged.
It would appear that the pay of semi-skilled workers benefits as much from
some other group of manual workers being in a pre-entry closed shop (probably

a group of skilled workers) as from being in it themselves. The same is found to be the case for skilled workers also.

The question of interactions with the bargaining variables is addressed next. Establishment size is the first considered for the reasons discussed earlier. The effect of allowing the bargaining effects to differ between the public and private sectors, and between single independent establishments and those part of a larger organisation is discussed later. The results of including interactions between the four bargaining variables and a binary variable indicating establishments employing 100 or more workers in the equation for the pay of the semi-skilled are summarised in table 4. The coefficients on the other variables remain largely unchanged. Although the addition of these four interactions does not produce a significant likelihood ratio statistic, the interaction with CSPRE is clearly significant – both statistically and in its magnitude. The four non-interacting terms are now insignificant. The differentials that result form this are presented in table 5. Among the larger establishments, only those with some form of pre-entry closed shop experience a significant differential (of about 12%). Among the smaller establishments, all the bargaining variables are insignificant and hence all those in the union sector experience a similar size differential (also of about 12%). Various specifications for additional heterogeneity in the impact of the bargaining terms (between the manufacturing and non-manufacturing sectors, between the public and private sectors, and between single independent establishments and those that are part of a larger organisation) are all rejected.[13] In the case of skilled workers' pay, the differentials are not found to differ by establishment size. Interaction terms when introduced in the same way as for semi-skilled are all individually insignificant and jointly produce a $\chi^2(4)$ – statistic of 2.4. The average and pre-entry differentials are both almost identical for large and small establishments.

TABLE 4 : Maximum Likelihood Estimates of Union Sector Wage Equation with Additional Establishment-Size Interactions : Semi-skilled Manual Workers.

CSPRE	−.0070	(.0468)	CSPRE*LE	.1275	(.0512)
CSPOST	.0294	(.0267)	CSPOST*LE	.0235	(.0303)
MRJT	.0254	(.0400)	MRJT*LE	−.0064	(.0435)
MRSP	.0461	(.0334)	MRSP*LE	−.0163	(.0369)
σ = .1871, R^2 = .503, log L = −1984.1, N = 1141.					

Notes: 1. Other variables included in equation as listed in Table 1.

2. LE = 1 for establishments employing 100 people or more;
        0 otherwise

TABLE 5 : Ceteris Paribus Wage Differentials Associated with Various Bargaining Structures : By Establishment Size : Semi-Skilled Manual Workers.

	Smaller Establishments	Larger Establishments
Mean differential for union sector	.0749 (.0233)	
Mean differential	.1112 (.0246)	.0368 (.0298)
No closed shop; single union recognised	.0904 (.0282)	−.0056 (.0314)
At least some in pre-entry closed shop	.0834 (.0514)	.1148 (.0566)
None in pre-entry; at least some in post entry closed shop	.1198 (.0322)	.0473 (.0411)
More than one recognised union; joint negotiations	.1158 (.0454)	.0132 (.0505)
More than one recognised union; separate negotiations	.1366 (.0389)	.0142 (.0456)

Notes: see table 2.

Finally, differentials (and standard errors) for individual establishments are calculated as laid out in section II. A summary of the results of this exercise is presented in table 6. The sample of union establishments is partitioned on the basis of whether the differential is significantly greater than zero at the 1%-level and weighted relative frequencies presented. 18.9% of unionised establishments pay semi-skilled wages that are significantly (in the statistical sense) above what they would be in the non-union sector.[14] In the remaining 81.1% the average pay of semi-skilled workers is not significantly greater than it would be in the non-union sector. In the case of skilled workers' pay, 11.6% of unionised establishments pay wages that are significantly above what they would be in the non-union sector. Of course there is, as ever, some degree of arbitrariness in the choice of significance level for these calculations.

The significant differentials are of course far from being randomly distributed across the establishments. Among the "smaller" establishments, 32.8% pay semi-skilled wages significantly above what they would in the non-union sector, while among the "larger" establishments only 4.3% do. In "larger" establishments with a pre-entry closed shop arrangement however 12.8% pay significantly above what they would in the non-union sector. Of this group of establishments which pay a significant union differential, 88.9% are "smaller" establishments. (They make up 51% (weighted) of the unionised sample.) 45.3% are in establishments with closed shop arrangements and only 6.4% are in "larger" establishments without a closed shop. These results confirm that, with a few exceptions, only "smaller" establishments and larger ones with closed shop arrangements pay significant union differentials. However within this group there is still considerable variation, with the majority of establishments not paying significantly more than the non-union sector.

TABLE 6 : Estimated Union Wage Differentials in Individual Establishments

per cent of union establishments

Establishment Differential (%)	Semi-skilled Manual Workers		Skilled Manual Workers	
	Significantly greater than zero	Insignificant	Significantly greater than zero	Insignificant
<0	–	5.7%	–	23.1%
0-5	–	30.0%	–	34.4%
5-10	–	23.8%	–	15.6%
10-15	3.7%	17.5%	1.0%	11.3%
15-20	6.6%	3.5%	4.8%	3.1%
20-25	5.9%	0.5%	2.7%	0.8%
>25	2.7%	0.1%	3.1%	–
All	18.9%	81.1%	11.6%	88.4%

Note: Weighted relative frequencies; 1% significance level; One-tail tests.

So far results have been presented in terms of the numbers and proportions of establishments involved. Finally brief attention is given to the average across the workers involved. Since the differential for semi-skilled workers varies with size of establishment it is likely that this will differ from the average across establishments. Unfortunately the survey does not provide information on the number of semi-skilled manual workers in the establishment. Thus the number of manual workers in the establishment not classified as skilled is used for additional weighting. This produces a mean differential for semi-skilled union workers of 6.8%.

IV   Conclusions

This paper uses establishment-level data to examine the impact on union/non-union pay differentials of the indusrial relations setting in which the bargaining takes place. The pre-entry closed shop is found to be of prime importance for the pay of both skilled and semi-skilled manual workers. In the case of skilled workers' pay, an average differential of $7^1/_2$% is estimated in the presence of a pre-entry closed shop. Elsewhere the differentials are insignificantly different from zero. For semi-skilled workers the differential varies with the size of establishment. In larger establishments with a pre-entry closed shop the mean differential is estimated at 12%, whilst without it is found to be insignificantly different from zero. In smaller establishments the differential is not found to vary significantly with the type of bargaining arrangements and is estimated at $11^1/_2$% on average. However within any group there is considerable variation and it is found that only a minority of establishments pay significantly more than they would in the non-union sector.

FOOTNOTES

*   I am indebted to David Deaton, Ben Knight, David Blanchflower, Neil
    Millward, David Metcalf and two anonymous refereees of this journal for
    their comments on an earlier version of this paper.

1. In addition Lewis (1983) points out that the estimates from these
    aggregate studies should not be interpreted as union/non-union wage
    differentials since they contain a mixture, in uncertain proportions, of
    this with an "extent of unionism" effect.

2. This survey was conducted on behalf of the Department of Employment, the
    Policy Studies Institute and the Social Science Research Council. It
    covered about two thousand establishments throughout British industry.
    See Daniel and Millward (1983) for details. See Stewart (1985) for an
    assessment of the pay data in the survey. This data set is also used by
    Blanchflower (1984).

3. Closed shops might also be expected to affect a range of non-wage
    benefits. This paper, however, concentrates on their effect on relative
    wages.

4. A higher differential in pre-entry closed shops would, for example, be
    expected in both the union monopoly and efficient contracts models.

5. See for example Mayhew (1976) and George, McNabb and Shorey (1977).

6. See Mellow (1983) for an interesting study of these issues for the United
    States.

7. The pay distributions produced by the survey are analysed in Stewart
    (1985) and found to be consistent with the published distributions from
    the New Earnings Survey.

8. Of the establishments in the survey 3.1% did so for semi-skilled workers'
    pay and 2.8% did so for skilled workers' pay.

9. This grouped dependent variable model (see Stewart, 1983b) differs from
    the ordered qualitative response model (see Amemiya, 1981) in that the
    interval boundaries are known.

10. These and all other mean differentials are evaluated at weighted means,
    since different sampling fractions were used for different establishment
    size bands. For a discussion of the calculation of the weights see
    Daniel and Millward (1983).

11. (a) This is the mean differential received by unionised establishments.
    The mean differential that would be received by currently non-union
    establishments (calculated using the non-union means) is estimated at
    8.9%.
    (b) When 13 industry dummy variables are added to each equation to
    control for unspecified industry characteristics, the mean differential
    received by unionised establishments is estimated to be 7.3% (8.7% using
    non-union means).

12. This gives a coefficient on the recognition dummy of ·0733 (·0158),
    implying a very similar differential of 7.6%.

13. The likelihood ratio tests produce $\chi^2(8)$-statistics of 8·07, 8·27 and 10·45 respectively, against a 5% critical point of 15·51, and very poor precision on individual coefficients.

14. This represents about 18,000 establishments nationally.

Appendix

Description and Means of Explanatory Variables in Table 1.

Variable	Description	Means (weighted)			
		Semi-skilled sample		Skilled sample	
		Union Sector	Nonunion Sector	Union Sector	Nonunion Sector
E2	50-99 employees in establishment	.243	.282	.236	.316
E3	100-199 employees in establishment	.209	.118	.211	.120
E4	200-499 employees in establishment	.160	.053	.172	.051
E5	500-999 employees in establishment	.071	.007	.084	.008
E6	1000+ employees in establishment (Base group is 25-49)	.048	.002	.051	.004
MANUF	Manufacturing sector	.382	.243	.429	.304
SINGLE	Single independent establishment (not part of larger organisation)	.113	.338	.135	.415
UKOWN	UK owned	.945	.924	.939	.912
PUBLIC	Public sector	.387	.100	.321	.080
EA	Member of employers' assoc.	.338	.185	.380	.207
PBR	Majority of this particular skill group paid by results	.323	.188	.334	.176
SHIFT	Shift work at establishment	.516	.338	.528	.378
MPROP	Proportion of employees in establishment manual	.641	.545	.670	.619
PPROP	Proportion of employees in establishment part-time	.151	.242	.126	.198
FPROP	Proportion of full-time employees in establishment female	.348	.427	.283	.387
SKPROP	Proportion of manual employees in establishment skilled	.271	.251	.350	.373
CSPRE	At least some manual workers in pre-entry closed shop	.093		.109	
CSPOST	No manual workers in pre-entry closed shop, but at least some in post-entry closed shop	.320		.317	
MRJT	More than one recognised union for manual workers - joint negotiations	.165		.180	
MRSP	Ditto, but separate negotiations with different unions or groups of unions	.249		.266	

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