ORGANISATIONAL CHARACTERISTICS AND SKILL FORMATION IN BRITAIN: IS THERE A LINK?

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ABSTRACT

The processes of globalisation, technological change and the intensification of international competition have produced a series of changes in organisational forms which are now well established in the literature. These include the delayering of organisations, the greater use of techniques such as Total Quality Management, Quality Circles, teamwork, the more widespread adoption of information technologies, multi-skilling, improved communication systems and more participative forms of management. During these debates it is sometimes assumed that such practices automatically call forth new skill demands such as problem-solving, communication and teamworking. Yet apart from a few case studies there has been no systematic attempt to identify the existence and distribution of these skills within the labour force and to link them to the existence of new organisational forms. By drawing on a nationally representative survey of British employees, this paper – for the first time – provides strong and robust empirical support for such a linkage.

1. INTRODUCTION

This paper focuses upon the impact that organisational innovations, new management practices or high performance systems – as they are variously termed – have on employers' skill demands. There has been considerable debate about the extent to which these innovations and practices merely represent another management fad, how far they have been adopted by organisations across the economy and, more recently, what impact they have had on organisational performance and profitability. During these debates it is sometimes assumed that such practices automatically call forth new skill demands such as problem-solving, communication and teamworking. Yet apart from a few case studies there has been no systematic attempt to identify the existence and distribution of these skills within the labour force and to link them to the existence of new organisational forms.

The first part of the paper examines existing research on this topic. In the second we present the findings from interviews of a survey of 2,195 employees. This provides robust evidence of a relationship between the adoption of these new organisational practices and the demand for new types of skill among sections of the labour force.[1] We conclude with an examination of some of the implications of these findings for practitioners, policy-makers and academics.

2. CHANGING ORGANISATIONAL FORMS

The processes of globalisation, technological change and the intensification of international competition associated with them have produced a series of changes in organisational forms which are well established in the literature. These include the delayering of organisations, the greater use of techniques such as Total Quality Management (TQM), quality circles (QCs), teamwork, the more widespread adoption of information technologies, multi-skilling, improved communication systems and more participative forms of management. These are adopted as organisations struggle to reduce costs while increasing the quality of their products (Ezzamel *et al.*, 1996). The introduction of competitive tendering and the more extensive use of market mechanisms in the delivery of public services have produced similar consequences in the public sector and among not-for-profit organisations.

Yet there is a lack of agreement in the literature about the precise terminology to be used to denote these new practices. In the US, Ichniowski *et al*. (1996) refer to them as 'workplace innovations' by which they mean innovations which 'seek greater degrees

[1] Although the survey on which the paper is based was not specifically designed to look at this linkage, we do have evidence which allows us to test the strength of the association. Our definitions of organisational forms are, therefore, restricted in scope (see later).

of flexibility in work organisation, cooperation between labor and management, and worker participation in the decisions and financial well-being of the company' (ibid: 300). In the UK, Bacon *et al*. (1996: 87) drawing on the work of Storey (1992) refer to similar innovations under the umbrella of the 'new management' model or the 'new management agenda'. This consists of the following: a culture change programme, devolved management, teamworking, performance appraisals, a mission statement, team briefings, quality circles, harmonised terms and conditions, psychometric tests, delayering, and increasing flexibility between jobs.

Similar organisational practices are also discussed in the more practitioner-oriented debates. The American Society of Training and Development (ASTD), for example, includes employee-participation, self-managed work teams, team or group compensation, quality circles and self-directed work teams, gainsharing, and knowledge/skill-based payment systems as 'high performance work practices' (Bassi *et al*., 1997; Bassi and Van Buren, 1998). Similarly, in the UK the Institute of Personnel and Development (IPD) recently commissioned a study of the impact of people management practices on business performance. The work focused on the following management practices: sophisticated recruitment, selection and induction practices; extensive and sophisticated training provision; coherent appraisal system; flexibility of workforce skills; variety in shop-floor jobs; devolved responsibility for tasks and problem-solving; the use of formal teams; frequent and comprehensive communications; the use of quality improvement teams; the harmonisation of terms and conditions; high levels of pay; and incentive compensation systems (Patterson *et al*., 1997: 14).

Researchers have been concerned to examine these new practices for three main reasons. First, to identify the extent to which they have become embedded in the workplace (Storey, 1992; Ichniowski *et al*., 1996, Ezzamel *et. al.*, 1996; Osterman, 1995). Second, to establish the impact these practices have on organisational performance (Ichniowski *et al.*, 1996; MacDuffie, 1995; Patterson *et al*., 1997; Wood and Albanese, 1995; Wood, 1996). Third, to examine the impact of these practices on employee's experience of work (Morris *et al*., 1993; Rosenthal *et al*., 1997; Turnbull and Wass, 1998). Some researchers have focused on particular organisational characteristics. In the UK, for example, there has been a lively debate surrounding the impact that attempts to introduce QCs and TQM programmes have had (Hill, 1991a and 1991b; Wilkinson *et al*., 1992; Wilkinson and Marchington, 1994; Rosenthal *et al*., 1997). Similar debates have taken place over the impact of performance appraisal systems (Townley, 1989; Grint, 1993; Coates, 1994). More recently, there have been attempts within the UK to evaluate the impact of the Investors in People (IiP) standard in fostering the growth of these new management practices and linking HRD to business strategy (Spilsbury *et al*., 1995; Alberga *et al*., 1997).

However, the impact of these new practices on the skills of workers has received little attention by researchers from what may loosely be termed the Human Resource Management (HRM) perspective. Only in the US has there been any attempt to

identify the impact of new management practices on the level of training delivered in firms. However, their impact on the type of skills acquired by employees has remained largely unexplored.

Osterman (1995) examined the relationship between new organisational forms and training levels within organisations. Using a telephone survey conducted in 1992 among a sample of 875 business establishments in the US, he found a positive association between companies using high performance work systems and the level of training they provided. Companies which had adopted new forms of work organisation – such as team production, job rotation, TQM and QCs – provided higher levels of training for their employees than those who had not reorganised work. However, when the work organisation practices were examined separately, quality practices led to more training while the more indirect practices of team production and job rotation appeared to have little explanatory power. While Osterman's (1995) work represents an advance it tells us very little about the impact of these new practices on the type of skills required of employees working in these new forms of organisation. This is largely a consequence of his methodology which, because it relies on surveys of employers to provide the data, cannot provide information on the types of skills which individual jobs demand of employees.

MacDuffie (1995) and MacDuffie and Kochan (1995) have also looked at the relationship between new management practices and skill formation within the automobile industry. Using an international data set consisting of a sample of 62 automotive assembly plants MacDuffie and Kochan (1995) demonstrate a link between the production strategy of the organisation (flexible versus mass production) and the level of training. They find that firms with flexible production strategies provide higher levels of training. Their analysis highlights the importance of the content of training since it suggests that flexible production plants require some mix of general skills required for problem-solving and firm-specific skills related to the firm's production and technology systems. Furthermore, because of their reliance on work teams these plants are also likely to demand better communication skills. However, their data do not allow them to explore these ideas further.

MacDuffie (1995) in another analysis of the same data set found support for two main hypotheses. First, that innovative human resource (HR) practices affect performance not individually but as an internally consistent HR bundle or system. Second, that these bundles contribute most to assembly plant productivity and quality when they are integrated with manufacturing policies under the 'organisational logic' of a flexible production system which consists of team-based work systems, high commitment HR practices (such as contingent compensation and extensive training) and low inventory and repair buffers.[2] According to MacDuffie's (1995) data flexible production plants consistently outperformed their mass production counterparts. He

[2] Buffers refer to the degree to which production operations are protected against potential disruption. These are usually measured by work-in-progress and inventory levels.

argues that in order to understand these results it is important to see HRM practices as a collection of practices (a bundle) with their own logic which then mutually reinforce each other.

For MacDuffie (1995) the bundling of HR practices provides several ways for workers to acquire skills. For example, via off-the-job and on-the-job training, job rotation programmes, participation in problem-solving groups and the existence of multiple incentives to boost motivation such as performance-related pay and participation in decision-making and job design. However, these skills are only translated into improvements in performance if they are related to bundles of manufacturing practices which minimise buffers. What he finds is a relationship between practices aimed at minimising buffers and practices aimed at expanding worker skills. He argues that the existence of a buffer means that problem-solving is isolated from the production process directly. Elimination of buffers, therefore, transfers these problems to those involved directly in the production process, thereby heightening the need for problem-solving skills.

Following Osterman (1995), MacDuffie (1995) distinguishes between innovative work systems – the use of work teams, problem-solving groups, employee suggestion schemes, job rotation and decentralisation of quality-related tasks – and HRM policies – recruitment and hiring, contingent compensation, status differentiation, training of new recruits and training of experienced employees. He sees the work systems producing the skills for problem-solving through the use of a variety of multi-skilling practices, including extensive off-the-job and on-the-job training, a few broad job classifications, allowing job rotation within and across teams, and 'off-line' group problem-solving activities via employee involvement groups or quality circles. However, for workers to use these skills and knowledge effectively requires commitment to organisational goals, hence the use of high commitment practices by management via employment security, performance-related pay, and reducing the status divide between workers and managers. It is, therefore, interesting to note that while data on the types of skills acquired by workers is crucial for MacDuffie's (1995) argument, his data do not permit him to explore these questions. To do this he would require data from the individual workers themselves. Moreover, to extend our knowledge of these issues his argument would require corroboration from other manufacturing and service industries.

Therefore, important questions about whether or not the adoption of such practices by employers leads employees to acquire new skills or whether they have only a peripheral impact on the skills of the workforce remain unanswered. To tackle these issues requires a different type of methodology which enables the researcher to access the employee and identify the types of skills they have acquired and utilise at work. The use of case study methodology has produced some interesting and more directly relevant answers to the questions of how organisational forms in general and new organisational forms in particular have influenced the type of skills acquired by employees.

Case studies provide one means of exploring whether skills such as those described above are only to be found in the automobile industry where forms of flexible production have been introduced or whether these skills are found where new organisational forms have been introduced in other industries including those in the service sector.

One of the first studies to raise the issue of the impact of organisational structures on skill formation was that of Hirschhorn's (1984) study of operators in continuous process plants. He argued that the integrated nature of the production process required that operators develop what he called 'synthetic reasoning', that is the ability to determine the kind of problem one faces and the information that is relevant. This type of diagnostic skill depends on 'an ability to frame problems, infer causes from symptoms, and check the resulting hypotheses against one's analytic knowledge' (ibid: 90). He also argued that in such organisations operators require 'fringe awareness', being attuned to signals of anomalous events, a continuous feedback loop of which we are barely conscious but which keeps us aware of our environment and of any anomalous events within it, enabling us to take corrective action while still focusing on our main objective.

Subsequent to the work of Herschhorn (1984), and in line with the findings of MacDuffie (1995), other studies of new forms of organising production in the automobile industry have reported similar skills being required. In an international study of the automobile industry Thompson *et al.* (1995) report that the new forms of production utilised in commercial vehicle manufacture are creating demands for 'new skills':

> '… it is possible to identify common shifts in the nature of skills use across national boundaries. One of the things most researchers agree on is that, due to automation in advanced manufacturing, skill requirements shift from dexterity and other manual competencies toward cognitive abilities, and from skills related to a particular material or substance to skills related machinery and production processes. Commercial vehicles is typical of those industries where the relation between a person and a machine is being replaced by the relation between a team and an integrated production system. Due to a general tendency towards flow production, this is the case not only in continuous process production (chemicals, steel) but also in batch production such as automobiles and engineering (Pries *et al*. 1990:199f). On the one hand this means the "system skills", including organisational and technological knowledge and abilities, are required; on the other hand, workers have to be able to work in teams, with an emphasis on behavioural or "extra-functional" skills. However, the very same

> skill requirements lead to a preference for different labour inputs in particular countries or companies' (ibid: 738).

Outside the automobile industry reports of such changes in skills have been found in the service sector. Bertrand and Noyelle (1988) identified common emerging competencies in the banks and insurance companies they studied in five countries – Japan, France, Germany, Sweden and the US. The new skills they reported were: an ability to operate in an ill-defined and ever-changing environment; the capacity to deal with non-routine and abstract work process; an ability to handle decisions and responsibilities; and a capability for interactive group work and system-wide understanding, that is, an ability to operate within expanding geographical and time horizons.

Kelly (1989) in a separate study of US insurance companies reported that where new technology was introduced in a manner which upskilled the workers they reported an increase their 'contextual knowledge'. This consists of a substantial knowledge of the firm's products, customers, processes and procedures, together with the authority to make decisions and resolve problems. This enabled workers to operate with a minimum of supervision and to integrate properly with other related tasks. By contrast where the technology involved deskilling or no change, then job content was determined by technology such as word processing, graphical design or programming requirements. In addition to contextual knowledge, sales, clerical and administrative jobs in robustly organised firms required mastery of skills not previously associated with such work. These were: social and communication skills required to meet and integrate the needs of customers, clients, marketing staff and product designers; managerial skills related to planning, organising time effectively, thinking more comprehensively about the enterprise, and acting in a strategic manner; and general skills related to computer technology such as the ability to access larger networks, store and retrieve data, turn data into useful information, and use standard software packages.

While this is by no means an exhaustive list of research, the studies reviewed do suggest is that new organisational forms are creating a demand for new skills among workers. The evidence, which as we have seen, comes from a series of different case studies across a variety of industries and countries. It suggests three main areas in which new skills are emerging, namely: the greater use of problem-solving skills and an ability to utilise them in the context of a wider knowledge of the organisation as a whole; teamworking skills, that is the ability to operative collaboratively in pursuit of a common objective; and finally, the ability to communicate effectively with colleagues and clients. We refer to these as 'new skills'.

While this evidence is suggestive of a direct link between new organisational practices and workers' skills, there are serious weaknesses with it. Case studies always suffer from the problem of representativeness. More importantly, because they were

conducted by different researchers in different countries and at different times there is no uniformity in the way in which management practices are conceptualised. Therefore, we do not know whether the skills they identify are a result of certain types of management practices which are peculiar to the organisation studied or whether they are a function of more general changes which are being introduced across a range of industries and organisations. In many respects this echoes the findings of a recent review of the literature on skills and their utilisation (Parsons and Marshall, 1996). In short, we have no reliable evidence on the impact of management strategies on the skills of the labour force.

Yet both of the approaches predominant in the literature suggest a possible link between new organisational and managerial practices and new types of skills being developed among employees. However, given the methodological problems associated with both there are serious deficiencies in the evidence they can provide for the existence of such a link. To explore the existence of a link requires direct information from individual employees on the types of skills they have and the type of organisations which employ them. Only then can we address questions such as: are these skills present throughout the labour force or are they confined to organisations which have adopted new management practices? If they are found in the new organisational forms, are they a product of the bundle of practices as the work of MacDuffie (1995) suggests or can they be developed through the use of just a few of the new practices? These are some of the questions we seek to address.

3. INTRODUCING THE DATA

To answer these questions this paper draws on a British survey – known as the Skills Survey (SS) – carried out in the months of January-May 1997. Its aim was to investigate the concept of skill, its components and the implications for pay. The survey consists of data on individuals and their jobs. This includes conventional measures of skill (such as qualifications held by individuals), information on what people actually do in their jobs and their own assessment of how well they do it. The questionnaire used draws on the lessons of several disciplines such as economics which traditionally considers skill to be the stock of human capital acquired (eg, Becker, 1964; Stevens, 1994), sociology which focuses on the autonomy individuals enjoy at work (Braverman, 1974), and occupational psychology which examines what tasks people do in their jobs and how effectively they carry them out (Ash, 1988; Primoff and Fine, 1988). In this analysis we draw on a small sub-set of the questions asked. In particular, it focuses on problem-solving, teamworking, and communication skills – the 'new skills' which the case studies suggested were important – as well as on the organisational features of respondents' workplaces. A number of control variables are also used.

For comparability with other social science surveys (Social Change and Economic Life Initiative, 1986, and Employment in Britain, 1992), only those aged 20-60 years old and in paid employment at the time of contact were eligible for interview. Sample

selection procedures were followed to ensure that the achieved sample was representative of Britain. First, a list of all postal districts was generated and these were put into two groups – one for England and Wales and one for Scotland – and sorted into regions and sub-regions. The resulting groupings were stratified according to their socio-economic profile and levels of unemployment. A total of 10 postal districts were then drawn from the Scottish list (south of the Caledonian canal) using a random start and a pre-determined sampling interval. The same method was used to derive a total of 90 postal districts from the English and Welsh list. In each of the selected postal districts, one postal sector was selected randomly with probability proportional to the number of addresses. Finally, every eleventh address was extracted from each postal sector until a total of 85 addresses had been drawn, thereby generating a sample of 8,500 addresses. This acted as the sampling frame for the survey.

Individuals at each address were screened by SCPR interviewers according to the criteria for eligibility with one eligible individual per address being randomly selected for interview. Interviewers were subject to quality control procedures, including approximately 10% of interviews being 'back-checked' by telephone or post. The face-to-face interviews averaged 40 minutes in length. Of those selected for interview, 67.1% took part, with the main reason for not taking part being refusal.

After completion of the fieldwork a weight was calculated to account for the greater probability individuals in smaller households stood of being selected for interview and vice versa. A further weight was also calculated in order to correct for the over-representation of women in the sample as compared to the Spring 1997 Quarterly Labour Force Survey. In the descriptive findings which follow the data set has been weighted, unless otherwise stated, to correct for these sample selection biases. The results are, therefore, based on 2,224 employee responses (2,195 unweighted). Further checks have subsequently been made to confirm that the weighted sample was representative of the employed British workforce in other ways too – age, industry, occupation and ethnicity, for example.

4. IDENTIFYING ORGANISATIONAL CHARACTERISTICS

As we have seen while the current management literature is littered with references to changes in the management of labour there is no agreed nomenclature. The measurement devices, too, vary from study to study. These differences stem from the pragmatic consideration of making the best of the available data and/or the unit of observation. However, detail aside, they seek to identify work systems and worker-management relationships which depart from the traditional system of 'them' and 'us'. The traditional system is characterised by tightly defined jobs with associated rates of pay, clear demarcation lines separating the rights and duties of supervisors and workers, decision-making powers retained and jealously guarded by management, organisational information sparingly shared and the use of formal communication channels. Current workplace innovations, as we have seen, seek to promote greater

flexibility in the organisation of work, foster greater co-operation between management and workers, and open up more management decisions and information to worker scrutiny. In line with previous writers we use a battery of questions (albeit different ones) used to determine where a respondent's workplace falls along this continuum.

However, given the focus of the SS our unit of observation is the individual employee rather than a management respondent. This is where our data set differs from those used by many other researchers. This has advantages and disadvantages worthy of note. On the plus side, we are able to get a more accurate measure of whether certain work practices are felt by individual employees on the shopfloor rather than relying on management's estimates of who they affect (cf. Osterman, 1995). Another advantage is that we hear directly from employees themselves about the skills their jobs demand rather than relying on possibly distant and misinformed managerial views of what particular jobs entail (cf. Burchell *et al*., 1994). However, while our unit of observation may reduce measurement error in these ways, there are disadvantages with which we also have to contend. Pitching our questions at individual employees inevitably limits the organisational information we are usefully able to collect. For example, it is simply not appropriate to ask employees about strategic management policies such as selective recruitment since most employees are unlikely to know what the recruitment criteria are. Indeed, it is unlikely that they will know with any certainty how and why they got their current jobs. The answers to these questions can only really be revealed by management itself. Unfortunately, SS is unable to provide such additional information. This a drawback to which we will return towards the end of the paper.

SS respondents were asked a total of six questions which, in combination and singularly, provide pointers as to the style of work organisation adopted. These include whether: respondents belong to a Quality Circle (QC); their organisation is committed or recognised as an Investor in People (IiP); there is a formal appraisal system at their workplace[3]; management organises meetings to inform the workforce of organisational developments; management holds meetings where workers can express their views and opinions; and respondents have made more than one suggestion to improve work performance over the last twelve months. By awarding one point for each of these factors an organisational index is derived. Those scoring 0 or 1 are working for 'traditional' organisations, those scoring 5 or 6 are in 'modern' organisations, while those with 2-4 points are referred to as 'middling' organisations. This procedure follows the notion of 'bundling' human resource management techniques (cf. MacDuffie, 1995; MacDuffie and Kochan, 1995). For ease of presentation, the main results reported in this paper use this three-way organisational comparison – those with most, some and few 'new' organisational characteristics. However, the paper reassuringly finds that the main results are robust to changes in the way in which this

[3] Respondents were also asked, if there was a formal appraisal system in their workplace, whether they had been appraised during the twelve months before interview. Information from this question arguably double counts appraisal practice and so it has been excluded from our analysis.

organisational variable is constructed (see Section 6.2).

According to these data, around a fifth (20.9%) of employees work in organisations which have few, if any, of these new features (ie, 'traditional' organisations), while almost three in ten (29.5%) are in organisations which have most of these features in place. Around a half (49.6%) work in organisations somewhere in between these two extremes. An analysis of the distribution of the organisational index reveals a similar picture – a distribution slightly skewed towards the upper end (ie, positively skewed). However, the chances of working in each of these organisations varies according to worker characteristics and the nature of their employment. Table 1 shows a number of bivariate comparisons between the proportions of workers with certain characteristics who work in particular types of organisation. These suggest that the following are more likely to be found in 'modern' organisations: men, those in their forties, the better qualified, married individuals, some ethnic minorities, trade unionists and those living in Wales (see Table 1). Similarly, analysis by employment characteristics reveals that certain types of employment have above average proportions of workers who experience the benefits of working in a 'modern' organisation and vice versa. Those higher up the occupational hierarchy, for example, are more likely to report the presence of organisational features typical of 'modern' organisations than those lower down. The picture is reversed for those working in 'traditional' organisations (see Table 2). Similarly, organisational commitment is significantly higher in 'modern' organisations but significantly lower in 'traditional' organisations than recorded by respondents working in 'middling' organisations. The same story is repeated across a number of employment-related characteristics including size of workplace, job tenure, union recognition at workplace, training period for job, learning time to do job well, working time and permanency of job.

5. MEASURING 'NEW SKILLS'

A central part of SS was to examine the skills individuals used in their jobs. Respondents were therefore asked a series of questions about what their job comprises. They were asked about a number of job activities. This section of the questionnaire was prefaced by the following: 'You will be asked about different activities which may or may not be part of your job. At this stage we are only interested in finding out what types of activities your job involves and how important these are'. Respondents were asked: 'in your job, how important is [a particular job activity]'. Examples of the activities included caring for others, dealing with people, using a computer, analysing complex problems and planning the activities of others. The questionnaire focused on 36 activities designed to cover the tasks carried out in a wide range of jobs. The response scale ranged from 'essential' to 'not at all important', with 'very important', 'fairly important' and 'not very important' in between. Given the tendency individuals have to over-rate the importance of their job demands (the problem of social desirability), the response intervals at the top of the scale were intentionally designed to be smaller than those at the bottom. The aim here was to allow for more

differentiation at the top of the scale than would be possible by adopting a conventional five-point scale with equal intervals and a mid-point of three (as in the strongly agree/agree/neither agree or disagree/disagree/strongly disagree scale). Since these job activities and the measurement scale adopted were drawn from the Job Analysis (JA) literature, we denote these questions as such in the subsequent discussion.

Out of the 36 JA questions, those relating to problem-solving, communication and social interaction, and teamworking are singled out for particular attention here since these are the 'new skills', which our analysis of the case studies suggested, were those which 'modern' organisations are alleged to foster and promote. In addition, they form part of what the British government refers to as 'Key Skills' ie, the ability to operate in a workplace, alone or with others (see Dench *et al.*, 1998: 2-6). A total of 12 JA questions fall into this category. Problem-solving skills are captured by 4 JA questions; communication and social skills are covered by 6 JA questions; and 2 of the JA questions indicate the importance of teamworking skills. Collectively, we denote these as 'new skills' in the remainder of the paper. The activities themselves are shown in Table 3. By awarding scores according to how important each is reported to be in an individual's job we construct a skills score – the higher the score, the more important the skill. Without exception all 12 JA questions taken individually show that skills rise in line with the presence of 'modern' organisational characteristics (indeed all the JA questions apart from those relating to physical skills and knowledge of tools show a similar story). So, for example, on average employees working in 'traditional' organisations report that 'analysing complex problems in depth' is 'not very important', while those working in 'modern' organisations report that it is 'very important' (to be precise the scores are 1.25 compared to 2.64).

To make the subsequent analysis manageable and maintain presentational clarity, we reduce the data by constructing a composite skills score for each of these 'new skills'. The composites are derived by adding the scores for the responses under each skill and dividing by the number of questions. Tests of reliability are carried out on each of the resulting three scales. Correlations between the individual questions which make up the scale and those which remain (ie, corrected item-total correlation) and the extent to which responses to individual questions can be predicted from responses to those remaining (ie, squared multiple correlation) suggest *against* dropping any of the questions from the construction of the composite scales. In summary, Cronbach's Alphas (standardised) of 0.86, 0.80 and 0.74 for problem-solving, communication and social skills, and teamworking respectively are reasonably large. These indicate that our three composite skills scales are reasonably reliable measures of these underlying skills. Principal Components analysis provides further confirmation that these skills can be reliably reduced to a single score. Subjecting each set of questions to such an analysis provides the following: for problem-solving skills 71.1% of the variation in

responses to these questions can be explained by one component, while for teamworking the proportion is 79.1%. A one component solution is also suggested for communication and social skills (explaining 50.1% of the variation), but only just. Hence, additional checks on the main results are carried out to test whether splitting communication and social skills in two makes a difference to the picture the data paint (see Section 6.2).

6. SEARCHING EMPIRICALLY FOR THE LINK

The first step in the procedure is to examine how the skills scores by type of organisation behave when controlling for worker characteristics and the nature of employment. In short, this reveals an additional source of skill variation, related to sex, age, education, occupation, industry, job tenure and so on. For example, even after controlling for sex, problem-solving, communication and teamworking skills rise as one moves from 'traditional' to 'modern' organisations – albeit that men and women start with different skills scores. The rise, though, is quicker for women than men, especially for communication and teamworking skills where women claim greater importance for these skills than men in 'modern' or 'middling' organisations, but claim comparable levels in 'traditional' organisations. A similarly complex picture can be repeated for many other such variables. However, these results only hold one intervening variable constant at a time. Hence, the results of this stage in the procedure are not fully reported here. Suffice to say, the skills scores by type of organisation vary by a wide range of worker attributes and employment features. In order to identify the strength and significance of organisational characteristics on the chances of individuals being in jobs that demand particular skills we need to take into account a host of control variables. To do so we use multivariate analysis in the manner outlined below.

6.1 Main Results

The literature suggests that 'modern' organisational characteristics of the type identified by SS respondents encourage and promote 'new skills'. However, in addition to this link there may be others which, once taken into account, weaken the association between organisational characteristics and jobs which demand these skills. In other words, we need to take into account other variables which might affect both reported skill levels and the organisational context in which they are demanded. The model therefore contains a range of control variables. These include dummy variables on training and learning times to do the job, the source of training for current job, nature of organisational ownership, working time, sexual balance among job-holders, the level of organisational commitment and so on (see Table 4). By taking these control variables into account, multivariate analysis determines whether being in a 'modern' organisation raises or lessens respondents' chances of being in a job which demands 'new skills'. Three separate regression analyses are carried out on the data. Each specifies the independent variables in exactly the same way with

the dependent variable representing the skills score for problem-solving, communication and teamworking respectively.

The results are presented in Table 4. This shows a consistent pattern across skill types. On the one hand, being in a 'traditional' organisation reduces an individual's problem-solving, communication and teamworking skills score by around half a point on what might be expected had the same individual been in a 'middling' organisation ($p<0.01$). On the other hand, being in a 'modern' organisation raises these skills scores by between one-eighth and one quarter of a point (problem-solving, communication and teamworking, $p<0.01$). In other words, organisational characteristics can add around three-quarters of a point to an individual's communication skills score – well on the way to making the difference between, for example, a 'fairly important' and 'very important' rating.

The data also allow us to examine the strength of the link between organisational commitment and the formation of 'new skills'. The data set contains six organisational questions from which an organisational commitment score is derived (cf. Table 2). This exhibits a statistically significant association with all three types of 'new skills' ($p<0.01$). A rise from low organisational commitment to high organisational commitment – representing a shift across all six questions from strongly disagree to strongly agree, for example – adds between a half and four-fifths of a point to an individual's skills score holding all other things constant. To test whether organisational commitment and 'modern' organisational practices *combined* are associated with higher problem-solving, communication and teamworking skills we enter two interaction terms into the regressions reported in Table 4. One interacts the organisational commitment score with the 'modern' organisation variable, the other interacts organisational commitment with the variable which denotes the features of a 'traditional' organisation. An inconsistent picture emerges from these regressions. For communication skills the coefficients on both the interaction terms are highly insignificant, for problem-solving only one of the interactions is significant and for teamworking both interaction terms are negative and significant. On this evidence it is difficult to argue that there is a significant interaction between organisational commitment and organisational structures, such that high commitment among 'modern' organisations is associated with yet higher skills and vice versa. The interaction terms are, therefore, dropped from the subsequent analysis.

Interestingly, some of the other variables thought to have an association with skill formation display, according to this data, a weak relationship with the development of 'new skills'. Only a few significant associations can be found between training and 'new skills'. Although short training times appear to reduce communication and teamworking skills and long training times raise them, these associations are statistically insignificant (in all cases $p>0.15$). The relationship between training and problem-solving skills, however, is stronger – short training times are significantly associated with lower problem-solving skills ($p<0.05$), while longer training times are linked to raising them ($p<0.11$). One might expect that training delivered by a respondent's current employer to be

associated with higher problem-solving skills. However, the data suggest the reverse: receipt of training from current employer is significantly related to a lower problem-solving skills score ($p<0.10$). The relationship between training and development of 'new skills' is, therefore, not as strong as one might *a priori* expect.

The main result which stands out from this analysis is the suggestion that the organisational context in which respondents work is a powerful and significant predictor of an individual's 'new skills' score. Indeed, the evidence provides empirical support for the link between organisational characteristics and the formation of 'new skills'. However, it is important to test the robustness of these results by reformulating the precise specification of the model. It is to this that we now turn.

6.2 Additional Checks

Three sets of tests are carried out. First, the dependent variable is reformulated in several ways in order to find out whether a different picture can be painted. Second, we examine whether the story told so far varies according to the treatment and construction of the organisational variable itself. Thirdly, we test whether different organisational contexts can help to explain the trajectory of individuals' reported change in 'new skills' over the last five years.

The model reported in Table 4 regresses the undiluted additive skills scores onto a number of control variables. Our first test is to take the log of the skills scores and repeat the regression. This makes no difference whatsoever to the results – the direction of the effects is the same, and their strength and level significance is of a similar order. Another test is to split the communication and social skills score in two on the grounds that some of its component parts pick up different types of skills. It could be argued, for example, that 'instructing, training or teaching people' and 'making speeches or presentations' are of a higher order and are quite different from the other skills in the same category such as 'dealing with people'. We, therefore, create two different communication skills scores – one intended to measure higher communication skills, the other to measure lower ones.[4] Once again, the picture is the same – the organisational context appears to make a significant ($p<0.01$) difference to an individual's communication skills score on both of these counts – upward for those in 'modern' organisations, downward for those in 'traditional' organisations.

The creation of an additive scale for each of the 'new skills' examined here is one of number of ways of constructing the dependent variable. Another way is to reduce the relevant JA questions by using Principal Components analysis to extract hidden

[4] Higher communication skills are derived from the responses to questions about the importance of the following activities in respondents' jobs: 'instructing, training or teaching people' and 'making speeches or presentations'. Lower communication skills, on the other hand, refer to the importance of 'dealing with people', persuading or influencing others', 'selling a product or service' and 'counselling, advising or caring for customers and clients'. The scores are calculated in the same way as before.

variables based on the correlations between the JA questions under scrutiny. This suggests that much of the information gleaned from the problem-solving and teamworking[5] questions can be explained by one component, while communication skills are on the margin of a one or two component solution (see above). In order to test the robustness of our model we use a two component solution for the latter. Interestingly enough, the factor loadings suggest that one of the communication components captures 'making speeches or presentations', 'persuading or influencing others' and 'instructing, training or teaching' – similar to our 'high level' communication skills above – while the other loads more heavily on 'counselling, advising or caring', 'dealing with people' and 'selling a product or service' – what we denote above as 'low level' communication skills. Entering the four factor scores generated by this technique into the regression model produces a similar set of results. As a further test all 36 JA questions are reduced to eight interpretable components – four of which referred more or less to the 'new skills' focused upon in this paper. Yet again, the picture these results paint corroborates those contained in Table 4 – the levels of significance on the organisational variable remain high and are in the expected direction.[6]

A second set of tests revolve around the treatment of the our key independent variable which is designed to capture differences in the organisational context of work. Our main results are based on a three-way classification of organisations based on how many features individuals report as present. An alternative method is to simply enter the number of features each individual reports, thereby creating an organisational measure of progressiveness ranging from 0 to 6. Re-running the model on this basis confirms the strong, positive and significant association between the organisation of work and the formation of each set of 'new skills'.

The organisational variable can be reconstituted in other ways too. For example, by 'unbundling' our measure into its component parts, we are able to test whether the link remains for each HRM practice taken in isolation. Each of the six organisational questions are converted into a dummy variable and are entered into the regression equation. No other changes are made to the regression model reported in Table 4. The results – not reported here but summarised in Table 5 – show that virtually all the coefficients on each of these dummy variables are positive (see Table 5). More strikingly, all the features, apart from meetings where employees are allowed to express their own views and opinions, has a significantly positive

[5] The SS questionnaire also asked respondents: 'How much of your work is organised on the basis of teams … all, some, a little or none?'. As a check this measure was used as the dependent variable and the regression reported in Table 4 was re-run. The 'modern' organisation variable continued to have a positive and significant association with greater levels of teamworking, while the 'traditional' organisation variable was negative and significant.

[6] The associations are also strong and in the expected direction when all 12 of the questions used here are subject to regression analysis of their own.

asssociation with the formation of all three types of skills. Active suggestion schemes and the use of information meetings called by management, for example, both appear to be associated with significantly ($p<0.01$) higher 'new skills' across the board after controlling for a host of other intervening variables. Of particular policy relevance is the finding that organisations committed or recognised as Investors in People (IiP) demand significantly higher communication ($p<0.05$), teamworking ($p<0.05$) and problem-solving skills ($p<0.10$) from their employees (see Table 5).

The SS data set offers a third (and even stronger) way of testing the robustness of our results. Towards the end of the questionnaire survey respondents were asked a number of repeat questions about the job they held five years before the date of the survey. A total of 15 JA questions were asked, 11 of which focused on 'new skills'. From this we are able to track skill trends for those in work by simply subtracting their composite skills scores for problem-solving, communication and teamworking from their reported scores five years ago. However, given the nature of the questionning and hence the data, the analysis has to be limited to those in work five years ago (this excludes 16.0% of our employee sample). The nature of the analysis imposes a further restriction on the useable sample since it is only appropriate to focus attention on those in the *same* job with the *same* employer (thereby excluding a further 34.2%).

We are, therefore, able to assess the impact that being in a 'modern' organisation has on the trajectory of the 'new skills' of just under half of our employee sample. However, it must be noted that we only have observations on the organisational contextual within which employees worked at the time of the survey and not five years before. We know that certain organisational innovations have only recently been put in place – IiP, for example, was still in its infancy in the early 1990s – hence reducing the proportion people we would denote as working in 'modern' organisations had we been able to collect organisational as well as skill data for that period. Moreover, the data set provides little evidence on the length of employee exposure to innovative organisational features – they may have been recently introduced or have been part of the organisation's make-up for the entire five year period. We simply do not know. Despite these weakening influences, a 'traditional' organisational context has a significantly negative effect on the change in employees' problem-solving ($p<0.01$) and communication skills ($p<0.01$) over the five year period. On the other hand, working in a 'modern' organisation significantly increases the change in communication skills ($p<0.05$), while for changes in problem-solving skills the relationship is insignificant. The trajectory of teamworking skills is difficult to analyse with these data since only one of the teamworking questions was asked of the jobs employees held five years ago. Nevertheless, it would appear from these results that the organisation context of work helps to explain not only current patterns of 'new skill' formation, but can also explain – albeit more weakly given the nature of the data at our disposal – changes in 'new skills' over time.

7. CONCLUSION

We have presented strong quantitative evidence in support of those who argue that there is a link between new management practices and a number of 'new skills'. These findings are in line with suggestions which have emanated from previous studies of the impact of new management practices on skill formation. These case studies have gone further to suggest that such a linkage may have causal components. This paper gives *qualified* support to this hypothesis.

This qualification arises since we do not have a managerial interview to add to the organisational data gathered via the employee. It is, therefore, impossible to say with any certainty whether the strong association revealed here is simply a product of unobservable organisational policies. Hence, we know little about the organisation's recruitment and selection techniques, its employment policy and its job allocation strategy. Increasingly employers are seeking – or so we are told – to recruit employees who already have 'new skills' rather than generating these skills internally (see Dench *et al*., 1998: 78-90). The growth of assessment centres provides some evidence to this effect. The extent to which 'modern' organisations are more likely to recruit employees in this manner will reduce the strength of the link between 'modern' organisation variables and the 'new skills' jobs demand. Similarly, organisations may be becoming more selective in their redundancy policies – moving from policies of 'last in, first out' to redundancy based on relative skill levels. Furthermore, jobs may be allocated within workplaces according to skill rather than other criteria such as seniority. Without a managerial interview to add to the organisational data gathered via the employee is impossible to control for these effects. This is known as the problem of endogeneity. That is to say, other variables (not observed – here selective recruitment, redundancy and job allocation) may explain the observed relation between organisational forms and skills.

However, there are grounds for expecting the problem of endogeneity to be minimal. By definition recruitment and selection criteria only apply to new entrants to the organisation and not those who have been in their jobs a long time (54.5% of our sample have been in the same job for two years or more, while 30.9% have been there for over five years). In addition, selective recruitment strategies are often partial in their coverage, applying to particular grades of worker and not the entire workforce. Selective redundancy and selective job allocation are also only likely to apply to a proportion of those employed.

We cannot say with a great deal of certainty, therefore, that particular organisational forms *create* 'new skills'. Nevertheless, the robustness, strength and consistency of the association between the features of an organisation and the skills it demands is remarkable. If confirmed by future work, these findings could have important policy implications. The existence of a link between our three dimensions of skill and modern organisational forms suggests that aspects of the current policy toward 'new skills' is

reflecting the skill needs of employers. However, the data suggest that the demand for these skills is restricted to a minority of employers. At the moment, only three out of ten employees work in 'modern' organisations which are more likely to demand these skills from their workforce. On the other hand, for the vast majority of employees who work elsewhere these skills are sought at comparatively low levels. Many more employers will need to adopt these new management practices for the growth in the demand for problem-solving, communication and teamworking skills to become more widespread. The promotion and encouragement of IiP may offer one means by which government can influence such a change in employee skills.

TABLE 1:
TYPE OF ORGANISATION BY WORKER CHARACTERISTICS, BRITAIN 1997

Worker Characteristics	Proportions Working in 'Traditional' Organisations[1]	Proportions Working in 'Middling' Organisations	Proportions Working in 'Modern' Organisations
All	20.9	49.6	29.5
Male	19.7	48.2	32.1
Female	22.2	51.2	26.2
20-29	19.9	52.4	27.7
30-39	19.9	50.3	29.7
40-49	19.8	48.7	31.5
50-60	25.2	46.2	28.6
No qualifications held	38.7	46.2	15.0
NVQ level 1 or equivalent	27.0	50.8	22.2
NVQ level 2 or equivalent	21.2	50.8	28.0
NVQ level 3 or equivalent	16.6	49.1	34.3
Vocational qualification at NVQ level 4/5 or equivalent	8.6	50.1	41.3
Degree	8.6	51.2	40.2
Married/co-habiting	20.9	49.1	30.0
Unmarried	20.8	51.1	28.2
White	20.7	49.9	29.4
Black	16.6	53.3	30.1
Asian	26.0	44.2	29.8
Other	31.3	28.4	40.3
Union member	8.8	49.2	41.6
Not union member	27.5	49.9	22.6

England	21.1	50.1	28.8
Wales	14.1	48.7	37.2
Scotland	22.5	46.9	30.5

Note:
1. Respondents' organisations are scored according to the responses given to a series of organisational questions. These include whether: respondents belong to a Quality Circle, their organisation is committed or recognised as an Investor in People, there is a formal appraisal system at their workplace, management organises meetings to inform the workforce of organisational developments, management holds meetings where workers can express their views and opinions, and respondents have made more than one suggestion to improve work performance over the last twelve months. By awarding one point for each of these factors an organisational index is derived. Those scoring 0 or 1 are working for 'traditional' organisations, those scoring 5 or 6 are in 'modern' organisations, while those with 2-4 points are referred to as 'middling' organisations.

Source: Skills Survey, 1997.

TABLE 2:
TYPE OF ORGANISATION BY EMPLOYMENT CHARACTERISTICS, BRITAIN 1997

Employment Characteristics	Proportions Working in 'Traditional' Organisations[1]	Proportions Working in 'Middling' Organisations	Proportions Working in 'Modern' Organisations
All	20.9	49.6	29.5
Managers & administrators	11.0	46.6	42.4
Professional	4.9	48.6	46.5
Associate professional & technical	6.7	47.0	46.4
Clerical & secretarial	18.5	50.8	37.0
Craft & related	27.0	52.4	20.6
Personal & protective services	24.2	52.0	23.8
Sales	27.9	55.2	16.9
Plant & machine operatives	34.9	47.3	17.7
Other	44.9	47.6	7.5
Agriculture & fishing	29.0	57.6	13.3
Energy & water	11.7	52.3	36.0
Manufacturing	23.5	46.9	29.6
Construction	37.2	44.7	18.2
Distribution, hotels & restaurants	29.9	52.0	18.0
Transport	18.2	49.7	32.1
Banking, finance & insurance	19.8	46.1	34.2
Public administration, education & health	10.3	51.3	38.3
Other services	33.4	54.1	12.5
1-10 at workplace	40.6	45.2	14.2
11-24 at workplace	24.9	48.6	26.5
25-49 at workplace	23.6	52.4	24.1
50-99 at workplace	15.7	57.3	26.9
100-249 at workplace	12.5	51.1	36.4
250-499 at workplace	11.6	47.8	40.6
500+ at workplace	8.9	48.6	42.5

Full-time job	18.0	49.5	32.5
Part-time job	31.2	50.1	18.8
In job less than 1 year	29.2	55.1	15.7
In job 1 year, less than 2 years	28.8	51.4	19.8
In job 2 years, less than 5 years	24.1	48.0	27.9
In job 5 years, less than 10 years	19.4	49.2	31.4
In job 10 years, less than 20 years	14.5	47.6	38.0
In job 20 years or more	10.4	48.0	41.6
Business in private UK-ownership	30.6	48.3	21.1
Business in private foreign-ownership	9.6	52.7	37.7
Business in public-ownership	9.9	51.2	38.8
Permanent job	20.6	49.4	30.0
Temporary job	24.1	52.2	23.7
Unions recognised at workplace	10.3	49.8	39.8
Unions not recognised at workplace	14.7	48.1	37.3
Training received mainly during current job	8.5	48.3	43.2
Training not received mainly during current job	31.1	50.8	18.1

'Short' training for job (< 1 month)	40.1	48.3	11.6
'Medium' training for job (> 1 month, but < 2 years)	17.3	48.8	33.8
'Long' training for job (> 2 years)	11.7	52.8	35.5
'Short' learning time to do job well (< 1 month)	30.8	49.8	19.3
'Medium' learning time to do job well (> 1 montb, but < 2 years)	13.5	55.8	30.7
'Long' learning time to do job well (> 2 years)	9.0	44.9	46.1
Women's jobs	24.3	49.1	26.6
Jobs done by men and women in equal numbers	19.1	47.5	33.4
Men's jobs	19.4	51.7	29.0
Organisational commitment score[2]	3.03	3.28	3.40

Notes:
1. For definitions see Table 1.
2. The organisational commitment score is derived from six questions, each with a four item response set running from strongly agree to strongly disagree. The questions are as follows: 'I am willing to work harder than I have to in order to help this organisation to succeed'; 'I feel very little loyalty to this organisation'; 'I would take almost any job to keep working for this organisation'; 'I find that my values and the organisation's values are very similar'; 'I am proud to be working for this organisation'; and 'I would turn down another job with more pay in order to stay with this organisation'. Scores of 1 to 5 are given to the responses ranging from strongly disagree through to strongly agree with don't knows/missing recording a neutral score of 3. Given the wording on the loyalty question the scaling is reversed to give consistency of direction: the higher the score the more commitment the respondent shows towards the organisation. The scores on these six questions are added together for each respondent and then divided by six to produce an organisational commitment score. This additive scale performs well – it has a Cronbach Alpha (standardised) of 0.8084 and Principal Components analysis yields an Eigenvalue of 3.10 explaining 51.7% of the variation. Reduction of these quesitons to a single score is, therefore, valid.

Source: Skills Survey, 1997.

TABLE 3:
WORKERS' SKILLS BY TYPE OF ORGANISATION, BRITAIN 1997

Workers' Skills[1]	Skills Score		
	'Traditional' Organisations[2]	'Middling' Organisations	'Modern' Organisations
Problem-Solving Skills			
Spotting problems or faults	2.80	3.18	3.35
Working out the cause of problems or faults	2.86	2.88	3.18
Thinking of solutions to problems	2.16	2.85	3.21
Analysing complex problems in depth	1.25	2.06	2.64
Communication & Social Skills			
Dealing with people	2.82	3.38	3.60
Instructing, training or teaching people	1.39	2.38	2.90
Making speeches or presentations	0.35	1.11	1.78
Persuading or influencing others	1.30	2.12	2.59
Selling a product or service	1.24	1.71	1.97
Counselling, advising or caring for customers or clients	1.60	2.48	2.76
Team Working			
Working with a team of people	2.43	3.08	3.49
Listening carefully to colleagues	2.50	3.10	3.35
Composite Skills Scores[3]			
Problem-solving	2.14	2.74	3.09
Communication and social skills	1.45	2.20	2.60
Teamworking	2.46	3.09	3.42

Notes:
1. Workers' skills are measured by the responses given to questions about a range of activities which may or may not be part of respondents' jobs. Respondents were asked: 'in your job, how important is …'. In total 36 types of activities used this item stem. We focus on a subset of them for the purposes of this paper. We award scores of 0-4 depending on the answer given: 0 = not at all important; 1 = not very important; 2 = fairly important; 3 = very important; and 4 = essential.
2. For definitions see Table 1.
3. Composite Skills Scores are derived by adding the scores for the responses under each heading and dividing by the number of questions. Cronbach's Alphas (standardised) = 0.8619 for problem-solving skills; 0.7986 for communication and social skills; and 0.7359 for teamworking skills. Principal Components for problem-solving skills: 1 component; Eigenvalue = 2.84; 71.1% of variation explained; highest loading on thinking of solutions to problems. Principal Components for communication and social skills: 1 component; Eigenvalue = 3.00; 50.1% of variation explained; highest loading on persuading or influencing others; 2 component solution explains 65.7% of variation (see text). Principal Components for teamworking skills: 1 component; Eigenvalue = 1.58; 79.1% of variation explained; loading equally on both variables.

Source: Skills Survey, 1997.

TABLE 4:
CHARACTERISTICS ASSOCIATED WITH 'NEW SKILLS'

	Skills Score		
	Problem-Solving	Communication	Teamworking
'Modern' organisational structures	0.1317*** (0.0465)	0.2219*** (0.0416)	0.2160*** (0.0453)
'Traditional' organisational structures	-0.4485*** (0.0543)	-0.4536*** (0.0485)	-0.4967*** (0.0528)
Training received mainly during current job	-0.0911* (0.0497)	0.0231 (0.0444)	0.0281 (0.0483)
'Short' training for job (< 1 month)	-0.1234** (0.0587)	-0.0696 (0.0525)	-0.0811 (0.0571)
'Long' training for job (> 2 years)	0.0911 (0.0566)	0.0204 (0.0506)	0.0037 (0.0550)
'Short' learning time to do job well (< 1 month)	-0.2213*** (0.0547)	-0.2124*** (0.0489)	-0.2035*** (0.0532)
'Long' learning time to do job well (> 2 years)	0.0254 (0.0506)	0.1004** (0.0453)	0.0239 (0.0492)
Organisational commitment score	0.1025*** (0.0247)	0.1400*** (0.0221)	0.1596*** (0.0241)
Part-time work	-0.1904*** (0.0580)	-0.1612*** (0.0519)	-0.1369** (0.0564)
Temporary work	0.0755 (0.0775)	0.0204 (0.0694)	0.1358** (0.0754)
Job tenure	-0.0006 (0.0006)	-0.0009* (0.0006)	-0.0014** (0.0006)
Job tenure squared	1.98e-06 (1.70e-06)	2.77e-06* (1.52e-06)	3.48e-06** (1.66e-06)
Women's jobs	-0.1157** (0.0552)	-0.0851 (0.0493)	0.0497 (0.0536)
Men's jobs	0.0576 (0.0560)	-0.1291*** (0.0501)	-0.0465 (0.0545)
Business in private foreign ownership	-0.0268 (0.0576)	0.0546 (0.0515)	0.1088* (0.0560)
Business in public ownership	-0.0609 (0.0669)	-0.0349 (0.0599)	-0.0101 (0.0651)

Union recognised at workplace	0.0137 (0.0535)	0.0299 (0.0482)	-0.0042* (0.0520)
Other controls[1, 2]	Yes	Yes	Yes
Adusted R^2	0.3042	0.4053	0.2078
Number of observations	2077	2078	2078

*** = significant at 1% level (ie, $p<0.01$);
** = significant at 5% level (ie, $p<0.05$);
* = significant at 10% level (ie, $p<0.10$).

Notes:
1. A range of other control variables were also entered (results not shown here) in the regressions reported here. These include: continuous entries for size of workplace and size of workplace squared; eight occupational dummies; eight industry dummies; five qualification dummies; two country dummies; and demographic dummies for sex, marital status, ethnicity and union membership, and continuous entries for age and age squared.
2. The significance and direction of the overall findings remain unaltered by the exclusion of these controls, although the adjusted R^2 falls dramatically.

Source: Skills Survey, 1997.

TABLE 5:
INFLUENCE OF INDIVIDUAL ORGANISATIONAL CHARACTERISTICS

Individual Organisational Characteristics[1]	Influence on Skills Score		
	Problem-Solving	Communication	Teamworking
Quality Circles	Positive & Significant **	Positive & Significant **	Positive & Significant ***
Investor in People	Positive & Significant *	Positive & Significant **	Positive & Significant **
Formal Appraisal System	Positive & Significant **	Positive & Significant **	Positive & Significant ***
Information Meetings Organised By Management	Positive & Significant ***	Positive & Significant ***	Positive & Significant ***
Employees Allow to Express Views and Opinions at Meetings Organised by Management	Negative & Insignificant	Positive & Significant *	Positive & Insignificant
Active Suggestion Scheme	Positive & Significant ***	Positive & Significant ***	Positive & Significant ***

*** = significant at 1% level (ie, $p<0.01$);
** = significant at 5% level (ie, $p<0.05$);
* = significant at 10% level (ie, $p<0.10$).

Note:
1. The results reported here are based on entering six dummy variables for the presence of the organisational characteristics on which our definition of 'modern', 'middling' and 'traditional' organisational forms is based. They replace the dummies for 'modern' and 'traditional' organisations and are entered into the model reported in Table 4. The remaining parameters of the model are unchanged.

Source: Skills Survey, 1997.

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TABLE A1:
VARIABLES, DESCRIPTIONS AND MEANS

Variable	Description	Mean[1]
'Modern' organisational structures	0/1: presence of 5 or 6 organisational features out of 6 (see text).	0.29
'Traditional' organisational structures	0/1: presence of 0 or 1 organisational features out of 6 (see text).	0.21
Training received mainly during current job	0/1	0.46
'Short' training for job (< 1 month)	0/1	0.50
'Long' training for job (> 2 years)	0/1	0.29
'Short' learning time to do job well (< 1 month)	0/1	0.22
'Long' learning time to do job well (> 2 years)	0/1	0.24
Organisational commitment score	1, 2, 3, 4 or 5 (see text)	3.29
Part-time work	0/1	0.22
Temporary work	0/1	0.07
Job tenure	In months	96.60
Job tenure squared	Months squared	18,272.13
Women's jobs	0/1: jobs done exclusively or mainly by women.	0.32
Men's jobs	0/1: jobs done exclusively or mainly by men	0.40
Business in private foreign ownership	0/1	0.15
Business in public ownership	0/1	0.32
Union recognised at workplace	0/1	0.33

Workplace size	Number of people	340.96
Workplace size squared	Number of people squared	1,150,255.4
Managers & administrators	0/1	0.14
Professional	0/1	0.11
Associate professional & technical	0/1	0.10
Clerical & secretarial	0/1	0.18
Craft & related	0/1	0.10
Personal & protective services	0/1	0.10
Sales	0/1	0.08
Plant & machine operatives	0/1	0.11
Other	0/1	0.08
Agriculture & fishing	0/1	0.01
Energy & water	0/1	0.01
Manufacturing	0/1	0.22
Construction	0/1	0.04
Distribution, hotels & restaurants	0/1	0.18
Transport	0/1	0.07
Banking, finance & insurance	0/1	0.14
Public administration, education & health	0/1	0.29
Other services	0/1	0.04
Female	0/1	0.49
Age	In years	38.63
Age squared	Years squared	1,599.68
Married/co-habiting	0/1	0.69

White	0/1	0.96
Union member	0/1	0.35
No qualifications held	0/1	0.19
NVQ level 1 or equivalent	0/1	0.08
NVQ level 2 or equivalent	0/1	0.31
NVQ level 3 or equivalent	0/1	0.17
Vocational qualification at NVQ level 4/5 or equivalent	0/1	0.13
Degree	0/1	0.13
Wales	0/1: living in Wales	0.06
Scotland	0/1: living in Scotland	0.10

Note:
1. The means are based on the unweighted data used in the regressions reported in Table 4, hence they differ from the weighted data reported in Tables 1, 2 and 3.

Source: Skills Survey, 1997.