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P.B. Beaumont and R.I.D. Harris

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Article abstract

This paper seeks to remedy some existing research deficiencies in Britain where discussions of the high technology non-union relationship have overwhelmingly consisted of small partial studies of the electronics industry.

High Technology Industries and Non-Union Establishments in Britain

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This paper seeks to remedy some existing research deficiencies in Britain where discussions of the high technology non-union relationship have overwhelmingly consisted of small partial studies of the electronics industry.

In Britain it has been generally alleged that the high technology industries contain a relatively high proportion of non-union plants and firms. This relationship has been attributed to individual organisations in these particular industries having a variety of human resource management policies (which generate relatively powerful union substitution effects) and this, in turn, has been held to be the result of a transference of US practice via US subsidiaries operating in Britain, or the result of such organisations operating in a highly competitive product market environment in which relatively short product life cycles place a premium on organisational flexibility[1].

The evidence in support of these beliefs has been anecdotal evidence concerning union difficulties in achieving organisational inroads into these companies and plants, case studies or illustrative examples of the human resource management policies of well known, high tech, US companies operating in Britain (e.g. IBM) and a number of small sample studies, par-

* BEAUMONT, P.B., Department of Social and Economic Research, University of Glasgow, Scotland.

HARRIS, R.I.D., Department of Economics, Queen's University of Belfast, Northern Ireland.

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1 For a summary of such arguments see P.B. BEAUMONT, «Industrial Relations Policies in High Technology Firms», *New Technology, Work and Employment,* Oxford, Vol. 1, No. 2, Autumn 1986, pp. 152-159.

ticularly in the electronics industry[2]. At the same time, however, other small partial studies in the electronics industry have suggested that the extent of non-union organisation is not nearly as great as some commentators have suggested[3]. In order to more fully and adequately investigate this matter in Britain it is essential to look beyond the position of the electronics industry in individual parts of the country. Specifically, there is a very real need for much more systematic research of the high technology industries/non-union relationship which must (i) proceed on the basis of an explicit and comprehensive definition of high technology industries which is not researcher specific in nature, (ii) utilise large and nationally representative sample data sets for the country concerned, and (iii) examine this particular relationship, *ceteris paribus,* through the use of multi-variate statistical analysis. These are some of the major shortcomings of the existing literature on the subject which we seek to redress, at least partially, in our subsequent analysis of the position in Britain. This is then followed by a preliminary examination of whether some individual policies and practices which arguably constitute components of a human resource management system are particularly associated with non-union establishments in the high technology industries in Britain.

The contents of the paper are presented in four basic sections. The first one discusses the basic definition of high technology industries used and indicates the particular data source which is utilised in our subsequent analysis. The second section outlines the basic pattern of findings for the high technology industries/non-union relationship, while in the third section multivariate statistical analysis is used to identify the relevant determinants of non-union status at the individual establishment level; the statistical performance of the high technology industries variable is obviously of major interest to us here. And the fourth section presents our available evidence concerning the presence of human resource management policies in non-union, high technology industry establishments. Finally, a brief conclusion draws together the major findings and implications of the analysis undertaken.

2 See, for example, Philip BASSETT, *Strike Free,* London, Macmillan, 1986; Leonard RICO, «The New Industrial Relations: British Electricians' New-Style Agreements», *Industrial and Labor Relations Review,* Cornell University, Vol. 41, No. 1, October 1987, pp. 63-78, and SDA, *Manpower Excellence and Corporate Performance in Scotland,* 1987, p. 5.

3 See Allan SPROULL and John MACINNES, «Patterns of Union Recognition in Scottish Electronics», *British Journal of Industrial Relations,* Oxford, Vol. 25, No. 3, November 1987, pp. 335-338.

BASIC DEFINITION AND DATA SOURCE

The Department of Trade and Industry in Britain has recently produced a definition of high technology industries which was strongly influenced by the nature of work undertaken for a similar purpose in the United States[4]. The individual industries contained in the high technology category, which was primarily based on relative levels of R & D expenditure and to a lesser extent on the proportion of scientists, engineers and technicians in the workforce, are indicated in Table 1; these particular industries employed approximately 1,24 million workers, or some 6% of the total workforce, in 1986.

Table 1

High Technology Industries in Britain

SIC No.	*Industry Description*
2514	Synthetic resins and plastics materials
2515	Synthetic rubber
2570	Pharmaceutical products
3301	Office machinery
3302	Electronic data processing equipment
3420	Basic electrical equipment
3441	Telegraph and telephone apparatus and equipment
3442	Electrical instruments and control systems
3443	Radio and electronic capital goods
3444	Components other than active components mainly for electronic equipment
3453	Active components and electronic sub-assemblies
3640	Aerospace equipment manufacturing and repairing
3710	Measuring, checking and precision instruments and apparatus
3720	Medical and surgical equipment and orthopaedic appliances
3732	Optical precision instruments
3733	Photographic and cinematographic equipment
7902	Telecommunications
8394	Computing services
9400	Research and development

Source: R.L. BUTCHARD, «A New UK Definition of the High Technology Industries», *Economic Trends,* No. 400, February 1987, p. 87.

4 The relevant British paper is R.L. BUTCHART, «A New UK Definition of the High Technology Industries», *Economic Trends,* No. 400, February 1987, pp. 82-88, while for the US see, for example, R. RICHE, D. HECKER and J. BURGAN, «High Technology Today and Tomorrow: A Small Slice of the Employment Pie», *Monthly Labor Review,* Washington, Vol. 57, No. 1, November 1984, pp. 50-58.

There have been no specific criticisms made to date, at least to our knowledge, of this particular definition and list of high technology industries. However, there have always been certain general reservations expressed about the whole approach of attempting to define and identify a group or category of high technology industries. For example, some individual commentators have argued that (i) the concept of high technology is more appropriately applied and used at the level of individual organisations (regardless of which particular industries they are in), (ii) attempts to produce an industry level definition and classification will be too time specific in nature and (iii) will be too product, as opposed to production process, orientated[5].

The basic view taken here is that there are considerable advantages to researchers making use of this official definition of high technology industries, not the least of these being that useful and meaningful comparisons can be made between the findings of individual studies based on this common starting point; in contrast, the existing literature, at least in Britain, contains too many studies based on researcher specific definitions and data sources which seriously constrains any attempt to compare and replicate individual results. Accordingly, in what follows we partition and categorize our basic data (i.e. Tables 2 and 3) into high technology and non-high technology industries along the lines of this official definition. The statistical performance of this particular variable will obviously be of major interest to us in our subsequent multivariate analysis of the determinants of non-union status at the individual establishment level. However, because of the above general reservations concerning the validity and value of any categorisation of high technology industries, this multivariate analysis contains a *second* high technology variable. This second variable comes from our basic data source and is for the percentage of manual employment (in an individual establishment) involved in producing products or using *processes* which include microprocessors in them; an individual establishment is classified as high technology if this figure exceeds the mean figure across all private sector establishments. (The full definition of this variable, and all others used in our analysis, is set out in an Appendix available from the author upon request.) These two variables are quite different, essentially unrelated ($r = -.116$) measures of the concept of high technology, and thus allow us to see whether any findings for non-union status are likely to be particularly sensitive to the use of particular measures of this concept.

5 See, for example, John R. FIRN and David ROBERTS, «High Technology Industries», in Neil HOOD and Stephen YOUNG (eds), *Industry, Policy and the Scottish Economy*, Edinburgh, Edinburgh University Press, 1984, pp. 289-292. Also the work cited in Andrew GOULD and David KEBLE, «New Firms and Rural Industrialisation in East Anglia», *Regional Studies*, Vol. 18, No. 3, 1984, pp. 197-199.

The basic data source for our analysis is the 1984 workplace industrial relations survey[6]. This is the most recently conducted, large scale and nationally representative survey data set on industrial relations structures at the individual establishment level in Britain, containing more than 2,000 individual establishment observations from all sectors of economic activity. The basic sampling frame excludes establishments with less than 25 employees and contains only a small proportion of relatively new establishments, while our own statistical analysis is based on the sub-set of 1,267 establishments (63,3% of the total sample) for the *private* sector only; the decision to exclude the public sector from our analysis follows from the widespread existence of union recognition arrangements there.

THE BASIC PATTERN OF FINDINGS

In Table 2 we present our first set of findings, which are for the proportion of individual establishments that recognise (or do not) recognise trade unions for collective bargaining purposes in high technology and non-high technology industries. The 'do not recognise' unions group of establishments consists in fact of two sub-groups of establishments, namely those where there are no union members present among the workforce and those where there are union members present but the establishment concerned does not recognise trade unions for collective bargaining purposes (the former sub-group is considerably more sizeable than the latter one). The data is solely for the private sector, with the information being differentiated by ownership (i.e. domestically or foreign owned establishments) and provided separately for manual and non-manual employees; the reason for the division of the data along ownership lines is that foreign owned firms have figured so prominently in discussions of non-unionism and high technology industries in Britain[7].

The contents of Table 2 indicate, firstly, that the extent of union recognition is actually greater in the high technology industries than in the non-high technology industries in the case of domestically owned establishments, both for manual and non-manual employees. In contrast, however, the extent of union recognition is less in the high technology industries than in the non-high technology industries in the case of foreign owned establishments, particularly in the case of manual employees. Indeed we find that the level of union recognition is very much less among foreign

6 The basic survey results are contained in Neil MILLWARD and Mark STEVENS, *British Workplace Industrial Relations 1980-1984,* Aldershot, Gower, 1986.

7 See, for example, BASSETT, *loc. cit.* and RICO, *loc. cit.*

owned establishments than among domestically owned ones in the high technology industries, whereas this relationship is reversed in the case of the non-high technology industries.

Table 2

Percentage of Establishments that Recognise or Do Not Recognise Trade Unions in High Technology and Non-High Technology Industries by Ownership and Manual/Non-Manual Distinction, Britain, 1984 (Private Sector Only)

	Recognise Unions	*Do Not Recognise Unions*	*No Manual Employees*
	NON-MANUAL EMPLOYEES		
High Technology Industries			
Domestically owned	50,8	44,7	N/A
Foreign owned	24,7	70,2	N/A
Non-High Technology Industries			
Domestically owned	27,0	69,2	N/A
Foreign owned	33,9	61,9	N/A
	MANUAL EMPLOYEES		
High Technology Industries			
Domestically owned	48,2	24,1	21,0
Foreign owned	23,6	59,0	16,9
Non-High Technology Industries			
Domestically owned	37,1	45,7	12,7
Foreign owned	50,1	29,8	16,6

Percentages across each row may not add to 100,0 due to non-response to the survey question.

In considering the question of union organisational inroads into *any* industry, it could be argued that the extent of the union's presence is more appropriately measured by the proportion of employees in the industry that work in unionised establishments, rather than by the proportion of establishments in the industry which are unionised. This is because the union movement in most advanced industrialised economies has traditionally concentrated on (and been most successful in) organising relatively large-sized establishments. Accordingly if this practice has been followed in the high technology industries one would expect to find that the proportion of employees in unionised establishments in these industries exceeds the proportion of unionised establishments in them. The contents of Table 3 provide the relevant information on this matter.

Table 3

Percentage of Employees in Establishments that Recognise or Do Not Recognise Trade Unions in High Technology and Non-High Technology Industries by Ownership and Manual/Non-Manual Distinction, Britain, 1984 (Private Sector Only)

	Recognise Unions	*Do Not Recognise Unions*
*NON-MANUAL EMPLOYEES**		
High Technology Industries		
Domestically owned	82,4	16,9
Foreign owned	48,4	51,6
Non-High Technology Industries		
Domestically owned	36,8	63,6
Foreign owned	42,7	55,6
*MANUAL EMPLOYEES***		
High Technology Industries		
Domestically owned	85,8	10,9
Foreign owned	58,9	41,0
Non-High Technology Industries		
Domestically owned	84,8	13,4
Foreign owned	78,5	17,6

*Percentages were calculated across each sector by dividing by the total number of non-manual employees in the sector.

**Percentages were calculated as for * but with total manual employees as the denominator.

The expected relationship is in fact confirmed in all cases, with the figures in the 'recognise unions' column of Table 3 exceeding their counterpart entries in Table 2. That is, the proportion of employees in unionised establishments exceeds the proportion of establishments that are unionised, indicating that union recognition arrangements are disproportionately associated with relatively large-sized establishments in all sectors of employment. More specifically, we find that the proportion of employees in unionised establishments which are domestically owned is greater in the high technology industries than in the non-high technology industries, particularly in the case of non-manual employees. For foreign owned ones we again find different relationships (from those for domestically owned establishments) in that here the majority of non-manual employees work in establishments that do not recognise unions, although there is little difference here between the high technology and non-high technology in-

dustries in this regard. In the case of manual employees in foreign owned establishments the majority work in unionised establishments, but the relevant figure is very much less in the high technology industries than in the non-high technology ones. The latter relationship is similar to that observed earlier in Table 2, and thus is supportive of the tendency to focus on foreign owned establishments when discussing non-unionism in high technology industries in Britain.

In summary, the major substantive findings of Tables 2 and 3 would appear to be as follows: (i) the percentage of employees in unionised establishments exceeds the percentage of establishments that are unionised in all categories for which the data is presented; (ii) for domestically owned establishments, union organisation (on both the percentage employee and establishment basis) is generally greater in the high technology than in the non-high technology industries, with the difference being most marked in the case of non-manual employees; and (iii) for foreign owned establishments, union organisation is most obviously less in the high technology industries compared to the non-high technology ones in the case of manual employees. The multi-variate statistical examination of the determinants of union recognition at the establishment level undertaken below will hopefully shed some further light on the nature of these particular relationships.

THE DETERMINANTS OF INTER-ESTABLISHMENT VARIATION IN UNION RECOGNITION

There have in fact been remarkably few studies of the determinants of union recognition (conversely, non-union) status at the level of the individual employment establishment in Britain[8]. However, Bain's well known explanation of white collar union development postulates a strong, positive relationship between the existence of union recognition status and the level of union membership,[9] a relationship that has generally been confirmed (for both manual and non-manual employees) by existing survey evidence in Britain[10]. Accordingly our basic estimating equation contains a relatively sizeable number of variables, which have been used in existing

8 For a recent exception see SPROULL and MACINNES, *loc. cit.*

9 George SAYERS BAIN, *The Growth of White Collar Unionism,* Oxford, Oxford University Press, 1970, Chapter 8.

10 See, for example, MILLWARD and STEVENS, *op. cit.*, pp. 50-65 and W.W. DANIEL and Neil MILLWARD, *Workplace Industrial Relations in Britain,* London, Heinemann, 1983, pp. 20-29.

studies of inter-establishment variation in the level of union membership,[11] to control for certain, key *organisational characteristics* of establishments (the Appendix available from the author upon request lists the details of them in full), with our primary interest being in the performance of the two high technology variables. As we have a dichotomous dependent variable, a probit estimation procedure has been utilised,[12] and Table 4 sets out the separate results obtained for manual and non-manual employees.

Table 4

Probit Regression Model of Trade Union Recognition (= 1) or Non-Recognition (= 0), Private Sector Establishments, Britain, 1984

Variables	Manual Employees		Non-Manual Employees	
	Parameter value	t statistic	Parameter value	t statistic
High technology industries	-1,885	2,49	-0,048	0,08
Ownership of establishment	0,570	1,19	0,683	1,67
Organisation size	1,208	5,58	1,929	8,41
Establishment size	0,813	3,89	0,533	3,02
% Part time employment	-0,407	6,16	0,091	1,48
Age of establishement	2,784	4,25	0,426	0,70
Multi-establishment organisation	-0,373	0,64	-1,477	2,23
Head office establishment	-0,222	0,64	-0,397	1,21
% Women workers	-0,353	3,87	-0,256	2,93
% Manual workers	0,533	4,11	-0,220	5,29
Shift work	-0,466	1,22	0,410	1,07
Process (second high technology variable)	0,830	2,06	0,513	1,26
Labour cost	0,504	1,76	0,424	1,55
Manufacturing sector	-0,195	0,42	-0,398	0,77
Intercepts				
North	1,561	2,57	3,872	8,43
South	1,094	1,77	3,666	8,02
x^2 = 1026,7*** 700		x^2 = 831,7* 770		
parallelism x^2_{14} = 23,1*		parallelism x^2_{14} = 2,94		
N = 716		N = 786		

The chi-squared statistic is a test of homogeneity of the regression residuals, while the parallelism chi-squared is a test of the need for separate intercepts for a North and South (i.e. spatial) division in the data.

11 See, for example, G.S. BAIN and F. ELSHEIKH, «Unionisation in Britain: An Inter-Establishment Analysis Based on Survey Data», *British Journal of Industrial Relations*, Oxford, Vol. 18, No. 2, July 1980, pp. 169-178.

12 The probit model used is defined as PROBIT (P) + 5 = + X where probit is the inverse of the standard normal cumulative distribution.

If we concentrate initially on the results for the relatively conventional organisational characteristics variables we find that in the case of manual employees the *non-union* status of establishments is significantly and *positively* associated with smaller sized organisations, smaller sized establishments, a relatively high proportion of part time employees, newer establishments, a relatively high proportion of women workers, a relatively small proportion of manual employees, and is *negatively* associated with establishments located in the northern regions of the country; in the case of the latter finding, related work has indicated that the nature of the industrial structure of particular regions is not the major factor involved in this relationship[13]. For non-manual employees essentially the same variables achieve statistical significance, with non-union establishments being positively associated with small organisation and small establishment size, a relatively high proportion of women workers, and a relatively small proportion of manual employees. The non-union status of establishments for non-manual employees is also significantly and *negatively* associated with multi-establishment organisations, and with northern region location. Interestingly, the ownership variable failed to attain statistical significance in either equation, although it came closest in the case of non-manual employees. Furthermore, we experimented (in view of the figures in Tables 2 and3) with a multiplicative variable (i.e. foreign ownership x high technology industries), but this also proved to be insignificant in both equations. One possible explanation of the 'poor' performance of the ownership variable here may be the fact that we could not distinguish between the individual countries of origin for our foreign owned establishments; this data limitation could be particularly important as references to non-union, foreign owned establishments in Britain almost inevitably refer to US owned ones.

For non-manual employees neither of our two high technology variables is statistically significant. However, both attain statistical significance for manual employees, albeit with different signs. That is, the high technology industries variable is positively associated with non-union status for manuals, whereas the process variable is negatively related to non-union status. These differing relationships were not entirely unexpected given that the two variables are quite different measures of the high technology notion (the former being a product orientated, industry level classification, while the latter is an individual establishment based notion with more of a production process orientation), although they do clearly illustrate the need for researchers to be quite clear and precise about just which particular measure of high technology is being used in any discussion

13 See P.B. BEAUMONT and R.I.D. HARRIS, «Sub-Systems of Industrial Relations: The Spatial Dimension in Britain», *Occasional Paper No. 28,* Department of Economics, Queen's University of Belfast, June 1987.

and debate about any possible relationship with the non-union status of organisations. The significant, positive relationship between the official definition of high technology industries and non-union status, once we simultaneously control for a wide range of establishment correlates, is an important result that cannot be ignored or lightly dismissed as being due to the use of an 'odd' definition or the analysis of an atypical data set. Indeed it is this particular finding that prompted us to consider the potential role of human resource management policies in these particular industries.

THE ROLE OF HUMAN RESOURCE MANAGEMENT POLICIES

The individual components of an 'ideal' human resource management system are typically held to be relatively well developed internal labour market arrangements (in matters of promotion, training, and individual career development), flexible work organisation systems, contingent compensation practices, skills or knowledge based pay structures, high levels of individual employee and work group participation in task related decisions, and extensive internal communications arrangements. Such a system can be viewed as an integral part of an *organic,* as opposed to mechanistic, management system,[14] the essence of which is a strong individual employee-organisation identification process which, in turn, has the potential to limit the extent of employee job dissatisfaction which existing research has shown to be a necessary, if not sufficient, condition for employees demanding union representation[15]. There are a number of *a priori* reasons for expecting relatively well developed human resource management policies to be strongly associated with establishments in high technology industries; as previously mentioned, their rapidly changing, highly competitive, product market environment (with relatively short product life cycles) is one of the key influences typically cited in this regard[16].

Ideally we would like to be able to examine whether the significant, positive relationship between non-union establishment status and the high technology industries variable in Table 4 was associated with the presence of a comprehensive human resource management system. Unfortunately, our survey data does not contain information on anything like the full range of

14 Tom BURNS and G.M. STALKER, *The Management of Innovation,* London, Tavistock Publications, 1959.

15 See, for example, Thomas A. KOCHAN, «How American Workers View Labor Unions», *Monthly Labor Review,* Washington, Vol. 52, No. 4, April 1979, pp. 23-32.

16 See Thomas A. KOCHAN and Michael J. PIORE, «Will the New Industrial Relations Last? Implications for the American Labor Movement», *Annals of the American Academy of Political and Social Science,* No. 473, May 1984, p. 183.

human resource management policies identified above, although it does contain some useful information on three particular arrangements and practices which would seem to be of some potential importance in this regard.

The survey data indicates, firstly, whether an establishment has a joint consultative committee. These relatively long-standing, management initiated institutional arrangements in Britain were originally associated with 'human relations' orientated practices in some non-union settings, although in the post-war years they became increasingly popular as a vehicle for 'integrative', as opposed to 'distributive', bargaining in unionised establishments. These differences in the origins and rationale for early joint consultative committees appear to have become even greater through the course of time, as survey evidence in the 1970s has indicated that the distribution, composition and subject matter of these committee arrangements is extremely heterogeneous in nature across industry as a whole[17]. The second practice is whether the establishment has a profit sharing scheme in operation, a particular form of employee participation that the present Conservative Government is keen to see developed more extensively[18]. The third set of information is for whether or not management has made any change in the last four years (i.e. 1980-84) with the aim of increasing employee involvement in the operation of their work; in practice more two-way communication was particularly prominent among the initiatives reported to be undertaken[19]. Although not adding up to anything like a fully developed human resource management system, the potential relevance of these particular arrangements and practices is suggested by the results of a recent US study which reported that organisations which have encouraged employee participation and communication arrangements were relatively successful in maintaining their non-union status[20].

In order to provide some feel for the data, the distribution of these three arrangements or practices according to various establishment characteristics is set out in Table 5.

17 See, for example, P.B. BEAUMONT and D.R. DEATON, «The Extent and Determinants of Joint Consultative Arrangements in Britain», *Journal of Management Studies,* Vol. 18, No. 1, January 1981, pp. 49-74. See also Mick MARCHINGTON, «A Review and Critique of Research on Developments in Joint Consultation», *British Journal of Industrial Relations,* Oxford, Vol. 25, No. 3, November 1987, pp. 339-359.

18 See D.G. BLANCHFLOWER and A.J. OSWALD, «Profit Sharing — Can it Work?», *Centre for Labour Economics, LSE,* Discussion Paper No. 255, October 1986.

19 MILLWARD and STEVENS, *op. cit.*, pp. 163-167.

20 Jack FIORITO, Christopher LOWMAN and Forrest D. NELSON, «The Impact of Human Resource Policies on Union Organizing», *Industrial Relations,* Berkeley, Vol. 26, No. 2, Spring 1987, pp. 113-126.

Table 5

Proportion of Private Sector Establishments by Certain Characteristics that Have Joint Consultative Committees, Profit Sharing Schemes or Have Taken Initiatives to Increase Employee Involvement in the Last Four Years, Britain, 1984

	Joint Consultative Committee		*Profit Sharing Scheme*		*Increased Employee Involvement Initiative*	
	Yes	*No*	*Yes*	*No*	*Yes*	*No*
Manual employees						
unionised establishments	35,0	65,0	49,2	50,8	40,9	58,5
non-union establishments	21,2	78,8	34,8	65,2	28,9	71,1
Non-manual employees						
unionised establishments	34,0	66,9	55,5	44,5	44,8	54,8
non-union establishments	22,0	78,0	38,1	61,9	29,5	70,5
High technology industries	49,3	50,7	21,5	78,5	44,6	55,4
Non-high technology industries	25,6	74,7	43,4	56,5	33,4	66,3
Domestically owned establishments	25,6	74,4	44,1	55,9	33,1	66,6
Foreign owned establishments	35,2	64,8	24,6	75,4	42,8	57,2

The statistical approach adopted here involved the use of discriminant analysis[21] to observe the effects of these three human resource management proxies on a four-way dependent variable for high technology industries by union status. Table 6 sets out the means of each human resource management variable across the four groupings of the dependent variable. These variables took a (0, 1) form, with 1 indicating the existence of a joint consultative committee (JCC), the existence of a profit sharing scheme (PSS) and the recent occurrence of an employee involvement initiative (EII) which means that the figures in the Table are also percentages.

An F-test rejects the hypothesis that group means are equal for each variable, indicating that there are statistically significant difference to be analysed when establishments are split on the basis of this four-way dependent variable. The respective sizes of the group means generally suggest that establishments in the high technology industries were more likely to have joint consultative committees and to have undertaken recent employee in-

21 For a useful discussion of this technique see William R. KLECKA, *Discriminant Analysis,* Beverly Hills, Sage, 1980.

volvement initiatives, although these particular establishments, especially where unions were not recognised, had less in the way of profit sharing schemes. The discriminating functions were then formed using a stepwise technique that only entered a variable into the function if it passed on an entry criterion (based upon a minimisation of Wilks lambda). The standardised coefficients for the variables were as follows:

Non-Manual Employees			*Manual Employees*		
Variable	*Coefficients*		*Variable*	*Coefficients*	
	(1)	*(2)*		*(1)*	*(2)*
JCC	0,44	0,69	JCC	0,70	-0,56
PSS	0,58	-0,75	PSS	0,42	0,86
EII	0,51	0,17	EII	0,37	-0,00

Table 6

Means of Human Resource Management Variables Across Establishments when Classified by the 4-way Dependent Variable (High Technology by Union Status)

Dependent variable	*JCC*	*PSS*	*EII*
NON-MANUAL EMPLOYEES			
High tech/no unions	0,49	0,15	0,46
Non-high tech/no unions	0,21	0,39	0,29
High tech/unions	0,55	0,33	0,41
Non-high tech/unions	0,33	0,56	0,45
Total	0,25	0,43	0,34
MANUAL EMPLOYEES			
High tech/no unions	0,48	0,16	0,41
Non-high tech/no unions	0,20	0,35	0,29
High tech/unions	0,71	0,37	0,52
Non-high tech/unions	0,34	0,50	0,41
Total	0,28	0,42	0,35

The model classifies 43,3% of establishments correctly for manual workers (and 42,5% for non-manual workers) into their proper groups (i.e. high tech by union status), which admittedly is not a particularly high figure, although it is arguably not unreasonable given that we would not expect three human resource management proxies to be anything like the only factors involved in the extent of the variation observed here. A second

measure of the 'goodness of fit' of the discriminating functions is their canonical correlations, which were 0,23 and 0,12 for manuals, and 0,22 and 0,13 for non-manual employees. The standardised coefficients of each model have to be interpreted in relation to the respective means of the two discriminating functions for each dependent variable. This is done in Table 7.

Table 7

Discriminating Functions Evaluated at Group Means

Group	*Function 1*	*Function 2*
	NON-MANUAL EMPLOYEES	
High tech/no unions	0,046	0,867
Non-high tech/no unions	-0,147	-0,015
High tech/unions	0,261	0,647
Non-high tech/unions	0,353	-0,042
	MANUAL EMPLOYEES	
High tech/no unions	0,166	-0,718
Non-high tech/no unions	-0,217	-0,017
High tech/unions	0,783	-0,632
Non-high tech/unions	0,227	0,060

Where the mean values for each group have opposite signs across discriminating functions (and/or coefficients have different signs), it is *not* possible to uniquely relate a particular group of establishments on the basis of high tech/union status to the value of one or other of the predictor variables. It is only where the sign of the (discriminating function) mean values is the same as the sign of the coefficients in all functions that a unique relationship can be specified. The unique relationships which are apparent are (1) the positive association between a joint consultative committee and a recent employee involvement initiative and establishments in the high technology industries, regardless of whether unions are recognised there or not; and (2) the positive association between profit sharing schemes and establishments in the non-high technology industries that recognise trade unions. In summary, although our results are not statistically very strong, we do find that two of our three human resource management system proxies are positively associated with establishments in the high technology industries. However, these particular proxies do not provide a basis for differentiating *within* the high technology industries, between

union and non-union establishments;[22] there may possibly be some differences in the particular *nature* of the recent employee involvement initiatives undertaken that would be relevant in this regard, but unfortunately data limitations prevent an examination of this possibility at the present time. It is also interesting to note that profit sharing schemes have exactly the opposite relationship to what some individuals would expect and favour,[23] being very much associated with unionised establishments in non-high technology industries.

CONCLUSIONS

The methodological and substantive findings and lessons of our analysis can be basically summarised as follows. The use of two quite different measures of high technology revealed different relationships with non-union establishment status in Britain. The individual establishment based, more process orientated one was negatively associated with non-union status, whereas the use of the official definition of high technology industries (more of a product orientated one) produced a positive association with non-union status. The latter relationship was not obviously apparent in the basic data, but proved to be significant when multi-variate analysis was used to control simultaneously for a sizeable number of establishment level correlates. As to the basis or source of this particular relationship, our use of three particular proxies for human resource management found (with the notable exception of profit sharing schemes) some generally positive relationships with establishments in the high technology industries. However, they provided no basis for distinguishing between union and non-union establishments within these particular industries. This could be because our data does not provide detailed, in-depth knowledge of the nature of these particular policies and arrangements.

Alternatively, these particular proxies for human resource management systems may be relatively less important in the human resource management policy mix of non-union, high technology industry establishments compared to other policies and practices not identified here, or opposition to unions in high technology, non-union establishments may not be an essentially homogeneous phenomenon centring around human

22 Furthermore, we re-ran our basic probit model (as in Table 4) for establishments in the high technology industries only, but obtained few significant findings.

23 Weitzman, for example, argues that the macro level benefits of profit sharing schemes will be most fully realised in the absence of collective bargaining arrangements. See Martin L. WEITZMAN, *The Share Economy,* Cambridge, Harvard University Press, 1984.

resource management policies. These different possibilities point to the need for considerably more research into this particular subject area, both in Britain and elsewhere.

Industries de haute technologie et entreprises non syndiquées en Grande-Bretagne

On soutient souvent que les industries de «haute technologie» dans les économies industrialisées les plus développées regroupent une forte proportion d'entreprises non syndiquées. Ceci, en retour, a été attribué au fait que celles-ci possèdent des politiques sophistiquées de gestion des ressources humaines qui génèrent un «effet de substitution» au syndicalisme. Cependant, ces prétendues relations sont davantage des actes de foi que des propositions empiriques bien établies. En effet, la recherche, à l'heure actuelle, semble comporter des faiblesses de fond et de méthodologie soit, en particulier: 1) le défaut d'une définition explicite et compréhensive des industries de haute technologie; 2) l'absence d'un ensemble de données établies comme base d'analyse qui soient valables pour tout le pays; 3) le défaut d'examiner ce type de relations en recourant, ceteris paribus, à l'utilisation de l'analyse multivariée.

Le présent article s'efforce de remédier aux déficiences actuelles de la recherche en Grande-Bretagne où les débats concernant le syndicalisme dans les industries de haute technologie se sont toujours limités à des études courtes et partielles tirées de l'industrie de l'électronique. L'analyse se fonde d'abord sur la définition «officielle» des industries de haute technologie telle que fixée par le ministère du Commerce et de l'Industrie qui s'appuie sur le degré relatif de dépenses en recherche et en développement et sur la proportion de scientifiques, ingénieurs et techniciens par rapport à l'ensemble de la main-d'oeuvre. L'utilisation de cette définition par les chercheurs comporte l'avantage de pouvoir comparer les résultats de leurs études. Toutefois, on a toujours exprimé certaines réserves au sujet de l'utilisation du concept de haute technologie au niveau de l'industrie par opposition aux analyses au niveau de l'entreprise. Pour ce motif, on a eu recours à une deuxième mesure de la haute technologie dans un certain nombre d'analyse multivariée. Il s'agit du pourcentage d'emplois manuels par entreprise (comparé aux estimations moyennes pour le secteur privé) engagé dans la fabrication de produits ou l'utilisation de processus qui comportent l'emploi de micro-ordinateurs. Ces deux définitions de la haute technologie ont donné des valeurs vaguement interreliées ($r = -.116$).

La source principale de statistiques utilisées dans l'analyse provient d'une enquête effectuée en 1984 concernant les relations professionnelles sur les lieux du travail. Il s'agit de la recherche la plus récente et la plus représentative au pays en matière d'accords structurés en relations du travail pour les entreprises considérées

individuellement. L'échantillon global recouvre l'examen de plus de 2 000 établissements, mais notre analyse se confine au secteur privé qui touche un sous-échantilon d'environ 1 300 entreprises.

L'étude des facteurs déterminants de la reconnaissance syndicale par un modèle probit révèle que la définition officielle de la haute technologie (c'est-à-dire pour l'ensemble de l'industrie en tenant compte des produits fabriqués) est reliée de façon positive et significative à la non-syndicalisation des travailleurs manuels. Par contre, la deuxième définition ou mesure (c'est-à-dire établissements individuels où l'on considère les processus de production) est reliée d'une manière significative mais négative à une situation de non-syndicalisation. Ces résultats statistiques différents sont importants puisqu'ils révèlent la nécessité pour les chercheurs d'être très clairs et précis à propos de la définition et de la mesure de la haute technologie utilisée dans une analyse des rapports possibles avec l'état de la syndicalisation.

Au sujet de la relation positive entre la définition officielle de la haute technologie et la non-existence des syndicats, nous avons ensuite considéré le rôle possible de la politique de gestion des ressources humaines dans une telle relation. Bien que nous manquions de renseignements sur l'ensemble des politiques individuelles typiquement identifiées dans les discussions théoriques concernant les systèmes de gestion des ressources humaines, nos données contenaient trois variables utiles à cette fin: l'existence (ou non) d'un comité consultatif paritaire; un régime de partage des bénéfices; la présence (ou non) récente d'un régime quelconque de participation des employés. L'utilisation de l'analyse discriminante a révélé que les comités consultatifs paritaires et les régimes récents de participation des travailleurs étaient positivement reliés aux établissements de l'industrie de haute technologie, tandis que les systèmes de participation aux bénéfices étaient négativement reliés à ces établissements. Toutefois, dans ce dernier cas, il n'y avait pas de différenciation marquée à l'intérieur des industries de haute technologie entre les établissements syndiqués et ceux qui ne l'étaient pas. Ceci laisse voir que ou bien il faut des renseignements de meilleure qualité et plus approfondis sur la nature de ces variables et mettre au point un nouvel ensemble de variables pour les régimes de gestion des ressources humaines; ou bien, la non-syndicalisation des entreprises dans les industries de haute technologie n'est pas un phénomène homogène relié au concept même des systèmes de gestion des ressources humaines. Ces diverses explications possibles font nettement ressortir la nécessité de recherches complémentaires plus détaillées sur cette question.