The Search for the 'Silver Bullet': Labour Related Indicators of Workplace Performance and Labour Management Policies

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ABSTRACT

The context of this paper is the 'high performance paradigm', the research agenda associated with empirical studies investigating possible causal relationships between particular human resource management policies and corporate performance. However, all workplace labour management policies impact, directly or indirectly, upon employees, and the consequences of these impacts may be measured using 'intermediate' workplace performance indicators, such as turnover and absence, as well as 'final' workplace performance indicators, such as labour productivity.

This paper explores the correlations between 27 workplace labour management policies commonly associated with the high performance paradigm and 10 labour related indicators of workplace performance. The 27 labour management policies are categorised according to five principal activities of human resource management, and referred to as human resource management policies sub sets. Eight of the workplace performance indictors relate to intermediate measures of performance, and the remaining two to final measures of performance. The explorations make use of tobit, logit and ordered logit estimations and a data set which has its origins in the survey of managers, one of the cross section components of the 2004 Workplace Employment Relations Survey.

Given the claims often made by proponents of the high performance paradigm, the results are disappointing. Only one variable within the 27 (a binary variable associated with a positive response to a statement to the effect that individuals in the largest occupational grouping within the workplace have a lot of control over the pace at which they work) produced results consistently compatible with expectations. Another (another binary variable associated with a positive response to a statement to the effect that individuals in the largest occupational group at the workplace have a lot of variety in the jobs they do) was compatible with expectations in nine of the ten regressions. Additionally, some variables within the 'work organisation/job design' subset of human resource management policies were found to be negatively correlated with labour turnover and absence, and some other variables within the 'process and participation' subset were found to be negatively correlated with some form of industrial action at the workplace.

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The Search for the 'Silver Bullet': Labour Related Indicators of Workplace Performance and Labour Management Policies [1] [2]

1.   CONTEXT AND MOTIVATION

One important, policy relevant feature of the 2004 Workplace Employment Relations Survey (Kersley *et al*, 2006) and its 1998 equivalent (Cully *et al*, 1999) has been the manner in which the establishment data collected have been used to investigate the possibility of a relationship between management policy and corporate performance (Bryson *et al*, 2008). The focus of many of these investigations has been on a particular subset of human resource management policies, variously entitled high performance/high commitment/high involvement and the extent to which their implementation enhances performance, as measured by profitability and/or productivity, often generically referred to as the 'high performance paradigm' (Procter, 2008).

Low levels of productivity in Britain have concerned policy makers for many years (Caves, 1980: Phelps Brown, 1971: Ulman, 1968). Contemporary researchers give credence to the continuing concern. For example, Oulton (1998) comments upon the existence of "a long tail of under-performing companies (p.23) and Griffiths *et al* (2006) note that "wide and persistent differences … exist across establishments even within very narrowly defined industries" (p. 514). Given this, the claims made for the labour management policies associated with the high performance paradigm are politically seductive. Corporate human resource management systems are now considered a strategic asset and, as a consequence, human resource management has come to be seen as one of the principal drivers of an organisation's competitive

[2] The metaphor is due to Legge (2001) who maintains: "*If* it could be convincingly demonstrated that certain HR practices or bundles of practices unequivocally lead to positive organisational performance outcomes, and that the size of the effects far outweigh the cost of implementing such policies, one would indeed have found a silver bullet to aim at organisations performing poorly" (p. 32). (Italics in the original.)

advantage (DTI, 2003: Mayhew and Neely, 2006). According to this perspective, the implementation of appropriate policies has the potential not only of moving under-performing companies closer to their production possibility frontiers but also of shifting this frontier further outwards for all companies.

Moreover, the implementation of these policies is assumed to be to the mutual benefit of organisation and worker. From the outset, mutuality has been the central tenet of the policy prescriptions which have come to be associated with these studies (Kochan and Osterman, 1994: Levine, 1995). Studies of job satisfaction, for example, are frequently used to demonstrate the benefits which may accrue to workers (Pfeffer, 2008). Nonetheless, the policies associated with high performance/high commitment/high involvement are not necessarily implemented without cost. The cost of their implementation to companies is often forwarded as the principal explanation of why these particular policies are not more evident than they are (Delaney and Godard (2001). The potentially profound implications for employees of transforming workplace customs, practices and rules to implement a system of labour management associated with the high performance paradigm, however, are under researched. The company based case studies of Baird (2002) and Conway and Monks (2009) and the telephone survey of Godard (2001) are notable exceptions. The increasing demands of work, reflected in work intensification for example, are often seen to be indicative of some of these costs (Green, 2001: Ramsay *et al*, 2000).[3]

Eschewing the claim that policies associated with the high performance paradigm enhance corporate performance, this paper explores more generally the relationships between workplace labour management policies and labour related measures of workplace performance. All labour management policies impact, directly or indirectly, upon employees. Sometimes, from the perspective of management, these impacts may be positive, with outcomes similar to those found by proponents of the efficacies of the high performance paradigm, manifest, for example, in statistics indicative of increased labour productivity or improved quality (e.g. a reduction in spoils or waste). On other occasions, however, these impacts may be 'negative',

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[3] Whereas Green (2001) examines the issue of intensification *per se*, the essence of Ramsay *et al* (2000) is to examine the extent to which 'improved' employee outcomes have their origin less in the incentives and motivations conventionally associated with high commitment type policies and more from the process of work intensification which tend to accompany these.

manifest, again for example, in statistics of increased absence or labour turnover, perhaps increased accidents or increased conflict.[4]

Ten indicators of workplace performance are identified from the WERS 2004 data set viz. (in most instances over the past 12 months) labour turnover; the percentage of working days lost through absence; whether some form of industrial action had occurred; whether some threat of some form of industrial action had been made; whether employees had formally raised matters via grievance procedures; the incidence of sanctions levied against employees; the incidence of specified injuries sustained by employees during working hours; the incidence of specified illnesses/diseases suffered by employees; the (respondent's) assessment of the workplace's labour productivity relative to other workplaces in the same industry; and the (respondent's) assessment of the workplace's quality of product/service relative to other workplaces in the same industry. Although some of these performance indicators may be co-related, the assumption is that each will have distinct determinants, reflecting the structural characteristics of the workplace, the characteristics of the external environment in which the workplace operates, and the human resource management policies in operation at the workplace. The specific aim of the paper is to explore the relationships between selected human resource management policies and each of these indicators of workplace performance.

2.   SOME LITERATURE OF RELEVANCE

To evaluate the impact of policy upon performance, and thereby establish the efficacy or otherwise of the former, entails addressing three questions viz. how is 'policy' to be conceptualised and subsequently measured; how is 'performance' to be conceptualised and subsequently measured; and how is the (possibility of a) relationship between both to be tested methodologically? The central requirements are twofold, therefore. First, appropriate data. Secondly, appropriate models with which to analyse these data, minimising if not eliminating entirely the inherent econometric

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[4] There was a time when industrial conflict, or more specifically strikes, was seen as a very important, 'negative' indicator of workplace performance (Durcan et al, 1983: Hyman, 1972: Smith et al, 1978) (and, indeed, forwarded as the principal cause of low productivity within companies).

difficulties associated with cross section census/survey data of response bias, measurement error, sample selectivity, endogeneity and omitted variable bias.

The earliest seminal works of relevance are those of Piore and Sabel (1984) and Kochan *et al* (1986), recording the transformations taking place across the manufacturing sector of the United States (US) economy during the 1980s. Whereas the former noted the replacement of Taylorist-type mass production technologies with new forms of work organisation, termed 'flexible specialisation', the latter observed that the introduction of these new forms of working were the product of managerial initiatives, often unconstrained by union opposition (Ichniowski *et al*, 1996). However, what is now referred to as the high performance paradigm is associated principally with specific empirical studies of the mid 1990s in the US, for example those of Huselid (1995), Ichniowski *et al* (1997) and Osterman (1994) (Procter, 2008), when the methodological issues identified in the preceding paragraph are both raised and addressed, if somewhat imperfectly. The tradition of this research agenda continues in the US, notably in the work of Black and Lynch (2001: 2004), (whose panel data sets allow a more sophisticated if still less than perfect examination of the central relationships under investigation).[5] No longer are comparable studies unique to the US, however. They now constitute part of the human resource management and industrial relations research agendas in Great Britain and elsewhere (Paauwe and Richardson, 2001).

Many of the US based studies cited in the previous paragraph are associated with the application of what has come to be known as 'insider econometrics' (Bartel *et al*, 2004: Ichniowski and Shaw, 2003). Insider econometrics is based upon two principles. The first is the use of extensive field work to generate a detailed understanding of the production processes and the nature of work these involve, thereby helping to ensure the collection of appropriate data. Making use of the specialist knowledge of the principals at the workplace/firm and accessing often confidential information are particular features of this process of data collection. "(N)ot only does getting 'the right data' matter a great deal, but so too does getting insiders' insights about what the right data really are" (Bartel *et al*, 2004 p. 2004). The

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[5] The Black and Lynch research was surveyed in the latter's lecture to WPEG in Manchester (Lynch, 2007).

second principle is research designs conducive to creating the necessary *ceteris paribus* conditions which make more likely more accurate estimations of the impact of treatment variables (such as human resource management policies) on performance outcomes variables (such as productivity).[6]

British studies are two types, categorised according to the nature of the data sets analysed. The first follows US example, seeking to gather appropriate primary data. For example, Guest *et al* (2003) collected data via structured questionnaires of managers responsible for human resources using telephone interviews from a sample of firms. Using a data collection process more akin to that of insider econometrics, Bloom and van Reenen (2006) examined the impact of management more generally on productivity. The second type, which constitutes the majority of the studies, makes use of the WIRS 1998 and WERS 2004 data sets. Illustrative examples of this latter type would include de Menezes and Wood (2006), Guest (2001), Ramsay *et al* (2000) and Wood and de Menezes (1998).[7] Relative to comparable empirical US studies, there is much less consistency in the findings of the British studies. Perhaps for this reason, there is less support in Britain for the putative efficacy of the high performance paradigm.

Despite a plethora of both conceptual and empirical studies (or, perhaps, because of them?), there is no unambiguous definition of what constitutes high performance/high commitment/high involvement [8]; there is more disagreement than agreement on how the policies in question operate to produce the performance outcomes under investigation; and there is no consensus as to the precise list of policies in question.

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[6] There are other examples of the application of the same principles associated with the methodology of insider econometrics where there is no reference to insider econometrics *per se*. Lazear's (2000) investigation of the effect of piece rate compensation (i.e. the treatment effect) on worker-specific output (i.e. the performance outcome) is such an example.

[7] Although not addressing the central issues associated with the high performance paradigm, related studies of relevance which make use of the same data sets would include Collier *et al*, 2005, who examine the impact of training on establishment survival, and Jones *et al*, 2009, who investigate the relationship between training, job satisfaction and workplace performance.

[8] Wood (1999a), for example, comments upon the "proliferation of terms (used) to describe non-Taylorist models of organisation" (p. 395). Evaluating whether this proliferation of terms is about "different conceptions" or merely "a matter of semantics" (p. 370) is a principal theme in his review of the literature (Wood 1999b).

Usually, there are two inter-related elements to the 'treatment' component of the models explaining why policy generates improved outcomes, although the specific nature of the inter-relationship between the two elements is somewhat imprecise. [9] The first element is associated with the organisation of work, where the assumption is that the adoption of particular innovative practices improves efficiency. In this context, some researching within the manufacturing sector seek to differentiate between 'lean' and 'team' production systems, with the former being associated also with inventory management systems, such as 'just-in-time', and the latter being associated mostly with particular types of job re-design to establish semi-autonomous group working (Godard, 2004).

The second element is associated with management policies towards human resources, notably the manner in which management seeks to resolve the not necessarily novel problem of extracting effort from labour to generate high performance (Legge, 2005). However, there are two contrasting perspectives of how this is best achieved, one associated with 'high commitment' and the other with 'high involvement', both in themselves very complex constructs. The former requires a policy framework designed to engage (or re-engage) the worker with the cultural norms and expectations of the organisation, and would include policies which relate to recruitment and selection, training, communication and reward. Effectively, given the appropriate calibre of labour input, policies designed to motivate workers. By contrast, the latter emphasises the salience of participation, variously if somewhat nebulously defined (Lansbury and Wailes, 2008). According to this perspective, the essential assumption is that the implementation of policies such as the establishment of quality circles, the creation of semi autonomous work teams, employee profit sharing schemes etc., all designed to create involvement, improves worker effort. Effectively, again given the appropriate calibre of labour input, requisite employee behaviour becomes self-regulated (Levine, 1995).[10] One consequence of these alternative perspectives is that the human resource management policies in question tend to be over lapping between both perspectives rather than mutually exclusive to

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[9] In terms of the traditional sub divisions within Economics, one element may be identified with the 'economics of the organisation' and the other with 'personnel economics' (Ichniowski and Shaw, 2003).

[10] Whether or not employee voice in this process of involvement is achieved better with or without union presence at the workplace is one important development in this literature (e.g. Bryson *et al*, 2006: Wood and de Menezes, 1998).

each. For example, both perspectives assume positive recruitment and selection, a degree of employment security for those selected and employee development and training.[11]

Further disagreement arises when researchers produce lists of policies reflecting work organisation and human resource management, 'high commitment' or 'high involvement'. The oft quoted (e.g. Golding, 2007) (and admittedly dated) survey paper by Becker and Gerhart (1997) is used frequently to illustrate this point. Becker and Gerhart identified 27 policies used in five empirical studies. None of the policies were common across all five papers; two (selective hiring and information sharing) were common to four papers; but 20 were unique to one paper. Finally, there is no consensus as to manner in which the designated policies – whatever they may be – might operate. Do they operate individually, each having an independent impact of the performance variable? Perhaps with their combined impact increasing with the successive addition of further policies? Or are the policies indivisible parts of a system, where each policy is effectively impotent unless appropriately bundled? (Procter, 2008). [12]   [13]

The high performance paradigm, therefore, has its critics, both from authors writing from within the paradigm (e.g. Guest, 2001) and those writing from within some other perspective (for example, and most frequently, industrial relations) (e.g. Delaney and Goddard, 2001: Godard, 2004: Godard and Delaney, 2000: Frost, 2008).

Despite these differences, however, most of the studies have a common objective: to examine the extent to which innovative ways of organising work and managing people have on the performance of organisations where performance is measured

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[11] In both perspectives, the tendency is to assume that workers respond automatically to the policy intervention in the manner required. The possibility that individuals may have different behavioural responses to the same policy/policy regime is rarely addressed (Kinnie *et al*, 2005).

[12] In some literature, there is further debate about the nature of the composition of the bundle. Do the constituent components of the bundle fit internally i.e. one with each other within the HRM system of the enterprise? Or is the fit external, integrating with the corporate strategy of the enterprise as it is devised to address the perceived threats and opportunities prevailing in the external environment? The question of fit is examined comprehensively in Wood (1999b).

[13] This selective review of the literature has focussed upon the 'treatment' (i.e. policy) component of the paradigm, because of the aim of this paper. There is a wider debate addressing the two other central issues, the measurement of 'performance' and the methodology appropriate to examining the impact of policy on performance.

most frequently in terms of what Forth and McNabb (2004a: 2004b: 2008) describe as "final performance indicators" (p. 106 in the 2008 publication), notably profitability and productivity.

Corporate objectives are statements of specific outcomes to be achieved, frequently multiple and complex in their nature and conventionally expressed in financial terms (Johnson and Scholes, 2002). Performance targets relate to outputs, such as sales turnover, and outcomes, such as profits. The performance of an organisation is judged on its ability to meet these objectives/targets. In principle, therefore, there is some legitimacy in making use of the same to evaluate the impact of policy. In practice, however, profit is part determined by the product market conditions in which companies operate; not all organisations are necessarily profit seekers operating in the traded goods and services sectors of the economy; the relevance of 'corporate' objectives when the level of examination is that of the establishment is questionable, unless the unit of observation is a single plant firm or an establishment which is part of a multi-plant company required to operate as a profit centre.[14] Productivity, even when defined by measures of financial variables such as sales per worker and total labour costs (Cappelli and Neumark, 2001), is rarely seen by management to be an end in itself, rather than a means to an end. Finally, both profit and productivity are, by definition, final performance measures, where the probable impact of generic management policies (such as inventory, marketing etc.) is likely to be both greater and more immediate than that of more specific human resource management policies (Bloom and van Reeman, 2006: Griffith *et al*, 2006).

Exceptionally, some researchers have chosen to examine the impact of high performance paradigm type policies on what Forth and McNabb (2004a: 2004b: 2008) define as "intermediary measures" (p. 106 in the 2008 publication). Huselid (1995) – addressing the issue of turnover – and Wood and de Menezes (1998) – addressing the issues of the employee relations climate, turnover and absenteeism – may be cited as illustrative examples of this work. Both studies, however, merely serve to demonstrate the manner in which these measures are seen as incidental, seemingly of secondary importance to that of final, financial performance indicators.

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[14] That it is workplace level survey is the first of seven "inherent limitations" (p. 580) within WERS, according to Bryson *et al* (2008).

Nevertheless, it may be preferable to evaluate the impact of the human resource management policies associated with the high performance paradigm by making use of intermediary measures of workplace performance. Performance indicators such as labour turnover, absence, and work-related injury and illness, for example, will have their own determinants. Some may even be (negatively and/or positively) correlated, not least because they are part determined by the same set of objective circumstances, including, the human resource management policies in operation (or otherwise) at workplaces. When combined, these indicators provide a statistical profile of workplace performance from a labour perspective (Paterson, 1960). And, of course, separately and in combination, they will have imponderable consequences for final performance variables, such as profitability and labour productivity (Forth and McNabb, 2004a: 2004b: 2008).

3.   DATA

The exploration used a data set which has its origins in the 'Survey of Managers', one part of the cross section component of the 2004 Workplace Employment Relations Survey (WERS 2004), the fifth in a series of surveys which map the contours of employment relations in Great Britain (Kersley et al, 2006).

The unit of analysis is the workplace, defined as "the activities of a single employer at a single set of premises" employing at least five workers (Kersley et al, 2006, p. 3). The population of workplaces sampled is drawn randomly from the International Departmental Business Register maintained by the Office for National Statistics and constitutes 700,000 workplaces (33 percent of the Great Britain (GB) total) and 22.5 million employees (89 percent of the GB total). The sample selected is stratified by workplace size and industry, with workplaces being randomly selected from within size bands and industries. In the original survey, this generates 2,295 observations.

The 'Survey of Managers' contains the questionnaire responses of the senior manager at the workplace responsible for employment relations on a day-to-day basis. Some of these responses provide a potential set of variables reflecting labour related indicators of workplace performance.

The 10 dependent variables reflecting labour related performance indicators used in this exploration are presented in Table 1. Some evidence that some of these variables are themselves (negatively and positively) correlated may be seen from Table 2, which reports 'crude' OLS regression coefficients when each variable is regressed on all the others, in turn.[15] The statistically significant positive correlations between *absence* and *illrate* and *action* and *threat* and *raised* may be interpreted as being in accordance with expectations. There is a string of statistically significant negative correlations between *labprod* and *action, threat, raised, injury* and *illness*. Given these results, the positive correlation between *labprod* and *turnover* is somewhat surprising. A similar pattern of results is to be found between *quality* and this same list of variables. Further, the relationship between *labprod* and *quality* is sizeable, positive and statistically significant. Some of these latter results may be interpreted as being in accordance with the expectations of proponents of the high performance paradigm, with 'high performance' workplaces – as proxied by measures such as labour productivity and quality – being less likely to experience industrial action or the threat of it, or their workforces to suffer work-related injuries or illnesses.

These dependent variables are of three types:

- Subjective and ordinal (such as labour productivity and the quality of product/service, relative to other workplaces in the same industry),
- Objective and nominal (such as whether the plant had experienced industrial conflict, or some threat of it), and
- Objective and scalar (such as the percentage of working days lost through absence and the incidence of specified injuries and illnesses/diseases)

The subjective, ordinal variables within WIRS 1998 reflecting performance have been the subject of criticism e.g. there is a lack of clarity about what is being measured, in the context both of the basis for the measure in question (for example labour productivity) and the lack of precision in what is being associated with the industry comparison requested: the dimensions of performance may be measured with error,

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[15] These coefficients are described as 'crude' because of the diverse nature of the variables in question – binary, ordinal and scalar, with a large proportion of zeros – and the inappropriateness of OLS regression, under these circumstances.

due to incomplete or inaccurate knowledge (if not ignorance) on the part of the management respondent: there is limited variance in the data, because of the limited response categories in the questions put: and the limited, ordinal nature of the response categories means that it is not possible to quantify the relationship between policy and performance in any meaningful way other than by the sign of the coefficients on the policy variables and its relative importance, by means of the value of the marginal effects of these coefficients.[16] Notwithstanding these reservations, two of these subjective ordinal variables are used in this exploration. Fewer criticisms may be levelled against the other types of data collected WERS 2004 and used in this paper. That said, the problems of limited variance in the data and quantification and interpretation of the estimation results are applicable to the three nominal/binary response variables examined, and the problem of measurement error is inherent within survey methodology.[17]

Additionally, the cross section survey of managers provides a rich array of potential independent variables – 'control' and 'treatment' – with information, *inter alia*, on:

- the structural characteristics of the workplace, such as the number of employees employed, the number of employees who are female, the number of employees who work part time, its corporate status, its Standard Industrial Classification,
- the external environment of the workplace, for example the unemployment rate prevailing in the Travel to Work Area of the workplace, and
- the human resource management policies in operation at the workplace and statements which reflect the prevalent managerial perspectives vis-à-vis the management of human resources, both capable of categorisation into the principal activities of the human resource management (HRM) function

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[16] These criticisms part explain the attempt made in WERS 2004 to collect objective, accounts based measures of workplace profitability and labour productivity with the administration of the Financial Performance Questionnaire with the cross section survey (Forth and McNabb, 2004a: 2004b: 2008). However, in their tests for convergent, discriminate and contract validity, Forth and McNabb find a degree of congruence between the subjective and objective measures of performance, where it is possible to make legitimate comparisons.

[17] Inherent limitation number four, on Bryson *et al's* (2008) list in the context of WERS.

The intent of the exploration was to produce as large and as comprehensive a coverage of 'workplaces' as possible e.g. market and non-market, public and private *etc.*. As a consequence many of the responses to potentially important questions were 'not applicable' to many establishments. For example, responses to questions about: the ownership characteristics of the workplaces; the manner of team working; the extent to which employees were rewarded by means of profit bonuses or share allocations; the conditions prevailing in the product market. As a consequence, many of these were dropped from the list of potential independent variables at the outset, despite their possible relevance to particular subsets of the workplaces surveyed (Brown, 2008).[18] Despite this strategy, the extent to which each of the data sets analysed contained observations which had incomplete information on all the required variables and had to be dropped from the estimations was considerable. This will become more apparent subsequently when the results are presented.

The list of independent variables is presented in Table 3. The 'control' variables (the structural characteristics of the workplace and the external environment characteristics of the workplace) are distinguished from the 'treatment' variables ('human resource management policies'). The 27 human resource management policies (and the two statements which reflect managerial perspectives about the management of human resources) are categorised – not necessarily arbitrarily – into the principal activities of the HRM function viz. 'resourcing', 'training and development', 'process and participation', 'appraisal and reward' and 'work organisation/job design'. Although WERS 2004 provides a rich data set, because the primary data are gathered by means of survey methodology and not case study methodology they do not necessarily have the quality, especially the precision, associated with 'insider econometrics'. As may be seen from the table, there is the possibility that some of the human resource management variables are alternatives (such as *Topbest*, and *Noconsult*); others are potential complements (such as *Attests*,

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[18] Much of the US literature examines manufacturing plants. The 'manufacturing' sector, however, constitutes only 13.51 percent of the workplaces surveyed in WERS 2004. Much of the 'commitment'/'involvement' literature emphasises the role of reward, comprehensively defined. The scope to introduce motivating reward packages is much reduced in what may be described as the 'not for profit' sector, very prevalent within the British economy and particularly manifest in establishments within the ambit of local/central government (including NHS and LEAs) which comprise 19.91 percent of the establishments surveyed in WERS 2004.

Pertests and *Selection*); and others are different manifestations of the same process e.g. *Invplan, Finance* and S*taffing* in the context of communication.

The population of workplaces with 5 or more employees is dominated by small workplaces (e.g. restaurants, small retail outlets, workshops etc.). The proportion of larger workplaces (e.g. hospitals, local government offices, manufacturing plants etc.) is correspondingly smaller. One consequence of this is that the proportions reported of HRM policies in the unweighted sample is heavily influenced by the smaller workplace. Column 4 in Table 5, therefore, does not illustrate the incidence of the identified HRM policy variables across workplaces in Britain. Rather, the proportions reported reflect the size distribution of workplaces and the tendency for some of the policies in question to be prevalent only in larger workplaces.

As proponents of 'insider econometrics' would contend, however, this is but the 'incidence' of policy, not its 'substance', a central feature when seeking to examine the impact of policy variables on performance variables. And Bryson *et al* (2008) would concur. Their final 'inherent limitation' of WERS is the claim that "..the survey instrument remains a fairly blunt instrument for divining what really is going on in a particular workplace………….. it is rarely capable of explaining the process underlying *why* things are as they are (p. 581, italics in the original).

4.   MODELS AND ESTIMATION STRATEGY

The structural model is as follows:

$$\mathbf{y_i} = \mathbf{x_i}\boldsymbol{\beta} + \boldsymbol{\varepsilon_i}$$

where $\mathbf{y_i}$ is the 'i'[th] observation associated with a dependent variable, as appropriate; $\mathbf{x_i}$ is a vector of values for this 'i'[th] observation; $\boldsymbol{\beta}$ is a vector of parameters to be estimated, depicting the structural characteristics of the workplace, its external environment and the HRM policies in operation; and $\boldsymbol{\varepsilon_i}$ is an error term.

Given the three distinct types of dependent variables, three distinct models are estimated viz. a tobit (for the variables *turnover, absence, incidence, injuryrate* and

illrate), a binomial logit (for *action, threat* and *raised*) and an ordered logit (for *labprod* and *quality*). Central to each type of estimation is the notion of a latent variable y^* , that there is an underlying propensity which generates the observed state, where the particular nature of this state will vary according to the dependent variable in question. Although y^* may not be observed directly, at some point a change in y^* results in a change in what is observed (Baum, 2006; Green, 2003; Long, 1997; Long and Freese, 2006; Madalla, 2001).

In the tobit model, y^*_i is not observed if $y^*_i \leq 0$. y^*_i is only observed if $y^*_i > 0$. Consequently, the observed y_i is defined as follows:

$$y_i = y^*_i = x_i\beta + \varepsilon_i \quad \text{if } y^*_i > 0$$
$$y_i = 0 \quad \text{if } y^*_i \leq 0$$

In the logit model, the latent variable y^* is linked to the observed binary variable y_i by two measurement equations viz.:

$$y_i = 1 \text{ if } y^*_i > \tau$$
$$y_i = 0 \text{ if } y^*_i \leq \tau$$

where τ is some threshold level such that, when y^* crosses this, then ($y_i = 0$) becomes ($y_i = 1$).

In the ordered logit model, the latent variable crosses four threshold levels, determined by the perception category of the dependent variable in question, such that:

$$y_i = 1 \text{ (i.e. 'a lot below industry average')} \quad \text{if } \tau_0 = -\infty \leq y^*_i < \tau_1$$
$$y_i = 2 \text{ (i.e. 'below industry average')} \quad \text{if } \tau_1 = \leq y^*_i < \tau_2$$
$$y_i = 3 \text{ (i.e. 'about industry average')} \quad \text{if } \tau_2 = \leq y^*_i < \tau_3$$
$$y_i = 4 \text{ (i.e. 'above industry average')} \quad \text{if } \tau_3 = \leq y^*_i < \tau_4$$
$$y_i = 5 \text{ (i.e. 'a lot above industry average')} \quad \text{if } \tau_4 = \leq y^*_i < \tau_5 = \infty$$

The tobit estimations were weighted, using [weight = *estwtnr*]. The logit and ologit estimations made use of Stata's 'svy' routines (Stata, 2005). Each dependent variable was estimated first using only the independent variables associated with the HRM policies in operation at the workplace. These results are reported in columns 2, 3, and 4 of Tables 4 through to 13. Each dependent variable was then re-estimated, this time with the inclusion of the control variables, reflecting the structural characteristics of the workplace and its external economic environment. These results are reported in columns 5, 6 and 7 of the same tables. Log Likelihood and Wald tests were used, as appropriate, to determine the joint significance of the control variables. In each instance, the set of control variables were not unimportant, manifest in their joint significance, confirmed via the LR and Wald tests. Moreover, when added to the initial estimation, often their impact was to change sign/magnitude/ level of statistical significance of some of the coefficients of the HRM policy variables. Hence the description of the results in the subsequent section of the paper focuses entirely upon the output of the second estimation.

The assumption throughout is that the effect of each HRM policy is positive with respect to each performance indicator (where the alternative position is that of 'no policy'). For example, labour productivity is improved and labour turnover is reduced as a consequence of 'policy'.[19] Proponents of the high performance paradigm would hypothesise positive and statistically significant correlations between *labprod* and an array of policy related variables drawn from all five of the subsets of human resource management policy used to describe the discrete functions of HRM. Similar outcomes may be expected for *quality*, if this too is assumed to be a final performance indicator. Alternatively, if *quality* is assumed to be an intermediate performance indicator – negatively associated with 'spoils' and 'wastage', for example - then the expectation is for positive and statistically significant correlations between *quality* and policies more likely within the 'training and development' subset. The expectation is for negative and statistically significant correlations between each of the eight intermediate performance variables and some of the policy variables. More specifically, the expectation is that *turnover* and *absence* are negatively correlated more likely with policies within the 'resourcing' and 'training and development'

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[19] The effect of the two 'statement' variables, reflecting managerial perspectives about human resource management is more problematic.

subsets, much in accordance with the Personnel Economics literature (cf. Lazear, 1998); that *action*, *threat, raised* and *sanctions* are negatively correlated more likely with policies within the 'process and participation' subset, in accordance with some schools of thought in the industrial relations literature (cf. Burchill, 2008); and that *injuryrate* and *illrate* are negatively correlated more likely with policies within the 'training and development' and 'work organisation/job design' subsets, again in accordance with the Personnel Economics literature.

5.   RESULTS

The detail of the results for the two estimations associated with each of the 10 dependent variables are presented in Tables 4 through to 13. Table 14 is a composite table, which extracts for each coefficient its sign and its statistical significance in each of the 10 estimations.

In the context of *turnover* (Table 4), only two of the five variables within the 'resourcing' subset (*Attests* and *Pertests*) are negative (with the latter being statistically significant), results which are not in accordance with expectations. In the 'training and development' subset, one variable is negatively signed and statistically significant (*Offjob*) and the other is positively signed (*Othjob*), again results somewhat contrary to expectations. The majority of the variables within the 'process and participation' subset are negatively signed. Other than the negative signs on *Design*, *Meeting*, *Brief* and *Joint* (none of which is statistically significant), there is little coherency in the story they tell, however. The 'appraisal and reward' subset appears to be of little consequence, perhaps surprisingly given the dependent variable in question, but perhaps attributable to the nature of the independent variables available to be included in the estimation. In the 'work organisation/job design' subset, *variety*, *Discret* and *Controlover* are negatively signed (and each is statistically significant), although *Teams* is not. This does suggest some relationship between voluntary quitting and aspects of job discretion.

All five variables associated with the 'resourcing' subset are negative in the *absence* estimation, although none is statistically significant (Table 5). Both variables in the 'training and development' subset are positively signed, and *Othjob* is statistically

significant. In terms of the coefficients in the 'process and participation' subset, although the majority of the variables are negatively signed the only two which are statistically significant are positively signed (*Brief* and *Procedure*). Again, the variables associated with 'appraisal and reward' are of little consequence. Once again, however, three of the four variables in the 'work organisation/job design' subset are negatively signed (on this occasion *Discret*, *Controlover* and *Teams*), with the last two also being statistically significant, results which suggest some relationship between absence and aspects of job discretion.

In the *action* estimation, *Topbest* and *Noconsult* in the 'process and participation' subset are both positively signed and statistically significant (Table 6). Elsewhere within this same subset of variables, there is some evidence of the importance of 'process and participation' in reducing the likelihood of industrial action, with *Design*, *Meeting*, *Brief*, *Procedure*, *Grievance*, *Equalops* and *Healthand* all being negatively signed (and all but the last of these also being statistically significant). That said, *Joint* and *Circles* are positively signed, as are all of the three variables associated with 'communication' (i.e. *Invplan*, *Finance* and *Staffing*). Of the positively signed variables in this subset, however, only *Joint* is statistically significant. Rarely are the variables associated with the other four subsets of HRM policy of consequence in the context of this dependent variable.

The results of the *threat* estimation are quite different to those of *action* estimation, if surprisingly so (Table 7). On this occasion, whereas *Topbest* is negatively signed, *Noconsult* is positively signed (and statistically significant). Elsewhere within the 'process and participation' subset, on balance the coefficients of the policy variables are negatively signed, although the policy variables which are negatively signed in this estimation are not always the same as those found to be negatively signed in the *action* estimation. Only two of the negatively signed coefficients are statistically significant (*Meeting* and *Equalops*), whereas three of the positively signed coefficients are statistically significant (*Staffing*, *Procedure* and *Healthand*). Once again, the variables associated with the other four subsets of HRM policy are of little/no consequence. It would appear, therefore, that the determinants of *threat* are different from those of *action*, and much less likely to be correlated with the policy variables.

Whereas *action* and *threat* may be identified with collective dispute/grievance at the workplace, *raised* and *sanctions* are indicators associated with the concerns and behaviour of individual workers. The expectation is that policy variables within the 'process and participation' subset are more likely to be of consequence in the context of both these dependent variables. However, this does not prove to be the case in either instance. In the context of *raised,* there are only two statistically significant variables within the 'process and participation' subset (*Brief* and *Circles*) and both are negatively signed. That said, in all there are just as many negatively signed as positively signed variables (Table 8). Little of consequence is associated with the other four subsets of HRM policy. There is more that is of statistical consequence in the *sanctions* estimation, although none of it produces a coherent, consistent story (Table 9). For example, nine of the policy related variables within the 'process and participation' subset are positively signed, three of which are statistically significant (*Meeting*, *Staffing* and *Discipline*). Conversely, all four variables within the 'work organisation/job design' subset are negatively signed, two of which are statistically significant (*Discret* and *Teams*). Four variables within the 'resourcing' subset are statistically significant, although whereas *Longterm* and *Pertests* are negatively signed, *Attests* and *Selection* are positively signed.

Injuryrate and *illrate* are presumed to be comparable, to the extent that both variables are expected to be correlated more likely with policies within the 'training and development' and 'work organisation/job design' subsets. There is some support for this argument. In the context of *injuryrate*, both policy variables associated with 'training and development' are negatively signed, but neither is statistically significant (Table 10). In the context of the variables associated with 'work organisation/job design', all four are negatively signed and two (*Controlover* and *Teams*) are statistically significant. The 'resourcing' and 'process and participation' subsets produce a mix of positively and negatively signed variables, few of which are statistically significant. In the context of *illrate*, the two variables associated with 'training and development' are statistically significant, although one is positive (*Offjob*) and the other *(Othjob)* is negative (Table 11). However all four variables associated with 'work organisation/job design' are again negatively signed, with *Variety* and *Controlover* being statistically significant on this occasion. The variables

within the 'resourcing' and 'process and participation' subsets are very much as described for *injuryrate*.

In this exploration, *labprod* epitomises the final performance indicator variable associated with the high performance paradigm. Therefore, in contrast to the preceding intermediate performance indicators discussed thus far, *labprod* is expected to be positively correlated with variables drawn from all five subsets of HRM policy. There are 10 statistically significant variables in the *labprod* estimation, drawn from three of the five subsets of policy – the exceptions being 'appraisal and reward' and 'work organisation/job design' (Table 12). However, four of the 10 are negatively signed (*Noconsult, Finance, Grievance* and *Equalops*). Furthermore, of the 27 policy related variables (i.e. excluding the two 'statement' variables *Topbest* and *Noconsult*), 10 are negatively signed and are to be found in four of the five subsets. The exception, where both variables are positively signed and statistically significant is 'training and development'.

Given the argument that presumes that *quality*, too, is a final performance indicator, the expectation is that it also would be positively correlated with a range of policy variables drawn from across all five subsets of HRM policy. However, were '*quality*' to be more akin to 'spoils' or 'wastage', the variables of consequence would more likely be found in those associated with the 'training and employee development' subset. There is little supporting evidence for either argument. In the quality estimation, only seven variables are statistically significant, two of which are negatively signed (*Grievance* and *Jobeval*) (Table 13). Of the 27 policy related variables (i.e. again excluding the statement variables *Topbest* and *Noconsult*), 11 are negatively signed. Although the two variables associated with the 'training and development' subset are positively signed (*Offjob* and *Othjob*), neither is statistically significant. In the crude correlations reported in Table 2, *labprod* and *quality* were shown to be positively correlated. In terms of the outcomes of their estimations, however, their determinants prove to be very different and are rarely supportive of the high performance paradigm.

The composite Table 14 offers an alternative perspective of the results of the 10 estimations, where it is possible, row by row, to compare and contrast the sign and

statistical significance of the correlations of the 29 variables, again categorised by the five principal activities of the HRM function. Only one variable (*Controlover*) is consistently signed across the columns in accordance with expectations, negatively signed for the eight intermediate performance indicators and positively signed for the two final performance indicators. Moreover, the variable is statistically significant on four occasions. *Variety* is consistently signed with one exception (*absence*), and on the occasions when it is appropriately signed it is statistically significant three times. Variables tend to be signed in accordance with expectations more frequently for the two final performance indicators than the eight intermediate performance indicators. For example, 12 of the 27 policy related variables are positively signed in both the *labprod* and *quality* estimations *(Attests, Induct, Offjob, Othjob, Design, Brief, Invplan, Staffing, Discipline, Healthand, Variety* and C*ontrolover*). Moreover, these are drawn from four of the five subsets of HRM policy (the exception is 'appraisal and reward').

6.   CONCLUSIONS

This paper was motivated by the 'high performance paradigm', the presumption that the presence at the workplace of certain human resource management policies enhances corporate performance, variously defined and measured.

Writing in the context of the high performance paradigm, Ichniowski *et al* (1996) warned (with the additional implication for this paper of mixing metaphors) that "there are no one or two 'magic bullets' that are *the* work practices that will stimulate worker and business performance" (p. 322, italics in the original). This paper has not sought to investigate the stimulants of worker and business behaviour, rather the correlates of 10 indicators of workplace performance, a much less ambitious task.

Two of the ten indictors of workplace performance were final performance indicators. Although expressed in terms of (subjective) ordinal variables, nonetheless they were compatible with the measures of performance conventionally used within the high performance paradigm research agenda: the (respondent's) assessment of the workplace's labour productivity relative to other workplaces in the same industry, and the (respondent's) assessment of the workplace's quality of product/service relative to

other workplaces in the same industry. The remainder were intermediate performance indicators, very diverse in their nature but, in principle, more directly related to the HRM policies in operation (or not) at workplaces: labour turnover; the percentage of working days lost through absence; whether some form of industrial action had occurred; whether some threat of some form of industrial action had been made; whether employees had formally raised matters via grievance procedures; the incidence of sanctions levied against employees; the incidence of specified injuries sustained by employees during working hours; the incidence of specified illnesses/diseases suffered by employees.

Correlations – positive and negative, as appropriate – were sought between these 10 indicators and 27 HRM policies, where, again, these policies were compatible with those to be found within the high performance paradigm research agenda. Additionally, these policies were categorised, according to what was identified as five principal activities of the HRM function : 'resourcing', 'training and development', 'process and participation', 'appraisal and reward' and 'work organisation/job design'.

Only one variable within the 27 (a binary variable associated with a positive response to a statement to the effect that individuals in the largest occupational grouping within the workplace have a lot of control over the pace at which they work) within the total of 27 policy related variables, was found to be consistently compatible with expectations across all 10 estimations. Another (another binary variable associated with a positive response to a statement to the effect that individuals in the largest occupational group at the workplace have a lot of variety in the jobs they do) was compatible with expectations in nine of the estimations. Both policy variables were associated with the 'work organisation/job design' subset of HRM policy. Furthermore, some variables within this same subset of HRM policy were found to be negatively correlated with labour turnover and absence, results in accordance with expectations. Some variables within the 'process and participation' subset were found to be negatively correlated with there having been some form of industrial action taken at the workplace, again results in accordance with expectations.

No claim is made for the potency of either of the two single variables in question – magical or metallic. Nor is any claim made for the particular properties of the two policy subsets found to be correlated with the three intermediate performance indicators. However, why the outcomes of the exploration are so apparently at odds with some of the more positive findings associated with the high performance paradigm research agenda does warrant some possible explanation.

There are inherent econometric problems associated with the analysis of cross section survey data viz.: response bias, measurement error, sample selectivity, endogeneity and omitted variable bias. Two are claimed to be especially important within this exploration, rationalising, perhaps, the results reported: measurement error and omitted variable bias. The 'check list' of HRM policy variables, denoting whether or not they operate at the workplace, is a limited substitute for the 'right data' from the 'right people', one of the central tenets of those who practise 'insider econometrics'. Merely denoting the workplace presence of these policies does not measure their substance. Further, managing 'human resources' is only one function of 'management'. How well management manages its other functions undoubtedly helps explain final performance indicators, such as profitability. It may also help part explain intermediate labour related indicators of workplace performance.

Within WERS 2004, therefore, in empirical investigations of this type there is a need to introduce further controls which denote the quality of management at the workplace (such as the information available on the use made of benchmarking and targeting, often considered as illustrative examples of 'good management' practice). And doing so may be done better in a more disaggregated study, for example of manufacturing industry, where establishments are more homogenous.

Further in the context of future empirical investigations of this type, within WERS 201(?), perhaps there is a need to incorporate more generic 'management' variables? And, to reduce the magnitude of measurement error, perhaps there is a need to introduce complementary methodologies, such as linked case studies (Delbridge and Whitfield, 2007).

REFERENCES

Baird, M. (2002) 'Changes, Dangers, Choice and Voice: Understanding what High Commitment Management Means for Employees and Unions', *Journal of Industrial Relations*, 44: 3, pp 359 -375.

Bartel, A., Ichniowski, C. and Shaw, K. (2004) 'Using "Insider Econometrics" to Study Productivity', *American Economic Review*, 94: 2, pp 217 -223.

Baum, C.F. (2006) *An Introduction to Modern Econometrics Using Stata.* College Station, Texas, USA: The Stata Press.

Becker, B. and Gerhard, B. (1996) 'The Impact of Human Resource Management on Organisation Performance: Progress and Prospects', *Academy of Management Journal*, 39: 4, pp 779 -801.

Black, S.E. and Lynch, L. (2001) 'How to Compete: The Impact of Workplace Practices and Information Technology on Productivity', *Review of Economics and Statistics*, 83: 3, pp 434 -445.

Black, S.E. and Lynch, L. (2004) 'What's Driving the New Economy? The Benefits of Workplace Innovation', *Economic Journal*, Vol. 114 (February), pp F97 – F116.

Bloom, N. and Van Reenen, J. (2006) 'Management Practices, Work-Life Balance, and Productivity: A Review of Some Recent Evidence', *Oxford Review of Economic Policy*, 22: 4, pp 457 -482.

Brown, W. (2008) 'The Influence of Product Markets in Industrial Relations', in P. Blyton, N. Bacon, J. Fiorito, J. and E. Heery, E. (eds.) (2008) *The Sage Handbook of Industrial Relations*. London: Sage.

Bryson, A., Charlwood, A. and Forth, J. (2006) 'Worker Voice, Managerial Response and Labour Productivity', *Industrial Relations Journal*, 37: 5, pp 438 -455.

Bryson, A., Green, F. and Whitfield, K. (2008) 'A Quarter Century of Workplace Employment Relations Surveys', *British Journal of Industrial Relations*, 46: 4, pp 577 -586.

Burchill, F. (2008) *Labour Relations*. Basingstoke, Palgrave Macmillan.

Cappelli, P. and Neumark, D. (2001) 'Do "High-Performance" Work Practices Improve Establishment –Level Outcomes?', *Industrial and Labour Relations Review*, 54: 4, pp 737 -776.

Caves, R.E. (1980) 'Productivity Differences among Industries', in R.E. Caves and L.B. Krause (eds.) *Britain's Economic Performance*, Washington, DC: The Brookings Institution.

Collier, W., Green, F. and Peirson, J. (2005) 'Training and Establishment Survival', *Scottish Journal of Political Economy*, 52: 5, pp 710 -735.

Conway, E. and Monks, K. (2009) 'Unravelling the Complexities of High Commitment: An Employee-level Analysis', *Human Resource Management Journal*, 19:2, pp 140 -158

Cully, M., Woodland, S., O'Reilly, A. and Dix, G. (1999) *Britain at Work: As Depicted by the 1998 Workplace Employee Relations Survey*. London: Routledge

Delaney, J.T. and Godard, J. (2001) 'An Industrial Relations Perspective on the High Performance Paradigm', *Human Resource Management Review*, 11: 2, pp 395 -429.

Delbridge, R. and Whitfield, K. (2007) 'More than Mere Fragments? The Use of the Workplace Employment Relations Data in HRM Research'. *International Journal of Human Resource Management*, 18: 12, pp 2166 -2181.

De Menezes, L.M. and Wood, S. (2006) 'The Reality of Flexible Work Systems in Britain', *International Journal of Human Resource Management*, 17: 1, pp 106 138.

DTI (2003) *Innovation Report: Competing in the Global Economy: The Innovation Challenge*, London: Department of Trade and Industry.

Durcan, J.W., McCarthy, W.E. and Redman, G.P. (1983*) Strikes in Post War Britain: A Study of Stoppages of Work Due to Industrial Disputes, 1948 -1973*. London: Allen and Unwin.

Forth, J. and McNabb, R. (2004a) 'Innovations in WERS 2004: The Collection of Objective Data on Workplace Performance'. WERS 2004 Information and Advice Service Technical Paper No. 1.

Forth, J. and McNabb, R. (2004b) 'Workplace Performance: A Comparison of Subjective and Objective Measures in the 2004 Workplace Employment Relations Survey'. WERS 2004 Information and Advice Service Technical Paper No. 2.

Forth, J. and McNabb, R. (2008) 'Workplace Performance: A Comparison of Subjective and Objective Measures in the 2004 Workplace Employment Relations Survey, *Industrial Relations Journal*, 39: 2, pp 104 -123.

Frost, A.C. (2008) 'The High Performance Work Systems Literature in Industrial Relations', in P. Blyton, N. Bacon, J. Fiorito, and E. Heery (eds.) (2008) *The Sage Handbook of Industrial Relations*. London: Sage.

Godard, J. (2001) 'High Performance and the Transformation of Work? The Implications of Alternative Work Practices for the Experience and Outcomes of Work', *Industrial and Labor Relations Review*, 54: 4, pp 776 -805.

Godard, J. (2004) 'A Critical Assessment of the High-Performance Paradigm', *British Journal of Industrial Relations*, 42: 2, pp 349 -378.

Godard, J. and Delaney, J.T. (2000) 'Reflections on the 'High Performance' Paradigm's Implications for Industrial Relations as a Field', *Industrial and Labour Relations Review*, 53: 3, pp 482 -502.

Golding, N. (2007) 'Strategic Human Resource Management', in J. Beardwell and T. Claydon (eds.) *Human Resource Management: A Contemporary Approach* (5th edition). Harlow: Pearson Education. (Table 2.6, p. 61).

Green, F. (2001) 'It's Been a Hard Days Night: The Concentration and Intensification of Work in Late 20th Century Britain', *British Journal of Industrial Relations*, 39: 1, pp 243 -256.

Green W.H. (2003) *Econometric Analysis*, 5e, New Jersey, USA: Prentice Hall.

Griffiths, R., Haskell, J., and Neely, A. (2006) 'Why is Productivity so Dispersed?', *Oxford Review of Economic Policy*, 22:4, pp 513 -525.

Guest, D.E. (2001) 'Human Resource Management: When Research Confronts Theory', *International Journal of Human Resource Management*, 12,: 7, pp 1092 -1106.

Guest, D.E., Michie, J, Conway, N. and Sheehan, M. (2003) 'Human Resource Management and Corporate Performance in the UK', *British Journal of Industrial Relations,* 41: 2, pp 291 -314.

Huselid, M. (1995) 'The Impact of Human Resource Management Practices on Turnover, Productivity and Corporate Performance', *Academy of Management Journal*, 38: 3, pp 635 -672.

Hyman, R. (1972) *Strikes*. London: Fontana Press.

Ichniowski, C., Kochan, T., Levine, D., Olson, C. and Strauss, G. (1996) 'What Works at Work: Overview and Assessment', *Industrial Relations*, 35: 3, pp 299 -333.

Ichniowski, C. and Shaw, K. (2003) 'Beyond Incentive Pay: Insiders' Estimates of the Value of Complementary Human Resource Management Practices', *Journal of Economic Perspectives*, 17: 1, pp 155 -180.

Ichniowski, C. Shaw, K. and Prennushi, G. (1997) 'The Effects of Human Resource Management Practices on Productivity: A Study of Steel Finishing Lines', *American Economic Review*, 87: 3, pp 291 -313.

Johnson, G. and Scholes, K. (2002) *Exploring Corporate Strategy*, 6th edition, Harlow: Pearson Education.

Jones, M.K., Jones, R.J., Latreille, P.L. and Sloane, P.J. (2009) 'Training, Job Satisfaction and Workplace Performance in Britain: Evidence from WERS 2004', *Labour* , 23: 1, pp 139 -175.

Kersley, B., Alpin, C., Forth, J., Bryson, A., Bewley, H., Dix, G. and Oxenbridge, S. (2006) *Inside the Workplace: Findings from the 2004 Workplace Employment Relations Survey*. London: Routledge.

Kinnie, N., Hutchinson, S., Purcell, J., Rayton, B. and Swart, J. (2005) 'Satisfaction with HR Practices and Commitment to the Organisation: Why One Size Does Not Fit All', *Human Resource Management Journal*, 15: 4, pp 9 – 29.

Kochan, T.. Katz, H. and McKersie, R. (1986) *The Transformation of American Industrial Relations*. New York: Basic Books.

Kochan, T. and Osterman, P. (1994) *The Mutual Gains Enterprise*. Boston: Harvard Business School Press.

Lansbury, R.D. and Wailes, N. (2008) 'Employee Involvement and Direct Participation', in P. Blyton, N. Bacon, J. Fiorito, and E. Heery, E. (eds.) (2008) *The Sage Handbook of Industrial Relations*. London: Sage.

Lazear, E.P. (1998) *Personnel Economics for Managers*. New York: John Wiley and Sons.

Lazear, E.P. (2000) 'Performance Pay and Productivity', *American Economic Review*, 90: 5, pp 1346 -1361

Legge, K. (2001) 'Silver Bullet or Spent Round? Assessing the Meaning of the 'High Commitment Management'/Performance Relationship', in J. Storey (ed.) *Human Resource Management: a Critical Text*. London: Thomson.

Legge, K. (2005) *Human Resource Management: Rhetorics and Realities.* Basingstoke: Palgrave Macmillan.

Levine, D.I. (1995) *Reinventing the Workplace: How Business and Employees Can Both Win*. Washington DC: Brookings Institution.

Long J.S. (1997) *Regression Models for Categorical and Limited Dependent Variables.* London: Sage Publications.

Long, J.S. and Freese, J. (2006) *Regression Models for Categorical Dependent Variables Using Stata, (2nd edition).* College Station, Texas, USA: The Stata Press.

Lynch, L. (2007) 'Organisational Performance and the New Economy', WPEG Conference, Manchester.

Maddala G.S. (2001) *Introduction to Econometrics*, 3rd edition. Chichester: Wiley.

Mayhew, K. and Neely, A. (2006) 'Improving Productivity – Opening the Black Box', *Oxford Review of Economic Policy*, 22: 4, pp. 445 -456.

Osterman, P. (1994) 'How Common is Workplace Transformation and Who Adopts It?' *Industrial and Labor Relations Review*, 47: 2, pp 173 – 88.

Oulton, N. (1998) 'Competition and the Dispersion of Labour Productivity amongst UK Companies', *Oxford Economic Papers*, 50: 1, pp 23 -38.

Paauwe, J. and Richardson, R. (2001) 'Editorial Introduction: HRM and Performance: Confronting Theory and Reality', *International Journal of Human Resource Management*, 12: 7, pp 1085 -1091.

Paterson, T.T. (1960) *Glasgow Ltd.: A Case-Study in Industrial War and Peace*. Cambridge: Cambridge University Press.

Phelps Brown, E.H. (1971) 'Labour Policies: Productivity, Industrial Relations and Cost Inflation', in A. Cairncross (ed.) *Britain's Economic Prospects Reconsidered.* London: Allen and Unwin.

Pfeffer, J. (2008) 'Human Resources from an Organisational Behaviour Perspective: Some Paradoxes Explained', *Journal of Economic Perspectives*, 21: 4, pp 115 -134.

Piore, M. and Sabel, C. (1984) *The Second Industrial Divide: Possibilities for Prosperity*. New York: Basic Books.

Procter, S. (2008) 'New Forms of Work and the High Performance Paradigm', in P. Blyton, N. Bacon, J. Fiorito and E. Heery (eds.) (2008) *The Sage Handbook of Industrial Relations*. London: Sage.

Ramsay, H., Scholarios, D. and Harley, B. (2000) 'Employees and High-Performance Work Systems: Testing inside the Black Box', *British Journal of Industrial Relations*, 38: 4, pp 501 -531.

Smith, C.T.B., Clifton, R., Makeham, P. Creigh, S.W. and Burn, R.W. (1978) *Strikes in Britain*. London: Department of Employment, Manpower Paper No. 15.

Stata (2005) *Stata Survey Data Reference Manual, Release 9*. College Station, Texas, USA: Stata Press.

Ulman, L. 1968) 'Collective Bargaining and Industrial Efficiency', in R.E. Caves and Associates *Britain's Economic Prospects*, Washington DC: The Brookings Institution.

Wood, S. (1999a) 'Getting the Measure of the Transformed High Performance Organisation', *British Journal of Industrial Relations*, 37: 3, pp 391 -417.

Wood, S. (1999b) 'Human Resource Management and Performance', *International Journal of Management Reviews*, 1: 4, pp 367 – 413.

Wood. S. and de Menezes, L. (1998) 'High Commitment Management in the UK: Evidence from the Workplace Industrial Relations Survey and Employers' Manpower and Skills Practices Survey', *Human Relations*, 51: 4, pp 485 -515.

Table 1. The Dependent Variables

Variable Name	Variable Descriptor	Variable Type	Mean (SD) or Proportion	Number of Observations
turnover	Labour turnover	Scalar	13.22 (15.67)	2125
absence	The percentage of working days lost through absence	Scalar	5.03 (6.8)	1897
action	Some form of industrial action has taken place	Nominal: Binary: yes =1	0.06	2293
threat	Some threat of some sort of industrial action has been made	Nominal: Binary: yes =1	0.09	2110
raised	Employees have formally raised matters via grievance procedures	Nominal: Binary: yes =1	0.45	2137
sanctions	The (percentage) incidence of sanctions levied against employees	Scalar	5.50 (22.5)	2182
injuryrate	The (percentage) incidence of injuries sustained by employees during working hours	Scalar	0.57 (3.4)	2248
illrate	The (percentage) rate of specified illnesses/diseases suffered by employees	Scalar	2.61 (6.5)	2094
labprod	The assessment of establishment labour productivity relative to other establishments in the same industry	Ordinal (5 responses)	3.49 (0.7)	1977
quality	The assessment of establishment product/service quality relative to other establishments in the same industry, (additionally to be seen as indicative of 'errors', 'mistakes', 'spoils', 'wastage' *etc*., if in reverse order)	Ordinal (5 responses)	3.97 (0.7)	2137

Footnote to Table 1: The Definition and Derivation of the Dependent Variables (original WERS variable identification in parenthesis).

Labour Turnover: the number who quit voluntarily in the last 12 months (zresigne) as a percentage of the numbers employed at the workplace one year ago (zemp1ago).

Absence: the percentage of work days lost through employee sickness or absence in the last 12 months (zabsence).

Action: whether or not any one of the specified forms of industrial action has taken place at the workplace in the last 12 months (gactio01).

Threat: whether or not any one of the specified forms of industrial action has been threatened at the workplace in the last 12 months (gpstyr1).

Raised: whether or not any employees have formally raised matters through individual grievance procedures at the workplace in the last 12 months (hraised).

Sanctions: the number of employees who have had disciplinary sanctions levied against them in the last 12 months (hsusnum) as a percentage of the numbers currently employed at the workplace (zallemps).

Injuryrate: the number of employees at the workplace who have sustained any one of the injuries identified in the last 12 months (inumij) as a percentage of the numbers currently employed (zallemps).

Illrate: the number of employees at the workplace who have suffered from any one of the illnesses or diseases identified in the last 12 months (illnum) as a percentage of the numbers currently employed (zallemps).

Labprod: compared with other establishments in the same industry how would you (i.e. the respondent) assess your labour productivity (kestper2).

Quality: compared with other establishments in the same industry how would you (i.e. the respondent) assess the quality of your product/service (kestper3).

Table 2. OLS Regression Coefficients: regressing row variable on column variable

	absence	Action	threat	raised	sanctions	injuryrate	illrate	labprod	quality
turnover	0.74	-5.01	4.51	-18.80	0.07 **	0.51	-0.16 **	24.34 **	0.99
absence		0.30	0.09	0.58 **	0.01 ***	0.04	0.11 ***	-0.30	0.14
action			0.41 ***	0.08 ***	-0.00	0.01	0.01 ***	-0.02 ***	-0.02 ***
threat				0.12 ***	-0.00	0.01 **	0.01 ***	-0.02 ***	0.13 ***
raised					0.00	0.01 **	0.01 **	-0.06 ***	-0.04 ***
sanctions						0.20	0.05	-0.89	-0.47
injuryrate							0.05 ***	-0.07	-0.18 *
illrate								-0.22	-0.73 ***
labprod									0.36 ***

Footnote to Table 2. : * , ** , and *** statistically significant at 0.1, 0.05, and 0.001 respectively

Table 3. The Independent Variables, by Category

Variable Name	Variable Descriptor	Variable Type	Mean (SD) or Proportion	Number of Observations
Structural Characteristics of the Workplace				
Logtotalemp	Log of the total number of employees	Scalar	4.45 (1.7)	2295
Logpcwom	Log of the percentage of women employed	Scalar	3.58 (1.1)	2285
Logpcpte	Log of the number of employees who work part time	Scalar	2.08 (2.2)	2295
Logpcocc	Log of the percentage of employees who are classified as 'managers', 'professionals' and 'associate professionals'	Scalar	2.80 (1.6)	2281
Logpcyoung	Log of the percentage of employees who are aged 16 – 21	Scalar	0.39 (2.4)	2210
Logpcold	Log of the percentage of employees who are aged 50 plus	Scalar	2.38 (1.8)	2207
Logpcethnic	Log of the percentage of employees who are members of non-white ethnic groups	Scalar	-0.13 (2.5)	2093
Logpcunion	Log of the percentage of employees who are members of a union or staff association	Scalar	0.53 (3.3)	1994
logpchighwage	Log of the percentage of employees who are earning £15 per hour or more	Scalar	0.91 (2.7)	2130
Logpcfixterm	Log of the percentage of employees who are working on temporary and fixed term contracts	Scalar	-0.82 (2.5)	2229
Logpcagency	Log of the percentage of workers who are 'agency' workers	Scalar	-1.53 (2.1)	2168
Plantype1	The establishment is part of a multi-plant organisation	Nominal: Binary: yes =1	0.75	2295
Plantype2	The establishment is a single plant organisation – the reference category	Nominal: Binary: yes =1	0.22	2295
Plantype3	The establishment is the sole UK establishment of a foreign organisation	Nominal: Binary: yes =1	0.02	2295

Table 3. (cont.)

Variable	Variable Descriptor	Variable Type	Mean (SD) Or Proportion	Number of Observations
Structural Characteristics of the Workplace (cont.)				
Status	The (legal) status of the establishment X 12 dummy variables	Nominal: Binary: yes =1		2295
Covered	Most employees (i.e. more than 60 percent) have their pay determined by union negotiation	Nominal: Binary: yes =1	0.43	2269
Assist	The respondent has staff to assist with personnel etc. matters	Nominal: Binary: yes =1	0.75	2295
Nsicode	Industry dummies X 12	Nominal: Binary: yes =1		2295
External Environment Characteristics of the Workplace				
Urate	The unemployment rate in the TTWA of the workplace (banded)	Ordinal	3.32 (1.8)	2295
Uvratio	The unemployed to vacancies ratio in the TTWA of the workplace	Scalar	3.62 (2.5)	2295
Gor	Government Office Region X 11 dummy variables	Nominal: Binary: yes =1		2295

Table 3. (cont.)

Variable	Variable Descriptor	Variable Type	Mean (SD) Or Proportion	Number of Observations
Human Resource Management Policies: Resourcing				
Longterm	Employees are led to expect long term employment	Nominal: Binary: yes =1	0.77	2295
Attests	Personality/attitude tests are used in the process of selection	Nominal: Binary: yes =1	0.33	2292
Pertests	Performance/competency tests are used in the process of selection	Nominal: Binary: yes =1	0.60	2291
Induct	There is an induction programme for new recruits	Nominal: Binary: yes =1	0.89	2289
Selection	Selection is monitored according to identified criteria	Nominal: Binary: yes =1	0.44	2281
Human Resource Management Policies: training and development				
Offjob	Most employees i.e. more than 60 percent have been given time off work to undertake training	Nominal: Binary: yes =1	0.54	2249
Othjob	Most employees i.e. more than 60 percent are formally trained to do jobs other than their own	Nominal: Binary: yes =1	0.16	2229

Table 3. (cont.)

Variable	Variable Descriptor	Variable Type	Mean (SD) Or Proportion	Number of Observations
Human Resource Management Policies: process and participation				
Topbest	Statement: Those at the top are best placed to make decisions at this workplace	Nominal: Binary: yes =1	0.51	2295
Noconsult	Statement: Most decisions at this workplace are made without consulting employees	Nominal: Binary: yes =1	0.14	2295
Design	Statement: members of the large occupational group have a lot of involvement about decisions	Nominal: Binary: yes =1	0.24	2285
Meeting	There are meetings between senior managers and the workforce	Nominal: Binary: yes =1	0.77	2294
Brief	There are meetings between line managers/supervisors and the workers for whom they are responsible	Nominal: Binary: yes =1	0.80	2293
Joint	There is/are committee/s of managers and employees concerned with consultation	Nominal: Binary: yes =1	0.35	2291
Circles	There are groups of non managerial employees who meet to discuss issues of performance and quality	Nominal: Binary: yes =1	0.33	2283
Invplan	Management regularly give employees/their representatives information about internal investment plans	Nominal: Binary: yes =1	0.51	2279
Finance	Management regularly give employees/their representatives information about the financial position of the establishment	Nominal: Binary: yes =1	0.67	2292
Staffing	Management regularly give employees/their representatives information staffing plans at establishment	Nominal: Binary: yes =1	0.65	2293
Procedure	There is a formal procedure for dealing with collective disputes	Nominal: Binary: yes =1	0.57	2265

Table 3. (cont.)

Variable	Variable Descriptor	Variable Type	Mean (SD) or Proportion	Number of Observations
Human Resource Management Policies: process and participation				
Grievance	There is a formal procedure for dealing with individual grievances	Nominal: Binary: yes =1	0.93	2294
Discipline	There is a formal procedure for dealing with discipline and dismissal	Nominal: Binary: yes =1	0.95	2291
Equalops	There is an equal opportunities policy or policy for managing diversity	Nominal: Binary: yes =1	0.85	2281
Healthand	There is a joint committee of managers and employees which deals with health and safety	Nominal: Binary: yes =1	0.36	2287
Human Resource Management Policies: appraisal and reward				
Paid1	Payments by results (PBR) schemes operate for some employees	Nominal: Binary: yes =1	0.31	2294
Paid2	Merit pay schemes operate for some employees	Nominal: Binary: yes =1	0.15	2294
Paid3	Neither PBR nor merit schemes of payment operate – the reference category	Nominal: Binary: yes =1	0.53	2294
Jobeval	There are formal job evaluation schemes	Nominal: Binary: yes =1	0.33	2292

Table 3. (cont.)

Variable	Variable Descriptor	Variable Type	Mean (SD) Or Proportion	Number of Observations
Human Resource Management Policies: work organisation/job design				
Variety	Individuals in the largest occupational group have a lot of variety in their job	Nominal: Binary: yes =1	0.43	2285
Discret	Individuals in the largest occupational group have a lot of discretion over how to do their jobs	Nominal: Binary: yes =1	0.22	2285
Controlover	Individuals in the largest occupational group have a lot of control over the pace at which they do their work	Nominal: Binary: yes =1	0.20	2286
Teams	Most employees (i.e. more than 60 percent) in the largest occupational group work in teams	Nominal: Binary: yes =1	0.70	2279

Table 4. Tobit Results: Dependent Variable: turnover

Variable	Coef	Std Err	P > |t|	Coef	Std Err	P > |t|
Longterm	1.826	1.498	.223	.922	1.409	.513
Attests	1.690	1.597	.290	-.675	1.503	.653
Pertests	-6.435	1.259	.000	-4.116	1.186	.001
Induct	5.122	1.706	.003	1.989	1.585	.210
Selection	-3.529	1.468	.016	.424	1.398	.762
Offjob	-6.187	1.335	.000	-4.017	1.251	.001
Othjob	1.089	1.499	.468	.967	1.422	.497
Topbest	-.323	1.260	.797	-.831	1.184	.483
Noconsult	-.504	1.732	.771	-2.653	1.586	.095
Design	-.719	1.477	.627	-.505	1.421	.722
Meeting	-.837	1.566	.593	-1.934	1.443	.180
Brief	-.291	1.411	.837	-.238	1.318	.857
Joint	-4.764	2.355	.043	-.824	2.206	.709
Circles	2.117	1.631	.195	2.181	1.512	.149
Invplan	-2.564	1.352	.058	-1.332	1.252	.287
Finance	4.995	1.410	.000	5.086	1.333	.000
Staffing	1.927	1.403	.170	1.193	1.302	.360
Procedure	-7.244	1.351	.000	-5.877	1.287	.000
Grievance	3.966	2.473	.109	6.565	2.362	.006
Discipline	.255	2.548	.920	-4.341	2.424	.074
Equalops	2.269	1.659	.172	.251	1.583	.874
Healthand	.819	2.219	.712	2.008	2.121	.344
Paid1	1.204	1.352	.373	.027	1.364	.984
Paid2	-1.057	2.130	.620	1.036	1.994	.603
Jobeval	-.938	1.688	.578	-.581	1.594	.716
Variety	-1.992	1.290	.123	-2.870	1.212	.018
Discret	-6.453	1.568	.000	-4.035	1.480	.007
Controlover	-4.435	1.630	.007	-2.555	1.518	.093
Teams	-2.250	1.288	.081	.861	1.234	.486
Constant	14.472	3.132	.000	10.427	5.610	.063
/sigma	21.175	.457		18.533	.398	
'controls' included		No			Yes	
Number of observations			1400			1400
LR chi2 (29) (78)			208.99			557.81
Prob > chi2			0.000			0.000
Psuedo R2			.017			.045
Obs. Summary		253 left-censored observations at turnover < = 0				
LR Test for exclusion of 'controls':						
LR chi2 (29)						118.11
Prob > chi2						0.000

Table 5. Tobit Results: Dependent Variable: absence

Variable	Coef	Std Err	P > |t|	Coef	Std Err	P > |t|
Longterm	-.805	.524	.125	-.721	.532	.176
Attests	-.563	.566	.319	-.639	.579	.270
Pertests	-.037	.441	.931	-.282	.450	.530
Induct	-.395	.580	.496	-.950	.587	.106
Selection	.045	.512	.930	-.506	.529	.339
Offjob	.821	.466	.078	.578	.475	.224
Othjob	1.426	.527	.007	1.823	.541	.001
Topbest	-.515	.443	.245	-.442	.453	.330
Noconsult	-.364	.621	.558	-.340	.619	.582
Design	.259	.521	.619	.267	.543	.623
Meeting	.135	.550	.805	-.456	.556	.412
Brief	1.407	.515	.006	.955	.527	.070
Joint	1.206	.810	.137	.940	.831	.258
Circles	.259	.561	.644	-.404	.566	.475
Invplan	-.987	.475	.038	-.711	.479	.138
Finance	.346	.490	.480	.604	.512	.238
Staffing	.082	.497	.868	-.107	.512	.834
Procedure	1.970	.477	.000	2.079	.497	.000
Grievance	-.714	.863	.408	-.465	.887	.600
Discipline	-.058	.878	.947	-.990	.911	.277
Equalops	1.023	.574	.075	.219	.594	.712
Healthand	-.688	.769	.371	-.982	.797	.219
Paid1	.458	.475	.335	.773	.527	.143
Paid2	-.091	.746	.903	.187	.762	.806
Jobeval	-.086	.593	.884	-.219	.617	.723
Variety	.513	.453	.258	.495	.469	.291
Discret	-.272	.542	.615	-.383	.560	.494
Controlover	-1.280	.573	.026	-1.436	.585	.014
Teams	-1.830	.457	.000	-2.170	.473	.000
Constant	4.266	1.066	.000	3.250	2.116	.125
/sigma	7.221	.148		6.908	.141	
'controls' included		No			Yes	
Number of observations			1249			1249
LR chi2 (29) (78)			91.27			201.71
Prob > chi2			0.000			0.000
Psuedo R2			.009			.021
Obs. Summary		46 left-censored observations at absence <=0				
LR Test for the exclusion of 'controls':						
LR chi2 (29)						71.64
Prob > chi2						0.000

Table 6. Logit Results: Dependent Variable: action

Variable	Coef	Std Err	P > |t|	Coef	Std Err	P > |t|
Longterm	.079	.567	.888	.673	.845	.426
Attests	1.145	.558	.040	.869	.506	.086
Pertests	-.295	.550	.591	-.507	.418	.225
Induct	1.563	.964	.105	2.120	.963	.028
Selection	.060	.534	.909	.151	.532	.776
Offjob	-.093	.500	.851	-.382	.520	.463
Othjob	-1.405	.694	.043	-.858	1.020	.400
Topbest	.594	.474	.210	.809	.434	.063
Noconsult	.777	.574	.176	1.874	.672	.005
Design	-.741	.459	.107	-1.422	.775	.067
Meeting	-1.223	.466	.009	-1.830	.535	.001
Brief	-.446	.479	.351	-1.687	.730	.021
Joint	1.645	.714	.021	1.485	.562	.008
Circles	.068	.598	.908	.708	.608	.245
Invplan	.053	.584	.927	.659	.555	.235
Finance	1.192	.511	.020	.494	.591	.403
Staffing	.251	.432	.562	1.204	.752	.110
Procedure	.233	.575	.685	-1.280	.571	.025
Grievance	-1.370	1.546	.376	-3.116	1.289	.016
Discipline *						
Equalops	-.511	1.197	.669	-2.987	.886	.001
Healthand	.663	.528	.210	-.291	.546	.594
Paid1	-.932	.628	.138	-.448	.523	.391
Paid2	-1.197	.603	.048	.115	.736	.876
Jobeval	.980	.434	.024	.450	.667	.500
Variety	.718	.573	.210	-.325	.453	.473
Discret	.498	.456	.275	.236	.662	.721
Controlover	-1.607	.783	.040	-1.273	1.032	.217
Teams	.390	.430	.365	.293	.960	.760
Constant	-4.988	1.607	.002	-5.938	2.656	.026
'controls' included		No			Yes	
Number of observations			1440			1440
F (28, 1412) (71, 1369)			5.93			3.57
Prob > chi2			0.000			0.000
Wald Test (43, 1397)						3.60
Prob > F						0.000

* Discipline (=1) predicts failure perfectly in both estimations, and hence is dropped from both estimations. 6 control variables also predict failure perfectly, and they are dropped from the second estimation.

Table 7. Logit Results: Dependent Variable: threat

Variable	Coef	Std Err	P > |t|	Coef	Std Err	P > |t|
Longterm	.146	.511	.774	-.131	.429	.760
Attests	.082	.421	.845	-.428	.426	.316
Pertests	.003	.385	.992	-.279	.456	.541
Induct	-.500	.530	.346	-.778	.813	.339
Selection	-.591	.543	.277	-.355	.512	.488
Offjob	-.310	.431	.484	-.439	.463	.342
Othjob	-1.117	.476	.019	-1.212	.841	.150
Topbest	-.237	.387	.541	-.324	.393	.409
Noconsult	-.017	.424	.967	1.349	.520	.010
Design	-.825	.667	.217	-.691	.495	.163
Meeting	-.430	.425	.313	-.895	.454	.049
Brief	.298	.562	.596	-.035	.557	.950
Joint	.047	.493	.924	-.288	.522	.581
Circles	-.025	.609	.966	.236	.433	.585
Invplan	-.012	.442	.978	.027	.360	.939
Finance	-.366	.407	.369	-.649	.474	.171
Staffing	.864	.565	.127	2.216	.585	.000
Procedure	1.495	.394	.000	1.135	.522	.030
Grievance *						
Discipline	-.705	1.134	.534	-1.256	.771	.104
Equalops	-.909	.583	.119	-1.958	.600	.001
Healthand	1.403	.489	.004	.978	.493	.047
Paid1	.674	.426	.114	1.226	.386	.002
Paid2	-.070	.547	.897	.886	.657	.178
Jobeval	1.032	.548	.060	.969	.483	.045
Variety	-.757	.502	.132	-.863	.389	.027
Discret	.796	.646	.218	.592	.470	.208
Controlover	-.599	.491	.223	-.772	.479	.108
Teams	.171	.398	.667	.048	.495	.922
Constant	-2.797	1.712	.103	.432	1.530	.778
'controls' included		No			Yes	
Number of observations			1321			1321
LR chi2 (28, 1293) (74, 1247)			3.06			3.25
Prob > chi2			0.00			0.000
Wald Test (46, 1275)						3.60
Prob > F						0.000

* Grievance (=1) predicts failure perfectly in both estimations, and hence is dropped from both estimations. 3 control variables also predict failure perfectly, and they are dropped from the second estimation.

Table 8. Logit Results: Dependent Variable: raised

Variable	Coef	Std Err	P > |t|	Coef	Std Err	P > |t|
Longterm	.094	.261	.717	-.099	.278	.720
Attests	.480	.245	.051	.188	.295	.525
Pertests	.188	.220	.391	.228	.254	.368
Induct	-.094	.346	.785	-.688	.368	.062
Selection	.714	.230	.002	.692	.250	.006
Offjob	-.331	.234	.157	-.446	.234	.057
Othjob	.051	.285	.856	.363	.305	.235
Topbest	-.109	.220	.619	-.121	.242	.615
Noconsult	.414	.292	.157	.436	.308	.158
Design	-.012	.263	.963	.104	.272	.701
Meeting	-.006	.303	.983	-.028	.308	.925
Brief	-.234	.288	.416	-.552	.321	.086
Joint	.304	.305	.320	-.212	.341	.533
Circles	-.258	.209	.213	-.591	.214	.006
Invplan	.392	.247	.114	.444	.276	.108
Finance	-.131	.243	.589	-.025	.270	.924
Staffing	.325	.264	.218	.444	.283	.118
Procedure	-.195	.226	.387	-.157	.240	.512
Grievance *						
Discipline	.530	.808	.512	.113	.841	.893
Equalops	.319	.305	.296	-.031	.327	.924
Healthand	.818	.300	.006	.466	.302	.123
Paid1	-.177	.245	.469	-.047	.286	.869
Paid2	.746	.309	.016	.677	.330	.041
Jobeval	.152	.241	.528	.249	.272	.360
Variety	-.346	.235	.142	-.318	.235	.177
Discret	-.073	.292	.801	-.045	.300	.880
Controlover	-.211	.299	.480	-.298	.320	.352
Teams	.045	.225	.841	-.076	.264	.773
Constant	-2.628	1.005	.009	-4.103	1.453	.005
'controls' included		No			Yes	
Number of observations			1354			1354
LR chi2 (28, 1326) (77, 1277)			2.80			3.49
Prob > chi2			0.000			0.000
Wald Test (49, 1305)						3.07
Prob > F						0.00

* Grievance is dropped in both estimations for reasons of collinearity.

Table 9. Tobit Results: Dependent Variable: sanctions

Variable	Coef	Std Err	P > |t|	Coef	Std Err	P > |t|
Longterm	-8.265	4.073	.043	-11.138	4.264	.009
Attests	18.448	4.304	.000	10.433	4.491	.020
Pertests	-14.484	3.601	.000	-13.116	3.780	.001
Induct	12.851	5.236	.014	6.043	5.604	.281
Selection	4.174	4.017	.299	12.427	4.232	.003
Offjob	-6.519	3.797	.086	-5.687	3.939	.149
Othjob	-4.521	4.288	.292	-5.610	4.507	.213
Topbest	-10.532	3.540	.003	-11.083	3.721	.003
Noconsult	21.841	4.733	.000	19.035	4.787	.000
Design	-.367	4.261	.931	2.212	4.588	.630
Meeting	11.085	4.622	.017	8.937	4.790	.062
brief	-1.980	4.012	.622	-2.788	4.253	.512
Joint	.135	6.355	.983	.267	6.574	.968
Circles	-5.630	4.667	.228	-9.927	4.808	.039
Invplan	5.590	3.837	.145	4.625	4.017	.250
Finance	1.825	4.023	.650	5.505	4.249	.195
Staffing	6.537	4.018	.104	9.570	4.170	.022
Procedure	-14.032	3.811	.000	-6.903	3.999	.085
Grievance	2.212	7.562	.770	5.760	8.054	.475
Discipline	17.512	8.304	.035	17.341	8.863	.051
Equalops	7.058	4.774	.140	5.402	5.182	.297
Healthand	-5.659	6.243	.365	-6.351	6.635	.339
Paid1	-1.560	3.821	.683	-9.151	4.294	.033
Paid2	5.996	5.930	.312	-1.757	6.359	.782
Jobeval	-4.166	4.784	.384	.412	.4963	.934
Variety	-12.921	3.689	.000	-6.244	3.855	.106
Discret	-9.131	4.624	.049	-11.707	4.986	.019
Controlover	-3.485	4.755	.464	-7.687	5.014	.125
Teams	-13.360	3.609	.000	-13.092	3.844	.001
Constant	-21.688	9.463	.022	-40.041	18.515	.031
\sigma	52.335	1.229		49.893	1.169	
'controls' included		No			Yes	
Number of observations			1399			1399
LR chi2 (29) (78)			168.94			330.09
Prob > chi2			0.000			0.000
Psuedo R2			.014			.024
Obs. Summary		465 left-censored observations at incidence <=0				
LR Test for exclusion of 'controls':						
LR chi (29)						128.38
Prob> chi2						0.000

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Table 10. Tobit Results: Dependent Variable: injuryrate

Variable	Coef	Std Err	P > |t|	Coef	Std Err	P > |t|
Longterm	1.457	1.372	.288	.113	1.312	.931
Attests	-2.752	1.538	.074	-1.912	1.464	.192
Pertests	-4.443	1.136	.000	-2.511	1.114	.024
Induct	-.314	1.552	.839	1.862	1.685	.269
Selection	-5.361	1.438	.000	-3.837	1.372	.005
Offjob	.804	1.136	.479	-.064	1.188	.956
Othjob	-.705	1.378	.609	-.493	1.414	.727
Topbest	-3.061	1.112	.006	-3.578	1.100	.001
Noconsult	-.039	1.456	.978	-.217	1.380	.875
Design	-.065	1.405	.963	.119	1.416	.933
Meeting	-1.764	1.285	.170	-.254	1.283	.843
Brief	4.427	1.430	.002	5.210	1.428	.000
Joint	-.147	1.659	.929	.463	1.672	.782
Circles	-3.162	1.502	.036	-.969	1.426	.497
Invplan	-1.363	1.240	.272	-2.611	1.197	.029
Finance	-1.844	1.262	.144	-1.101	1.230	.371
Staffing	1.170	1.212	.335	2.323	1.184	.050
Procedure	2.385	1.178	.043	1.301	1.168	.266
Grievance	-7.740	2.166	.000	-8.675	2.324	.000
Discipline	2.823	2.381	.236	4.151	2.376	.081
Equalops	.968	1.582	.541	1.787	1.642	.277
Healthand	.964	1.590	.544	1.791	1.618	.269
Paid1	1.112	1.170	.342	.506	1.262	.688
Paid2	-.035	1.767	.984	.273	1.843	.882
Jobeval	.131	1.469	.929	-.760	1.444	.598
Variety	-.635	1.160	.584	-.530	1.146	.643
Discret	-.706	1.486	.634	-.101	1.454	.944
Controlover	-2.461	1.467	.094	-2.575	1.471	.080
Teams	-1.608	1.159	.166	-2.521	1.171	.032
Constant	-4.231	2.794	.130	3.127	4.967	.529
/sigma	9.494	.441		8.185	.372	
'controls' included		No			Yes	
Number of observations			1419			1419
LR chi2 (29) (78)			98.12			284.31
Prob > chi2			0.000			0.000
Psuedo R2			.028			.082
Obs. Summary		1137 left-censored observations at injuryrate <=0				
LR Test for exclusion of 'controls':						
LR chi2 (29)						67.22
Prob> chi2						0.000

Table 11. Tobit Results: Dependent Variable: illrate

Variable	Coef	Std Err	P > |t|	Coef	Std Err	P > |t|
Longterm	.942	1.021	.356	1.427	1.031	.167
Attests	-1.088	1.081	.314	-.239	1.079	.824
Pertests	-1.786	.860	.038	-1.596	.867	.066
Induct	-1.826	1.158	.115	-2.006	1.199	.095
Selection	3.203	.923	.001	2.989	.952	.002
Offjob	4.191	.925	.000	2.756	.919	.003
Othjob	-3.180	1.109	.004	-1.898	1.108	.087
Topbest	-2.424	.860	.005	-1.462	.863	.091
Noconsult	-1.821	1.217	.135	.026	1.187	.982
Design	1.676	.998	.094	.309	1.014	.760
Meeting	-1.333	1.070	.213	-.561	1.061	.597
Brief	-1.901	.966	.049	-1.686	.997	.091
Joint	.532	1.479	.719	1.451	1.451	.317
Circles	-1.267	1.102	.251	-.913	1.084	.400
Invplan	-1.508	.924	.103	-1.833	.912	.045
Finance	2.750	.974	.005	2.381	1.001	.018
Staffing	.015	.965	.987	-.234	.976	.810
Procedure	1.333	.906	.142	.534	.955	.576
Grievance	-3.360	1.749	.055	-4.817	1.808	.008
Discipline	4.304	2.015	.033	4.992	2.068	.016
Equalops	-1.840	1.151	.110	-1.719	1.201	.152
Healthand	-1.708	1.422	.230	-2.272	1.429	.112
Paid1	.592	.919	.519	1.726	1.046	.099
Paid2	2.910	1.383	.036	3.046	1.401	.030
Jobeval	4.045	1.048	.000	3.348	1.076	.002
Variety	-2.036	.888	.022	-1.925	.895	.032
Discret	-.104	1.088	.924	-.572	1.114	.607
Controlover	-3.129	1.140	.006	-3.460	1.156	.003
Teams	-.319	.890	.720	-.887	.910	.330
Constant	-1.584	2.229	.477	17.341	4.094	0.000
/sigma	11.195	.355		10.396	.327	
'controls' included		No			Yes	
Number of observations			1346			1346
LR chi2 (29) (78)			122.98			259.44
Prob > chi2			0.000			0.000
Psuedo R2			.019			.040
Obs. Summary		754 left-censored observations at illrate <=0				
LR Test for exclusion of 'controls':						
LR chi2 (29)						93.81
Prob > chi2						0.000

Table 12. Ologit Results: Dependent Variable: labprod

Variable	Coef	Std Err	P > |t|	Coef	Std Err	P > |t|
Longterm	-.092	.208	.658	-.053	.234	.821
Attests	.463	.227	.042	.472	.249	.059
Pertests	-.024	.185	.894	-.080	.191	.674
Induct	-.054	.303	.858	.121	.290	.677
Selection	.059	.194	.759	.044	.208	.831
Offjob	.271	.198	.171	.406	.204	.048
Othjob	.459	.263	.082	.442	.258	.088
Topbest	.149	.184	.417	.135	.204	.507
Noconsult	-.535	.286	.062	-.670	.273	.014
Design	.629	.229	.006	.594	.230	.010
Meeting	.074	.258	.772	-.091	.276	.741
Brief	.392	.218	.072	.334	.218	.127
Joint	-.314	.237	.187	-.221	.246	.369
Circles	.106	.217	.625	.167	.226	.460
Invplan	.401	.216	.064	.417	.215	.053
Finance	-.565	.215	.009	-.559	.216	.010
Staffing	.342	.197	.083	.330	.210	.117
Procedure	-.019	.198	.922	.047	.234	.839
Grievance	-.608	.336	.071	-.856	.390	.029
Discipline	.415	.382	.277	.686	.407	.093
Equalops	-.669	.234	.004	-.609	.281	.031
Healthand	.106	.266	.690	.282	.270	.297
Paid1	.165	.205	.423	.196	.244	.422
Paid2	.481	.282	.088	.474	.305	.121
Jobeval	-.397	.243	.104	-.394	.257	.126
Variety	.111	.185	.549	.081	.191	.670
Discret	-.128	.230	.579	-.175	.243	.471
Controlover	.238	.253	.347	.200	.251	.427
Teams	-.037	.187	.840	-.046	.204	.822
/cut1	-5.388	.913	.000	-5.933	1.188	.000
/cut2	-2.669	.514	.000	-3.076	.882	.001
/cut3	-.025	.495	.958	-.198	.900	.826
/cut4	2.581	.524	.000	2.615	.904	.004
'controls' included		No			Yes	
Number of observations			1273			1273
LR chi2 (29, 1244) (78, 1195)			2.43			5.86
Prob > chi2			0.000			0.000
Wald Test (49, 1244)						1.82
Prob > F						0.000

Table 13. Ologit Results: Dependent Variable: quality

Variable	Coef	Std Err	P > |t|	Coef	Std Err	P > |t|
Longterm	.063	.207	.758	.087	.226	.700
Attests	.490	.208	.019	.433	.222	.051
Pertests	.086	.193	.655	.007	.183	.968
Induct	.383	.225	.089	.302	.246	.219
Selection	-.226	.186	.225	-.094	.194	.626
Offjob	.140	.206	.495	.075	.204	.710
Othjob	.224	.211	.289	.209	.231	.366
Topbest	.140	.177	.428	.135	.186	.470
Noconsult	-.046	.226	.837	-.012	.235	.959
Design	.644	.226	.005	.564	.246	.022
Meeting	.078	.226	.729	-.018	.238	.940
Brief	.132	.199	.508	.225	.219	.304
Joint	-.123	.316	.697	-.101	.348	.770
Circles	.057	.229	.802	-.043	.229	.849
Invplan	.118	.199	.553	.115	.206	.577
Finance	-.344	.217	.114	-.304	.228	.184
Staffing	.475	.210	.024	.445	.220	.044
Procedure	-.399	.199	.045	-.243	.207	.241
Grievance	-1.044	.357	.004	-1.194	.402	.003
Discipline	.081	.369	.824	.073	.436	.866
Equalops	.125	.218	.567	.239	.239	.317
Healthand	.630	.275	.022	.716	.313	.022
Paid1	-.042	.199	.833	-.253	.219	.249
Paid2	-.160	.296	.588	-.416	.341	.224
Jobeval	-.579	.267	.030	-.537	.277	.053
Variety	.341	.194	.080	.250	.204	.221
Discret	.449	.233	.055	.555	.250	.026
Controlover	.132	.237	.578	.135	.258	.601
Teams	-.407	.187	.029	-.312	.202	.122
/cut1	-7.347	.915	.000	-7.337	1.219	.000
/cut2	-4.389	.529	.000	-4.371	.969	.000
/cut3	-1.434	.441	.001	-1.271	.915	.165
/cut4	1.464	.458	.001	1.878	.915	.040
'controls' included		No			Yes	
Number of observations			1362			1362
LR chi2 (29, 1333) (78, 1284)			3.28			5.51
Prob > chi2			0.000			0.000
Wald Test (49, 1313)						2.22
Prob >						0.000

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Table 14. Composite Results

Variable	turnover	absence	action	threat	raised	sanctions	Injuryrate	illrate	labprod	quality
'Resourcing'										
Longterm	+	-	+	-	-	- ***	+	+	-	+
Attests	-	-	+ *	-	+	+ **	-	-	+ *	+ *
Pertests	- ***	-	-	-	+	- ***	- **	- *	-	+
Induct	+	-	+ **	-	- *	+	+	- *	+	+
Selection	+	-	+	-	+ ***	+ ***	- ***	+ ***	+	-
'Training and Development'										
Offjob	- ***	+	-	-	- *	-	-	+ ***	+ **	+
Othjob	+	+ ***	-	-	+	-	-	- *	+	+
'Process and Participation'										
Topbest	-	-	+ *	-	-	- ***	- ***	- *	+	+
Noconsult	- *	-	+ ***	+ **	+	+ ***	-	+	- **	-
Design	-	+	- *	-	+	+	+	+	+ **	+ **
Meeting	-	-	- ***	- **	-	+ *	-	-	-	-
Brief	-	+ *	- **	-	- *	-	+ ***	- *	+	+
Joint	-	+	+ ***	-	-	+	+	+	-	-
Circles	+	-	+	+	- ***	- **	-	-	+	-
Invplan	-	-	+	+	+	+	- **	- **	+ *	+
Finance	+ ***	+	+	-	-	+	-	+ **	- **	-
Staffing	+	-	+	+ ***	+	+ **	+ *	-	+	+ **
Procedure	- ***	+ ***	- **	+ **	-	- *	+	+	+	-
Grievance	+ ***	-	- **			+	- ***	- ***	- **	- ***
Discipline	- *	-		-	+	+ *	+ *	+ **	+ *	+
Equalops	+	+	- ***	- ***	-	+	+	-	- **	+
Healthand	+	-	-	+ **	+	-	+	-	+	+ **

Table 14. (cont.)

Variable	turnover	absence	action	threat	raised	sanctions	injuryrate	illrate	Labprod	quality
'Appraisal and Reward'										
Paid1	+	+	-	+ ***	-	- **	+	+ *	+	-
Paid2	+	+	+	+	+ **	-	+	+ **	+	-
Jobeval	-	-	+	+ **	+	+	-	+ ***	-	- *
'Work Organisation/Job Design'										
Variety	- **	+	-	- **	-	-	-	- **	+	+
Discret	- ***	-	+	+	-	- **	-	-	-	+ **
Controlover	- *	- **	-	-	-	-	- *	- ***	+	+
Teams	+	- ***	+	+	-	- ***	- **	-	-	-

+ and – depicts a positive and negative sign, respectively, on the coefficient in question.

*, ** and *** denotes statistical significance at 0.1, 0.05 and 0.01, respectively.

Where the cell is blank, no results were reported in the original estimation for the reasons given there.