High-performance workplace practices from the employees' perspective

SKOPE Research Paper No. 77 March 2008

By Annalisa Cristini
University of Bergamo

Editor's Foreword

SKOPE Publications

This series publishes the work of the members and associates of SKOPE. A formal editorial process ensures that standards of quality and objectivity are maintained.

Abstract

This paper examines the effects of high performance workplace practices on employees' work attitudes, wage and quality of work. The model is recursive and workplace practices can affect work attitudes both directly and indirectly, by influencing the wage and the job content. The results suggest three distinct ways to elicit motivation: give employees voice either in formal arrangements and/or by promoting suggestions, set up partly autonomous teams and adopt appraisal schemes. Appraisals indirectly impact on motivation by raising the wage, though they strengthen supervision and intensify effort at the expense of safety; on the contrary, voice practices indirectly affect work attitudes by intrinsically enriching the job in terms of autonomy and discretion. Team-working scores mixed results: positive on work attitudes, wage and job quality if the team is autonomous in deciding tasks and time, largely negative if the team self-determines the group membership or is held responsible for the output, impoverishing jobs if no autonomy is allowed and, at best, ineffective on motivation and wages if full autonomy and self-determination is granted. Finally, the adoption of quality standards reduces employees' motivation although it is associated with better working conditions.

1. Introduction

More than 40 years ago Leibenstein (1966:413) put forward the relevance of input reorganisation as a way to achieve efficiency for a given resource allocation and regarded motivation to be a major determinant of X-efficiency, suggesting that 'for a variety of reasons people and organisations normally work neither as hard nor as effectively as they could'. In the last two decades two things have renewed economists' interest in these issues: the emergence of a new management strategy as a distinct and promising alternative to the Fordist approach and the introduction of national representative surveys collecting information at the workplace level.

Based on Taylor's Scientific Management (Taylor, 1911), the job, in the traditional workplace, is based on fixed, small and accountable tasks; it is usually repetitive and strictly supervised, workers are asked to comply with standards of effort and productivity and there are no incentives to exceed requirements; a specialised hierarchy is usual, and any form of partnership between management and workers is virtually unknown: control is the word to elicit effort (Walton, 1985).

The alternative approach replaces control with commitment; it brings back concepts such as employees' autonomy, discretion and task variety, typical of the artisan work style. Initially undertaken by several large firms in the 1970s, the commitment approach reconsidered the quality of working life and implemented so-called employee involvement programmes. The final goal remains efficiency although the road undertaken aims at extracting the tacit knowledge of the employees and making it productive in a context in which incomplete work contracts leave room for unexploited efficiency (Simon, 1991). Employees are allowed to undertake broader tasks, are informed about the company's plans, take part in problem-solving meetings and are given more autonomy and, eventually, responsibility and decision-making power on some operations; the whole organisational structure is flattened, mainly at the expense of middle managers and line supervisors. Individual work is typically replaced by teams, which can be self-managed, self-monitored and responsible for their own output; incentive pay and job security are essential parts of the new management (Walton, 1985).

As these practices spread (Osterman, 2000) and workplace-level data were made available, evidence of their role in firm performance, beyond anecdotal and case studies, began to accumulate, and largely confirmed that they can yield significant

productivity improvements, a fact which led to them being described as high-performance workplace practices (HPWPs).[1] The economic relevance of these new practices lies in the fact that they achieve efficiency by enriching the job, making it less monotonous and more interesting, thereby potentially constituting a win–win strategy. Indeed, workers involved in new workplace practices tend to report relatively higher levels of job satisfaction than workers in the same firm who are not involved (Freeman and Kleiner, 2000; Godard, 2001; Bauer, 2004; Mohr and Zoghi, 2006).

If we move beyond job satisfaction, however, findings are a little less clear and the evidence is in some cases uncomfortable. Some practices are found to be associated with increasing occupational illnesses, mental strain and risk of injuries (Askenazy, 2001; Fairris and Brenner, 2001; Brenner *et al.*, 2004); peer pressure in small teams, coupled with high quality standards, can result in increased pace of work and stress (Adler *et al.*, 1997); the adoption of new practices may lead to major reorganisations and redundancies (Osterman, 2000; Black *et al.*, 2004). Moreover, the extent to which wages rise in response to the productivity gain ascribable to the new practices appears to be very modest (Handel and Levine, 2004:1).

Yet, the fact that workers like the innovative work system even if it jeopardises their job safety and security implies that the benefits involved are sufficiently large to compensate for the costs. Indeed, the general perception is that the non-pecuniary reward related to the change in the intrinsic job content is what drives the job satisfaction results, although the quantitative evidence is scanty and fragmented (see for example Clark, 2004, Helliwell and Huang, 2005).

---

[1]Ichniowski et al. (1997), among the most cited papers in this area, use data from the US steel finishing industry and show that productivity is 6.7% higher in companies that employ innovative HRM systems. Black and Lynch (2004), using a large US national representative sample, found that multifactor productivity accounts for 1.6 percentage points of the 4.7% average annual manufacturing output growth between 1993 and 1996 and that 1.4 percentage points of this productivity increase is attributable to workplace re-engineering and new HR practices. Patterson et al. (1997) examined longitudinal data on 67 British firms and found that 17% of the variation in firms' profitability is due to workplace practices and organisational innovations. Evidence has also been produced for Germany (Bauer, 2003; Zwick, 2004), France (Greenan, 1996; Caroli and Van Reenen, 2001) and Italy (Cristini et al., 2003). Practices' complementarity, according to which it is a coherent system of HPWP that leads to a more efficient use of labour and to productivity gains, has also been supported together with complementarity between innovative practices, technological change and high skills (Brynjolfsson et al., 2002; Breshnan et al., 2002, and others). However, results are not unanimous: Freeman and Kleiner (2000) found no significant impact of employee involvement programmes on productivity and, likewise, nor do Cappelli and Neumark (2001). Moreover, some argue that the analysis is flawed by difficulties in measuring practices and their extent of adoption; Godard (2004) points out that the literature may have emphasized the positive productivity results more than the negative ones.

This paper contributes to this literature by disentangling and quantifying the various effects of the new workplace practices on workers' well-being; we distinguish the effects on wages from those on the quality of work and work attitudes and account for their interactions. The data are from a national survey, conducted in 2004, of a sample of representative Italian employees working in the private sector.

The rest of the paper is organised as follows. The next section reviews the empirical literature on the various dimensions of workers' well-being in relation to the innovative practices. Section 3 outlines the empirical model, section 4 describes the data and provides some initial descriptive evidence, section 5 discusses the econometric results and the last section concludes.

2. Workplace practices and workers' well-being: the existing evidence

The literature on workers' well-being and workplace practices mainly developed along two distinct strands: the extent to which workers share productivity gains through higher wages and the impact of HPWPs on safety and working conditions. Some evidence has also being produced on the relationship between innovative practices, job security and wage inequality. On the wage side, workplace practices, overall, appear to play only a modest role.[2] Handel and Gittelman (2004) used a sample of 1062 US establishments from the 1995 Survey of Employer-Provided Training and investigated both the average establishment wage and the individual wage, the latter taken from the related dataset obtained by interviewing two random employees from each surveyed establishment. On neither measure did they find a significant impact of HPWP,[3] even when allowing for practices' complementarity. Osterman (2000), using a sample of about 300 US establishments in the private sector, found that core workers employed in firms that introduced HPWP four years previously enjoyed no significant wage gains and even appeared to suffer a net wage loss, when controlling for firm's growth using employment changes.

In contrast, Cappelli and Neumark (2001), using the Education Quality of the Workforce National Employer Survey (EQW NES) US panel, restricted to firms in existence since 1977, found a positive and significant relationship between practices[4]

---

[2]See the survey by Handel and Levine (2004).
[3]They consider: job rotation, quality circles, re-engineering, self-managed teams, peer performance review, employee involvement, pay for skill, profit sharing, total quality management, and just in time.
[4]Meetings, total quality management, team training, profit sharing.

and employee labour cost. Black *et al.* (2004) used the same longitudinal EQW NES but restricted it to manufacturing firms while keeping open the date of entry; they also found a positive association between wages, meetings and profit sharing, but only when the practices were interacted with the union dummy. Similarly Godard (2007), using Canadian and English data, showed that wages rise when union representation is combined with innovative practices although the latter are also strongly associated to non-union wages. The role of unions in allowing wage increases in presence of new workplace practices has been challenged by Osterman (2006); using 1997 National Establishment Survey, he found a positive impact of a principal component indicator of HPWP on the median wages of core non-managerial employees, although the union interaction term remained insignificant; Osterman also excluded the possibility that practices act on wages via the usual skill and technology channel and found that across-the-board pay mechanisms convey the wage effects. This agrees with his other finding of no increase in wage inequality, similar to that of Black *et al.* (2004). Handel and Levine, in their survey on the wage effects of innovative practices, conclude that '... many programs have no effect on wages, while on average, the effect is a small increase in wages after companies introduce new work systems with higher employee involvement' (2004: 1).

The evidence on workers' occupational safety is more limited, as there is a lack of matched data on innovative workplace practices and safety; however, the existing findings mostly agree that some practices are associated with a worsening of individuals' well-being at work, both physical and psychological. Askenazy (2001), using a panel of 26 US sectors over four quinquennia from 1979 to 1991, found that total quality management,[5] job rotation and autonomous work teams are associated with an increase in occupational injuries and illnesses. Farris and Brenner (2001) and Brenner *et al.* (2004), studying US establishments,[6] also found that total quality management and the interaction of total quality management and teamwork result in an increase in cumulative trauma disorders; the suspicion that total quality management may represent a potential new form of Taylorism with associated health

---

[5]The International Organization for Standardization defines total quality management (TQM) as 'a management approach for an organization, centred on quality, based on the participation of all its members and aiming at long-term success through customer satisfaction, and benefits to all members of the organization and to society.'

[6]They combine the 1993 Survey of Employer Provided Training, which gives information on workplace practices, with the 1993 Survey on Occupational Injuries and Illnesses, the latter used to obtain the rate of newly identified repeated trauma cases.

costs for the workers is raised and partly confirmed also by Adler *et al.*, (1997). More recently, Askenazy and Caroli (2006), using a representative sample of French workers, found quality norms and job rotation to be the most hazardous practices, being associated with a riskier workplace, a higher number of injuries and increased mental strain.[7] Mohr and Zoghi (2006), using Canadian data, found that quality circles increase the desire to work fewer hours due to stress but found no direct relationship between days of work lost and HPWPs, although they did not include total quality management among their practices. Anxiety and work intensity seem to characterise UK skilled workers and workers' upskilling (Gallie and Green, 2002), and Green (2004) associates work intensification with these new types of workplaces.

Finally, workplace innovation appears to reduce job security by increasing layoffs (Osterman, 2000); according to Black *et al.* (2004, Table 7), the probability of experiencing a reduction in employment of 20 percent or more is positively associated with the intensive use of self-managed teams and job rotation among non-managerial workers although the results are attenuated in unionised establishments.

On the whole, it seems fair to conclude that, in terms of wages, safety and job security, innovative workplace practices do not leave workers significantly better off, yet workers involved in such practices usually report higher levels of job satisfaction and organisational commitment than workers not involved in such programmes. Freeman and Kleiner (2000) found that employees participating in employee involvement (EI) programmes[8] report higher trust and loyalty to the firm and higher satisfaction with work than non-involved employees. Godard (2001), using a sample of Canadian workers, found that job satisfaction, commitment and motivation are all positively related to an indicator of new workplace practices although he also found that work intensification can in same cases offset the benefits. In another Canadian matched employer–employee dataset, Mohr and Zoghi (2006) found that practices such as suggestions, task team, job rotation, quality circles, information sharing, self-

---

[7]Other practices they explore, such as hourly and daily flexibility and meetings, do not affect the number of injuries.
[8]Such programmes comprise total quality management, opinion surveys, information sharing, committee on productivity, worker involvement in the design of EI programmes, worker involvement in work processes and self-managed teams.

directed workgroups and class training are all positively related to job satisfaction. The evidence from most European countries confirms these findings (Bauer, 2004).[9]

3.   The model

Workplace practices can affect employees' attitudes, wage and quality of work. Work attitudes, mainly captured by organisational commitment indicators, are affected by workplace practices both directly and indirectly, via the wage and the work quality which is defined in terms of working conditions, job security and intrinsic job characteristics. The wage is modelled as a standard hedonic wage equation.

3.1   Employees' work attitudes

Work attitudes are usually associated with job satisfaction, organisational commitment and work motivation; although these concepts essentially depend on the same set of variables, they capture slightly different aspects. Job satisfaction is directly linked to workers' well-being and as such is the most appropriate measure of it; it summarises various job features (Hammermesh, 1977; Freeman, 1978) and is strictly associated with life satisfaction. Organisational commitment is a more specific concept related to firm loyalty and firm identification (Simon, 1991); many studies in applied psychology have found that it is a good indicator of outcomes such as turnover and absenteeism and, more generally, of firm performance, and that such associations are stronger than with job satisfaction.[10] Work motivation is a more general concept and indicates the psychological state driving behaviours and actions to determine positive outcomes such as work efficiency and performance. Because of the way in which work attitudes are measured in the data used in the following empirical analysis, hereafter we refer mainly to commitment.[11]

We distinguish between the pecuniary and the non-pecuniary factors that affect commitment. The former may range from the actual wage to the expected pecuniary prospects within the organisation, where the relevance of the latter

---

[9]The degree of job autonomy (regarding task order, methods of work, job speed and quality) and the extent of information sharing (horizontal and vertical communication) are the practices driving the positive relation between HPWPs and job satisfaction.

[10]See, for example, Roe *et al*. (2000) and references therein.

[11]The issue of whether there exists a causal relationship between job satisfaction and commitment and, if so, in which direction, does not seem to be settled in applied psychology. On the one hand, a committed worker is likely to be satisfied on most dimensions of their job; on the other hand, satisfaction need not imply commitment, for example one can be satisfied because the job ensures a quiet life, but this does not imply work motivation or commitment.

component is expected to rise as commitment intensifies from sharing the firm's values to a promise to work harder and stay with the company.[12] The reward is considered in relation to peers' pay; if this rises relative to an employee's actual and future expected rewards, motivation and commitment are weakened in the same way as the reference income reduces utility by the envy incurred by perceiving our peers to be relatively better-off (see, for example, Clark and Oswald, 1996 and Luttmer, 2005). However, both the reference and the actual wage also provide information about the expected future wage; then, if the latter is unobservable, the estimated coefficient of the peer group reference wage compounds two opposite effects: the negative relative wage effect and the positive expected wage effect. Let Ω be the organisational commitment, w the wage, $\overline{w}$ the reference wage and w^e the expected wage within the organisation; then, we can express commitment as follows:

$$\Omega = ?\,(w,\, w^e,\, \overline{w},\, \boldsymbol{c}) \qquad\qquad (1)$$

where ? is a vector of non-pecuniary and other regressors, and

$$\frac{\partial \boldsymbol{w}}{\partial w} \geq 0,\, \frac{\partial \boldsymbol{w}}{\partial w^e} \geq,\, \frac{\partial \boldsymbol{w}}{\partial \overline{w}} \leq 0.$$

The total derivative of the reference wage is therefore given by:

$$\frac{d\Omega}{d\overline{w}} = \frac{\partial \boldsymbol{w}}{\partial w^e} \cdot \frac{\partial w^e}{\partial \overline{w}} - \frac{\partial \boldsymbol{w}}{\partial \overline{w}} \qquad\qquad (2)$$

In the empirical counterpart of equation (1) the sign of the reference wage is therefore *a priori* ambiguous. Generally, if the role of the expected wage is relevant ($\frac{\partial \boldsymbol{w}}{\partial w^e} \neq 0$)

and the latter are permeable to the external peer group wage ($\frac{\partial w^e}{\partial \overline{w}} > 0$), then a non-negative effect of the reference wage is more likely. In contrast, where commitment is less dependent on the expected rewards and/or these are somehow insulated from the outside market, the usual negative coefficient on the reference wage is likely to prevail. On the whole, we expect internal monetary prospects to be particularly relevant for work attitudes related to a strong type of commitment and less so for those related to a loose type of commitment. In the context of the relative income hypothesis, Hirschman (1973) used the 'tunnel' metaphor to explain how the usual negative sign on the peer group's income, induced by 'relative deprivation' sentiments, can be counterbalanced or even reversed if the same reference income acts

---

[12]On the definition of commitment and work attitudes see Gallie *et al.* (1998).

as an indicator of future income prospects. Recent evidence of this has been found, for example, for Russia (Senik, 2004) and Denmark (Clark *et al.*, 2006) using measures of satisfaction. The non-pecuniary factors affecting commitment are captured both by the presence of workplace practices aimed at increasing employees' participation and involvement and by the effectiveness of such practices. On the assumption that the degree of job autonomy, discretion, variety, strictness of supervision, job repetitiveness and similar attributes are significant indicators of the way in which practices are actually implemented, we augment the usual dichotomous information regarding the presence of practices in the workplace by a vector of job content indicators. Considering the various elements discussed above, we specify Ω as follows:

$$\Omega = ? (\pi, h, \mathbf{z}, \mathbf{f}, \mathbf{d}, w, \overline{w}, u_w) \qquad (3)$$

where w is the monthly take-home wage, $\overline{w}$ is the peer group wage, h is monthly hours of work, p is the vector of workplace practices, $\mathbf{d}$ is the vector of all job attributes, $\mathbf{z}$ is the vector of personal characteristics,[13] $\mathbf{f}$ is the vector of workplace and firm characteristics and u_w is the error term.

3.2   The wage

The wage is modelled according to a standard hedonic wage equation. This includes job attributes, individual and ?rm characteristics; workplace practices are expected to affect the individual wage via two possible mechanisms:

1. Compensating differentials. As long as workplace practices are regarded as amenities and workers can move between jobs, we expect wages to fully or partly compensate for them.

2. Workplace productivity. The notion that workplace practices have a relevant impact on productivity is probably the most investigated field concerning workplace practices and finds a large empirical support, as we reported in the introduction. Once productivity improves, in order for the workers to share the gains in the form of higher wages, we have to allow for some non-competitive elements. Bargaining is the obvious means, whereby workers share the rent in proportion to the union's bargaining

---

[13]Usual ID and elements of one's personal life that might affect one's life at work or the job choice (for example: health status, family circumstances) as well as other characteristics directly related to the job (for example: experience, tenure, occupation, over-education).

power. Independently of unions, some pay schemes may provide for a wage premium linked to productivity or profitability measures. Pay schemes of this type may be unilaterally decided by the firm, for reasons of fairness or of a 'quiet life' (Nickell, 1996), or may be part of the bargaining process if unions are present and sufficiently strong. Some systems spread the overall productivity gains equally to all employees; others are merit systems based on the assessment of individual (or team) performance;[14] the latter are believed to be more effective in motivating and encouraging effort than the former.[15]

Thus, if any such non-competitive elements are present, the wage equation can be written as follows:

$$w = w(\pi, h, \mathbf{z}, \mathbf{f}, \mathbf{d}, \mathbf{z}^w, u_w) \qquad (4)$$

where u_w is the error term, z^w are individual characteristics that affect the wage but not commitment and the remaining variables are as previously defined.

Workplace practices therefore play two roles in the wage equation: they can be regarded as amenities as well as productivity enhancing factors. In the latter case they exert a positive effect on the wage, but in their former role they exert a negative effect; the sign is therefore *a priori* undetermined.

As will be discussed in section 3.4 below, z^w serves to identify the commitment equation and, in practice, to avoid perfect multicollinearity between the wage and its determinants; the empirical literature on commitment being very limited, we used existing results on job satisfaction as a guide to exclusion restrictions for O. Education is a potential candidate, having a strong theoretical foundation for inclusion in the wage equation, while playing a relatively weak role in job satisfaction, once income and all other job attributes are controlled for. Although Clark and Oswald (1996) suggest that the more educated have higher expectations and therefore tend to be less satisfied, the evidence is mixed. They found a strong negative coefficient and identified previous evidence that supported their finding; yet they control for only a

---

[14]Osterman (2006) credits the idea that workplace practices have an average wage effect more than an individual wage effect because of across-the-board pay schemes. Black et al. (2004), instead, support the unions' medium. In both cases HPWPs do not seem to raise within-firm wage inequality.

[15]For Italy, Cristini and Leoni (2007) found that, where unions are present and take part in the design of merit systems, the rent sharing is highest; their findings substantiate the theoretical result according to which, where bargaining and efficiency wages meet, rent sharing is higher.

few job attributes[16] and warn that the sign of the coefficient could well be due to related social class events taking place during that period. Borjas (1979), using US data, found education to be insignificant. More recently, in a cross-country comparison of 14 European countries, Kaiser (2007) found years of schooling to be insignificant in six countries, including Italy, negative in six other countries and positive in two countries. In a study comparing job satisfaction among public and private sector employees in Italy, conditional on occupation, education dummies were jointly insignificant (Ghinetti, 2007). Böckerman and Pekka (2006), who include a large number of job attributes, also find education dummies to be insignificant on Finnish data. In contrast, education dummies were found to be negative and significant by Bender *et al.* (2005), Heywood *et al.* (2002) and Bryson *et al.* (2004) while Mohr and Zoghi (2005), for Canada, found mixed results. In addition to level of education, full-time vs. part-time work, as a relevant part of the labour contract, is an important determinant of the individual wage but, given the wage and all other job attributes, is not expected to have an additional effect on commitment. These restrictions are tested in the empirical section. Finally, the reference wage is obtained as a linear prediction from equation (2) on the assumption that the employees do not know the job attributes and the practices of their peers' job, so the coefficients of p and **d** are restricted to zero.

3.3   *Work quality*

The process of empowerment and involvement that ensues from the adoption of innovative workplace practices reshapes the way in which tasks are defined and carried out, hence the very content of the job which ultimately yields the labour efficiency gain. We assume that job attributes are a function of workplace practices and other exogenous variables such as personal and firm characteristics; in addition, we assume that the organisational area in which the employee carries out his or her job contains some information about the job content: for example, accidents and discomfort are more likely to be experienced in production and maintenance than in general and legal affairs; variety is likely to be greater in data processing than in

---

[16]For example, they do not control for stress or effort which, if positively related to education at various levels and negatively to job satisfaction, could produce a downward biased estimate of the education dummies.

production and so on. Let $\mathbf{z}^d$ be the organisational area dummies. We can then write the attributes' equation as follows:

$$\mathbf{d}=(\pi, h, \mathbf{z}, \mathbf{f}, \mathbf{z}^w, \mathbf{z}^d, u_d) \qquad (5)$$

where u_d is the error term.

3.4 The overall model: direct and indirect effects of the practices

The overall structural model is composed of equations (3), (4) and (5):

$$\Omega=w(\pi, h, \mathbf{z}, \mathbf{f}, \mathbf{d}, w, \overline{w}, u_w) \qquad (3)$$

$$w=w(\pi, h, \mathbf{z}, \mathbf{f}, \mathbf{d}, \mathbf{z}^w, u_w) \qquad (4)$$

$$\mathbf{d}=(\pi, h, \mathbf{z}, \mathbf{f}, \mathbf{z}^w, \mathbf{z}^d, u_d) \qquad (5)$$

The endogenous variables are O, w, $\mathbf{d}$. The model is recursive: equation (5) is clearly identified while covariance restrictions could be used to identify equations (3) and (4); in particular, we would need to assume that the covariance matrix is diagonal, so that errors are not correlated across equations (Wooldridge, 2002:228). In fact, we expect individual or workplace unobservable fixed effects to enter the error terms of all three equations; therefore, although we take care of this empirically (see section 5), the system above also implies some exclusion restrictions for *a priori* identification. In particular, $\mathbf{z}^d$ and $\mathbf{z}^w$ identify equation (3) and $\mathbf{z}^d$ identifies equation (4).

Given the model, we are interested in quantifying the direct effects of workplace practices on all three dimensions of workers' well-being: $?_p$, w_p, $\mathbf{d}_p$; furthermore, we are interested in the additional indirect effects on the wage via the job attributes (quality of work), and on commitment via both the wage and the job attributes. The total effects are then given by:[17]

$$\frac{d\Omega}{d\boldsymbol{p}} = \boldsymbol{w_p} + \boldsymbol{w}_w \cdot \left(w_{\boldsymbol{p}} + w_d \cdot d_{\boldsymbol{p}} \right) + \boldsymbol{w}_d \cdot d_{\boldsymbol{p}} \qquad (6)$$

$$\frac{dw}{d\boldsymbol{p}} = w_{\boldsymbol{p}} + w_d \cdot d_{\boldsymbol{p}} \qquad (7)$$

The direct effects are immediately readable from the estimated structural model whereas, for the indirect effects, we compare the structural equations with their reduced forms. In fact, a reduced form of equation (3) is also interesting on estimation grounds since the joint presence of a vector of detailed job attributes and of the wage, which we expect to be highly correlated, may impede attempts to identify the effect of

---

[17]The total effect for the quality of work coincides with the direct effect.

the wage on commitment.[18] Substituting for **d** in the commitment and wage equation yields:

$$\Omega = \widetilde{w}(\pi, h, \mathbf{z}, \mathbf{f}, \mathbf{z}^d, \mathbf{w}, \overline{w}) \qquad (8)$$

$$w = \widetilde{w}(\pi, h, \mathbf{z}, \mathbf{f}, \mathbf{z}^d, \mathbf{z}^w) \qquad (9)$$

By further substituting equation (9) into equation (8) we obtain the final reduced form commitment equation in which all the cross-equation relations in the model have been accounted for:[19]

$$\Omega = \widetilde{\widetilde{w}}(\pi, h, \mathbf{z}, \mathbf{f}, \mathbf{z}^d, \mathbf{z}^w) \qquad (10)$$

The partial derivative of equation (10) with respect to p therefore encompasses the direct and all the indirect effects of the workplace practices on commitment. By comparing this partial derivative to the corresponding one from equation (8), one obtains the indirect effect working through the wage and, likewise, a comparison of the partial derivatives of equation (3) and (8) yields the indirect effect working through the job attributes.

3.5 *Productivity, rents and amenities*

As suggested by the existing evidence, innovative workplace practices share the features of both job attributes (amenities) and productivity-enhancing factors. Suppose a practice p is a mere amenity; then, in a competitive framework, from the theory of compensating differentials, we would expect wages to be negatively related to such a practice. Moreover, to the extent that work attitude O is a proxy for the employee's utility from work and the wage fully compensates for the amenability of the practice, we expect $d\Omega/d\mathbf{p} = 0$ If, on the contrary, workplace practices significantly enter the fully reduced form, equation (10), either the wage does not fully compensate or there are some productivity effects at work, or both. Generally, if the total derivatives of the practice in the wage and in the 'work utility' function have opposite signs, then the wage-compensating differentials are likely to be insufficient (productivity effects may be present but are small and cannot revert the signs). On the

---

[18]Indeed, in the job satisfaction literature, the usual method is to substitute for **d** in equations (3) and (4) using equation (5). For example, Bauer (2004) and Mohr and Zoghi (2006) estimate a job satisfaction equation of this kind although they do not consider the link between **d** and p; also they do not include $\hat{w}$ so do not need to estimate a wage equation. Clark and Oswald (1996) also use this model although they are not interested in workplace practices and do not include them; they use a standard wage equation to compute $\hat{w}$.

[19]The reference wage, being determined by a subsample of the right-hand side variables of the wage equation, is then also automatically substituted out.

other hand, in the case of practices with the same sign in the two reduced-form equations, either the wage is excessively compensating or, if the signs are both positive, some productivity effects are probably present.

Table 1: Classification of workplace practices by total derivative sign

		Utility from work +	Utility from work −
Wage	+	Likely productivity effects	Undesirable practice insufficiently compensated Small productivity effects
Wage	−	Desirable practice insufficiently compensated Small productivity effects	Desirable practice excessively compensated No productivity gain or productivity loss Recently introduced practice or obsolete practice

Specifically, a positive sign of the total derivative of workplace practices in the wage equation as well as in the 'work utility' equation indicates that employees are enjoying a rent that is probably due to the productivity gain engendered by the practice itself unless it simply reflects excess wage compensation in the presence of a disagreeable practice, which is quite unlikely. Likewise, a negative sign of both total derivatives is consistent with the wage excessively compensating an amenable practice; the excess compensation in this case is consistent, for example, with rising costs typical of recently adopted practices,[20] In fact, the case of both negative derivatives could even signal an undesirable and unproductive practice, although one would wonder why such a practice should exist in the first place, unless it is an obsolete practice that, for various reasons, for example resistance to change, the management failed to remove.[21] The length of time the practice has been in place could therefore help distinguishing between these two cases. Table 1 summarises the four cases.

4. The Data

The data are from a new national representative survey of Italian employees working in the private sector. The survey, named OAC (organisation, learning and competencies), was designed by ISFOL and conducted in May 2004 (ISFOL, 2007).

---

[20]Evidence of a time lag between practices adoption and performance effect is provided, for example, by Brynjolfsson *et al*. (2002), Kato and Morishima (2002) and Bauer (2003).
[21]See, for example, Batt (2004) for resistance to self-managed teams.

This survey is particularly useful to our investigation because it contains detailed information on many job characteristics, from contractual aspects to various intrinsic job attributes, as well as on the main innovative workplace practices in which the employee is directly involved or which the firm has adopted; basic workplace and ?rm characteristics are also available. The survey involved 4000 employees and 3605 observations are available net of errors and invalid strings.[22]

4.1   The measure of employees' attitudes

Despite the thorough job description, the survey does not contain a general question on overall job satisfaction; however, it includes a few specific statements regarding the employee's attitudes towards his/her job and towards the firm. Respondents were asked to indicate their level of agreement with the statements using a seven-point Likert scale: totally disagree (1), strongly disagree (2), disagree (3), indifferent (4), quite agree (5), strongly agree (6), totally agree (7). Specifically, we focus on the following statements:

1. This organisation really inspires the very best in me in the way of job performance.
2. I am proud to be working for this organisation.
3. I find that my values and the organisation's values are very similar.
4. I feel very little loyalty to this organisation.
5. I am willing to work harder than I have to in order to help this organisation succeed.
6. I would take almost any job to keep working for this organisation.
7. I would turn down another job with more pay in order to stay with this organisation

Although all seven items are dear about the degree of the employee's motivation, statements 5–7 look for a very strong sense of commitment, which may go as far as refusing to resign in order to take up a better-paid job; they are also clear indicators of possible actions and behaviours. Statements 1–4, on the other hand, are about a softer type of commitment; they refer not to precise actions but to feelings, and in this sense we regard them as being closer to a job satisfaction indicator although, in the absence

---

[22]Various problems related to errors in eligibility details, insufficient supplementary nominatives and low response rates required additional interviews. The validation procedure discarded any bias between the two parts of the survey. ISFOL(2007), chapter 1.

of a specific question on job satisfaction, we prefer the term 'weak commitment'.[23] The responses to statements 1–7 are shown in Figure 1.

With the exception of statements 6 and 7, responses are negatively skewed and the mode is category 5, 'quite agree'. On the basis of the degree of commitment to the organisation implicit in each item, we compute two overall measures of work attitudes to use in the subsequent econometric analysis, by summing the items from 1 to 4 and from 5 to 7, after reversing the scales of statement 4, and then rescaling both compound indicators back into seven categories.[24] Figure 2 (first column) shows the distribution of the resulting indicators: 'weak commitment' is negatively skewed and, as one would expect, the 'strong commitment' distribution shows, instead, very little skewness.

Note that these 'summary' indicators increase both with the number of statements the respondent agrees with and with the intensity of the agreement. An alternative composite indicator could be defined to increase only with the number of statements the respondent agrees with, independently of the intensity with which he/she agrees. These alternative distributions, shown in the second column of Figure 2, are also quite different from each other: for weak commitment the mode corresponds to three statements and for strong commitment to one statement; compared with the other composite measures their distributions are further from the normal. On this basis, and because the sum-measures comprise more complete information, we carry on with those.

4.2   *Definition of workplace practices and their diffusion among employees*

The survey provides information on workplace practices, by asking employees whether they are actually involved, and on the intensity of job attributes like autonomy, discretion and variety, which add thickness to the practice dichotomic information, particularly with regard to its actual implementation and effectiveness. Four main groups of practices are characterised: voice, appraisals, quality norms and team-working. Employees can be given voice in formal arrangements, they can

---

[23]Evidence to support the relation between the concepts we are measuring and satisfaction is provided by Helliwell and Huang (2005), who find that, for life satisfaction 'to move up one point on a ten-point scale of workplace trust is equivalent to a 0.17 change in log income'. See also Helliwell et al. (2006).

[24]Overall indicators are usually employed: Freeman and Kleiner (2000) use questions about firm trust, loyalty and satisfaction towards particular job aspects; Bartel et al. (2004) use the average of 18 items to define workers' attitudes. Usually, where both single items and an overall question are present, they are highly correlated (Hamermesh, 1977). For a discussion on the overall job satisfaction measure in relation to its components see also Rose (2005).

simply receive information from colleagues and heads and they can give suggestions. **Voice: formal** is a dummy equal to one if the employee takes part in quality circles or mixed supervisors-employees meetings and **Voice: suggestions** is a dummy equal to one if the employee has made at least one suggestion to improve production efficiency. **Appraisal** is a dummy equal to one if the employee is systematically appraised in a formal way. **Quality norms** is equal to one if the firm complies with ISO9000 or other quality standards.[25] The final set of practices regards team-working; if the employee declares she or he works in a team (**teamworking**), there is a further question asked about the extent of autonomy of the team, according to the following eight features:

1. The team members decide how the task has to be done.
2. The team members suggest the team leader to the managers.
3. The team members appoint the team leader.
4. The team members are responsible for the products and services they make.
5. The team members decide together when each of us has to work.
6. The team members decide together on additional tasks.
7. The team members decide together the internal distribution of the tasks.
8. The team members decide together on questions of new entrants into the team.

On the basis of this information we define four types of self-managed teams according to three kinds of autonomy dimensions: task procedure and work time, group management and output responsibility. Each autonomy dimension is defined as a dummy variable computed as follows: (a) (**autotask**) = at least one, of features 1, 6, 5 and 7 (b) (**autogroup**) = at least one from features 2, 3 or 8 above is present, (c) (**autoresp**) = feature 4 is present.[26] A final team-related item, included in a different section of the questionnaire, relates to the presence of performance-related pay linked to team output (**teampay**).

---

[25]Quality standards based on TQM principles can be certified. ISO9000 is a family of standards for a quality management system issued by the International Organization for Standardization. It is widely implemented and through the global supply chain it rapidly spread from Europe all over the world. This quality standard is based on several key points: for each product quality objectives are established; up-to-date records of all processes are kept and used to make quality decisions; all employees are given measurable objectives to work towards; skill requirements and suitable training are determined for each job; customer needs are determined and feedback is important; performance and quality are regularly reviewed through internal audits and meetings; continual improvement of performance is pursued.

[26]The average number of items declared by employees working in teams is five, the median is six and the top quartile is eight. All measures are indeed highly correlated.

Table 2 shows the share of employees in the defined workplace practices, ranked in descending order. Over 70 percent of the employees claim to have given suggestions to improve work efficiency; this indicates a rather diffused type of involvement which may also take place informally and outside organized employer-employee meetings or in pre-arranged quality circles which involve less than 60 percent of employees. Almost half of the employees work in teams but only 38 percent are allowed some autonomy in task or time and around a third are responsible for the output produced by the team. Workplaces comply with quality norms in 43 percent of the cases, although the figure may be an underestimate as 37 percent of workers did not know. Regular and formal appraisal of individual performance is claimed by 28 percent of the employees.

Table 2: Share of employees by workplace practices

All employees		Employees involved in at least 5 practices (top quartile)		Employees involved in 2 or less practices (bottom quartile)	
voice: suggestions	0.71	teamworking	1.00	voice: suggestions	0.48
voice: formal	0.58	autotask	0.92	voice: formal	0.30
teamworking	0.47	voice: suggestions	0.88	quality norms	0.20
quality norms	0.43	autoresp	0.83	teamworking	0.07
autotask	0.38	voice: formal	0.78	appraisal	0.06
autoresp	0.33	autogroup	0.69	autotask	0.01
appraisal	0.28	quality norms	0.57	autoresp	0.00
autogroup	0.26	appraisal	0.45	teampay	0.00
teampay	0.08	teampay	0.23	autogroup	0.00

Notes: No. of all employees 3605, no. of employees in the top quartile: 1240; no. of employees in the bottom quartile: 1443. The median is 3 practices.

The next columns of Table 2 report the share of employees according to the number of practices they are involved in. Employees in the top quartile of the distribution are involved in at least 5 practices; the most diffused are team-working and task autonomous team-working followed by suggestions. On the contrary, virtually none of the employees involved in two or less practices (the first quartile) participate in self-managed teams and only seven percent work in traditional teams. For these employees innovative workplace practices essentially mean giving suggestions, taking part in formal employer-employee meetings and working in firms which comply with quality standards; ten percent of the employees are involved in none of the above practices.

Table 3: Differences in work attitudes between employees involved and employees not involved by workplace practices

	1	2	3	4	5	6	7	8	9
	weak	strong	inspires	proud	share values	loyal	work harder	any job	no quit
voice: suggestions	0.44**	0.20**	0.30**	0.42**	0.35**	0.64**	0.50**	-0.12**	0.22**
voice: formal	0.35**	0.20**	0.25**	0.39**	0.24**	0.47**	0.40**	-0.06	0.27**
appraisal	0.17**	0.10**	0.15**	0.25**	0.07	0.16**	0.15**	0.00	0.08
quality norms	0.05	0.03	0.01	0.10**	-0.03	0.07	0.12**	-0.11**	0.05
teamworking	0.01	0.06	-0.09*	0.04	-0.08*	0.13**	0.10**	0.04	-0.02
autotask	0.09**	0.09**	0.02	0.12**	0.03	0.19**	0.20**	0.00	0.01
autogroup	0.05	0.01	0.02	0.01	0.02	0.07	0.13**	-0.07	-0.06
autoresp	0.04	0.03	-0.04	0.02	-0.01	0.13**	0.16**	-0.05	-0.08
teampay	0.11*	0.06	-0.02	0.20**	0.03	0.23**	0.16*	-0.15	0.07

Notes: ** Significant at the 5% level or less * Significant at the 10 % level

Finally, Table 3 reports how work attitudes differ between employees that are involved and those that are not involved in a given workplace practice. Employees that are involved in formal arrangements or can share their views and make suggestions report higher scores in all work attitudes except in the commitment to do any job in order to stay in the company. The same is true for employees that are formally appraised. Quality standards is only weakly associated with work attitudes. Employees working in teams report significantly higher levels of loyalty[27] and willingness to work harder to help the organization succeed (cols. 6 and 7) although commitment on the whole is not affected unless employees work in teams that are autonomous in task procedure and timing, in which case commitment, both weak and strong, is significantly higher. The other dimensions of the self-managed teams are only weakly associated with work attitudes. Finally, being involved in any practice raises the employees' willingness to work harder for the organisation but not the willingness to do any job to stay with the organisation.

---

[27]Freeman and Keliner (2000) find a similar result.

4.3   Work quality indicators

The survey provides self-reported information on various job aspects; variables are all categorical on a 1–7 scale, from low or nil to high:

1. frequency of exposure to serious accidents (**accidents**);
2. frequency of exhaustion from work (**exhaust**);
3. effort intensity (**effort**);
4. strictness of supervisor's control (**superv**);
5. job repetitiveness (**repetit**);
6. job autonomy (on timing, effort, task procedure) (**auton**);[28]
7. job discretion (**discret**);
8. probability of unemployment in the next 12 months (**pr.unem**);

Almost all job attributes are significantly correlated with workplace practices (Table 12 in the Appendix). There are some similarities across the correlations which support existing findings: virtually all practices are positively associated with the so-called job enriching attributes: autonomy, discretion, decreased repetitiveness; all practices are also positively associated with effort and frequency of exhaustion; the frequency of accidents is positively associated with quality standards and team-working, including self-managed teams but negatively associated with employees' voice. The next section moves on to the multivariate analysis.

5. Econometric issues and evidence

Although the exclusion restrictions imposed on the model take care of the identification issue, the simultaneity across the model equations due to unobservables in the error terms, related to one or more of the individual (e.g. ability), the job (e.g. the co-workers) or the workplace (e.g. management quality, overall safety conditions), are still an issue for the estimation. Since the work attitudes O and the vector of job attributes **d** are all ordinal 1–7 categorical variables, a simultaneous estimation is not straightforward. An additional practical problem is the multiplication of regressors in the wage and the commitment equations where job attributes enter as covariates; in fact, each job attribute would entail six separate dummies implying $13 \times 6 = 78$ additional right-hand variables, that would be difficult to interpret. As both issues

---

[28] The latter is obtained by summing the scores of three types of job autonomy: job autonomy on timing and effort, job autonomy on tasks and their sequence and job autonomy on how to do the task. The total score is then re-scaled to 1-7.

would be easier to tackle were the variables not ordinal in nature, following Terza (1987) the qualitative job attributes are transformed into discrete variables ranging on the real axis.[29] This avoids the use of dummy variables in the commitment and wage equations and solves the second problem. As far as the simultaneity is concerned, we proceed as follows: first we estimate equation (5) linearly using the transformed variables so that we can account for the correlations across the job attributes' error terms; in particular, as all right-hand variables of (5) are exogenous we use Zellner's seemingly unrelated estimator. From the SUR residuals, using factor analysis, we obtain the first component (van Praag *et al*., 2003) and use it in the wage and commitment equations; this controls for correlation between the error term and **d** and ensures that the covariance matrix is diagonal so that equations (3) and (4) can be separately estimated, using ordered probit and OLS respectively.[30]

## 5.1   *Work quality and workplace practices*

Workplace practices that give voice to employees are pervasively and positively associated with all job enrichment attributes[31] (Table 4); voice through suggestions is further associated with higher job security while formal voice has a relatively stronger link to overall better working conditions (lower exhaustion and effort). In contrast, appraisal schemes bear no relation to job discretion and autonomy and, consistent with some existing findings, are also significantly related to higher effort, exhaustion, and higher frequency of accidents. The link between team-working and work quality is a complex one; team-working *per se* is associated with job repetitiveness, low job autonomy and discretion; however, granting the team members control over tasks and timing can effectively counterbalance these negative aspects. The team's command over group membership shows contradictory results on job quality: it is positively associated with autonomy and discretion but also with the strictness of supervision, effort intensity and frequency of exhaustion. From the job enrichment point of view, this implies that fully autonomous team-working is no better than individual working while effort intensity is higher (Figure 2 illustrates the predicted densities).

---

[29]Terza's (1987) suggested transformation replaces each category j of an ordinal variable by F_j, where $F_j = E(f_j \,/\, ?_{j-1} < f_j = ?_j)$ and $?_j$ are the (maximum likelihood) normal quantile values of the percentages of the sample observed in category j. See also van Praag *et al*. (2003) for similar considerations.

[30]Note, however, that the results presented below are robust using the ordinal variables in place of their Terza's transformation; estimating job attributes by single equation ordered probits instead of SUR; and estimating O by OLS instead of ordered probit.

[31]All estimations are weighted using the population weight provided in the dataset (ISFOL, 2007).

FIGURE 2:
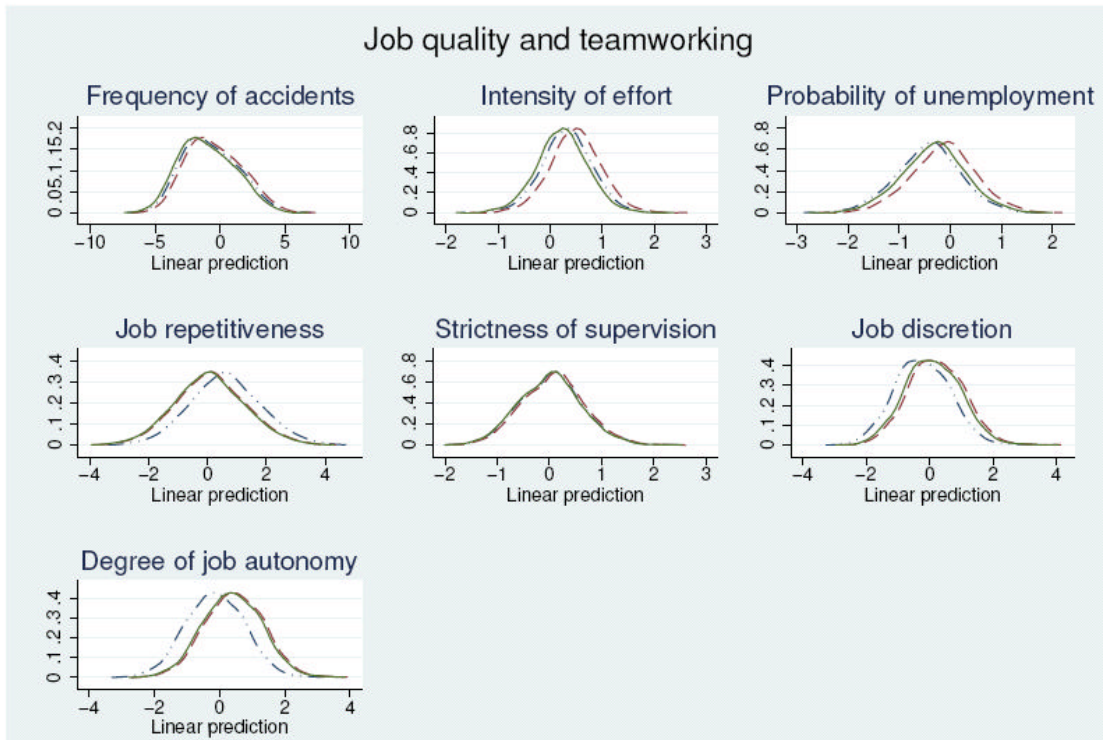
Legend: solid line = no team working; dash dot dot = no fully autonomous team working; dash = fully autonomous team working

Finally, working in firms that comply with quality standards increases the chances of better working conditions: effort and exhaustion are all significantly lower and the sign is negative for the frequency of accidents although the coefficient is not statistically significant in this case.[32] The presence of quality norms is also inversely linked to the strictness of supervision.

---

[32]This finding contrasts with Askenazy and Caroli (2006), who find quality norms to be associated with a higher frequency of injuries; however, their measure is based on employees self-declaring that they comply with quality norms, rather than the organisation complying with quality standards, which is what our indicator captures. Their quality norm indicator is thus closer in content to our measure of output responsibility of team members, which gives results qualitatively similar to theirs.

Table 4: Work quality

	accidents	exhaust	effort	pr.unem	repetit	superv	discret	auton
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
voice: suggestions	0.053	0.139	0.052	-0.169***	-0.354***	-0.126**	0.378***	0.403***
	0.13	*0.1*	*0.05*	*0.05*	*0.11*	*0.06*	*0.05*	*0.07*
voice: formal	0.061	-0.425***	-0.157***	0.072	-0.268**	-0.132**	0.192***	0.214***
	0.13	*0.1*	*0.05*	*0.05*	*0.11*	*0.06*	*0.05*	*0.07*
appraisal	0.436***	0.342***	0.261***	-0.190***	-0.428***	0.240***	0.062	-0.056
	0.14	*0.11*	*0.06*	*0.06*	*0.12*	*0.07*	*0.06*	*0.07*
quality norms	-0.16	-0.269***	-0.181***	-0.085*	0.14	-0.208***	0.047	0.087
	0.12	*0.09*	*0.05*	*0.05*	*0.11*	*0.06*	*0.05*	*0.06*
teamworking	0.264	0.440***	0.095	-0.105	0.545***	0.019	-0.330***	-0.524***
	0.21	*0.16*	*0.09*	*0.09*	*0.19*	*0.1*	*0.09*	*0.11*
autotask	0.248	-0.527***	-0.229**	0.249**	-0.338	-0.132	0.249**	0.317**
	0.24	*0.19*	*0.1*	*0.1*	*0.21*	*0.11*	*0.1*	*0.13*
autogroup	-0.233	0.405**	0.283***	0.072	-0.208	0.324***	0.194**	0.604***
	0.22	*0.17*	*0.09*	*0.09*	*0.19*	*0.11*	*0.1*	*0.12*
autoresp	0.289	0.066	0.11	-0.018	0.062	-0.14	0.004	-0.323***
	0.22	*0.17*	*0.09*	*0.09*	*0.19*	*0.1*	*0.09*	*0.11*
teampay	-0.062	-0.612***	-0.098	-0.326***	-0.02	0.162	-0.047	-0.157
	0.23	*0.18*	*0.1*	*0.1*	*0.2*	*0.11*	*0.1*	*0.12*
Constant	-2.498*	-6.503***	-2.250***	0.197	-0.105	0.927	-2.080***	-2.761***
	1.28	*0.98*	*0.54*	*0.53*	*1.12*	*0.61*	*0.55*	*0.67*
R sq.	0.35	0.159	0.141	0.201	0.172	0.133	0.319	0.261
No. observations:	3529							

Notes: Standard errors in italic; ***Significant at the 1% level **Significant at the 5% level *Significant at the 10 % level

SUR estimates. Breusch-Pagan test of independence: chi2(78) = 9421.478, Pr = 0.0000

The system includes the following controls: occupation dummies, workplace and firm size dummies, region dummies, sector dummies, organizational area dummies, individual characteristics (see Appendix)

5.2 Wages, work attitudes and workplace practices

The wage is responsive to all job attributes (Table 5): it compensates for the frequency of accidents and exhaustion and for the intensity of effort while job repetitiveness, strictness of supervision and probability of unemployment are indicators of low paid jobs. The second column shows the results when substituting for job attributes: the estimated coefficients of workplace practices then encompass the direct effect shown in column (1) and the indirect effects working via the job content and working conditions. Only a few workplace practices have a significant impact on the individual wage: employees regularly appraised gain a 3.5 percent higher wage, a third of which is indirectly conveyed by job characteristics; autonomous team-working raises the wage by five percent as long as there is team autonomy in relation to tasks and time; the team's control over membership has no significant effects on the wage but if the team is responsible for the output the wage reduces by a significant five percent thereby wiping the wage benefits away in a fully autonomous team.[33]

The next columns in Table 5 report the ordered probit estimates of weak and strong commitment.[34] The immediate difference between the two types of commitment is that strong commitment is responsive to the wage and the reference wage, even when controlling for job attributes, whereas weak commitment is not and is driven essentially by workplace practices and job attributes. As expected, the wage coefficients rise when substituting for job attributes (columns 4 and 7) but the wage still remains significantly more important for strong commitment. Moreover, the signs of the reference wage support the idea that the latter is mostly taken as an indicator of the expected wage when the work attitudes relate to strong commitment and as an indicator of the outside wage in weak commitment attitudes. The overall impact of workplace practices (columns 5 and 8) shows that giving employees voice in formal arrangements or favouring suggestions as well as using appraisal schemes all significantly raise weak and strong commitment. However, whereas the size of the effects of these three practices is the same on weak commitment, on strong

---

[33] The linear restriction (teaworking+autoteam+autoresp+autogroup=0) is not rejected: $F(1,2888)=1.46$, Prob>F=0.23, column 2

[34] The joint significance of the dummies used as exclusion restrictions (undergraduate degree, master/doctorate degree and fulltime job) is $chi2(3)=4.49$, Prob>chi2=0.21 for weak commitment (column 3), and $chi2(3)=6.43$, Prob>chi2=0.09 for strong commitment. In the wage equation the same exclusion restrictions are strongly rejected $F(3,2895)=92.53$, Prob>F=0.0000.

Table 5: Wage and Commitment

	Wage		Weak commitment			Strong commitment		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
log wage			0.026	0.115		0.128	0.190**	
			0.08	*0.08*		*0.08*	*0.08*	
predict log wage			-0.125	-0.365		0.721***	0.404	
			0.28	*0.27*		*0.28*	*0.27*	
PRACTICES								
voice: suggestions	-0.017	0.013	0.167**	0.226***	0.261***	0.02	0.100**	0.081*
	0.02	*0.01*	*0.07*	*0.05*	*0.04*	*0.07*	*0.05*	*0.04*
voice: formal	-0.001	0.007	0.291***	0.307***	0.281***	0.281***	0.313***	0.293***
	0.01	*0.01*	*0.05*	*0.05*	*0.04*	*0.05*	*0.05*	*0.04*
appraisal	0.023*	0.035***	0.201***	0.219***	0.281***	0.099*	0.106*	0.139***
	0.01	*0.01*	*0.06*	*0.06*	*0.05*	*0.06*	*0.05*	*0.05*
quality norms	0.004	0.006	-0.148***	-0.121***	-0.107**	-0.069	-0.04	0.005
	0.01	*0.01*	*0.05*	*0.05*	*0.04*	*0.05*	*0.05*	*0.04*
teamworking	0.018	-0.004	-0.155*	-0.214**	-0.157**	-0.078	-0.159*	-0.097
	0.02	*0.02*	*0.09*	*0.09*	*0.08*	*0.09*	*0.08*	*0.07*
autotask	0.037	0.052**	0.391***	0.408***	0.391***	0.483***	0.492***	0.383***
	0.02	*0.02*	*0.10*	*0.10*	*0.09*	*0.10*	*0.10*	*0.08*
autogroup	-0.032	-0.013	-0.009	-0.016	-0.132*	-0.242**	-0.199**	-0.231***
	0.02	*0.02*	*0.10*	*0.09*	*0.08*	*0.10*	*0.09*	*0.08*
autoresp	-0.044**	-0.049**	-0.210**	-0.196**	-0.147*	-0.160*	-0.149*	-0.12
	0.02	*0.02*	*0.09*	*0.09*	*0.08*	*0.09*	*0.09*	*0.08*
teampay	-0.014	-0.02	-0.124	-0.077	-0.085	-0.272***	-0.245***	-0.306***
	0.02	*0.02*	*0.10*	*0.10*	*0.08*	*0.10*	*0.09*	*0.08*
JOB ATTRIBUTES								
accidents	0.004**		-0.005			-0.012*		
	0.00		0.01			0.01		
exhaust	0.008**		0.003			0.005		
	0.00		*0.01*			*0.01*		

Cont. Table 5

	1	2	3	4	5	6	7	8
effort	0.010[*]		-0.059[**]			-0.045[**]		
	0.01		*0.02*			*0.02*		
pr.unem	-0.014[***]		-0.119[***]			-0.067[***]		
	0.00		*0.02*			*0.02*		
repetit	-0.008[***]		-0.027[***]			-0.016[*]		
	0.00		*0.01*			*0.01*		
superv	-0.014[**]		0.018			0.013		
	0.01		*0.03*			*0.03*		
discret	0.029[**]		0.095[*]			0.141[**]		
	0.01		*0.06*			*0.06*		
auton	0.027[**]		0.024			0.038		
	0.01		*0.05*			*0.05*		
factor1	-0.078		-0.005			-0.132		
	0.05		*0.23*			*0.23*		
cons	5.758[***]	5.558[***]						
	0.14	*0.11*						
other conts	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
wrkpl-firm dum	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
21 region dum	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
40 sector dum	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
8 occup dum	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
org dum	No	Yes	No	Yes	Yes	No	Yes	Yes
exclusion restr.	Yes	Yes	No	No	Yes	No	No	Yes
R sq.	0.616	0.606						
N	3016	3016	3016	3016	3529	3016	3016	3529

Notes: Standard errors in italic; [***]Significant at the 1% level [**]Significant at the 5% level [*]Significant at the 10 % level.
The wage equation is estimated by OLS, commitment equations are estimated by Ordered Probit. The following controls are included: occupation dummies, workplace and firm size dummies, region dummies, sector dummies, individual characteristics (see Appendix). The cut points of the ordered probits are not shown for reasons of space.

commitment formal arrangements, where employees can express their views (employer-employee meetings and quality circles), largely outperform both appraisals and suggestions. As far as team-working is concerned, it is clear that it is only by granting some autonomy to the team that employees' commitment can be enhanced: the team control over tasks and time provides the most powerful means to induce motivation. However, team responsibility for output as well as team self control over group membership reduces motivation and implies that fully autonomous teams may even be detrimental to commitment.[35]

Figures 3 and 4 illustrate the direct and indirect effects of the practices on commitment. They compare the marginal effects[36] of the workplace practices in the structural model (i), to the marginal effects in reduced form models obtained by successively substituting for: (ii) the job enriching attributes (repetitiveness, supervision, discretion and autonomy); (iii) the remaining job attributes (working conditions and job security); (iv) the wage[37] (see also Table 13 in the Appendix). Most of the lines are straight, implying that the indirect effects are minor in size, compared to the direct effects. However, the practice of suggestions shows a clear positive indirect effect from its role on the job enriching attributes while the opposite is true for team-working. The figures illustrate the marginal effects of four team types: (i) traditional team-working, (ii) task and time autonomous teams, (iii) task-time autonomous and output responsible teams, (iv) task-time autonomous, output and group responsible teams. The second type of team largely makes up for the negative motivational impact of traditional team-working and raises the probability of strong and weak commitment to the size of the other best practices. The third type of team, which is also output responsible, is less effective in this and even less so in the fourth type of team which self-manages the group membership. A positive indirect effect of quality norms through job quality is rather important as well, especially for strong commitment and counterbalances its otherwise negative direct effect on commitment.

---

[35] The linear restriction (teaworking+autoteam+autoresp+autogroup=0) is not rejected, both for weak commitment chi2(1)=0.93, Prob>chi2=0.33 (column 5) and for strong commitment: chi2(1)=1.73, Prob>chi2=0.19 (column 8). The practice of relating the pay of team members to the team performance is a further disincentive to strong commitment.

[36] The effects are relative to category 6 of commitment which corresponds to a strong agreement with the underlying statements defining commitment. The quantitative comparisons on the effects of strong versus weak commitment should account for the fact that the latter has a considerably larger frequency in the category considered (28% versus 11%).

[37] Then, (i) are the marginal effects relative to columns 3 and 6, (iii) are the marginal effects relative to columns 4 and 7, (vi) are the marginal effects relative to columns 5 and 8; the ordered probit for the marginal effects (ii) are not shown. Table 13 in the Appendix reports the Table of the marginal effects.
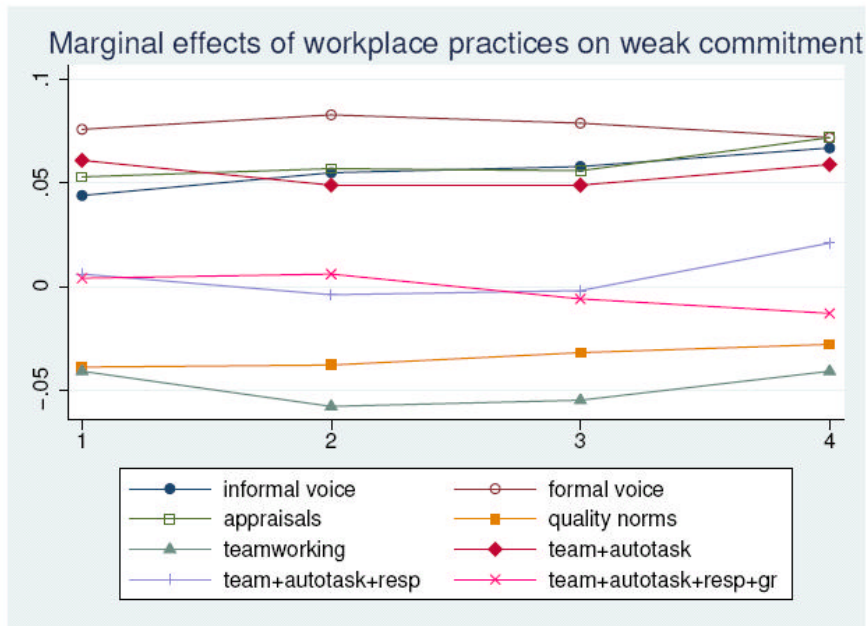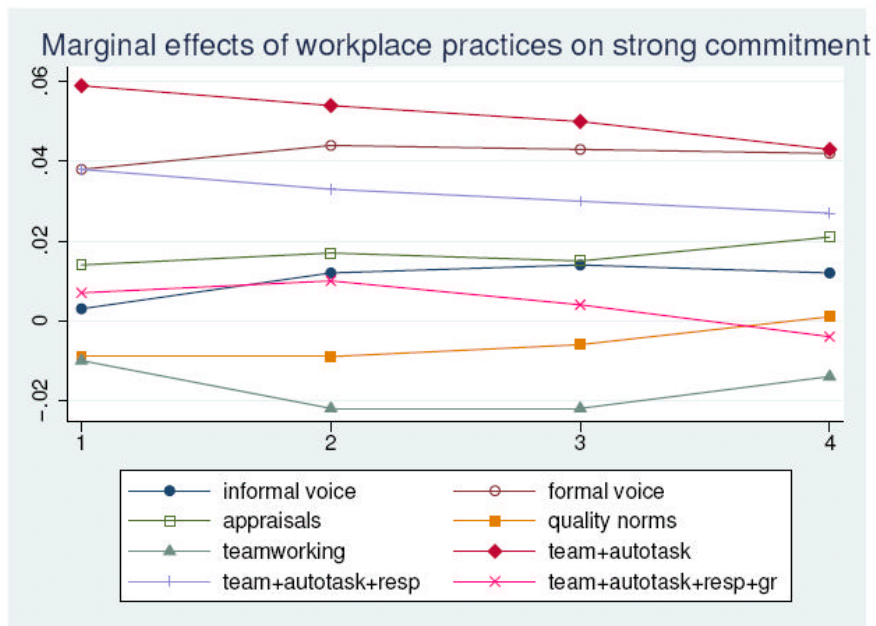
Marginal effects of workplace practices on weak commitment

FIGURE 4:

Marginal effects of workplace practices on strong commitment

Notes: the points on the x-axis indicate successive substitutions starting from the structural model:

1. marginal effects from structural model;
2. marginal effects after substituting for intrinsic job quality
3. marginal effects after substituting for working conditions and unemployment probability
4. marginal effects after substituting for the wage

One should recall, however, that the median employee is involved in three of the practices discussed above and since the most diffused are the voice practices

(formal and suggestions), the median employees' overall work attitudes are likely to be positively affected by the presence of these workplace practices.

We can finally draw the empirical counterpart of Table 1 (Table 6). Workplace practices are placed according to the signs of the total derivatives in the wage and commitment equations; most practices have a positive sign on both derivatives and enter the top left cell of the table: appraisals, and voice practices are likely productivity enhancing practices. The classification of self-managed teams is less straightforward and depends very much on how a self-managed team works. Autonomy in tasks and working time is a good practice but making the team responsible for the output and for the management of the group is detrimental to both employers and employees. Finally, quality norms can be regarded as a practice disagreeable to employees which the wage fails to fully compensate and which probably does not spur sufficient productivity gains to cover this cost.

Table 6: Empirical classification of workplace practices.

		COMMITMENT +	COMMITMENT +
WAGE	+	Individual appraisal schemes (w s *) Task-time autonomous team (w *) Voice: Formal and Informal(w s)	Quality norms (w)
WAGE	-		Output responsible teams (w *) Group autonomous teams (w s) Fully autonomous teams (w s) Team performance related pay (s)

Notes: Practices in the table are those significant in the reduced form commitment equation (8). Symbols: w=significant in the weak commitment regression; s=significant in strong commitment regression; * significant in the wage equation

5.3   Sensitivity analysis: the wage and work attitudes by occupations

The main limitation of the empirical analysis is the potential bias from unobservable fixed effects, which is typical of cross-sectional data. In particular, hedonic wage equations are likely to be flawed by unobservable productivity effects: if a more able worker can use his or her productivity endowment to obtain both a higher wage and better job attributes, then, although for a given productivity the 'price' of the job attribute (i.e. the partial derivative of the wage with respect to the job attribute) is the same, the failure to control for individual productivity results in an underestimation of the compensating differential (Hwang *et al.*, 1992; Helliwell and Huang, 2005). In the

case of productivity among homogeneous workers but heterogeneous firms, the same bias applies (Hwang *et al.*, 1998). More precisely, let a be the unobserved individual productivity in the wage equation. Since we expect corr(**d**,a) > 0 and corr(w, a) > 0, then the 'price' of the attribute is artificially biased towards zero (and may even become positive). By the same token, since ability and skills are correlated, if organisational changes are skill biased (Caroli and Van Reenen, 2001), then corr(a, p) > 0 and we expect the coefficient of workplace practices to suffer the same bias in the wage equation; hence, it will be overestimated if workplace practices are productivity enhancing and biased towards zero if practices are mere desirable job attributes.

An additional problem could arise if workplace practices are complementary to specific skills only; in particular, it has been found that innovative workplace practices are complementary to high skills so that in establishments with a highly skilled labour force the productivity increase due to organisational change is larger (Caroli and Van Reenen, 2001; Bresnahan *et al.*, 2002).[38] If wages are linked to productivity, then we should observe the same effect in the wage equation;[39] in particular, if a certain occupation is complementary to a specific practice, then we would expect the wage of this occupational group to respond relatively more to this practice than does the wage of another occupational group whose skill does not complement the practice. It follows that the diffusion of workplace practices could differ across occupations.

So far we have tackled the unobservable fixed effects by including many controls in the equations and by employing the information from the job attributes residuals in the wage and commitment equation. We now move on to consider homogeneous occupational groups as a way to control for ability and to check for any specificity of practices by occupational group. We estimate the reduced form commitment and wage equations by four main occupations: managers and senior

---

[38]In fact, there may be other enabling factors beside employees' skill level, such as the presence of unions (Black and Lynch (2001, 2004) or the firm's efficiency in introducing a new practice. In this regard the complementarity among practices (Milgrom and Roberts, 1995) suggests that productivity increases only occur when a coherent system of practice is present (Ichniowsky *et al.*, 1997) so that the extent of reorganisation can be regarded as an additional enabling factor for innovative workplace practice. On the whole, if a firm can adopt a new practice at comparatively lower costs or, for the same cost of adoption, can obtain a higher yield from it, then such a firm can offer a higher salary for the given practice or both a higher salary and a higher amount of the practice.

[39]Black and Lynch (2004) found that the effects of workplace practices on wages, using either cross-section or panel data, are largely consistent with those on productivity.

officials (SOC 1), administrative and secretarial occupations (SOC 4), skilled trades occupations (SOC 5) and process, plant and machine operatives (SOC 8).

The estimated wage equations reported in Table 7 confirm that workplace practices are indeed occupationally specific: appraisals are relevant for administrative workers, task autonomous teams work for skilled workers but not for manual workers for whom the team's command on the group yields a higher wage, quality norms also raise the wage of manuals. Non-autonomous team-working is associated with a lower wage for managers but granting autonomy exactly counterbalances this effect. On the whole, fully autonomous teams do not have a significant wage effect for any of the occupations. Only the work attitudes of managers and manual workers are responsive to the wage while administrative and skilled workers' commitment is significantly responsive to practices and job attributes only.

For manual workers, the reference wage clearly captures the outside opportunity whereas for managers this effect appears counterbalanced by the expected future rewards. For all non-managerial occupations the practice of giving employees voice in formal arrangements has a positive effect on both weak and strong commitment (columns 5 to 8 of Tables 8 and 9); appraisals are effective for administrative and manual workers whereas skilled occupations gain most from task autonomous team-working which improves weak and strong commitment, as long as the control of the membership is left outside the team; this type of self-managed team also enhances the weak commitment of manual workers. On the contrary, any type of team-working is a bad practice for administrative staff and has contradictory effects on managerial occupations. In fact, no clear pattern of workplaces emerges for the latter. (Table 10 summarises the results).

Table 7: The wage by main occupational groups

	1	2	3	4
	manager	**administrative**	**skilled**	**manual**
voice: suggestions	-0.029	0.021	0.011	-0.021
	0.06	*0.02*	*0.03*	*0.02*
voice: formal	-0.021	0.022	-0.054**	-0.01
	0.05	*0.02*	*0.03*	*0.03*
appraisals	0.05	0.077***	0.015	0.057*
	0.03	*0.02*	*0.03*	*0.03*
quality norms	-0.011	0.034*	0.014	0.055**
	0.03	*0.02*	*0.03*	*0.03*
teamworking	-0.163**	-0.021	0.013	-0.016
	0.07	*0.05*	*0.05*	*0.04*
autotask	0.177**	-0.057	0.103**	-0.098*
	0.07	*0.05*	*0.05*	*0.05*
autogroup	-0.008	0.035	-0.092**	0.110**
	0.05	*0.04*	*0.04*	*0.05*
autoresp	0.016	0.005	-0.019	-0.013
	0.05	*0.04*	*0.05*	*0.05*
teampay	0.04	0.021	-0.048	0.071
	0.04	*0.04*	*0.06*	*0.05*
Constant	6.792***	6.025***	5.104***	5.141***
	0.44	*0.22*	*0.56*	*0.4*
other conts	Yes	Yes	Yes	Yes
wrkpl-firm dum	Yes	Yes	Yes	Yes
sector dum	Yes	Yes	Yes	Yes
org dum	Yes	Yes	Yes	Yes
R sq.	0.572	0.622	0.688	0.559
N	487	793	379	458

Notes: Standard errors in italic; *** Significant at the 1% level ** Significant at the 5% level * Significant at the 10 % level

Table 8: Weak commitment by main occupational group. Ordered probit

	1	2	3	4	5	6	7	8
	mang	adm	skt	man	mang	adm	skt	man
log wage	0.499**	-0.29	-0.104	0.865***				
	0.21	*0.19*	*0.35*	*0.26*				
predict log wage (manag)	0.519							
	0.51							
predict log wage (admin)		0.254						
		0.44						
predict log wage (skl)			-0.865					
			1.09					
predict log wage (manual)				-1.489*				
				0.86				
voice: suggestions	0.378	0.012	-0.015	0.217*	0.374*	0.029	0.125	0.295**
	0.24	*0.1*	*0.16*	*0.13*	*0.2*	*0.09*	*0.14*	*0.12*
voice: formal	0.146	0.341***	0.322*	0.659***	0.089	0.375***	0.255*	0.443***
	0.2	*0.1*	*0.16*	*0.13*	*0.18*	*0.09*	*0.14*	*0.12*
appraisals	-0.171	0.220**	0.353**	0.439**	-0.289**	0.301***	0.168	0.501***
	0.14	*0.11*	*0.18*	*0.18*	*0.12*	*0.1*	*0.15*	*0.16*
quality norms	-0.065	-0.114	0.086	-0.372***	-0.122	-0.114	0.099	-0.161
	0.13	*0.09*	*0.17*	*0.14*	*0.12*	*0.08*	*0.14*	*0.13*
teamworking	-0.158	-0.276	-0.684**	-0.376*	-0.043	-0.357*	-0.379	-0.27
	0.3	*0.24*	*0.28*	*0.21*	*0.27*	*0.19*	*0.24*	*0.19*
autotask	0.093	0.109	1.901***	0.564**	-0.097	0.331	1.242***	0.244
	0.31	*0.26*	*0.32*	*0.27*	*0.27*	*0.21*	*0.27*	*0.25*
autogroup	0.202	-0.18	-0.974***	-0.075	0.348**	-0.287	-0.898***	-0.041
	0.21	*0.22*	*0.28*	*0.27*	*0.17*	*0.18*	*0.24*	*0.25*
autoresp	-0.411*	0.342	0.221	-0.407*	-0.530***	0.276	0.366	-0.255
	0.23	*0.22*	*0.29*	*0.24*	*0.18*	*0.18*	*0.24*	*0.21*
teampay	0.091	-0.189	-0.118	-0.306	0.231	-0.317*	0.409	-0.26
	0.17	*0.2*	*0.35*	*0.27*	*0.15*	*0.17*	*0.26*	*0.25*
other conts	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
wrkpl-firm dum	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
sector dum	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
org dum	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
exclusion restr.	No	No	No	No	Yes	Yes	Yes	Yes
N	487	793	379	458	609	930	443	513

See notes in Table 9.

Table 9: Strong commitment by main occupational group. Ordered probit

	1	2	3	4	5	6	7	8
	mang	adm	skt	man	mang	adm	skt	man
log wage	0.388*	-0.082	-0.273	1.140***				
	0.2	*0.19*	*0.34*	*0.26*				
predict log wage (manag)	0.272							
	0.5							
predict log wage (admin)		0.293						
		0.44						
predict log wage (skl)			-1.008					
			1.06					
predict log wage (manual)				0.053				
				0.85				
voice: suggestions	-0.224	-0.039	0.042	0.144	-0.345*	-0.079	0.1	0.178
	0.23	*0.1*	*0.16*	*0.12*	*0.2*	*0.09*	*0.14*	*0.11*
voice: formal	-0.035	0.226**	0.388**	0.477***	-0.042	0.289***	0.411***	0.327***
	0.2	*0.1*	*0.16*	*0.13*	*0.17*	*0.09*	*0.14*	*0.12*
appraisals	-0.231*	0.221**	0.382**	0.024	-0.129	0.289***	0.158	0.139
	0.13	*0.11*	*0.17*	*0.17*	*0.11*	*0.1*	*0.15*	*0.16*
quality norms	0.107	-0.059	-0.198	-0.146	0.024	-0.042	-0.081	0.083
	0.13	*0.09*	*0.16*	*0.14*	*0.11*	*0.08*	*0.14*	*0.12*
teamworking	0.633**	-0.275	-0.115	-0.622***	0.681***	-0.344*	-0.221	-0.475**
	0.29	*0.23*	*0.27*	*0.21*	*0.26*	*0.19*	*0.24*	*0.19*
autotask	-0.587**	0.242	0.947***	1.494***	-0.475*	0.287	0.880***	1.080***
	0.3	*0.26*	*0.31*	*0.27*	*0.26*	*0.21*	*0.26*	*0.25*
autogroup	0.068	0.248	-0.859***	-0.988***	0.064	0.196	-0.972***	-0.911***
	0.21	*0.21*	*0.27*	*0.27*	*0.16*	*0.18*	*0.24*	*0.25*
autoresp	-0.289	-0.348	0.123	-0.042	-0.364**	-0.316*	0.287	0.144
	0.22	*0.21*	*0.28*	*0.24*	*0.17*	*0.18*	*0.24*	*0.21*
teampay	0.097	-0.18	-0.26	-0.373	0.027	-0.290*	-0.500*	-0.314
	0.17	*0.2*	*0.34*	*0.27*	*0.14*	*0.17*	*0.27*	*0.25*
other conts	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
wrkpl-firm dum	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
sector dum	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
org dum	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
exclusion restr.	No	No	No	No	Yes	Yes	Yes	Yes
N	487	793	379	458	609	930	443	513

Notes to Tables 8 and 9: Standard errors in italic; *** Significant at the 1% level ** Significant at the 5% level * Significant at the 10 % level; the reference wage is computed from a wage equation that includes: gender, age, age squared, education dummies, North, Centre, South, sector dummies, permanent job dummy, full time job dummy .

6. Conclusions

It has long being recognized that workplace practices affect employees' motivation and firm performance; in this paper a recursive model is used to assess the direct and indirect effects of workplace practices on work quality, employees' work attitudes and the wage.

The findings clearly distinguish three main ways to enhance motivation and productivity: give voice to employees, introduce systematic appraisals and implement partly autonomous team-working. Voice can be given either by organising formal arrangements (quality circles, employer employee meetings) and/or by favouring the practice of suggestions: the former way is more effective on strong commitment but both ways are equally valuable on weak commitment. Appraisal schemes have a positive and across the board effect on motivation and are also significantly associated with higher wages. Team-working is a complex practice to characterise as teams can be very diverse and can have opposite outcomes on employees' well being. The team's self-determination about tasks and work timing has a strong and positive effect on both work attitudes and wage whereas the team's autonomy about membership issues as well as the team's responsibility for the output produced bring about consistently negative results and imply that an advanced fully self managed team is, at best, ineffective on the wage and on work motivation. The practice of further linking team members' pay to team performance worsens the results even further.

Though appraisals, voice practices and task autonomous teams all appear successful in improving work attitudes, they depict rather different workplaces: the former are the only ones to enrich the job across all dimensions; task autonomous teams salvage jobs otherwise impoverished by traditional team-working but do not yield a net gain in terms of work quality; appraisals require a strictly supervised workplace, raise effort and, with it, exhaustion and accidents. On the whole, appraisals stand as a traditional type of practice, which directly aims at effort disregarding job enrichment; voice practices result in the archetype of the so-called high performance workplace practices; self-managed teams share the features of both, traditional and innovative practices and therefore can potentially be designed to fit either type of practice. We have shown that the pressure from output responsibility and from peers easily outweighs the benefits induced by task autonomy.

Finally, is there a best practice? The answer depends on the target: if it is strong commitment, formal arrangements and task autonomous teams are the best but for weak commitment appraisals and suggestions are as good; from the policy point of view, concerns about job security and safety could imply a different ranking.

Table 10: Empirical classification workplace practices by occupational groups

MANAGERS

		COMMITMENT +	COMMITMENT +
WAGE	**+**		Appraisals (w *) Output team responsibility (w)
WAGE	**-**	Voice: suggestions (w) Autonomous teams group (w) Non autonomous teamworking (s *)	Voice: suggestions (s) Non autonomous teamworking (w)

ADMINISTRATIVE

		COMMITMENT +	COMMITMENT +
WAGE	**+**	Appraisals (w s *) Voice: formal (w s)	Team performance related pay (w s) Output team responsibility (s)
WAGE	**-**		Non autonomous teamworking (w s)

SKILLED

		COMMITMENT +	COMMITMENT +
WAGE	**+**	Task-time autonomous teams (w s *)	
WAGE	**-**	Voice: formal (w s *)	Team performance related pay (s) Group autonomous team (w s *)

MANUALS

		COMMITMENT +	COMMITMENT +
WAGE	**+**	Appraisals (w *)	Group autonomous team
WAGE	**-**	Voice: suggestions (w) Task-time autonomous team (s) Voice: formal (w s)	

Notes: See Table 6.

Acknowledgements

References

Adler, Paul, Barbara Goldoftas and David I. Levine (1997) Ergonomics, employee involvement, and the Toyota production system: a case study of NUMMIs 1993 model introduction. *Industrial and Labor Relations Review* 50(3), pp. 416-437.

Askenazy, Philippe (2001) Innovative workplace practices and occupational injuries and illnesses in the United States. *Economic and Industrial Democracy* 22, pp 485-516.

Askenazy, Philippe. and Eve Caroli (2006) *Innovative Work Practices, Information Technologies and Working Conditions: Evidence for France*. IZA DP No. 2321.

Bartel, Ann, Richard Freeman, Casey Ichniowski and Morris Kleiner (2004) *Can a Work Organisation Have an Attitude Problem? The Impact of Workplaces on Employee Attitudes and Economic Outcomes*, CEP Discussion Paper No. 636, May.

Batt, Rosemary (2004) Who benefits from teams? Comparing workers, supervisors, and managers. *Industrial Relations*, 43(1), pp. 183-212.

Bauer, Thomas (2003) *High Performance Workplace Practices and Job Satisfaction: Evidence from Europe*, RWI-Mitteilungen. 2003-2004, 54-55(1), pp.1–29 and IZA discussion paper no. 1265.

Bender, Keith A., Donohue Susan M., Heywood John S. (2005), Job Satisfaction and Gender Segregation, *Oxford Economic Papers*, 57, pp.479-496.

Black, Sandra E., and Lisa M. Lynch (2001) How to compete: the impact of workplace practices and information technology on productivity. *Review of Economics and Statistics* (August), pp. 434-445.

Black, Sandra E., and Lisa M. Lynch (2004) What's driving the new economy: the benefits of workplace innovation. *The Economic Journal*, 114 (February), pp. F97-F116.

Black, Sandra, Lisa Lynch and Anya Krivelyova (2004) How Workers Fare When Employers Innovate, *Industrial Relations*, vol. 43, n.1, pp.44-66.

Böckerman, Petri and Pekka Ilmakunnas (2006) Do job disamenities raise wages or ruin job satisfaction?, *International Journal of Manpower*, Vol. 27 No. 3, pp. 290-302.

Borjas, George J. (1979) Job Satisfactions, Wages and Unions, *The Journal Of Human Resources*, XIV, 1, pp. 21-40.

Brenner, Mark, David Fairris and John Ruser (2004) Flexible work practices and occupational safety and health: exploring the relationship between cumulative trauma disorders and workplace transformation. *Industrial Relations* 43(1), pp.242-266.

Bresnahan, Timothy, Eric Brynjolfsson and Lorin Hitt (2002) Information technology, workplace organisation and the demand for skilled labor: firm-level evidence. *Quarterly Journal of Economics* 117, pp.339–376.

Brynjolfsson, Eric, Lorin M. Hitt and Shinkyu Yang (2002) Intangible assets: computers and organisational capital. *Brooking Papers on Economic Activity* 1, pp. 137–181.

Bryson, Alex, Cappellari Lorenzo, Lucifora Claudio (2005) Why So Unhappy? The Effects Of Unionisation On Job Satisfaction, Cesifo Working Paper No. 1419, March.

Caroli, Eve and John Van Reenen (2001) Skill biased organisational change? Evidence from a panel of British and French establishments. *Quarterly Journal of Economics* 116, pp. 1449–92.

Cappelli, Peter and David Neumark (2001). Do high performance work practices improve establishment level outcomes? *Industrial and Labor Relations Review* 54, pp. 737-775.

Clark, Andrew E. (2004) What makes a good job? Evidence from OECD countries, Delta discussion paper 2004-28.

Clark, Andrew E., and Andrew J. Oswald, (1996) Satisfaction and comparison income. *Journal of Public Economics* 61, pp. 359–81.

Clark, Andrew E., Nicolai Kristensen and Niels Westergård-Nielsen (2006) Job Satisfaction and Co-worker Wages: Status or Signal? paper presented at the DTI Conference "New Perspectives on Job Satisfaction Well Being", London December.

Cristini, Annalisa and Riccardo Leoni (2007) The '93 July Agreement in Italy: bargaining power, efficiency wage or both? In Nicola Acocella and Riccardo Leoni (eds.) *Social Pacts, Employment and Growth: A Reappraisal of Ezio Tarantelli's Thought*. Physica Verlag, Heidelberg.

Cristini, Annalisa, Alessandro Gaj, Sandrine Labory and Riccardo Leoni (2003) Flat hierarchical structure, bundles of new work practices and ?rm performance. *Rivista Italiana degli Economisti* 2, pp. 313–341.

Fairris, David, and Mark Brenner (2001) Workplace transformation and the rise in cumulative trauma disorders: Is there a connection? *Labor Research* 22 (winter), pp. 15–28.

Freeman, Richard, and Morris Kleiner (2000) Who benefits most from employee involvement: firms or workers? *American Economic Review*, no. 2, May, pp.219-223.

Gallie, Duncan, and Francis Green (2002) *High Skills and High Anxiety: Skills, Hard Work and Mental Well-Being*, SKOPE Research Paper No.27 Spring 2002.

Ghinetti, Paolo (2007) The Public-Private Job Satisfaction Differential in Italy. *Labour*, 21(2) June, 361-88.

Godard, John (2001) High performance and the transformation of work? The implications of the alternative work practices for the experience and outcome of work. *Industrial and Labor Relations Review* 54(4), pp. 776–805.

Green, Francis (2004) Why has work effort become more intense? *Industrial Relations* 43, pp. 709–41.

Greenan, Nathalie 1996. Innovation Technologique, Changements Organisationnels et Evolution des Compétences: une étude empirique sur l'industrie manufacturière. *Economie et Statistique* 8(298), pp. 15-33.

Hammermesh, Daniel S. (1977) Economic aspects of job satisfaction. In O. Ashenfelter and W.E. Oates (eds.) *Essays in Labour Market Analysis*. New York: John Wiley.

Handel, Michael, and David Levine (2004). Editors' introduction: the effects of new work practices on workers. *Industrial Relations*, Vol. 43, No. 1, pp.1-43.

Handel, Michael, and Gittleman, Maury (2004) Is there a wage payoff to innovative work practices? *Industrial Relations* 43, pp.67–97.

Helliwell, John F. (2006) Well-being, social capital and public policy: what's new? *Economic Journal* 11, pp. C34-C45.

Helliwell, John F., and Huang Haifang (2005) *How's the Job? Well-Being and Social Capital in the Workplace*. NBER Working Paper No. 11759. Cambridge: National Bureau of Economic Research.

Helliwell, John F., Huang Haifang, and Robert D. Putnam (2006) Are trust and social capital neglected workplace investments?, paper presented at the DTI Conference 'New Perspectives on Job Satisfaction and Well-Being', London, December 2006.

Heywood, John S., Stanley Siebert. and Xiangdong Wei,. (2002). Worker Sorting and Job Satisfaction: The Case of Union and Government Jobs, *Industrial and Labor Relations Review*, vol. 55(4), pp. 595-609.

Hirschman, Albert, (1973). The changing tolerance for income inequality in the course of economic development, *Quarterly Journal of Economics* 87 (4), pp. 544–566.

Hwang Hae-shin, Dale T. Mortensen and Robert Reed (1998) Hedonic wages and labor market search. *Journal of Labour Economics* 16, pp. 815–47.

Hwang, Hae-shin, Robert Reed and Carleton Hubbard (1992) Compensating wage differentials and unobserved productivity. *Journal of Political Economy* 100, pp. 835–58.

Ichniowski, Casey, Kathryn Shaw and Gabriella Prennushi (1997) The effects of HRM systems on productivity: a study of steel finishing lines. *American Economic Review* 87, pp. 291–313.

ISFOL (2007) 'Organizzazione, Apprendimento e Competenze', Rapporto.

Kaiser Lutz C. (2007) Gender-job satisfaction differences across Europe: An indicator for labour market modernization, *International Journal of Manpower* , Vol.28 (1), pp. 75-94.

Kato, Takao and Motohiro Morishima (2002) The productivity effects of participatory employment practices: evidence from new Japanese panel data. *Industrial Relations* 41, pp. 487–520.

Leibenstein Harvey (1966) Allocative Efficiency vs 'X-Efficiency', *American Economic Review*, June 56(3), pp.392-415.

Luttmer Erzo F.P. (2005) Neighbors As Negatives: Relative Earnings And Well-Being, *The Quarterly Journal of Economics,* August 2005, pp. 963-1002.

Milgrom, Paul and John Roberts (1995) Complementarities and fit: strategy, structure and organisational change in manufacturing. *Journal of Accounting and Economics* 19, pp.179–208.

Mohr, Robert D., and Cindy Zoghi (2006) *Is Job Enrichment Really Enriching*? US Bureau of Labor Statistics Working Paper 389 January.

Nickell, Stephen (1996) Competition and corporate performance. *Journal of Political Economy* 104, pp.724-46.

Osterman, Paul (2000) Work Reorganisation in an era of restructuring: trends in diffusion and effects on employee welfare. *Industrial and Labor Relations Review* 53, n.2 (January), pp. 176–96.

Osterman, Paul (2006) The wage effects of high performance work organisation in manufacturing. *Industrial and Labor Relations Review* 59, pp. 187–20.

Patterson, Malcolm G., Michael, West, Rebecca Lawthom and Stephen Nickell (1997) The impact of people management practices on business performance, Institute of Personnel and Development, London, *Issues in People Management*, no. 22.

Roe, Robert, Irina Zinovieva, Elisabeth Dienes and Laurens Ten Horn (2000), Comparison of work motivation in Bulgaria, Hungary, and the Netherlands: test of a model. *Applied Psychology: An International Review* 49, pp. 658–87.

Rose, Michael (2005) Job satisfaction in Britain: coping with complexity. *British Journal of Industrial Relations* 43, pp. 455–67.

Senik Claudia (2004), When information dominates comparison. Learning from Russian subjective panel data, *Journal of Public Economics*, 88, pp.2099-2123.

Simon Herbert A. (1991). Organizations and Markets, *Journal of Economic Perspectives*, Vol. 5, n.2, Spring, pp. 25-44.

Taylor Fredrick W. (1911). The Principles of Scientific Management. New York, Harper Bros.

Terza, Joseph V., (1987). Estimating linear models with ordinal qualitative regressors, *Journal of Econometrics* 34, pp.275–291.

van Praag Bernard M.S, Paul Frijters and Ada Ferrer-i-Carbonell, (2003)*,* The anatomy of subjective well-being, *Journal of Economic Behavior & Organization*, Vol. 51, pp. 29–49.

Walton, Richard E. (1985). From Control to Commitment in the Workplace, *Harvard Business Review*, March-April, pp. 77-84.

Warr, Peter. B. (1999). Well-being and the workplace, in Kahneman, Daniel, Edward Diener and Norbert Schwarz (eds) *Well-Being: The Foundations of Hedonic Psychology*. New York: Russell Sage Foundation.

Wooldridge Jeffrey M. (2002) Econometric Analysis of Cross Section and Panel Data, MIT Press, Cambridge, Massachusetts.

Zwick, Thomas (2004) Employee participation and productivity. *Labour-Economics* 11, pp. 715–40.

APPENDIX

Table 11: List of controls included in regressions

z	**z$_w$**
female	
age	master/doctorate
age squared	first degree
experience	full time job
tenure	
high school vocational	
high school technical	**f**
high school university	
union member	workplace located in the South
permanent job	union presence
commuting cost$^%$	job prevalent female
pension/insurance scheme	job prevalent male
overeducation*	wrkp size dummy2 (5 to 15)
extent of pc use	wrkp size dummy3 (15 to 50)
skill level	wrkp size dummy4 (more than 50)
shift work	firm size dummy2 (15 to 100)
supervisor	firm size dummy3 (100 to 500)
child dummy	firm size dummy4 (more than 500)
child below 6 yrs dummy	40 sector dummies
married	21 region dummies
divorced	
nr. child	
mother married	**z$_d$**
mother not married	17 organizational area dummies
8 occupational dummies	

h
monthly hours of work

*overeducation is given by the difference between the actual level of education and the respondent's assessment of the education level actually needed to cover the position she holds: positive values indicate excess education, negative value indicate an educational deficit.
$^%$commuting cost is computed on the basis of the distance between the county town of the workplace location and the county town of residence and imputing the estimated cost of motoring.

Table 12: Correlation between workplace practices and job attributes

	accidents	exhaustion	effort	repetit	superv	discretion	auton	prob.un
informal voice	-0.0425*	0.0630*	0.1215*	-0.1285*	-0.0599*	0.2848*	0.2839*	-0.1748*
formal voice	-0.0736*	-0.0116	0.0932*	-0.0949*	-0.0007	0.2181*	0.2516*	-0.1468*
appraisal	-0.0087	0.0535*	0.1039*	-0.0560*	0.1224*	0.0854*	0.1254*	-0.1353*
quality norms	0.0366*	0.0032	0.0301	-0.0275	0.0021	0.0561*	0.0790*	-0.0611*
teamworking	0.0688*	0.0938*	0.1221*	0.0401*	0.0552*	-0.0105	0.0048	-0.0348*
autotask	0.0329*	0.0921*	0.1244*	-0.0009	0.0169	0.0464*	0.0799*	-0.0236
autogroup	0.0413*	0.1051*	0.1196*	-0.0256	0.0272	0.0157	0.0576*	0.0355*
autoresp	0.0595*	0.0943*	0.1208*	0.0035	0.0336*	0.0088	0.0411*	0.0167
teampay	0.0196	0.0017	0.0539*	-0.0228	0.0340*	0.0344*	0.0609*	-0.1044*

Note: * significant at the 5% level.

Table 13: Marginal effects of workplace practices on weak and strong commitment

	WEAK COMMITMENT			STRONG COMMITMENT		
	(1)	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**
quality norms	-0.039	-0.032	-0.028	-0.009	-0.006	0.001
appraisal	0.053	0.056	0.072	0.014	0.015	0.021
teamworking	-0.041	-0.055	-0.041	-0.010	-0.022	-0.014
autotask	0.102	0.104	0.100	0.069	0.072	0.057
autogroup	-0.002	-0.004	-0.034	-0.031	-0.026	-0.031
autoresp	-0.055	-0.051	-0.038	-0.021	-0.020	-0.016
teampay	-0.032	-0.020	-0.022	-0.032	-0.030	-0.038
voice: suggestions	0.044	0.058	0.067	0.003	0.014	0.012
voice: formal	0.076	0.079	0.072	0.038	0.043	0.042
log wage	0.007	0.030		0.017	0.026	
predict log wage	-0.033	-0.095		0.097	0.055	

Note: The reported marginal effects are relative to category 6 of commitment (strong agreement). The frequency in this category is 28% for weak commitment and 11% for strong commitment. The marginal effects in columns (1) are obtained on the basis of the structural model; marginal effects in column (2) are obtained after substituting for job attributes and marginal effects in column (3) are obtained by successively substituting for the wage.