UNION WAGE DIFFERENTIALS, PRODUCT MARKET INFLUENCES AND THE DIVISION OF RENTS

by

Mark B Stewart
University of Warwick

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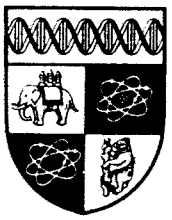

DEPARTMENT OF ECONOMICS

UNIVERSITY OF WARWICK
COVENTRY

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Abstract

This paper examines the circumstances which enable trade unions to establish wage differentials. Union wage differentials are created by the capturing of rents and the paper considers the circumstances in which rents exist to be captured and when unions are able to do so. In line with theoretical predictions, differentials are found to be very different in establishments facing competitive product market conditions and in those with some degree of product market power. In the former, high union coverage of the industry and the union strength given by a pre-entry closed shop are found to be dominant requirements, with only a very small minority of establishments satisfying even these. In contrast there is found to be considerably greater scope for unions in firms with market power and neither of the above conditions are a requirement for the existence of a differential in this case. Unions are found to be unable to create differentials in establishments which operate primarily in international markets.

Mark Stewart
Economics Department
University of Warwick
Coventry
CV4 7AL, U.K.

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I. INTRODUCTION

There is now considerable evidence to support the view that, on average, unionised establishments pay higher wages than otherwise comparable non-union ones. The evidence also suggests that this is not a temporary phenomenon, but one that persists. At the same time there appears to be considerable variation in these union wage differentials, from situations where wages are the same in comparable union and non-union establishments to ones where differentials of considerable magnitude have been established and maintained. Unions may reasonably be assumed to include wages among the arguments of their objective functions. Thus this suggests that, while in some circumstances unions are able to establish wage differentials, in others the economic conditions facing them in product and labour markets prevent them from doing so. This raises the interesting question of the identification of these circumstances.

Consider a firm operating in a perfectly competitive market (in which all firms produce an identical product using identical technology and labour). If the firm raises its wages above those of its competitors without a compensating rise in productivity, and if this situation persists, then the firm will eventually be driven out of the market by its competitors. So how do unionised firms survive (and prosper)? If the conditions of the above statement pertain, we would not expect unions to be able to establish (and maintain) wage differentials. Conversely where persisting union wage differentials are observed, we would expect the conditions of this textbook competitive market not to hold. It is therefore of interest to itemise the circumstances which provide the potential for unions to

establish wage differentials and thence to examine empirically which of these are actually most pertinent to the British economy in the 1980s and responsible for the observed differentials.

This paper therefore seeks to establish the relative empirical importance of various potential factors in permitting unions to establish and maintain differentials in pay between comparable union and nonunion establishments. The next section describes the circumstances under which unions might be expected to be able to generate wage differentials. Section III then presents a series of tests of some of the predictions that arise from the theoretical arguments presented and uses these findings to formulate a categorisation of the variation in the union wage differential and assess the relative importance of the various factors described. Some conclusions are drawn in Section IV.

II. MARKET CONDITIONS AND THE GENERATION OF DIFFERENTIALS

Union wage differentials are created by the capturing of rents. It is therefore necessary to consider the situations in which rents exist to be captured, the circumstances in which unions can capture part or all of these rents, and whether unions are able to generate rents themselves.[1/]

Competitive Product Markets

In a perfectly competitive market a single firm, facing an infinite elasticity of demand, could not pass any union wage

differential on in prices. Unions might be able to capture quasi-rents from capital in the short-run, but in the long-run the firm would leave the market in search of a higher return on capital or be forced out by nonunion firms with lower costs. One way that unions could succeed in raising wages in a competitive market would be to organise the entire market. (By this is meant a situation where all firms recognise unions for bargaining purposes and pay collectively bargained wage rates rather than that all workers are necessarily union members.) In this case costs are higher for all firms in the market. Employment may be lower than it would otherwise be, but the firms will survive.

The employment effects of any union wage differential will depend on the elasticity of labour demand and thereby, through the Marshallian laws of derived demand, on the elasticity of product demand. The union is now effectively bargaining with the entire (domestic) industry rather than the individual firm. Thus it is the industry elasticity of demand rather than that facing the firm that is relevant. If demand for the product produced by the industry is sufficiently inelastic, the bulk of the cost increases faced by all firms would simply be passed on to the consumer.[2/] It should be noted that the industry here referes to home production, so the potential substitution is by home consumers and may either be of another product or of an imported version of the same product. Since in general the union only organises workers in its own country, a wage differential could therefore only be sustained in firms producing mainly for home consumption in an industry in which there is little foreign competition.[3/]

The differential can also only be sustained if there are sufficient barriers to entry to prevent non-union firms, paying lower wages and hence having lower costs, entering the market and undercutting the union firms. These barriers may be natural ones. Alternatively they may be created by firms by the adoption of certain entry deterrence strategies. (The impact of unions on strategy choice is discussed below.) Finally they may be created by unions, where they have established the ability to rapidly organise new firms, for example by control over the labour supply of a certain occupation.

The possibility for rent-capture by a union in a competitive product market thus requires complete or extremely high union coverage of the industry, little foreign competition in the market, a relatively inelastic product demand faced by the industry as a whole and barriers to entry. This is a very demanding set of requirements unlikely to be met in many "competitive" markets.

Union Characteristics

This set of circumstances provides the potential for unions to establish a union differential in a competitive industry, but it does not ensure that one will be observed. This will also depend on the preferences and strength of the union. Consider a situation where the firm and union bargain over the wage and the firm then sets employment to maximise profits (i.e. on the labour demand schedule). The wage set will lie between the competitive nonunion outcome and the monopoly union outcome (where the union sets the wage unilaterally to maximise its objective function subject to the labour demand schedule). The observed outcome will depend on the trade-off between wages and

employment in the union objective function and the relative bargaining strengths of the two parties. These factors in conjunction, and interaction, with the conditions described earlier will determine whether or not a union differential is observed. For example a union that placed relatively little weight on employment would be able to establish a wage differential of given magnitude in the face of a more elastic industry product demand than would a union that placed more weight on employment.

It should however be noted that the weights attached to wage and employment objectives by the union are likely to vary with economic circumstances, including for example the level of unemployment. When unemployment is low, employment effects might be expected to have relatively little effect on union policy. However when unemployment is high, as at the time of the data used in the empirical part of this paper, most unions might be expected to place a higher than usual weight on employment in their objective functions.

Union bargaining strength comes in large part from the strike threat. A union with a closed shop arrangement at a particular establishment will be in a stronger position to call a strike and make it stick than one without. A union's bargaining strength would be reduced if there was a non-union pool of suitably qualified labour that an employer could hire from to reduce his costs. The likelihood of this is reduced, and thus the bargaining strength of the union increased, where there is a pre-entry closed shop. These factors, and likely differences in preferences, will make closed shops (particularly pre-entry ones) better able to capture part of the rents.

Sources of Rents

In the type of market considered so far the competing firms in the market are all operating under the same conditions and the union must organise them all in order to share in any rents. In this case barriers of some sort provide rents for all firms in the market, which the unions then attempt to bargain a share of. Examples of such barriers are provided by sunk-cost technology or legal licencing requirements.

An alternative possibility is that the firms in a market may differ in their ability to produce rents. Unions may be able to capture Ricardian rents resulting from firm-specific factors which lower costs or increase output quality.[4/] Connolly et al. (1986) examine R & D as an example of an intangible capital asset whose returns are likely to be vulnerable to union capture. Other illustrations are provided by other situations which result in some firms in the market being able to use superior technology to the remainder. Note however that differences in technology may also result from substitution in response to union wage gains. A third source of rents for unions to capture (considered in more detail below) is provided by individual firms having market power. Related to this, strategic differences may also be observed, in particular on entry deterrence.

Entry Deterrence Strategies

The discussion to this point has taken entry barriers as

exogenous. However firms take positive steps to deter entry by potential rivals. Since unions may be able to extract a share of any rents, the rational firm will take account of this when selecting an entry deterrence strategy. Policies designed to deter entry reveal information about, for example, the firm's costs of production. This information may improve a union's ability to extract a share of the rents. Thus union bargaining will affect the firm's choice of entry deterrence strategy (see Dewatripont, 1987). The firm's objectives in deterring entry by other firms and in collective bargaining with unions will conflict. This may reduce the use of certain entry deterrence strategies, such as limit pricing. Dewatripont also considers the use of sunk costs as an entry deterrence strategy. This lowers the firm's marginal cost of production and signals to potential entrants that they will face stiffer competition. Again the firm's entry deterrence objectives and collective bargaining objectives act in opposing directions.

Collective bargaining may also provide the firm with opportunities to increase its entry deterrence behaviour, through the use of binding, publically observable contracts with the union. Dewatripont gives the example of the firm committing to high severence pay for laidoff workers, thereby publically signaling a reduction in the likelihood of it cutting production if entry takes place.

Another case of interest is where wage rates themselves are used as a method of deterring entry (see Williamson, 1968). This requires the union to have organised the entire industry and to have the ability to organise new entrants. (See earlier discussion.) The firm may then be prepared to negotiate a high wage in return for a

union undertaking to secure the same rate from all other firms in the industry, as in the supreme court case considered by Williamson.

Rents from Market Power

Whilst there is only very limited scope for unions to capture rents in competitive product markets, unions will be better placed in situations where rents exist as a result of market power. Consider first the case in which the firm is the main supplier and dominates the market (a monopolist or perhaps a strong Stackelberg leader in an oligopoly). In this case the union may simply capture part (or even all) of the monopoly rents. This situation illustrates what Galbraith (1956) referred to as the "countervailing" power of the unions. However Rees (1962) and others have contested this suggestion on theoretical grounds. Whilst a profit-maximising monopoly may not pass the full cost increase on to prices, thereby reducing monopoly profits, this only unambiguously benefits the union if the effect on demand (and hence employment) of whatever price rise there is is smaller than it would be in a competitive industry. Rees argues that since, for given demand and cost conditions, the monopolist starts with a higher price and lower output (than would be the case in the competitive industry), and since this will usually mean that it faces a more elastic part of the demand curve, the smaller price rise can cause the same, or even a bigger, proportional reduction in output and employment.

What the Rees argument indicates is that facing a firm with monopoly power is not enough. The union's ability to raise wages above non-union levels will also be dependent on the elasticity of the

demand for the firm's product. The less elastic it is the more likely the union is to push for the wage differential since any employment effects are likely to be outweighted in its objective function by the wage increase. The firm faced by only a relatively small effect on profits may be inclined to prefer this option to confronting the union strike threat. Counter to this, it might be argued that monopolists will use part of their monopoly profits to build above-normal inventories to enable them to resist higher wages by sitting out a long strike, or at least threatening to do so. The existence of monopoly rents is not enough of course to ensure that the firm will share them with the union. The relative strengths of the two parties and the shape of union preferences will again be important.

Another non-competitive case is also worth considering briefly: one where, while the firm does not dominate the market on its own, it has very few competitors and they may be able to collude in the setting of prices. Such coordination in price setting is what one might expect to observe in oligopolies that have existed for some time. Prices are effectively taken out of competition. Again some inelasticity in the firm's product demand is required. In addition to the firm's coordination of pricing behaviour, there would need to be some ability on the part of the unions to coordinate wage setting. Therefore sufficient collective union strength in the sector is also a prerequisite in this case. Given the collusion in price setting it seems reasonable to expect such firms to collude (or threaten to do so) when confronting the unions and thereby to shift the bargaining advantage in their favour if collective union strength is lacking. If firms do not collude, then the requirements are as in the competitive case, including that the union should organise all the major players

in the market. This is a potential problem for empirical work since there are likely to be a lot of such cases in practice and in general there will not be information on whether or not there is collusion.

It should be noted that firms with market power are more likely to emerge, for example, in markets with natural entry barriers of the type discussed earlier; and that, in the long-run, union organising activity may be related to the rents available for division (Abowd and Farber, 1987).

III. EMPIRICAL TESTS OF SOME THEORETICAL PREDICTIONS

In this section data from the 1984 Workplace Employee Relations Survey is used to test some of the predictions that arise from the theoretical arguments presented in the preceding section. This establishment-level survey, like its predecessor conducted in 1980, provides a considerable amount of data on a sample of around two thousand establishments, with 25 or more employees, from throughout British industry. The 1980 survey was used by Blanchflower (1984) to estimate union wage effects and by Stewart (1987a) to examine the variation of union wage differentials with the collective bargaining arrangements at the plant and in particular the impact of the closed shop. Stewart (1987b) uses the 1984 survey to compare the level of union wage differentials in the very different economic and legal circumstances of 1980 and 1984. The 1984 survey is particularly suitable for the purposes of this paper since it provides potentially useful product market information not contained in the 1980 survey.

The focus of attention in this paper is on the determinants

of the typical pay of semi-skilled manual workers in private sector establishments. Log-linear pay equations are estimated using the vector of control variables formulated and tested in Stewart (1987b). Controls are included for the size of the establishment, a range of workforce composition factors, whether the establishment is in the manufacturing sector, is a single independent establishment or part of a longer organisation, whether shift working is used and whether the establishment is foreign owned. Sample means of the explanatory variables used are given in the appendix. The sample is restricted to private sector establishments employing semi-skilled manual workers who provided adequate information on both the pay variable and each of the variables in the control vector and who adequately answered a question on the number of competitors faced by the establishment in the market for its products or services.

The focus of attention here is on interactions between the union variables and the product market variables, often involving multiplicative interaction terms between three or more variables. As a result of this and the limited sample size available, the pay determination model is estimated as a single equation with union interactions, rather than using separate union and non-union equations as advocated in Stewart (1983a, 1987a, 1987b). The pay data on the survey is grouped into a number of pay bands. The reader is referred to Stewart (1987b) for the exact form of the survey pay questions and to that paper and Stewart (1983b) for a description and intuitive explanation of the Maximum Likelihood estimator for the parameters in pay equations based on such a variable. The resultant coefficient estimates can be interpreted as in a log-linear equation with continuously observed data. A consistent estimate of the latent

continuous dependent variable can be obtained for each observation by evaluating the conditional expectation of the latent variable given the available information at the Maximum Likelihood parameter estimates. This variable will be used later in this section. Note that if this estimated variable is regressed on the same set of explanatory variables, identical estimates of the coefficients in the equation result (see Stewart, 1983b).

The general line of argument presented in Section II is that it is only in particular circumstances that unions are able to capture part of a firm's rents. In relatively competitive product markets it will be very difficult for unions to establish wage differentials. The market in which the firm operates must possess a fairly restrictive set of characteristics laid out in that section and the union must be strong enough to extract a share. The conditions required are likely to be met in only a rather small minority of bargaining units. In firms with some degree of market power the situation is somewhat different. There are 'monopoly' rents to be bargained over. Thus the first prediction for testing in this section is that it is easier for a union to establish a wage differential in a firm which has some degree of market power and hence that the mean differential will be lower in establishments facing more competitive product market conditions.[5/] Once this has been investigated the variation in union wage differentials is then examined in subsequent subsections separately for establishments facing competitive conditions and establishments in firms with some degree of market power.

3.1 Competitiveness of Product Market Conditions Faced

The hypothesis that the potential for rent-capture differs greatly between firms facing competitive and non-competitive product market conditions is tested using management responses to a question on the survey concerning the number of competitors faced by the firm. This is asked about the market for the establishment's sole, main or range of products as suitable and as determined in an earlier question on the survey. The categories reported are:

1. Market dominated by the organisation (organisation is the main supplier);
2. There are only a few competitors ('few' being defined to be 5 or less);
3. There are many competitors.

This variable is labelled 'COMP' in the remainder of the paper.

A related issue has been studied in several papers that investigate the interaction between unionisation and industry concentration in wage equations, i.e. the impact of concentration on union/non-union wage differentials. For the United States, Mellow (1982) and Kwoka (1983), inter alia, find union wage differentials to be significantly negatively related to the level of concentration in the industry in which an individual works.[6/] This sign was predicted earlier by Weiss (1966) on the grounds that "in concentrated industries, where wages may already be high, unions may not add much" (p.98). However no theoretical justification for this suggestion is given. Weiss himself finds the interaction term to be insignificant. More recently Mishel (1986), using data on a sample of unionised

manufacturing establishments, finds union wages to be significantly higher in non-competitive industries than competitive ones, an industry being considered non-competitive if it is both highly concentrated and judged by the author to have entry barriers. However no evidence is provided on the impact of concentration on non-union pay. Abowd and Tracy (1988) also look only at union pay. They use a sample of union contracts in the U.S. manufacturing sector and find the impact of industry sales concentration to be positive at low concentration levels and negative at high concentration levels.

There is less evidence for Britain. Stewart (1983a) finds industry concentration to have a small and insignificant effect on individual union wages and a larger and significant positive effect on individual non-union wages. Hence union/non-union wage differentials are found to be smaller in more concentrated industries. However a test of the significance of this difference is not given. Blanchflower (1986), using data from the Workplace Industrial Relations Survey for 1980, finds a recognition dummy, an industry concentration ratio and their interaction to each be insignificant until an industry rate of return on capital variable is included in the equation. When this variable is added all three become significant, but the results make curious reading and are described by the author as "rather unlikely" (p. 1034).

A problem with all these studies is that the industry concentration ratio for the industry that the firm operates in is not an appropriate measure of the firm's market power. It represents the structure of the industry rather than the position of the individual firm. The standard measure of a firm's market power is given by the

mark-up of price over marginal cost that it is able to achieve. For a profit-maximising firm this price-cost margin can be written as $\lambda S/\eta$, where λ is the conjectural variation, S the firm's market share and η the industry elasticity of demand. Thus S is often taken as a proxy for market power. However it should be noted that firms with a given S in different industries will vary in their price-cost margins as the industry elasticity and conjectures do.

Recent empirical evidence on the structure - performance relationship indicates that it is the individual firm's market share that has the important positive impact on its profitability and not the extent of concentration in the industry in which it operates.[7/] For the United States Ravenscraft (1983), for example, finds a positive and highly significant effect of market share on profitability using the FTC Line of Business data, while the effect of concentration in the same regression is insignificant. Kwoka and Ravenscraft (1986) find a significant negative effect of concentration holding market share fixed. Thus both theoretical considerations and these empirical findings suggest that the concentration ratio for the industry in which a firm operates cannot be regarded as a satisfactory indicator of the market power of the individual firm.

The extent of competition faced by the individual firm, as measured by the variable COMP, is used here to indicate the presence of market power. Initially those in the third category of the variable COMP are treated as operating in competitive markets, while those in the first two categores are regarded as having some degree of market power. However the appropriateness of this division is

extensively examined in the next sub-section. On the basis of this division, the proportion of establishments in which unions are recognised is not significantly different for the two groups.[8/]

Pay equations for establishments facing competitive conditions and those with market power (on this definition) are presented in Table 1. It is clear that the average union wage differential in the two cases is very different. Where competitive conditions are faced it is zero (the absolute value of the asymptotic t-ratio is only 0.01), while in establishments within firms with market power the coefficient on the union recognition variable is .081 and significantly greater than zero. Note that these are average differentials. Thus, for example, the results should not be taken to imply that there are no significant union wage differentials in <u>any</u> establishments facing competitive conditions.

The equations are found to be accepted in tests against several forms of potential misspecification. Both equations are accepted on RESET-type general functional-form tests and both are accepted against the inclusion of a set of 2-digit industry dummies (over and above the indicator for the manufacturing sector that is already included),[9/] financial performance variables and a number of other factors.[10/]

There are a number of other results of interest arising from this division. Evaluating the coefficient differences at the means, semi-skilled pay is on average 11.5% higher ceteris paribus in establishments with market power than in ones facing competitive conditions (with a standard error of about 3%). This average

TABLE 1

Maximum Likelihood Estimates of Semi-Skilled Pay Equations

	Establishments Facing Competitive Conditions (COMP = 3)		Establishments with Produ Market Power (COMP = 1 or 2)	
Constant	4.286	(.096)	4.480	(.087)
Establishment size: 50-99	.232	(.053)	.023	(.046)
100-199	.276	(.055)	.073	(.050)
200-499	.271	(.058)	.028	(.050)
500-999	.419	(.065)	.040	(.055)
1000+	.362	(.069)	.068	(.058)
Proportion of employees manual	.135	(.081)	.036	(.065)
Proportion of employees part-time	-.449	(.097)	-.509	(.098)
Proportion of manual employees skilled	-.168	(.063)	-.208	(.057)
Proportion of employees female	-.174	(.106)	-.198	(0.97)
Majority of employees in skill group male	.332	(.044)	.294	(.044)
Manufacturing sector	-.127	(.040)	-.015	(.033)
Single independent establishment	-.059	(.049)	.001	(.041)
Shift work at establishment	.023	(.037)	.127	(.034)
Foreign owned	.107	(.047)	.004	(.054)
Union recognition for manual employees	.000	(.039)	.081	(.035)
σ	.227		.186	
log L	-405.93		-350.54	
R^2	.549		.553	
Diagnostic tests:				
Functional form, $X^2(1)$	1.83		2.63	
Industry effects, X^2 (20)	25.58		30.08	
Heteroscedasticity, X^2 (1)	1.73		0.05	
Mean y	4.679		4.774	
s.d. y	.326		.264	
N	256		243	

Notes: 1. Asymptotic standard errors in parentheses.
2. Sample means of the explanatory variables are given in the appendix.
3. Diagnostic tests: (i) Functional form: RESET-type LM test - augmentation by square of fitted value; (ii) Industry effects: Likelihood - ratio test; (iii) Heteroscedasticity: LM test for heteroscedasticity with respect to the union recognition variable. See text for interpretation.
4. Mean and s.d. at foot of table are estimates of those for the latent dependent variable.

'monopoly' differential of course differs between the union and non-union sectors. It is estimated to be 16% in an average unionised establishment and 7% in an average non-union one, although the latter figure is not very precisely determined. It is interesting that firms with market power tend to pay more even in the absence of unionisation. Clearly unions are able to extract a greater share of the rents, but there is some evidence of rent-sharing even in the absence of union bargaining. This may be indicative of efficiency wage effects, union spillovers, insider power or a number of other possibilities.

The ceteris paribus 'monopoly' differential is in fact greater than the raw one. One of the reasons for this is that 55% of establishments in the sample with market power are in the manufacturing sector, whereas only 39% of those facing competitive conditions are. (These are weighted percentages.) Since wages are lower in manufacturing, ceteris paribus, this would tend to make wages lower in firms with market power. Despite this they are higher on average and thus the ceteris paribus mean differential is even higher. It is also interesting to note that the negative manufacturing pay differential is restricted to establishments facing competitive conditions. The gap is highly significant there but insignificant in establishments with market power.

The impact of the size of the establishment on semi-skilled pay is very different in the two situations. In establishments facing competitive conditions there are large and highly significant size effects. Establishments with more than 500 employees pay of the order of 40% more than otherwise comparable ones with 25-50 employees (the base category). In contrast, in establishments with market power the

size variables are insignificant (jointly as well as individually), so that there is no significant ceteris paribus pay gap between large and small establishments.[11] Given the much larger intercept in the 'market power' equation, these findings are consistent with an interpretation in which the minimum level of remuneration required to compensate for any disutility associated with size results in a market-set size premium, but the redirection of part of the rents into higher pay in establishments with market power removes the necessity for this size premium in such establishments.

This formulation with separate equations for establishments with market power and those facing competitive conditions and an additive dummy variable for union recognition in each equation dominates in likelihood terms the alternative formulation with separate equations for union and non-union establishments and an additive dummy variable for possession of market power. Thus in a pure data sense this split is more fundamental than the union one. The more general four-way split would probably be desirable if sample size permitted, but it does not do so here. The RESET functional-form test reported in the table tests for the importance of omitted interactions between the variables (including union recognition) and finds the formulation acceptable in this regard. In addition an LM test is used to test for heteroscedasticity with respect to union recognition in the generalised residual and the null of constancy of variance found acceptable against this alternative in both equations. (The test statistics are given in the table.) Thus the use of a single equation for union and non-unioin establishments is not found to be a problem here.

3.2 Appropriateness of the Sample Division

Turning next to the question of the appropriateness of the division of the sample into "competitive" and "market power" establishments that is used, consideration is given first to the appropriate allocation of the COMP=2 observations, that is establishments where there are a few, but not many, competitors. The appropriate treatment of these establishments depends on whether the firms involved collude in the setting of prices or are competing with one another. If these establishments are allocated to the "competitive" sample the general conclusions are much the same, although the precision of the estimates for the non-competitive sector is much reduced (due to the dramatic reduction in sample size).

A more general and more appealing way of investigating this issue is to regard the COMP=2 establishments as having uncertain sector. A generalised stochastic switching model is specified in which the COMP=1 establishments are allocated to the "market power" sample and the COMP=3 establishments to the "competitive" sample, while the COMP=2 establishments are treated as having sector unknown. This can be thought of as a model in which 'extent of competition faced' is viewed as a latent variable. Observations for which this latent variable exceeds some threshold are regarded as operating in "competitive" markets and those for which the threshold is not exceeded are regarded as having some degree of market power. COMP=1 is taken to imply small values of the latent variable, below the threshold in all cases, and COMP=3 is taken to imply large values of the latent variable, above the threshold in all cases. The probability that a COMP=2 establishment has market power is then the

probability that this latent measure of the 'extent of competition faced' is below the threshold. There is partial observability for the sector indicator.

The dependent variable of interest (log pay in this case) is determined as follows in the two sectors:

Sector 1 ("market power"): $y_i = x_i'\beta_1 + \varepsilon_{1i}$ if $I_i = 1$

Sector 2 ("competitive"): $y_i = x_i'\beta_2 + \varepsilon_{2i}$ if $I_i = 0$

where x is a vector of explanatory factors that affect pay in one or both sectors and elements of β_1 or β_2 may be zero to accommodate the former. The sector indicator, I, is partially unobserved. That is to say sector is known for some observations, but unknown for others. The fully observed counterpart is given by

$$D_i = \begin{cases} 1 & \text{if observation } i \text{ is in Sector 1} \\ 2 & \text{if the sector of } i \text{ is unknown} \\ 3 & \text{if observation } i \text{ is in Sector 2} \end{cases}$$

In the case of the $D_i = 2$ observations, i is in Sector 1 if some latent continuous variable, I_i^* exceeds some threshold. The determination of the latent variable is specified as

$$I_i^* = z_i'\gamma + u_i$$

Since the scale and origin of I^* are arbitrary, it can be rescaled so that $var(u_i) = 1$ and the threshold is zero. Thus

$$P[I_i = 1 \mid D_i = 2] = P[z_i'\gamma + u_i > 0] = \Phi(z_i'\gamma) \ ,$$

under the assumption that the u_i are normally distributed (Φ being the distribution function of a standard normal). Given the likelihood of common omitted factors, u_i cannot reasonably be assumed independent of ε_{1i} and ε_{2i}. Thus a trivariate normal is specified in the case $D = 2$:

$$\begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ u \end{bmatrix} \sim N \left[\begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} \sigma_1^1 & \sigma_{12} & \rho_1\sigma_1 \\ & \sigma_2^2 & \rho_2\sigma_2 \\ & & 1 \end{bmatrix} \right]$$

The model is a generalisation of the standard stochastic switching model,[12/] reducing to it if there are no $D = 1$ or $D = 3$ observations.

The model is estimated by Maximum Likelihood methods. The likelihood contribution for a $D_i = 2$ observation is given by

$$L_i = P[u_i > - z_i'\gamma \mid z_i, x_i, \varepsilon_{1i}] \cdot f_1(\varepsilon_{1i})$$

$$+ P[u_i < - z_i'\gamma \mid z_i, x_i, \varepsilon_{2i}] \cdot f_2(\varepsilon_{2i})$$

where f_1, f_2 are the marginal density functions of ε_1, ε_2. The corresponding conditional densities are given by

$$u \mid \varepsilon_j \sim N(\varepsilon_j \rho_j/\sigma_j,\ 1 - \rho_j^2) \qquad j=1,2.$$

Thus the required probabilties are given by

$$P[u > k \mid \varepsilon_j] = 1 - \Phi\left[\frac{k - \varepsilon_j \rho_j/\sigma_j}{\sqrt{(1 - \rho_j^2)}}\right]$$

and the contribution to the likelihood by

$$L_i = \{1 - \Phi[\frac{-z_i'\gamma - \rho_1 (y_i - x_i'\beta_1)/\sigma_1}{\sqrt{(1 - \rho_1^2)}}]\} \cdot \frac{1}{\sigma_1} \phi (\frac{y_i - x_i'\beta_1}{\sigma_1})$$

$$+ \Phi[\frac{-z_i'\gamma - \rho_2(y_i - x_i'\beta_2)/\sigma_2}{\sqrt{(1 - \rho_2^2)}}] \cdot \frac{1}{\sigma_2} \phi (\frac{y_i - x_i'\beta_2}{\sigma_2}) \cdot$$

Define $w_{ji} = \dfrac{y_i - x_i'\beta_j}{\sigma_j}$ and thence $v_{ji} = \dfrac{z_i'\gamma + \rho_j w_{ji}}{\sqrt{(1 - \rho_j^2)}}$

Then, given that the likelihood contributions for the $D = 1$ and

$D = 3$ observations are as in the linear model, the full log-likelihood function to be maximised can be written as

$$\log L = \sum_{D_i=2} \log \{\Phi(v_1) \cdot \frac{1}{\sigma_1} \cdot \phi(w_{1i}) + [1 - \Phi(v_{2i})] \cdot \frac{1}{\sigma_2} \cdot \phi(w_{2i})\}$$

$$+ \sum_{D=1} \log \{\frac{1}{\sigma_1} \phi(w_{1i})\} + \sum_{D_i=3} \log \{\frac{1}{\sigma_2} \phi(w_{2i})\} .$$

Maximum Likelihood estimates of the parameters in the model with z containing a constant only are presented in Table 2.[13/] The estimates of the elements of β_1 and β_2 are very similar to those for the deterministic partitioned model given in Table 1. The coefficient on the union variable in the "competitive" sample is very close to zero (an absolute asymptotic t of 0.05), while in the "market power" sample it is signficantly greater than zero and similar in magnitude to the estimates presented earlier. It implies an average union differential in this sector of about 9½%.

The estimated unconditional probability of a COMP=2 establishment being in the "market power" sector, $\Phi(\hat{\gamma}_o)$, is .843. Even more informative for the current purposes is the corresponding conditional probability, that is also conditional on the level of pay at the establishment.[14/] If the establishments in the sample are allocated to the two sectors according to whether the estimated probability is above or below ½, then 94.7% of establishments are allocated to the "market power" sector. (In fact 85.1% of establishments have a conditional probability in excess of .8 and 91.3% in excess of .7.) Thus the endogenous switching model predicts

TABLE 2

Maximum Likelihood Estimates of Switching Model for Semi-Skilled Pay

	"Competitive" ($\hat{\beta}_2$) Establishments	"Market power" ($\hat{\beta}_1$) Establishments
Constant	4.317 (.085)	4.480 (.087)
Establishment size: 50-99	.227 (.047)	.014 (.045)
100-199	.268 (.049)	.051 (.047)
200-499	.253 (.052)	.031 (.047)
500-999	.391 (.058)	.018 (.051)
1000+	.330 (.062)	.075 (.055)
Proportion of employees manual	.124 (.071)	.040 (.065)
Proportion of employees part-time	-.454 (.085)	-.523 (.094)
Proportion of manual employees skilled	-.157 (.056)	-.245 (.054)
Proportion of employees female	-.191 (.091)	-.112 (.092)
Majority of employees in skill group male	.315 (.039)	.337 (.042)
Manufacturing sector	-.109 (.037)	-.011 (.032)
Single independent establishment	-.065 (.042)	.020 (.040)
Shift work at establishment	.021 (.033)	.150 (.033)
Foreign owned	.110 (.042)	-.028 (.051)
Union recognition for manual employees	-.002 (.035)	.092 (.034)
σ_2, σ_1	.214 (.009)	.186 (.013)
ρ_2, ρ_1	.312 (.316)	.891 (.114)
$\hat{\gamma}_o$	1.007 (.395)	
log L	103.40	
log L for D=1 and 2 v. D=3 split	98.28	
log L for D=1 v. D=2 and 3 split	93.49	
N	499	

Note: Asymptotic standard errors in parentheses.

quite clearly that the vast majority of the COMP=2 establishments belong to the "market power" sector.

If the sample is partitioned on the basis of this predicted allocation then the results are again very similar to those in Table 1. In particular the coefficient on the union variable is significantly greater than zero at .083 in the "market power" sample, while being insignificantly different from zero in the "competitive" sample.

Some additional light is potentially thrown on this issue of the appropriate definition of the "competitive" and "market power" samples by information on the survey concerning the sensitivity of product demand to price changes. The management respondents were asked about the likely effect on demand of a 5% increase in the current price(s) for their product(s) or service(s) while their competitors' prices remained the same. They were asked to indicate one of a number of categories from "remain about the same" to a fall of 10% or more. In effect they were asked to provide an interval estimate of the elasticity of product demand.

In theory firms operating in a competitive market face an infinite elasticity. Thus this variable potentially conveys important additional information. This information is utilised to examine two possibilities. Firstly the possibility that COMP=2 establishments

facing a high elasticity, specifically greater than 2 (the top category), should be allocated to the "competitive" sector is examined. This is done by adding a dummy variable indicating elasticity greater than 2 to the z-vector of the model presented in Table 2. Facing an elasticity greater than 2 is found to reduce the probability of being allocated to the "market power" sector, i.e. the coefficient on this dummy variable is negative. However it is insignificantly different from zero having a t-ratio of -0.78. Thus the null of equal probabilities for the two groups is accepted by the data. Given this and the even stronger earlier evidence, the COMP=2 establishments are allocated to the "market power" sector from now on.

The second possibility examined is that some of the COMP=3 establishments are not really operating in competitive markets. A stricter definition of the "competitive" sector is examined, requiring both COMP=3 and an elasticity greater than 2. A straight partition on the basis of this definition of the "competitive" sector is hugely dominated in log-likelihood terms by that used for the model in Table 1. A switching model with establishments with COMP=3 but an elasticity of less than 2 in the uncertain category allocates 67.5% of this group to the "competitive" sector (on the basis of a conditional probability in excess of $\frac{1}{2}$). In addition the union coefficients are little affected by this respecification: .085 and significant in the "market power" sector and insignificantly different from zero in the "competitive" sector.

The broad conclusions from the various examinations conducted are (i) that, as far as wage determination is concerned, the partition used in Table 1 is a satisfactory allocation of

establishments to "competitive" and "market power" samples; and (ii) that the central findings concerning the differences between the two types of establishment, particularly with respect to union wage differentials, are robust to potential respecifications of the division.

3.3 Competitive Product Markets

This sub-section takes a closer look at establishments facing competitive conditions. Given the evidence of the previous sub-section, the initial definition of the "competitive" sector, COMP=3, is adopted. The average union wage differential across establishments in this sample was estimated to be zero in the previous sub-section. The theoretical arguments presented in Section II predict that the differential will be zero in most establishments operating in competitive product markets, but that in certain very specific circumstances unions are able to establish a positive differential. Central to the arguments of Section II was the hypothesis that unions would have to organise the entire market (or at least a substantial majority of the workforce) in order to be in a position to establish a wage differential. It was also hypothesised however that this alone would not be sufficient and that other characteristics of the market and/or union organisation would also be required for the establishment of a wage differential to be possible.

The results presented in Table 3 test these propositions. Attention is focused on three factors of potential importance: the percentage of manual workers in the 3-digit industry in which this establishment primarily operates who are covered by a collective

agreement; a dummy variable indicating establishments in which there is a pre-entry closed shop for at least some of the manual workers, regarded as a measure of the bargaining strength of the union;[15/] and an indicator of establishments that operate primarily in international markets. Two further factors of importance are omitted from the analysis due to lack of suitable proxies. These are barriers to entry and the industry product demand elasticity. Since both of these are potentially important factors, the results presented should be considered with this in mind.

In column 1 the union effect is partitioned solely on the basis of the coverage rate in the industry in which the establishment operates.[16/] Whilst there is some evidence of a difference between the union effects in markets where a large majority of the manual workforce is unionised and in those where this is not the case, the effect is rather imprecisely determined. The cut-off point of 70% as well as being an intuitively plausible level of coverage for the definition, is also that selected as maximising the likelihood in a simple grid search.

In column 2 the union effect is further partitioned: with respect to PCS, the indicator of a pre-entry closed shop. The results support the hypothesis advanced in Section II that total (or at least very high) unionisation of the market is a prerequisite for the establishment of a union differential, but that it is not sufficient without other factors. In particular, a strong union presence is required. Column 2 indicates a significant union wage differential of about 29% in establishments with a pre-entry closed shop operating in highly unionised markets, but a small and insignificant one in the

Maximum Likelihood Estimates of Semi-Skilled Pay Equations for Establishments Facing in Competitive Conditions

	1	2	3	4	5
U*COVD	.066 (.046)				
U*(1-COVD)	-.014 (.038)				
U*COVD *PCS		.254 (.071)	.250 (.071)	.259 (.064)	
U*(1-COVD)*PCS		.013 (.067)			
U*COV *(1-PCS)		.014 (.047)			
U*(1-COVD)*(1-PCS)		-.020 (.038)			
U*(COVD=0 or PCS=0)			-.011 (.036)		
U*COVD* PCS*IM					.134 (.118)
U*COVD* PCS*(1-IM)					.300 (.081)
U*(COVD=0 or PCS=0)*IM					-.010 (.046)
U*(COVD=0 or PCS=0)*(I-IM)					-.014 (.038)
σ	.221	.216	.217	.217	.216
log L	-437.92	-432.12	-432.57	-432.61	-431.81
R^2	.560	.581	.579	.579	.582
N	280	280	280	280	280

Notes:

1. All equations also contain the same control variables as in table 1.
2. Asymptotic standard errors in parentheses.
3. Variables: U=1 if union recognised for manual employees; 0 else.
   COVD=1 if 70% or more of manual employees in the establishment's 3-digit industry are covered by a collective agreement 0 else.
   PCS=1 if there is a pre-entry closed shop for at least some of the manual workers in the establishment; 0 else
   IM=1 if establishment operates primarily in an international market; 0 else.

other three categories. In particular there is a small and insignificant one in establishments which operate in markets in which there is high unionisation but who do not have a pre-entry closed shop. The three other categories in the specification in column 2 remain insignificant when combined into a single category (see column 3) and are jointly insignificant (compare columns 2 and 4).

Partitioning the union effects in column 3 by a dummy variable indicating whether or not the market the establishment primarily operates in is "international" results in rather imprecisely determined estimates. For strong unions in highly unionised industries, the estimated union effect for those operating in an international market is about 15%, but not statistically significant, while for those who do not operate in an international market it is about 35% and highly significant. Outside the strong union and highly unionised industry group of establishments the effects are negligible in both cases. However a Likelihood Ratio test against the formulation in column 3 gives a $\chi^2(2)$-statistic of only 1.52. Whilst the "international" coefficient for the strong union and highly unionised industry group of establishments is not significantly different from zero, it is also not significantly different from the corresponding "non-international" coefficient, despite the numerical difference. It seems appropriate to conclude that there is some weak evidence of the importance of the extent of foreign competition faced, but that the data is not strong enough to determine the difference it makes with any precision. The number of observations that are in the

group of establishments found to achieve a significant union differential is too small to be informative about any further subdivisions. We have reached the limits of the information in the data.

In conclusion, the evidence suggests that a pre-entry closed shop in the establishment and a high level of unionisation in the (domestic) product market in which the establishment is operating are both required for a significant union wage differential to be observed in an establishment facing competitive conditions. This already describes quite a small minority of establishments: only about 4% (in weighted terms) of the establishments facing competitive conditions (on the definitions used here). The characteristics of this small group differ in a number of interesting ways from those of the full sample of establishments facing competitive conditions. They are predominantly in manufacturing (about 85% of them are). Apart from this, the industrial distribution is not noticeably different to that in the "competitive" sample as a whole with one glaring exception: industry 475, printing and publishing. Establishments in this industry are over-represented in the group by a factor of about 10, although it should be remembered that the group being focused on comprises a very small number of establishments and that there is therefore a "cell size" problem in such statements. Nevertheless establishments in this industry would seem to provide the archetypal illustration of this group in which there is strong union influence.

Surprisingly, the plant size distribution and the division between single- and multi-establishment firms do not differ much from

those in the full "competitive" sample. There are however some interesting differences in the workforce compositions. In all cases they are enlargements of those between the full "competitive" sample and the subsample of establishments that recognise unions. The characteristics of unionised establishments are accentuated in this group where unions are powerful. While in two-thirds of the full "competitive" sample manual workers comprise at least 60% of the establishment's workforce, this is the case in three-quarters of establishments that recognise unions and 100% of the group being focused on here. In one fifth of the full "competitive" sample at least 60% of these manual workers are "skilled"; by comparison this is the case in one quarter of establishments that recognise unions and in one half of those in the small group. In about 30% of the full "competitive" sample, part-time workers constitute in excess of 8% of the establishment's workforce. This is the case in about 20% of establishments that recognise unions and in none of the establishments in the small group in which unions are powerful that has been identified here. A similar magnification of the disparity is found with other compositional features of the workforces. A final interesting difference concerns the ownership of the establishments. About 1 in 8 of the full "competitive" sample are foreign owned. However, none of the establishments in the identified group are.

In addition to a potential foreign competition influence, it should also be remembered that the industry elasticity of product demand and barriers to entry are unobserved variables in this analysis. If there are also requirements on these factors as hypothesised in Section II then the actual proportion of establishments with a significant differential may be even smaller than estimated here.

3.4 Firms with Market Power

This subsection takes a closer look at union wage differentials in firms that have few competitors (COMP = 1 or 2). The average union wage differential for establishments in this category was estimated to be about 8½% in Section 3.1. The evidence of that section also indicates that the COMP = 1 and COMP = 2 observations can be treated in the same way. This is confirmed by the fact that when a dummy variable indicating COMP = 1 observations is added to the basic formulation in Table 1, column 2, together with its interaction with the union recognitition variable, they are insignificant both jointly and individually. Thus throughout this section no distinction will be made between COMP = 1 and COMP = 2 establishments.

A series of propositions for firms with market power are examined and the results presented in Table 4. In particular whether the same factors that were important in firms facing competitive conditions play a similar role in firms with market power is investigated. The dominant requirements in firms facing competitive conditions were found in the previous subsection to be high union coverage of the industry and the union strength given by a pre-entry closed shop. The role of these factors for firms with market power is examined in column 2 of Table 4. This can be compared with column 2 of Table 3. The number of observations in the sample used for the results in Table 4 differs very slightly (by 2 observations) from that used earlier, in Section 3.1. This is due to missing values on one or more of the variables used in this section. Because of this the basic equation presented in Table 1 is re-

TABLE 4

Maximum Likelihood Estimates of Semi-Skilled
Pay Equations for Establishments with Market Power

	1	2	3	4	5
U	.083 (.035)				
U*PCS*(COV $\geq$ 70)		.173 (.061)			
U*PCS*(COV $<$ 70)		.175 (.070)			
U*(1-PCS)*(COV $\geq$ 70)		.081 (.040)			
U*(1-PCS)*(COV $<$ 70)		.071 (.038)			
U*PCS			.173 (.052)		
U*(1-PCS)			.075 (.035)		
U*PCS*IM				.041 (.017)	
U*PCS*(1-IM)				.187 (.054)	.175 (.048)
U*(1-PCS)*IM				.020 (.047)	
U*(1-PCS)*(I-IM)				.085 (.035)	.075 (.027)
ϕ	.185	.182	.182	.180	.180
log L	-345.96	-343.25	-343.30	-340.98	-341.11
R^2	.561	.572	.571	.581	.581
N	241	241	241	241	241

Notes: 1. All equations also contain the same control variables as in Table 1.
2. Asymptotic standard errors in parenthesis.

estimated for this sample and the results given in Column 1.

The results show a marked contrast with those for firms facing competitive conditions. Firstly there is no role for high union coverage of the industry. The differentials, both for those with and those without a closed shop, are very similar in industries with high union coverage and those without. A formal test easily accepts their equality: a Likelihood Ratio test of column (3) against column (2) gives a $X^2(2)$ statistic of 0.1. In establishments with market power, it does not matter to the union whether or not the rest of the industry is unionised. The other main difference from the findings for firms facing competitive conditions is that there is a significant average differential outside the pre-entry closed shop. Average differentials are estimated to be 19% for establishments with a pre-entry closed shop and 8% for those without.

The final factor investigated is the distinction between establishments who operate primarily in an international market and those who do not. The results indicate strongly that unions are able to establish differentials only in establishments that do not operate primarily in international markets. In establishments that do operate primarily in international markets the estimated effects are relatively small and are both insignificant (see column 4). They are jointly insignificant, a Likelihood Ratio test giving a $X^2(2)$ statistic of 0.26, and the hypothesis that the average differential in establishments that operate primarily in international markets is zero is easily accepted.[17/]

IV. CONCLUSIONS

This paper has examined the extent of product market influences on union wage differentials. In line with theoretical predictions, differentials are found to be very different in establishments facing competitive product market conditions and those in firms with some degree of market power.

In establishments facing competitive product market conditions, high union coverage of the industry and the union strength given by a pre-entry closed shop are found to be the dominent requirements, although there is some rather weak evidence that unions find it harder to obtain differentials in firms operating in international markets. Only 4% (weighted) of establishments facing competitive conditions satisfy the two main requirements. The true proportion of such establishments in which differentials exist is likely to be even smaller since barriers to entry and the industry elasticity of demand are both omitted variables in the empirical analysis.

In contrast there is found to be considerably greater scope for unions to obtain wage differentials in firms with market power. Differentials are much bigger if there is a pre-entry closed shop at the establishment, but there is a significant average differential outside the closed shop. Unions are not able to obtain differentials in establishments which operate in international markets. In contrast to the situation for establishments facing competitive conditions, union wage differentials are found to be no higher in highly unionised

industries.

Clearly the structure of union wage differentials is very different among firms with some degree of market power from that among firms who face generally competitive product market conditions. The estimates of this paper imply that of the establishments in which unions are able to create a wage differential only 5% face competitive product market conditions.

FOOTNOTES

1/ Union wage differentials will refer throughout this paper to ceteris paribus differentials between comparable workers in establishments where unions are recognised for bargaining purposes and ones where they are not. In practice part of estimated union wage differentials may be due to unmeasured quality differences, compensating differentials, differences in fringe benefits, etc. However these seem unlikely to be more than a minor part of the story. There are still sizeable differentials in US panel estimates after control for some unmeasured labour quality differences (see Freeman (1984), Lewis (1986).) No such evidence is yet available for the UK. In the case of fringe benefits the US evidence suggests that union differentials in fringe benefits are actually higher than those in pay.

2/ The proportion of the burden borne by the consumers will, unless demand is completely inelastic, also depend among other things on the elasticity of supply.

3/ There are exceptions to this in certain circumstances, as indicated by the Marshallian conditions.

4/ Differences in firm-specific factors which affect the cost structures faced by firms may also result in efficiency wage effects in some firms. (See Akerlof and Yellen, 1986).

5/ Establishments within the same firm are assumed not to compete with one another in the true sense. Hence the market conditions faced by a given establishment are assumed to be determined by the market power of the firm of which it is a part.

6/ Lewis (1986) provides a summary of the findings on this issue for the U.S. Most, but not all, studies find a negative effect of industry concentration on the union wage differential

7/ For a survey see, inter alia, Geroski (1987).

8/ The usual test of the equality of the two proportions gives a standard normal test statistic of 0.84.

9/ There are conceptual problems with the inclusion of a large number of more detailed industry dummies in samples of this size when attempting to measure average ceteris paribus union wage differentials, due to the fact that the differential varies across industries. (see Stewart, 1983a). Industries in which all establishments are unionised - a very common occurrence in these samples at levels below the 2-digit - contribute nothing to the estimation of the union differential in linear formulations. (This follows directly from the expression for the OLS estimator.) The differential is estimated only over those industries that

are less than fully unionised in the sample. The problem can be avoided by appropriate aggregation of industries into longer groups, although this is ad hoc and the results will be sensitive to the grouping employed. However this still leaves a more general problem of which the above is simply an extreme manefestation. In general if the differential varies across industries and the industries also differ in their degree of unionisation, then estimation of a linear equation with additive industry dummies will give too little weight to the differentials in the highly unionised industries in the estimation of the mean union wage differential and too much to those in industries with low levels of unionisation.

10/ The main diagnostic test statistics are given in table 1. The equations are easily accepted against the RESET tests. They are both accepted against the inclusion of the industry effects at the 5% level (critical point 31.41), but only one would be at the 10% level. Tests for the exclusion of five financial performance dummies give $\chi^2(5)$ likelihood - ratio test statistics of 8.46 and 4.28. Their exclusion is easily accepted. This contrasts with the findings of Blanchflower et al. (1988), who use an ad hoc cardinalisation of the available categorical information.

11/ A likelihood - ratio test of their joint significance gives a $\chi^2(5)$ - statistic of 3.08.

12/ The standard stochastic switching model has been used recently, for example, by Dickens and Lang (1985), to investigate dual labour markets.

13/ The consistent estimate of the latent continuous dependent variable described at the start of this section is used for y.

14/ Bayes theorem gives this as:

$$\frac{\Phi(v_{1i}) \cdot \frac{1}{\sigma_1} \cdot \phi(w_{1i})}{\Phi(v_{1i}) \cdot \frac{1}{\sigma_1} \cdot \phi(w_{1i}) + [1 - \Phi(v_{2i})] \cdot \frac{1}{\sigma_2} \cdot \phi(w_{2i})}$$

See Dickens and Lang (1985), page 799.

15/ Stewart (1987a) finds no differences in union wage differentials according to either the proportions of workers covered by any closed shop arrangements or which groups of workers it is that are covered by them. 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.

16/ The sample size available for this section is slightly larger than that used in the previous section, since no

observations are lost for missing values on the 'elasticity' variable which was used in that section but is not used here.

17/ An alternative treatment might be to regard establishments operating in international markets as facing competitive conditions and transfer them to the "competitive" sample. The general conclusions of the paper remain unaltered if this treatment is adopted. However the evidence does not support such a reallocation. The equivalent equations to Table 1 produce again a small and insignificant union effect in the "competitive" sample, a slightly increased effect in the "market power" sample (to 0.11) due to the removal of this subset of establishments where there is no differential, but a reduction in the joint log-likelihood. The conclusions are the same for the more detailed specifications examined in Tables 3 and 4.

APPENDIX

Weighted Means of Explanatory Variables for Competitive and Market Power Samples

	Establishments Facing Competitive Conditions (COMP = 3)	Establishments with Product Market Power (COMP = 1 or 2)
Establishment size: 50-99	.292	.306
100-199	.149	.145
200-499	.063	.087
500-999	.014	.025
1000+	.009	.009
Proportion of employees manual	.678	.635
Proportion of employees part-time	.178	.110
Proportion of manual employees skilled	.346	.277
Proportion of employees female	.206	.202
Majority of employees in skill group male	.734	.840
Manufacturing sector	.388	.549
Single independent establishment	.246	.241
Shift work at establishment	.450	.418
Foreign owned	.063	.028
Union recognition for manual employees	.558	.523
At least some manual employees in a pre-entry closed shop	.080	.053
70% or more of manual employees in 3-digit industry covered by a collective agreement	.242	.346
Operate primarily in an international market	.213	.124

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