

High performance workplace practices from the employees' perspective

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Abstract

This paper examines the effects of high performance workplace practices on employees' well-being. We purpose and estimate a recursive model that accounts for the links between the quality of work, the wage and the work motivation. We distinguish between the direct effects of the workplace practices on work motivation, and the indirect effects channeled by the wage and the work quality (working conditions, job security and the intrinsic job content). The results suggest three distinct ways to elicit motivation: involvement, teamworking and appraisals. Although the overall effect on motivation may be similar, appraisals induce additional motivation indirectly, via the wage but lack any job enrichment effect and actually raise the strictness of supervision; on the contrary, the indirect effect of involvement practices is not via the wage but via job enrichment. Teamworking has mixed results, usually positive if teams are autonomous on task and procedures, largely negative if teams are responsible for the output and pervasively job impoverishing if task autonomy is not granted. Fully self managed teams however are, at best, ineffective on motivation. Finally, the adoption of quality standards reduces employees' motivation though associated to safer working conditions.

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1 Introduction

More than forty years ago Leibenstein (1966) put forward the relevance of input re-organization as a way to gain efficiency at a given resource allocation and regarded motivation to be a major

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determinant of X-efficiency, the case being that "for a variety of reasons people and organizations normally work neither as hard nor as effectively as they could" (p.413). The last two decades witnessed two interesting facts that renewed economists' attention in these issues: the emergence of a new management strategy as a distinct and promising alternative to the fordist approach, and the beginning 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 go beyond the requirements; a specialized hierarchy is in order and any form of partnership between management and workers is virtually excluded: control is the word to elicit effort (Walton, 1985).

The alternative approach replaces control with commitment; it brings back concepts like employees' autonomy, discretion and task variety, typical of the artisan work style and gone lost in the scientific management. Initially undertaken by several large firms in the seventies, the commitment approach started by re-considering the quality of working life and by implementing so-called employee involvement programs. The final goal remains efficiency though the road undertaken aims at extracting the tacit knowledge of the employees and making it productive in a context where incomplete work contracts leave room of unexploited efficiency (Simon, 1991). Employees are allowed broader tasks, are informed about the company's plans, take part in problem solving meetings, are given more autonomy and eventually responsibility and decisional power on some operations; the whole organizational structure flattens mainly at the expenses of intermediate managers and line supervisors. Individual work is typically replaced by teams which can be self managed, self monitoring and respond of their output; incentive pay and job security become essential parts of the new management (Walton, 1985).

As these practices spread (Osterman, 2000) and workplace level data were made available, evidence beyond anecdotal and case studies began to build on their role on firm performance, largely confirming that they can yield significant productivity improvements, a fact which finally earned them the name of high performance workplace practices (HPWP)¹ The economic

¹Ichniowski, Shaw and Prennushi (1997) among the most cited papers of this literature, use data from the US steel finishing industry and show that productivity is 6.7% higher under innovative human resource management systems. Black and Lynch (2000), using a large US national representative sample, find that productivity growth explains 1.6 percentage points of the 4.7% average annual manufacturing output growth between 1993 and 1996

relevance of these new practices lays in the fact that they gain efficiency by enriching the job, making it less monotonous and more interesting thereby potentially featuring a win-win strategy. Indeed, workers involved in new workplace practices tend to report relatively higher levels of job satisfactions compared to workers in the same firm who are not involved (Freeman and Kleiner (2000), Bauer 2004, Mohr and Zoghi (2006), Godard(2001)).

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 team groups 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 thorough reorganizations and increase in layoffs (Osterman, 2000, Black et al., 2004). Moreover, the extent to which wages respond to the productivity gain ascribable to the new practices appear to be very modest (Handel and Levine, 2004).

Yet, the fact the workers like the innovative work system even if it may jeopardize 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 fragmented².

This paper contributes to this literature by disentangling and quantifying the various effects of the new workplace practices on workers' wellbeing; we distinguish the effects on the wage 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 on a sample of representative Italian employees working in the private sector.

The rest of the paper is organized as follows: the next section reviews the empirical literature

and that 1.4 percentage points of this productivity increase is ascribable to workplace reengineering and new human resource practices. Patterson et al. (1997) use longitudinal data on 67 British firms and show that 17% of the variation of firms' profitability is due to workplace practices and organizational innovations. Evidence has also been produced for Germany (Bauer, 2003; Zwick, 2004), France (Greenan, 1996; Caroli and Van Reenen, 2001) and Italy (Cristini, Gaj and Leoni, 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) find no significant impact of employee involvement programs on productivity and, likewise, Capelli 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 all together may have emphasized the positive productivity results more than the negative ones.

²For example, Clark (2004), Helliwell and Huang (2005)

on the various dimensions of workers' wellbeing in relation to the innovative practices. Section 3 draws 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 the productivity gain through higher wages and the impact of HPWP on safety and working conditions; some evidence has also been 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 role³. Handel and Gittelman (2004) use a sample of 1062 US establishments from the 1995 Survey of Employer-Provided Training and investigate both the average establishment wage and the individual wage, the latter taken from the related data set obtained by interviewing two random employees from each surveyed establishment. On neither measures they do find a significant impact of HPWP⁴ even when allowing for practices complementarity. Osterman (2000), using a sample of about 300 US establishments in the private sector, finds that core workers employed in firms that introduced HPWP four years before, enjoy no significant wage gains and even appear to suffer a net wage loss, when controlling for firm's growth using employment changes. On the contrary, Capelli and Neumark (2001), using the Education Quality of the Workforce National Employer Survey (EQW NES) US panel, restricted to firms present since 1977, find a positive and significant relationship between practices⁵ and employee labour cost. Black, Lynch and Krivelyova (2004) use the same longitudinal EQW NES but restrict it to the manufacturing firms though keep it open as to the date of entry; they also find a positive association between wages, meetings and profit sharing, but only when the practices are interacted with the union dummy. This result has recently been objected by Osterman (2006); he uses the 1997 National Establishment Survey and finds a positive impact of a principal component indicator of HPWP on the level of the median wage of core non manager employees although the union interaction

³See the survey by Handel and Levine (2004)

⁴They consider: job rotation, quality circles, reengineering, self managed teams, peer performance review, employee involvement, pay for skill, profit sharing, total quality management, just in time

⁵Meetings, total quality management, team training, profit sharing

term remains insignificant; Osterman also excludes that practices act on the wage via the usual skill and technology channel and finds that across-the-board pay mechanisms convey the wage effects. This concurs with his other result of no increase in wage inequality, similarly to Black et al.(2004). Handel and Levine (2004) 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" (p...).

The evidence on workers' occupational safety is more limited, lacking matched data on innovative workplace practices and safety; however the existing findings mostly agree that some practices are associated with a worsening of individuals' wellbeing at work, both physical and psychological. Askenazy (2001), using a panel of 26 US sectors over four quinquennia from 1979 to 1991, finds that total quality management⁶, job rotation and autonomous work teams are related to greater occupational injuries and illnesses. Farris and Brenner (2001) and Brenner et. (2004) on US establishments⁷ also find that total quality management and the interaction of total quality management and team raise cumulative trauma disorders; the "suspicion that total quality management represents a new form of Taylorism" is raised also by Adler et al., (1997). More recently, Askenazi and Caroli (2006) using a representative sample of French workers find quality norms and job rotation to be the most hazardous practices, being associated with riskier workplace, higher number of injuries and mental strain⁸. Mohr and Zoghi (2006) using Canadian data find that QC rise the desire to work less hours due to stress but find no direct relation between days of work lost and HPWP although they do not include total quality management among their practices. Anxiety and work intensity seems to characterize UK skilled workers and workers' upskilling (Gallie and Green, 2001), and Green (2004) associates work intensification to the new workplace.

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 20% or more employment reduction is positively associated with an intensive use of self managed team and

⁶The International Organization for Standardization defines Total Quality Management (TQM) as "a management approach for an organization, centered 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"

⁷They 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.

⁸Other practices they explore, like hour and day flexibility and meetings do not affect the number of injuries.

job rotation by non managerial workers although the results are attenuated in unionized establishments.

On the whole, it seems fair to conclude that in terms of wages, safety and job security, innovative workplace practices do not seem to leave the workers significantly better off; yet, workers involved in such practices usually report higher levels of job satisfaction and organizational commitment relative to workers that are not. Freeman and Kleiner (2000) find that employees participating in employee involvement programs⁹ report higher trust and loyalty to the firm and higher satisfaction towards work than the non-involved employees. Godard (2001), using a sample of Canadian workers, finds that job satisfaction, commitment and motivation are all positively related to an indicator of new workplace practices although he also finds that work intensification can in some cases offsets the benefits. In another Canadian matched employer-employee data set Mohr and Zoghi (2006) find that practices like suggestions, task team, job rotation, QC, information sharing, self directed workgroup and class training are all positively related to job satisfaction. The evidence for most European countries also confirms these findings (Bauer,2004)¹⁰.

3 The model

We model the effect of workplace practices on employees' attitudes, wage and quality of work. Work attitudes, mainly captured by organizational commitment indicators, are affected by workplace practices both directly and indirectly, via the wage and the work quality which, in turn, distinguishes between: working conditions, job security and intrinsic job characteristics. The wage is modeled as a standard hedonic wage equation.

3.1 Employees' work attitudes

Work attitudes are usually associated with job satisfaction, organizational commitment and work motivation in general; though these concepts essentially depend on the same set of vari-

⁹Such programs comprise total quality management, opinion surveys, information sharing, committee on productivity, worker involvement in the design of EI programs, worker involvement in work processes, self managed teams

¹⁰The degree of job autonomy (regarding tasks 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 HPWP and job satisfaction.

ables, they capture slightly different aspects. Job satisfaction is immediately linked to workers' well being and as such is the most natural measure of it; it summarizes various job features (Hamermesh 1977, Freeman 1978) and it is strictly associated with life satisfaction. Organizational commitment is a more specific concept related to firm loyalty and firm identification (Simon, 1991); many works in applied psychology found that it is a good indicator of outcomes like turnover and absenteeism and, more generally of firm performance, and that such associations are stronger than with job satisfaction¹¹. Work motivation is a more general concept and indicates the psychological state driving behaviours and actions to determine positive outcomes like work efficiency and performance. Due to the way work attitudes are measured in the data I use, hereafter I will be referring mainly to commitment¹².

We distinguish between pecuniary and the non-pecuniary factors affecting commitment; as far as the former are concerned, the relevant monetary reward may stretch from the actual wage to the expected pecuniary prospects within the organization, where we expect the latter to be the more relevant the more commitment extends from a mere firm identification, like sharing values, to a promise to work harder and not to quit¹³. In both cases the reward is relative to the peer group's pay a rise of which, given the internal actual and future rewards, is expected to weaken motivation and commitment in the same way as the reference income is expected to reduce utility due to the envy that unfolds by seeing our peers relatively better off (see for example, Clark and Oswald (1996) and Luttmer, 2005).

In practice, absent information on expected promotions or pecuniary increases, the negative effect of the reference wage may be difficult to detect if the expected pecuniary reward depends on the wage of the older peers in addition to personal and firm characteristics. Then, the estimated coefficient of the peer group reference wage compounds two opposite effects.

Let Ω be the organizational commitment, w the wage, \bar{w} the reference wage and w^e the expected wage within the organization; then, we can express commitment as follows:

$$\Omega = \omega(w, w^e, \bar{w}, \chi) \tag{1}$$

¹¹See for example Roe et al. (2000) and references therein

¹²The issue of whether there exist a causal relationship between the job satisfaction and commitment and, if so, in which direction, doesn't seem to be settled in applied psychology. On the one hand a committed worker is likely to be satisfied on most dimensions of her 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 nor commitment.

¹³On the definition of commitment and work attitudes see Gallie et al., (1998)

where χ is a vector of other regressors and $\frac{\partial \omega}{\partial w} \geq 0$, $\frac{\partial \omega}{\partial w^e} \geq 0$ and $\frac{\partial \omega}{\partial \bar{w}} \leq 0$.

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

$$\frac{d\Omega}{d\bar{w}} = \frac{\partial \omega}{\partial w^e} \cdot \frac{\partial w^e}{\partial \bar{w}} - \frac{\partial \omega}{\partial \bar{w}} \quad (2)$$

In the empirical counterpart of equation (1) the sign of the reference wage is therefore *a priori* ambiguous. Generally, if the role of future internal prospects is relevant ($\frac{\partial \omega}{\partial w^e} \neq 0$) and the latter are permeable to the outside peer group ($\frac{\partial w^e}{\partial \bar{w}} > 0$), a non negative effect of the reference wage is more likely. On the contrary, 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 strong commitment and less so for loose commitment work attitudes.

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 reverted if the same reference income acts as indicator of future income prospects. Recent evidence of this has been found for example for Russia (Selik, 2004) and Denmark (Clark, 2006) using measures of satisfaction.

The non-pecuniary factors affecting commitment are captured both by the presence of workplace practices aiming at raising employees' participation and involvement and by the effectiveness of such practices. On the assumption that the extent of job autonomy, discretion, variety, strictness of supervision job repetitiveness and similar attributes are significant indicators of the way practices are implemented, we augment the usual dichotomic 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:

$$\Omega = \omega(\pi, h, \mathbf{z}, \mathbf{f}, \mathbf{d}, w, \bar{w}, u_\omega) \quad (3)$$

w is the monthly take home wage, \bar{w} is the peer group wage, h are monthly hours of work, π is the vector of workplace practices, \mathbf{d} is the vector of all job attributes, \mathbf{z} is the vector of personal

characteristics¹⁴, \mathbf{f} is the vector of workplace and firm characteristics and u_ω is the error term.

3.2 The wage

The wage is modeled according to a standard hedonic wage equation. This includes job attributes, individual and firm 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 across jobs, we expect the wage 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 is gained, in order for the workers to share such gain in form of higher wages, we have to allow for some non competitive elements. Bargaining is the obvious one thereby workers share the rent in proportion to the union's bargaining power. Independently of unions, some pay schemes may provide for a wage premium linked to productivity or profitability measures. Pay schemes of these type may be unilaterally decided by the firm, for reasons of fairness or 'quite life' (Nickell, 1996) or may be part of the bargaining if unions are present and sufficiently strong. Some systems are across the board mechanisms and spread the overall productivity gains equally to all employees; others are merit systems based on individual (or team) performance properly assessed¹⁵; the latter type of rewarding systems are thought to motivate and encourage effort better than the former¹⁶.

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

¹⁴Usual ID and elements of one's personal life that might affect one's life at work or the job choice (for example: health condition, familiar status) as well as other characteristics directly related to the job (for example: experience, tenure, occupation, overeducation).

¹⁵Osterman (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 HPWP do not seem to raise within firm wage inequality.

¹⁶For Italy, Cristini and Leoni (2007) find that where unions are present and take part in the design of merit systems, the rent sharing is highest; their finding substantiate the theoretical result according to which where bargaining and efficiency wages meet, rent sharing is higher.

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

where u_w is the error term, \mathbf{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 discuss in section 3.4 below, \mathbf{z}^w serve 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 small, we used existing results on job satisfaction as a guide to exclusion restrictions for Ω . Education, having a strong theoretical underpinning to be in the individual wage equation and but a weaker role in job satisfaction, once income and all other job attributes are controlled for, is a potential candidate. Although Clark and Oswald (JPE 1996) suggest that the more educated have higher expectations and therefore tend to be less satisfied, the evidence is mixed. Clark and Oswald find a strong negative coefficient and collect some other previous evidence supporting their finding; yet they control for only a few job attributes¹⁷ and warn that the sign of the coefficient could well be due to related social class events occurred in the period. Borjas (1979) on US data, finds education insignificant. More recently, in a cross country comparison of 14 European countries Kaiser (2005) finds years of schooling to be insignificant in 6 countries, among which Italy, negative in 6 other countries and positive in two countries (L.Kaizer,2005 IZA 1876). In a study comparing job satisfaction of public and private sector employees in Italy, conditional on occupations, education dummies are jointly insignificant (Ghinetti, 2006). Bockerman and Pekka (2004) who include a large number of job attributes also find education dummies to be insignificant on Finnish data. On the contrary education dummies are negative and significant in Bender et al (2005), Heywood Siebert and Wei (2002) and Bryson Cappellari and Lucifora (2004) while Mohr and Zoghi (2005), for Canada, find mix results. In addition to education, the fulltime vs parttime job, as a relevant

¹⁷For 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 of the education dummies

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 a large additional information for 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 employee does not know the job attributes and the practices of the peers' job, so the coefficients of π and \mathbf{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 like personal and firm characteristics; in addition, we assume that the organizational area in which the employee carries out her job contains some information about the job content: for example, the frequency of accidents and discomfort are more likely in production and maintenance than in general and legal affairs; variety is likely to be greater in data processing than in production and so on. Let \mathbf{z}^d be the organizational area dummies, then we write the attributes' equations as follows:

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

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) and reported below for convenience:

$$\Omega = \omega(\pi, h, \mathbf{z}, \mathbf{f}, \mathbf{d}, w, \bar{w}, u_\omega) \quad (3)$$

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

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

The endogenous variables are Ω , 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, 2001). 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 the workers' wellbeing: $\omega_\pi, w_\pi, \mathbf{d}_\pi$; also, we are interested in the additional indirect effects affecting the wage via the job attributes (quality of work), and affecting commitment via both the wage and the job attributes. The total effects are then given by¹⁸:

$$\frac{d\Omega}{d\pi} = \omega_\pi + \omega_w \cdot (w_\pi + w_d \cdot \mathbf{d}_\pi) + \omega_{\mathbf{d}} \cdot \mathbf{d}_\pi \quad (6)$$

$$\frac{dw}{d\pi} = w_\pi + w_d \cdot \mathbf{d}_\pi \quad (7)$$

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 to pin down the effect of the wage on commitment¹⁹. Substituting for \mathbf{d} in the commitment and wage equation yields:

$$\Omega = \tilde{\omega}(\pi, h, \mathbf{z}, \mathbf{f}, \mathbf{z}^d, w, \bar{w}) \quad (8)$$

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

By further substituting equation (9) into equation (8) we obtain the final reduced form commit-

¹⁸The total effect for the quality of work coincides with the direct effect.

¹⁹Indeed in the job satisfaction literature, a usual route is to substitute for \mathbf{d} in equations 3 and using equation 5. For example, Bauer (2004), Mohr and Zoghi (2006) estimate a job satisfaction equation of this kind although they do not consider the link between \mathbf{d} and π ; 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} .

ment equation where all the cross-equation relations in the model have been accounted for²⁰:

$$\Omega = \tilde{\omega}(\pi, h, \mathbf{z}, \mathbf{f}, \mathbf{z}^d, \mathbf{z}^w) \quad (10)$$

The partial derivative of equation (10) with respect to π 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 π is a mere amenity; then, in a competitive framework, for the theory of compensating differentials, we expect the wage to be negatively related to such a practice; moreover, to the extent that the work attitude Ω is a proxy for the employee's utility from work and the wage fully compensates for the amenability of the practice, we expect $\frac{d\Omega}{d\pi} = 0$. 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, a situation where the total derivatives of the practice in the wage and in the "work utility" function have opposite signs, is consistent with the idea of insufficient wage compensating differentials (productivity effects may be present but are small and cannot revert the signs). On the other hand, where practices appear 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. 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 which is likely due to the productivity gain engendered by the practice itself unless it simply reflects excess wage compensation in 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

²⁰The reference wage, being determined by a subsample of the right hand side variables of the wage equation, is then also automatically substituted out.

amenable practice; the excess compensation in this case is consistent, for example, with rising costs typical of recently adopted practices²¹. In fact, the case of both negative derivatives could even signal an undesirable and unproductive practice, although one would wonder why such a practice would be present at all in the first place, unless it is an obsolete practice that, for various reasons, for example resistance to change, the management failed to remove²². The length of time the practice has been in place could therefore help distinguishing between these two cases. Table 1 below summarizes the four cases.

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

4 The data

The data are from a new national representative survey of Italian employees working in the private sector. The survey, named OAC (organization, learning and competencies) has been designed by ISFOL and conducted in May 2004 (ISFOL, 2007). This survey is particularly useful to our investigation because it contains detailed information both 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 firm characteristics are also available. The survey was addressed to 4000 employees and 3605 observations are available net of errors and invalid strings²³.

²¹Evidence of a time lag between practices adoption and performance effect is provided, for example, by Brynjolfsson et al (2002), Kato and Morishima (2002), Bauer (2003)

²²See for example, Batt (2004) for resistance to self managed teams

²³Various problems related to errors in eligibility details, insufficient supplementary nominatives and low response rates required the conduct of extra interviews. The validation procedure discarded any bias between the two parts of the survey. ISFOL(2007), chapter 1.

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, on which the respondent is asked to agree or disagree, regarding the employee's attitudes towards his/her job and towards the firm; the answers are given in a 1-7 Likert scale: Totally disagree (1), Strongly disagree (2), Disagree (3), Indifferent (4), Fairly agree (5), Strongly agree (6), Totally agree (7). Specifically, we focus on the following statements:

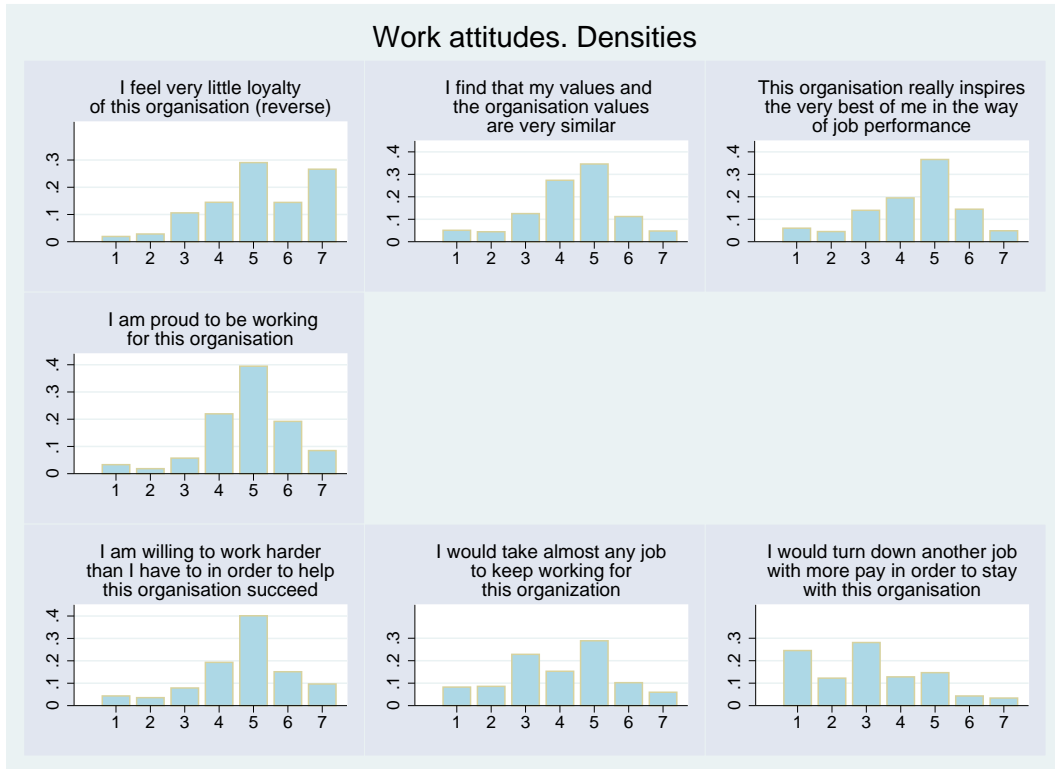
1. This organization really inspires the very best in me in the way of job performance
2. I am proud to be working for this organization
3. I find that my values and the organization's values are very similar
4. I feel very little loyalty to this organization
5. I am willing to work harder than I have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

Although all seven items are clearly about the degree of the employee's motivation, statements (5)-(7) search for a very strong sense of commitment which may go as far as refusing to quit for 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 do not refer to precise actions but to feelings and in this sense we regard them to be close to a job satisfaction indicator although, missing the exact question on job satisfaction, we rather use the diction "weak commitment". 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"²⁴. The densities of statements (1)-(7) are pictured in Figure 1.

With the exception of statements (6) and (7) they are all negatively skewed and the mode is in correspondence to category (5) "I fairly agree". On the basis of the degree of commitment to the organization 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

²⁴See also Helliwell (2006).

FIGURE 1:

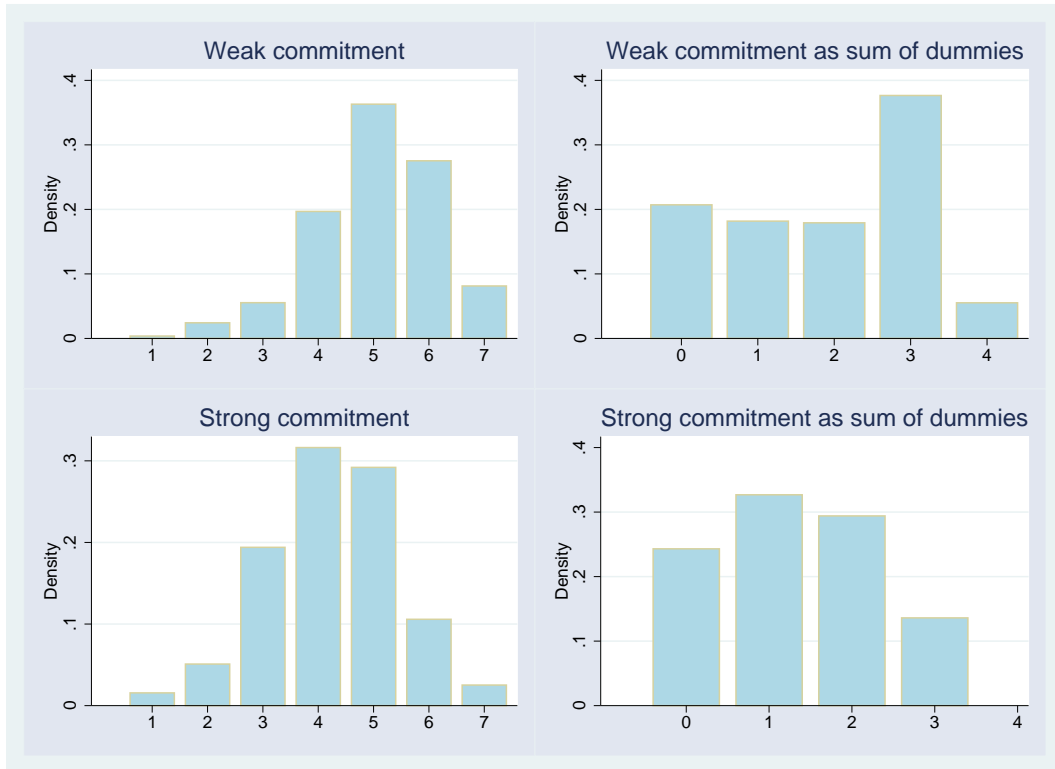


(7), after reversing the scales of statement (4), and then rescaling both compound indicators back into 7 categories²⁵. Figure 2 (first column) shows the distribution of the resulting indicators: the "weak commitment" is negatively skewed and it: as one would expect the "strong commitment" distribution shows, instead, very little skewness.

Notice 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 in correspondence with three statements and and for strong commitment it is in correspondence with one statement; compared with the other composite measures their distributions are further away from the normal. On this basis and on the account that the

²⁵Overall indicators are usually employed: Freeman and Kleiner, (2000) use questions about firm trust, loyalty and satisfaction towards particular job aspects; Bartel, Freeman, Ichniowsky and Kleiner (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).

FIGURE 2:



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 and on the intensity of job attributes like autonomy, discretion, variety and similar which add thickness to the practice dichotomic variables, specially concerning the effectiveness of the practices. Employees are asked whether they are involved in quality circles (**QC**), mixed supervisors-employees meetings (**meetings**) and whether they can give suggestions during these meetings (**meetings_s**); they are asked whether, more generally, they have ever made suggestions to colleagues or heads to improve efficiency and if so, how many times: only once(**occasional**) or at least twice (**informal**); whether they are systematically appraised in a formal way (**appraisal**) and, if this has occurred in the last year, whether the appraisal is used for wage (**appwage**) or training purposes (**apptrain**); the employee is also asked whether the firm complies with ISO9000 or other quality standards

(ISO9)²⁶. In addition, if the employee declares to work in teams (**team**), she is further 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. Together the team members decide when each of us has to work
6. Together the team members decide on additional tasks
7. Together the team members decide the internal distribution of the tasks
8. Together the team members decide on questions of new entries in the team

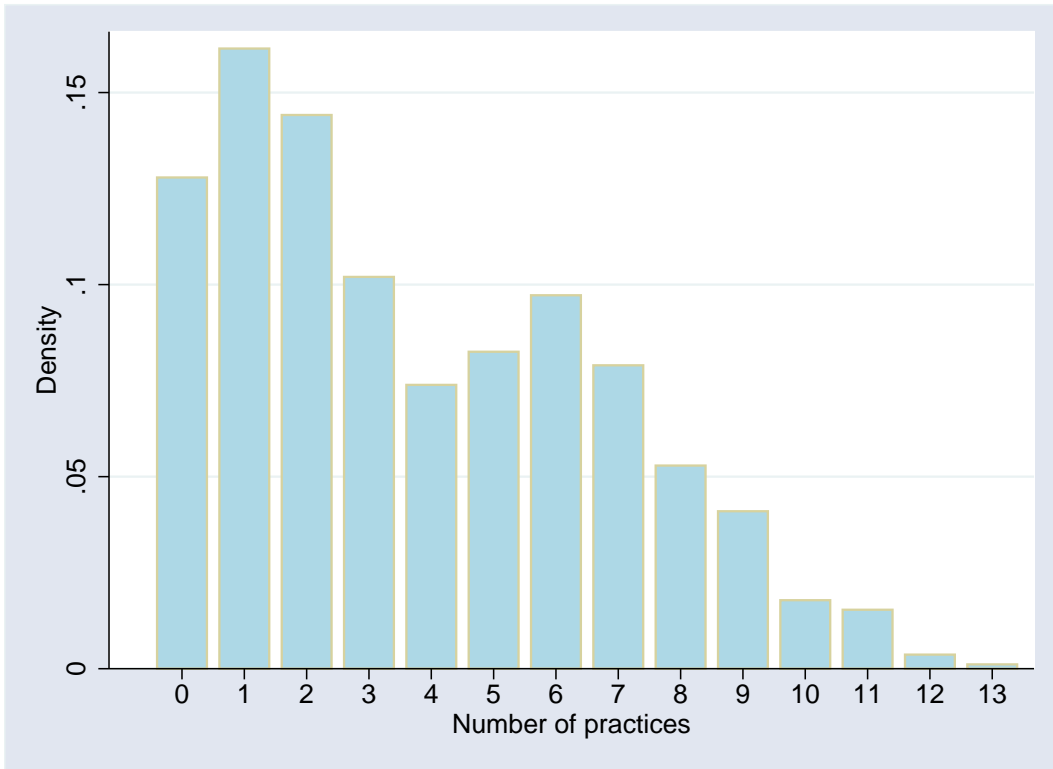
On the basis of this information we define four types of self managed teams according to four kinds of autonomy dimensions: task procedure, work timing, group management and output responsibility and to their interaction. Each autonomy dimension is defined as a dummy variables computed as follows: (a) task procedure autonomy = at least one, of features 1 and 6 above is present (**selftask**), (b) work timing autonomy = at least one, of features 5 or 7 is present (**selfwork**) (c) group autonomy = at least one from features 2, 3 or 8 above is present (**selfgroup**), (d) output responsibility = feature 4 is present (**selfresp**); an indicator of full self managed team is then given by the product the four dummies (**selfteam**)²⁷. A final team-related information, included in a different section of the questionnaire, regards the presence of otherwise of performance related pay linked to the team output (**selfpay**).

Table 2 shows the share of employees in the defined workplace practices, ranked in descending order. Over 60% of the employees claim to have given suggestions to improve work efficiency at least twice; this indicates a rather diffused but informal type of involvement which takes place

²⁶Quality standards based on TQM principles can be certified. ISO9000 is a family of standards for 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 to 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 train are determined for each job; customer needs are determined and feedbacks are important; performance and quality are regularly reviewed through internal audits and meetings; continual improvement of the performance is pursued.

²⁷The 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. An alternative overall measure defined as a dummy variable equal one if at least six of the eight features are present has a correlation of 0.97 with **selfteam**

FIGURE 3:



outside organized employer-employee meetings or per-arranged QC. In fact these two formal arrangements are also quite apart in terms of diffusion: meetings where employees can give suggestions are present in 52% of the cases and QC only in 9%. Almost half of the employees work in traditional teams and around a third is allowed some form of team autonomy. Workplaces comply with quality norms in 43% of the cases, although the figure may be underestimated as based on employees' claims and some of them (37%) do not know about it. Regular and formal appraisal of the individual performance is claimed by 28% of the employees but for only about half of these (13% of total employees) has the appraisal been carried out in the last year and affected the wage and for 10% affected training.

The next columns of Table 2 provide the share of employees by HPWP for two subsamples of employees according to the number of practices they are involved in; the distribution of the number of practices, presented in Figure 3, is positively skewed as the number of employees involved in more than three practices declines fairly steadily.

Employees in the top quartile of the distribution are involved in at least 6 practices; the most diffused are teams and self managed teams, followed meetings and suggestions. Quite the

contrary, virtually none of the employees involved in two or less practices (the first quartile) participate in self managed teams and only 7% works in traditional teams. For these employees innovative workplace practices essentially mean giving informal suggestions, taking part in formal employer-employee meetings and working in firms which comply with quality standards.

Finally, Table 3 reports differences in work attitudes between employees that are not involved and those that are involved in a given workplace practice; a negative number therefore indicates that involved employees report a higher motivation in work attitude. Employees involved formally (mixed meetings, QC) or informally (suggestions) report a higher commitment, weak and strong. The same is true for employees that are formally appraised although such a practice is not significantly associated with the decision about quitting. Differences in employees' motivation associated to quality standards are patchy whereas employees involved in teams and self managed teams report significantly higher levels of loyalty²⁸ and willingness to work harder to help the organization succeed (col. 6). In fact, it turns out that all workplace practices (except occasional suggestions) are positively and significantly associated to the latter work attitude. On the contrary, none of the workplace practices is positively associated with the employees' willingness to do any job within the organization.

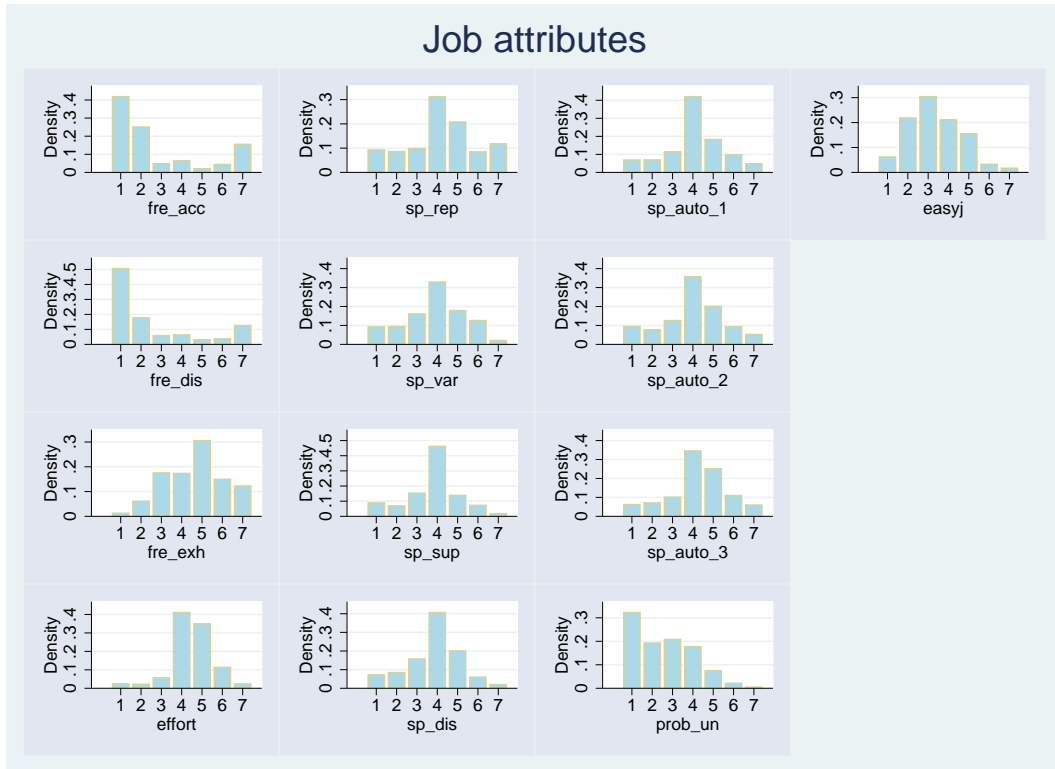
4.3 Work quality indicators

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 exposure to excess discomforts (**discomf**)
3. Frequency of exhaustion from work (**exhaust**)
4. Effort intensity (**effort**)
5. Strictness of supervisor's control (**super**)
6. Job repetitiveness (**repetit**)
7. Job variety (**variety**)
8. Job discretion (**discret**)
9. Job autonomy on timing and effort (**auto time**)

²⁸Freeman and Kellner, 2000 find a similar result.

FIGURE 4:



10. Job autonomy on tasks and their sequence (**auto task**)
11. Job autonomy on how to do the tasks (**auto procedure**)
12. Probability of unemployment over the next 12 months (**pr_unemp**)
13. Ease to finding a job of the same type if fired (**easyjob**)

The densities of are shown in Figure 4.

Almost all job attributes are significantly correlated with workplace practices (Table in Appendix). Except for the least diffused occasional involvement there are some similarities across the correlations which support existing findings: all practices are positively associated with job autonomy, discretion, variety and negatively associated with job repetitiveness; all practices are positively associated with effort and frequency of exhaustion; the frequency of accidents is positively associated with quality standards and self managed teams but negatively with meetings. The next section carries 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 either/both to 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 Ω and the vector of job attributes \mathbf{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 $13 \cdot 6 = 78$ additional right hand side variables, difficult to interpret.

As both issues would be easier to tackle were the variables not ordinal in nature, we follow Terza (1987) and transform the qualitative job attributes into discrete variables ranging on the real axis²⁹. 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, since all right hand side 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 \mathbf{d} and assures that the covariance matrix is diagonal so that equations (3) and (4) can be separately estimated, using ordered probit and OLS respectively³⁰.

Finally, with regard to the workplace practices, the results from the initial estimations, carried out using the definitions described in the previous section, suggest to group some practices in the following more concise still coherent sets, improving in clarity:

- **informal** is a dummy equal 1 if the respondent is involved by giving suggestions (either once or several times) involvement

²⁹Terza (1987)'s suggested transformation replaces each category j of an ordinal variable by Φ_j where $\Phi_j = E(\phi_j | \theta_{j-1} < \phi_j \leq \theta_j)$ and θ_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

³⁰Notice however that the results presented below are robust to: using the ordinal variables in place of their Terza's transformation; estimating job attributes by single equation ordered probits instead of SUR; estimating Ω by OLS instead of ordered probit.

- **formal** is a dummy equal 1 if the respondent is involved in either/both mixed meetings or/and QC
- **self_tawo** is a dummy equal 1 if the team is autonomous in either/both ask procedure or/and work timing
- **self_grre** is a dummy equal 1 if the team decides the team members/leader or/and responsible for the output produced
- **self** is a fully autonomous team, defined by the product of the above two team types.

5.1 Work quality and workplace practices

The estimated effects of workplace practices on the quality of work are reported in Table 4³¹. The role played by self managed teams on the job enrichment is significantly positive; in particular, team autonomy in tasks and timing effectively counterbalances the negative impact that team working in general has on all job enrichment aspects. This implies that, from the job enrichment point of view, autonomous teamworking is similar to individual working though repetitiveness is higher and conditions harsher in teamworking (Figure 5 illustrates the predicted densities). However, the results also show that the team’s responsibility for output increases exhaustion and that indeed all types of autonomous teams are associated to a higher exposure to accidents, a finding that backs the existing evidence reviewed in Section 2; the size of the effect is similar across team types and is roughly equivalent to a 1/4 of the standard deviation (Figure 5).

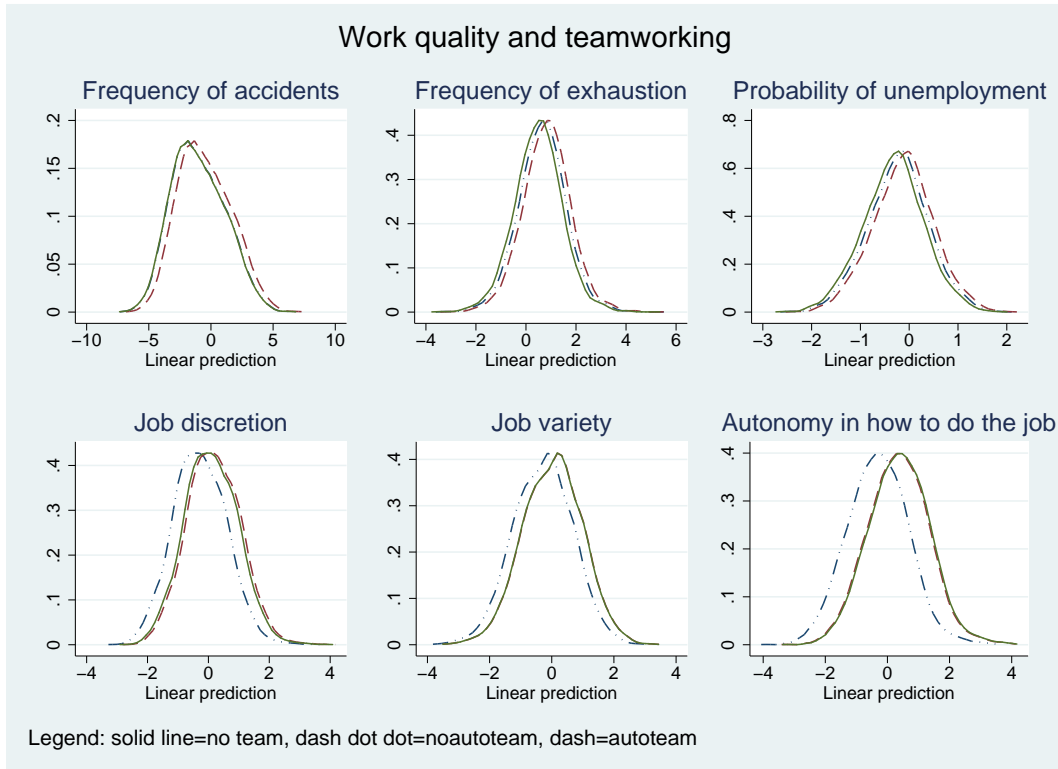
Regarding the effect of quality standards, the results suggest that working in firms that comply with them increases the chances of better working conditions: effort, exhaustion, discomfort are all significantly reduced; the sign is negative for accidents as well though the coefficient is not statistically significant in this case³². The presence of quality norms also plays a role in reducing the strictness of supervision and the effect is large relative, for example to the effect of formal or informal involvement. However, as expected, quality norms do not enhance job autonomy as far as tasks are concerned though they allow greater flexibility in work effort and timing.

Turning to specific involvement practices, we find that their formal or informal nature has indeed some bearings on work quality. Formal involvement is significantly associated to overall better working conditions (reduced exhaustion and effort) but has less pervasive effects on job

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

³²This finding contrasts with Askenazy and Caroli (2006) who find quality norms to be associated with higher injuries; however their measure is based on employees declaring to comply with quality norms themselves, rather than the organization complying with quality standard, which is what our indicator captures. Askenazy and Caroli’s quality norm indicator is then closer in content to our measure of output responsibility of team members which gives results qualitatively similar to theirs, as already discussed.

FIGURE 5:



enrichment and, if it does have, the effect is considerably smaller in size than the effect due to informal involvement which is also more effective on job security. Figure 6 report the predicted densities in the two cases.

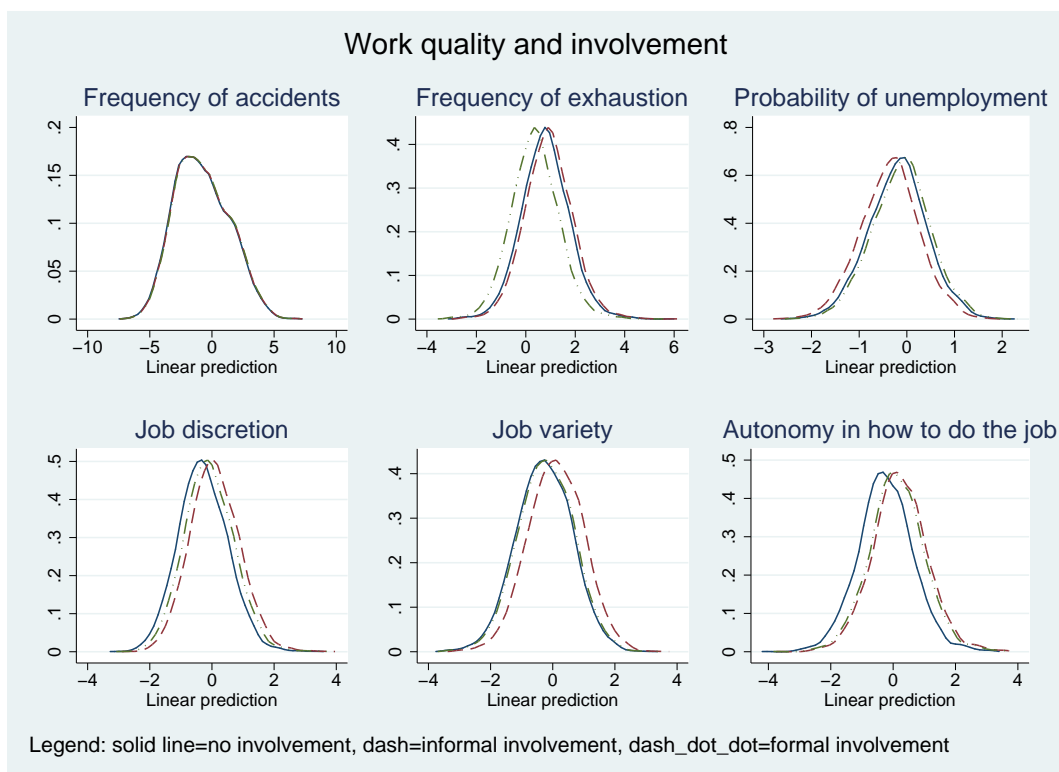
Finally, appraisals schemes raise the strictness of supervision, have no enrichment effects and even reduce employee's autonomy in how to do the job; in addition, consistently with some existing findings, they significantly raise effort, exhaustion, and the frequency of accidents.

5.2 The wage equation

The first three columns of Table 5 report the estimated wage equation³³. The first and second column differ for the inclusion of the factor component from the job attributes residuals while the third column reports the reduced form once all job attributes have been substituted out. With the exception of informal involvement, the role of workplace practices is fairly robust across the three specifications: the presence of appraisals scheme raise the individual wage by

³³The test of the joint significance in the wage equation of the three dummies used as exclusion restrictions in the commitment equation (first degree, master/doctorate and fulltime job) is $F(3, 2891) = 100.31$, $\text{Prob} < F = 0.0000$

FIGURE 6:



3%, task autonomous teams raise the wage by 7% to 11%, depending on the controls, whereas adding further team autonomy (specifically output responsibility) eventually wipes the benefits away. Since the major loadings of the component from the job attributes' equations residuals are associated to job autonomy and discretion, and it is not surprising that the exclusion of such factor (column 2) affects the coefficients of these variables most; moreover, since these job features are positively correlated with the practice of informal suggestions, the coefficient of the latter likely picks up the positive role of these job features when the factor is excluded.

5.3 Work attitudes and workplace practices

Columns (4) and (8) of Table 5 report the ordered probit estimates of weak and strong commitment³⁴. The immediate difference between the two is that strong commitment significantly

³⁴The joint significance in the commitment equation of the three dummies used as exclusion restrictions (undergraduate degree, master/doctorate degree and full time job) is $\chi^2(3) = 5.87$ (Prob $\chi^2 = 0.1182$) for weak commitment, and $\chi^2(3) = 7.37$, (Prob $\chi^2 = 0.0609$), for strong commitment. In view of these borderline results, we used alternative exclusion restrictions (for example we experimented with union membership and gender, on the basis of the recent findings (Bryson Cappellari and Lucifora (2004) and Bender, Donohue and Heywood

respond to the wage and the reference wage, whereas weak commitment is mostly responsive to workplace practices. Formal and informal involvement, as well as appraisals have a positive effect on weak commitment but, except for formal involvement arrangements, have only a small impact on strong commitment. Fully autonomous teams have no significant impact on neither measures of commitment as the team’s output responsibility exerts a strong negative effect on both and the practice of relating the pay to the team performance is a further disincentive to strong commitment.

The wage coefficient is positive and significant for strong commitment but negative and not significant for weak commitment, supporting the idea that the reference wage is actually capturing also the expected wage and that the latter is relevant for strong commitment more than for weak commitment. However, as expected, the size of the wage coefficient is also partly ascribable to the presence of job attributes; once substituted out (columns 5 and 9) the wage coefficient rises for both commitments and the negative impact of the reference wage capturing outside opportunities becomes relatively more important. In order to obtain the overall effect of the practices columns (6) and (10) report the estimated coefficients when finally substituting also for the wage: the main effect is to increase the positive role of task autonomous teams which indeed have a strong impact on the wage; still fully autonomous teams have, on the whole, no effect on commitment. Columns (7) and (11) report the marginal effects relative to category 6³⁵.

5.4 Quantifying the indirect effects

Using the marginal effects from the ordered probit estimates, the direct and indirect effects of workplace practices on the probability of commitment are computed³⁶; summary results are reported in Table 6. The direct effects (column 1) are normally larger than the total indirect effects (column 6), with the exception of teamworking; also, the indirect effect may reinforce the direct one or counterbalance it, as in the case of self managed teams³⁷ and quality norms; the latter, for example, exert a negative direct effect on commitment but a positive one through

(2005), respectively) and results were robust to this change.

³⁵Recall that the frequency of category 6 is 28% for weak commitment and 11% for strong commitment.

³⁶The 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.

³⁷A self managed team is here defined as a fully autonomous team.

work quality and the wage. The indirect effects from the job content (column 4) are all positive except for teamworking, on weak commitment and mostly positive on strong commitment. On the other hand, the indirect effects through working conditions are mainly negative, except for quality norms while those through job security are positive except for involvement and self managed teams. Looking at the total (direct and indirect) effects (column 7), we conclude that formal and informal involvement and appraisals are equally important for weak commitment whereas for strong commitment formal involvement practices are the most important ones; self managed teams have virtually no impact on any form of commitment unless team performance related pay is taken into account, in which case the effect is a negative one.

In accounting these effects one should recall that employees are involved in only a small number of practices³⁸. As long as employees are involved in some informal or formal involvement, then commitment is likely to rise; cases of employees working in non autonomous teams or in workplaces complying with quality standards and non adopting any other innovative practices are indeed very small.

We can finally draw the empirical counterpart of Table 1 (Table 10). 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, formal and informal involvement 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. Typically, autonomy in tasks and working time is a good practice but making the team responsible for the output produced turns out to be a detrimental choice 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.

³⁸Of the practices that we consider in Table 6, the most diffused is informal involvement (71%), followed by formal involvement (57%), teamworking (47%), quality norms (43%), self managed teams (32%), appraisals (28%) and self_pay (8%). A fourth of the employees is involved in one or none practices and 65% is involved in 3 or less

5.5 Sensitivity analysis: the wage and work attitudes by occupations

The main limitation of the empirical analysis is the potential bias from unobservable fixed effects, typical of cross section data. In particular, hedonic wage equations are likely to be flawed by unobservable productivity: if a more able worker can use 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 fail to control for individual productivity determines an underestimation of the compensating differential (Hwang, Reed, Hubbard, 1992; Helliwell and Huang, 2005). For productivity homogenous workers but heterogenous firms, the same bias applies (Hwang, Mortensen, and Reed, 1998). More precisely, let a be the unobserved individual productivity in the wage equation. Since we expect $\text{corr}(\mathbf{d}, a) > 0$ and $\text{corr}(w, a) > 0$, 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 organizational changes are skill biased (Caroli and Van Reenen, 2001), then $\text{corr}(a, \pi) > 0$ 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 addition 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 highly skilled labour force the productivity increase due to organizational changes is larger (Caroli and Van Reenen, 2001; Bresnahan et al., 2002)³⁹. If wages are linked to productivity, then we should observed the same effect in the wage equation⁴⁰; in particular, if a certain occupation is complementarity to a specific practice, then we expect the wage of this occupational group to respond relatively more to this practice than it 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

³⁹In fact, there may be other enabling factors beside employees' skill level, like the presence of unions (Black and Lynch, (2001, 2004) or the firm efficiency in introducing a new practice. At this regard the complementarity among practices (Milgrom and Roberts, 1995) suggests that productivity increases only 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 firm can offer a higher salary for the given practice or both a higher salary and a higher amount of the practice.

⁴⁰Black and Lynch (2004) find that the effects of workplace practices on the wage, using either cross section or panel, are largely consistent with those on productivity.

and by employing the information from the job attributes residuals in the wage and commitment equation. In the following we consider homogenous 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 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 equation reported in Table 7 confirms that workplace practices are indeed occupational specific: appraisals are relevant for administrative and managers, task autonomous teams work for skilled workers, quality norms for manuals. Task autonomous teamworking is actually a bad practice for manual occupations, formal involvement arrangements have mixed effects and are best for administrative staff while fully self managed teams have no wage impact across all 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 captures the outside opportunity whereas for managers this effect is likely counterbalanced by the expected future rewards. The overall effects of workplace practices (reading from columns 5 to 8 of Tables 8 and 9 where the final reduced form estimates are reported) show that the efficacy of workplace practices on commitment differs across occupations: no workplace practice appears to be really working for managers; appraisal schemes are effective for administrative and manuals whereas skilled occupations gain most from task autonomous teamworking although relating the team's pay to team's output can be productivity reducing. Formal involvement practices are particularly good for administrative staff and operatives and teamworking, if non accompanied by autonomy, is a costly practice for white collars (Table 11 summarises the results).

6 Conclusions

It has long being recognized that workplace practices affect employee motivation and firm performance; in the continue search for efficiency the so-called high performance workplace practices have drawn much attention as potentially winning strategy for both employers and employees. By enriching the job, favoring employee involvement and empowerment and raising motivation, these practices aim at a more efficient use of labour to eventually raise productivity. To account

for these links, we proposed a recursive model where workplace practices affect work motivation both directly and indirectly, by influencing the wage and the job content. The novelty of this approach is that the structural model allows to disentangle the effects of workplace practices on different, though interrelated, dimensions of employees' well-being: working conditions, job security, intrinsic job content, wage and motivation.

The results distinguish quite clearly between three main types of workplace practices all of which can elicit motivation: employee involvement, appraisals and autonomous teamworking. We find that involvement can be gained either through formal arrangements (quality circles, employer employee meetings) or in a friendly environment that favors the informal sharing of knowledge through suggestions; these two types of involvement are not, however, interchangeable. Appraisals schemes have a positive and across the board effect on work attitudes and are also significantly associated to higher wages. Teamworking is the most complex of these practices as teams can be very diversified and have very different outcomes on employees' well being. Highly advanced, fully self managed teams, where team members decides about job tasks, timing and distribution of work, team composition and leadership, and are responsible for the output are, at best, ineffective on motivation and on the wage. However, this is the compound effect of the autonomy in deciding tasks and work timing, which has a positive impact both on the wage and on commitment, and of the team responsibility for the output produced, a feature which, on the contrary, consistently scores negative results on both, the wage and the work attitudes. The practice of further linking the team members' pay to the team performance worsens the results even further.

Though appraisals, involvement practices and task autonomous teams all appear successful in enhancing motivation, they depict rather different workplaces: involvement practices are the only ones really job enriching across all dimensions; task autonomous teamworking essentially compensates for the impoverishment associated to teamworking in general but doesn't net gain in work quality; appraisals are also not associated to job enrichment and actually require a stricter supervised workplace. Not surprisingly they also raise effort and, with it, exhaustion and accidents; however, autonomous teams are also associated to a higher frequency of accidents, as already found in the literature.

On the whole, appraisals stand as a traditional type of practice, which directly aims at effort disregarding job enrichment; involvement practices result as the archetype of the job enrichment

practices, aiming at efficiency via motivation; self managed teams share the features of both, traditional and innovative practices and therefore can potentially be designed to fit either type of practices. We have shown that the pressure from output responsibility and peers easily outweighs the benefits induced by job autonomy.

Is there a best practice? We showed that the answer depends on the target: for strong commitment the effect of appraisals is half the size of that of formal involvement and smaller of that of task autonomous teams; for weak commitment the three effects are similar in size and informal involvement is also as good; for a policy objective function, with a different weighting scheme for job security and safety the ranking could still be a different one.

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TABLE 2: Share of employees by workplace practices

All employees			Employees involved in at least 6 practices			Employees Involved in 2 or less practices		
	Mean	Std. Dev.		Mean	Std. Dev.		Mean	Std. Dev.
informal	0.62	0.49	team	0.96	0.20	informal	0.39	0.49
meetings	0.56	0.50	selftask	0.86	0.35	meetings	0.28	0.45
meetings_s	0.52	0.50	selfwork	0.84	0.36	meetings_s	0.25	0.43
team	0.47	0.50	selfresp	0.82	0.39	ISO9	0.20	0.40
ISO9	0.43	0.49	informal	0.80	0.40	occasional	0.09	0.29
selftask	0.36	0.48	meetings	0.76	0.43	team	0.07	0.26
selfwork	0.34	0.47	meetings_s	0.71	0.45	appraisals	0.03	0.18
selfresp	0.33	0.47	selfgroup	0.70	0.46	QC	0.01	0.11
appraisals	0.28	0.45	selfteam	0.65	0.48	selfwork	0.01	0.07
selfgroup	0.26	0.44	ISO9	0.59	0.49	selfresp	0.01	0.07
selfteam	0.24	0.43	appraisals	0.48	0.50	selftask	0.00	0.07
appwage	0.13	0.34	appwage	0.28	0.45	apptrain	0.00	0.06
apptrain	0.10	0.31	selfpay	0.22	0.42	selfpay	0.00	0.04
QC	0.09	0.29	apptrain	0.22	0.41	appwage	0.00	0.03
occasional	0.09	0.29	QC	0.18	0.39	selfteam	0.00	0.00
selfpay	0.08	0.28	occasional	0.08	0.27	selfgroup	0.00	0.00

Notes: Nr. of all employees 3605, nr. of employees in the top quartile (nr. of practices greater than 6) 1217; nr. of employees in the bottom quartile (nr. of practices less than 2) 1319. The median is of 4 practices.

TABLE 3: Differences in work attitudes between employees not-involved and employees involved. By workplace practices

	(1) weak comm	(2) strong comm	(3) inspires	(4) proud	(5) values	(6) loyal	(7) work harder	(8) any job	(9) no quit
informal	-0.407 **	-0.177 **	-0.252 **	-0.407 **	-0.297 **	-0.600 **	-0.493 **	0.154 **	-0.200 **
meetings	-0.347 **	-0.202 **	-0.267 **	-0.383 **	-0.242 **	-0.457 **	-0.411 **	0.067	-0.263 **
meetings_s	-0.393 **	-0.234 **	-0.292 **	-0.415 **	-0.309 **	-0.508 **	-0.497 **	0.059	-0.265 **
appraisals	-0.172 **	-0.097 **	-0.150 **	-0.252 **	-0.070	-0.157 **	-0.148 **	0.003	-0.078
appwage	-0.236 **	-0.102 *	-0.181 **	-0.324 **	-0.164 **	-0.232 **	-0.247 **	0.085	-0.127
apptrain	-0.211 **	-0.137 **	-0.200 **	-0.260 **	-0.152 **	-0.282 **	-0.233 **	0.047	-0.100
QC	-0.303 **	-0.205 **	-0.191 **	-0.332 **	-0.214 **	-0.360 **	-0.394 **	0.026	-0.226 **
ISO	-0.051	-0.031	-0.006	-0.097 *	0.034	-0.072	-0.118 **	0.107 **	-0.055
occasional	0.055	0.017	-0.029	0.115	-0.038	0.102	0.170 *	-0.147	0.027
team	-0.006	-0.059	0.091 *	-0.041	0.075	-0.129 *	-0.096 *	-0.043	0.018
selfteam	-0.032	0.006	-0.011	-0.001	0.000	-0.056	-0.128 *	0.095	0.087
selfwork	-0.064	-0.040	0.011	-0.072	-0.019	-0.155 **	-0.148 **	0.034	0.051
selftask	-0.106 **	-0.112 **	-0.045	-0.127 **	-0.063	-0.170 **	-0.252 **	0.003	-0.033
selfgroup	-0.046	-0.008	-0.021	-0.015	-0.021	-0.071	-0.133 **	0.073	0.056
selfresp	-0.036	-0.027	0.044	-0.023	0.011	-0.133 **	-0.158 **	0.046	0.085
selfpay	-0.113 *	-0.062	0.024	-0.203 **	-0.026	-0.226 **	-0.157 *	0.149	0.149

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

TABLE 4: Work quality (job attributes)

	working conditions			job security			intrinsic job characteristics						
	acc (1)	unc (2)	exh (3)	eff (4)	une (5)	cas (6)	rep (7)	sup (8)	var (9)	dis (10)	aut (11)	aut (12)	aut3 (13)
informal	0.044 (0.13)	0.387*** (0.11)	0.130 (0.10)	0.045 (0.05)	-0.167*** (0.05)	0.126** (0.05)	-0.354*** (0.11)	-0.132** (0.06)	0.376*** (0.06)	0.374*** (0.05)	0.341*** (0.07)	0.320*** (0.08)	0.454*** (0.08)
formal	0.067 (0.13)	0.280** (0.11)	-0.427*** (0.10)	-0.149*** (0.05)	0.076 (0.05)	0.103* (0.05)	-0.267** (0.11)	-0.130** (0.06)	0.058 (0.06)	0.195*** (0.05)	0.075 (0.07)	0.290*** (0.08)	0.362*** (0.08)
ISO9	-0.172 (0.12)	-0.264** (0.11)	-0.271*** (0.09)	-0.179*** (0.05)	-0.079 (0.05)	0.068 (0.05)	0.136 (0.11)	-0.207*** (0.06)	0.004 (0.06)	0.047 (0.05)	0.193*** (0.07)	0.117 (0.08)	0.099 (0.08)
appraisals	0.430*** (0.14)	0.139 (0.13)	0.344*** (0.11)	0.261*** (0.06)	-0.190*** (0.06)	-0.059 (0.06)	-0.431*** (0.12)	0.242*** (0.07)	0.082 (0.07)	0.063 (0.06)	-0.017 (0.08)	-0.085 (0.09)	-0.211** (0.09)
team	0.034 (0.24)	0.555** (0.22)	0.156 (0.19)	0.090 (0.10)	0.094 (0.10)	-0.028 (0.10)	0.532** (0.21)	-0.119 (0.12)	-0.315** (0.12)	-0.379*** (0.11)	-0.494*** (0.14)	-0.491*** (0.15)	-0.692*** (0.15)
s.tawo	0.868*** (0.31)	-0.160 (0.28)	-0.171 (0.24)	-0.154 (0.13)	-0.056 (0.13)	-0.020 (0.13)	-0.223 (0.27)	0.060 (0.15)	0.270* (0.16)	0.345** (0.13)	0.347* (0.18)	0.471** (0.20)	0.414** (0.19)
s-grre	0.886** (0.37)	0.127 (0.33)	0.885*** (0.28)	0.160 (0.16)	-0.550*** (0.15)	-0.262* (0.16)	0.073 (0.33)	0.284 (0.18)	0.847*** (0.19)	0.164 (0.16)	-0.329 (0.21)	-0.089 (0.23)	-0.106 (0.23)
self	-1.267*** (0.43)	-0.649* (0.38)	-0.534 (0.33)	0.114 (0.18)	0.713*** (0.18)	0.394** (0.18)	-0.317 (0.38)	-0.191 (0.21)	-0.794*** (0.22)	-0.042 (0.19)	0.486** (0.25)	0.099 (0.27)	0.347 (0.27)
s-pay	-0.063 (0.23)	-0.175 (0.20)	-0.684*** (0.18)	-0.134 (0.10)	-0.316*** (0.09)	-0.236** (0.10)	0.001 (0.20)	0.110 (0.11)	-0.049 (0.12)	-0.076 (0.10)	-0.236* (0.13)	-0.262* (0.14)	-0.207 (0.14)
_cons	-2.372* (1.28)	0.348 (1.13)	-6.383*** (0.98)	-2.242*** (0.54)	0.111 (0.53)	-1.051* (0.54)	-0.088 (1.12)	0.986 (0.61)	-1.118* (0.65)	-2.057*** (0.55)	-2.844*** (0.73)	-2.901*** (0.80)	-3.091*** (0.79)
conts	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
w f d.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
reg d.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
sector d.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
occ d.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
org d.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R sq.	0.351	0.327	0.160	0.139	0.204	0.217	0.172	0.132	0.265	0.318	0.241	0.251	0.228
N	3529												

Notes: ¹ Standard errors in parenthesis ² ***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

TABLE 5: Wage and Commitment

	wage			weak commitment				strong commitment				
	OLS			OP			mfx	OP			mfx	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	
main												
lwage				0.052 (0.08)	0.128 (0.08)			0.150* (0.08)	0.203** (0.08)			
\widehat{lwage}				-0.245 (0.28)	-0.472* (0.26)			0.563** (0.28)	0.265 (0.26)			
informal	-0.031** (0.02)	-0.006 (0.01)	0.008 (0.01)	0.201*** (0.07)	0.233*** (0.05)	0.266*** (0.04)	0.069	0.078 (0.07)	0.111** (0.05)	0.088** (0.04)	0.012	
formal	-0.006 (0.01)	0.009 (0.01)	0.015 (0.01)	0.314*** (0.06)	0.303*** (0.05)	0.277*** (0.04)	0.072	0.300*** (0.06)	0.306*** (0.05)	0.287*** (0.04)	0.041	
ISO9	0.001 (0.01)	0.007 (0.01)	0.009 (0.01)	-0.145*** (0.05)	-0.120** (0.05)	-0.106** (0.04)	-0.028	-0.062 (0.05)	-0.038 (0.05)	0.005 (0.04)	0.001	
appraisals	0.028** (0.01)	0.026** (0.01)	0.033*** (0.01)	0.196*** (0.06)	0.221*** (0.06)	0.282*** (0.05)	0.072	0.101* (0.05)	0.104* (0.05)	0.140*** (0.05)	0.021	
team	0.013 (0.03)	-0.017 (0.02)	-0.029 (0.02)	-0.033 (0.11)	-0.106 (0.10)	-0.089 (0.09)	-0.023	0.063 (0.11)	-0.010 (0.10)	-0.032 (0.09)	-0.005	
self_tawo	0.072** (0.03)	0.093*** (0.03)	0.109*** (0.03)	0.038 (0.13)	0.098 (0.13)	0.247** (0.11)	0.064	0.102 (0.13)	0.113 (0.13)	0.229** (0.11)	0.034	
self_grre	-0.006 (0.03)	-0.008 (0.03)	-0.002 (0.03)	-0.590*** (0.15)	-0.488*** (0.15)	-0.343*** (0.13)	-0.088	-0.624*** (0.15)	-0.573*** (0.15)	-0.322** (0.13)	-0.044	
self	-0.095** (0.04)	-0.083** (0.04)	-0.095** (0.04)	0.624*** (0.18)	0.509*** (0.17)	0.172 (0.15)	0.044	0.512*** (0.18)	0.504*** (0.17)	0.108 (0.15)	0.016	
self_pay	-0.003 (0.02)	-0.017 (0.02)	-0.018 (0.02)	-0.117 (0.10)	-0.049 (0.09)	-0.062 (0.08)	-0.016	-0.237** (0.10)	-0.180* (0.09)	-0.270*** (0.08)	-0.034	
fre_acc_f	0.003 (0.00)	0.002 (0.00)		0.007 (0.01)				-0.000 (0.01)				
fre_dis_f	0.004* (0.00)	0.002 (0.00)		-0.033*** (0.01)				-0.036*** (0.01)				
fre_exh_f	0.005** (0.00)	0.003 (0.00)		0.003 (0.01)				0.001 (0.01)				
effort_f	0.006 (0.00)	0.004 (0.00)		-0.063*** (0.02)				-0.056*** (0.02)				
prob_un_f	-0.011*** (0.00)	-0.009** (0.00)		-0.121*** (0.02)				-0.065*** (0.02)				
easyj_f	-0.002 (0.00)	-0.003 (0.00)		-0.014 (0.02)				-0.020 (0.02)				
sp_var_f	0.006 (0.00)	0.001 (0.00)		0.040** (0.02)				0.021 (0.02)				
sp_rep_f	-0.008*** (0.00)	-0.007*** (0.00)		-0.020** (0.01)				-0.010 (0.01)				
sp_sup_f	-0.009** (0.00)	-0.006* (0.00)		0.015 (0.02)				0.023 (0.02)				
sp_dis_f	0.019*** (0.01)	0.009** (0.00)		0.086*** (0.02)				0.104*** (0.02)				
sp_auto_1_f	0.010* (0.01)	0.000 (0.00)		0.028 (0.02)				-0.003 (0.02)				
sp_auto_2_f	0.029*** (0.01)	0.007* (0.00)		-0.027 (0.04)				-0.012 (0.04)				
sp_auto_3_f	0.019*** (0.01)	0.004 (0.00)		-0.022 (0.03)				0.004 (0.03)				
factor1	-0.105** (0.04)			0.087 (0.19)				0.045 (0.19)				
_cons	5.775*** (0.14)	5.585*** (0.11)	5.527*** (0.11)									
c1				-3.548** (1.42)	-4.326*** (1.37)	-2.481*** (0.46)		2.330* (1.40)	1.093 (1.36)	-1.378*** (0.45)		
c2				-2.575* (1.41)	-3.385** (1.37)	-1.580*** (0.45)		3.116** (1.40)	1.853 (1.36)	-0.613 (0.45)		
c3				-1.876 (1.41)	-2.709** (1.37)	-0.895** (0.45)		4.084*** (1.40)	2.798** (1.36)	0.358 (0.45)		
c4				-0.905 (1.41)	-1.767 (1.37)	0.037 (0.45)		5.056*** (1.40)	3.752*** (1.36)	1.293*** (0.45)		
c5				0.247 (1.41)	-0.645 (1.37)	1.152** (0.45)		6.149*** (1.40)	4.831*** (1.36)	2.337*** (0.45)		
c6				1.484 (1.41)	0.562 (1.37)	2.360*** (0.45)		7.029*** (1.40)	5.713*** (1.36)	3.244*** (0.45)		
conts	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes		
wrk fr d	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes		
reg d	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes		
sec d	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes		
occ d	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes		
org d	No	No	Yes	No	Yes	Yes		No	Yes	Yes		
R sq.	0.613	0.612	0.602									
N	3016	3016	3016	3016	3016	3529		3016	3016	3529		

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

TABLE 6: Estimated percentage point change in the probability of weak commitment due to workplace practices: direct and indirect effects

	INDIRECT						
	DIRECT	work.cond.	job sec.	intrinsic	Overall work quality	Total (work quality and wage)	OVERALL
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
weak commitment							
informal	5.33	-1.03	-0.31	0.55	0.69	1.53	6.86
formal	8.28	-0.47	-0.63	0.12	-0.48	-1.12	7.15
quality norms	-3.83	0.28	0.07	0.14	0.73	1.08	-2.75
appraisals	5.15	-0.25	0.29	0.63	0.53	2.02	7.17
teamworking	-0.93	-0.18	0.38	-1.37	-1.81	-1.38	-2.32
self managed teams	0.91	0.01	-0.78	0.07	-0.71	-1.26	-0.35
self_pay	-3.12	0.81	1.43	0.49	1.86	1.52	-1.61
strong commitment							
informal	1.02	-0.34	-0.01	0.46	0.49	0.23	1.24
formal	4.02	-0.10	-0.14	0.38	0.19	0.09	4.11
quality norms	-0.84	0.20	0.01	-0.03	0.31	0.91	0.08
appraisals	1.40	-0.20	0.12	0.25	0.07	0.69	2.08
teamworking	0.87	-0.32	0.04	-0.85	-1.00	-1.33	-0.46
self managed teams	2.24	0.01	-0.49	-0.07	-0.38	-2.12	0.11
self_pay	-2.81	0.23	0.33	0.08	0.55	-0.60	-3.41

Notes: The probability of commitment is relative to category 6 (frequency is 28.9% for weak commitment and 11.0% for strong). The percentage point changes in the marginal effects are all relative to the structural model (column (8) of Table 5). cols.2-4: the corresponding ordered probits estimates are not reported in the paper. The results for Self managed teams are the sum of the changes relative to team, self.tawo, self.grre, self; self_pay is not added since it involves a much lower percentage of the employees.

TABLE 7: The wage by main occupational groups

	(1) manager	(2) administr	(3) skt	(4) maual
informal	-0.071 (0.06)	0.007 (0.02)	0.012 (0.03)	-0.025 (0.02)
formal	-0.020 (0.05)	0.034* (0.02)	-0.046* (0.03)	0.001 (0.02)
ISO9	-0.020 (0.03)	0.023 (0.02)	-0.005 (0.03)	0.055** (0.03)
appraisals	0.077** (0.03)	0.069*** (0.02)	0.031 (0.03)	0.061* (0.03)
team	-0.127 (0.08)	-0.019 (0.05)	-0.014 (0.05)	0.012 (0.04)
self_tawo	0.084 (0.09)	-0.060 (0.06)	0.142** (0.07)	-0.155** (0.08)
self_grrr	-0.104 (0.13)	0.068 (0.09)	0.101 (0.07)	-0.091 (0.06)
self	0.113 (0.14)	-0.021 (0.10)	-0.213** (0.09)	0.220** (0.09)
self_pay	0.036 (0.04)	0.026 (0.04)	-0.007 (0.05)	0.074 (0.05)
lhourm	0.034 (0.05)	0.080*** (0.03)	0.182*** (0.07)	0.143*** (0.04)
fem	-0.158*** (0.05)	-0.142*** (0.02)	-0.177*** (0.04)	-0.167*** (0.03)
age	0.000 (0.02)	-0.001 (0.01)	0.021** (0.01)	0.020** (0.01)
agesq	0.000 (0.00)	0.000 (0.00)	-0.000** (0.00)	-0.000** (0.00)
exp	0.000 (0.00)	0.008*** (0.00)	0.002 (0.00)	0.003 (0.00)
ten	0.000 (0.00)	0.001 (0.00)	0.002 (0.00)	0.003 (0.00)
edu_pro	-0.232*** (0.05)	0.023 (0.13)	0.095* (0.05)	0.032 (0.06)
edu_dtc	-0.144*** (0.05)	0.113 (0.13)	0.068 (0.06)	-0.073 (0.07)
edu_lic	-0.010 (0.02)	0.131 (0.13)	0.123** (0.06)	-0.013 (0.07)
edu_lau	0.177*** (0.03)	0.297** (0.14)	0.299*** (0.08)	0.184** (0.08)
edu_mas	0.251*** (0.05)	0.516*** (0.16)	(dropped)	(dropped)
permj	-0.543*** (0.12)	0.014 (0.03)	0.135*** (0.04)	0.095** (0.05)
fulltime	0.493*** (0.09)	0.344*** (0.03)	0.216*** (0.06)	0.266*** (0.05)
_cons	7.006*** (0.43)	5.994*** (0.21)	5.037*** (0.34)	5.384*** (0.25)
other conts	Yes	Yes	Yes	Yes
wrkpl-firm dum	Yes	Yes	Yes	Yes
7 sector dum	Yes	Yes	Yes	Yes
R sq.	0.540	0.603	0.670	0.536
N	487	793	379	458

Notes: Standard errors in parenthesis; ***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
	man2	ado2	skt2	map2	man3	ado3	skt3	map3
	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se
OC_weak								
lwage	0.495** (0.21)	-0.311 (0.19)	-0.023 (0.34)	0.813*** (0.26)				
lwage ^a	0.574 (0.51)	0.364 (0.44)	-0.513 (1.07)	-1.444* (0.86)				
informal	0.393 (0.24)	0.004 (0.10)	-0.050 (0.16)	0.228* (0.13)	0.442** (0.20)	0.012 (0.09)	0.130 (0.14)	0.306*** (0.11)
formal	0.092 (0.20)	0.336*** (0.10)	0.322** (0.16)	0.651*** (0.13)	0.002 (0.18)	0.384*** (0.09)	0.204 (0.14)	0.444*** (0.12)
ISO9	-0.055 (0.13)	-0.119 (0.09)	0.053 (0.16)	-0.358** (0.14)	-0.110 (0.12)	-0.112 (0.08)	0.047 (0.14)	-0.159 (0.13)
appraisals	-0.167 (0.13)	0.226** (0.11)	0.400** (0.17)	0.427** (0.17)	-0.303** (0.12)	0.299*** (0.10)	0.206 (0.15)	0.486*** (0.16)
team	-0.500 (0.36)	-0.561** (0.27)	-0.319 (0.31)	-0.333 (0.23)	-0.600* (0.33)	-0.502** (0.21)	-0.072 (0.27)	-0.180 (0.21)
self_tawo	0.535 (0.40)	0.442 (0.32)	1.411*** (0.42)	0.122 (0.40)	0.557 (0.37)	0.610** (0.25)	0.811** (0.36)	-0.138 (0.37)
self_grre	0.474 (0.54)	1.244** (0.48)	-0.431 (0.45)	-0.511 (0.34)	0.774 (0.48)	0.805** (0.39)	-0.243 (0.38)	-0.447 (0.30)
self	-0.800 (0.58)	-1.133** (0.52)	-0.035 (0.55)	0.480 (0.49)	-1.089** (0.53)	-0.955** (0.42)	-0.011 (0.47)	0.484 (0.45)
self_pay	0.034 (0.17)	-0.134 (0.20)	-0.214 (0.35)	-0.274 (0.27)	0.168 (0.15)	-0.285* (0.17)	0.428 (0.26)	-0.218 (0.25)
_cons1	10.851*** (3.55)	-0.966 (2.36)	-9.241 (7.43)	-9.208* (4.82)	4.108** (1.72)	-1.864* (1.09)	-6.587*** (1.52)	-4.802** (2.07)
_cons2	12.170*** (3.51)	-0.507 (2.36)	-7.795 (7.42)	-8.109* (4.83)	4.828*** (1.72)	-1.383 (1.08)	-5.185*** (1.50)	-3.753* (2.06)
_cons3	13.234*** (3.51)	0.086 (2.36)	-6.950 (7.42)	-7.353 (4.83)	5.712*** (1.72)	-0.727 (1.07)	-4.385*** (1.50)	-2.972 (2.06)
_cons4	14.589*** (3.52)	1.191 (2.36)	-5.885 (7.41)	-6.247 (4.82)	7.123*** (1.72)	0.353 (1.07)	-3.401** (1.50)	-1.935 (2.06)
_cons5	16.026*** (3.53)	2.340 (2.36)	-4.636 (7.41)	-4.962 (4.82)	8.634*** (1.73)	1.477 (1.07)	-2.184 (1.49)	-0.707 (2.06)
_cons6		3.542 (2.36)	-2.995 (7.41)	-3.520 (4.82)		2.633** (1.07)	-0.590 (1.49)	0.679 (2.06)
other conts	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
wrkpl-firm dum	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
7 sector dum	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
16org dum	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
R sq.								
N	487	793	379	458	609	930	443	513

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

^a lwage is computed from a wage equation that excludes controls for: gender, age, age squared, education dummies, North, Center, South, sector dummies, permanent job dummy, full time job dummy

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
	man2	ado2	skt2	map2	man3	ado3	skt3	map3
	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se
OC_strong								
lwage	0.406**	-0.078	-0.158	1.008***				
	(0.20)	(0.19)	(0.33)	(0.26)				
\hat{lwage}^a	0.149	0.237	-0.584	0.472				
	(0.49)	(0.44)	(1.05)	(0.84)				
informal	-0.195	-0.029	-0.001	0.200	-0.303	-0.071	0.078	0.234**
	(0.23)	(0.10)	(0.16)	(0.12)	(0.19)	(0.09)	(0.14)	(0.11)
formal	-0.099	0.226**	0.393**	0.454***	-0.092	0.281***	0.366***	0.309***
	(0.20)	(0.10)	(0.16)	(0.13)	(0.17)	(0.09)	(0.14)	(0.12)
ISO9	0.098	-0.059	-0.234	-0.097	0.016	-0.036	-0.112	0.124
	(0.13)	(0.09)	(0.16)	(0.14)	(0.11)	(0.08)	(0.14)	(0.12)
app	-0.260**	0.213*	0.434**	-0.052	-0.153	0.283***	0.211	0.059
	(0.13)	(0.11)	(0.17)	(0.17)	(0.11)	(0.10)	(0.15)	(0.16)
team	-0.108	-0.093	0.082	-0.548**	0.028	-0.178	-0.118	-0.344
	(0.35)	(0.27)	(0.31)	(0.23)	(0.32)	(0.21)	(0.27)	(0.21)
self_tawo	0.471	-0.121	0.748*	0.480	0.241	0.070	0.817**	0.174
	(0.39)	(0.32)	(0.41)	(0.39)	(0.35)	(0.25)	(0.36)	(0.36)
self_grre	1.708***	-0.885*	-0.265	-0.303	1.192**	-0.838**	0.164	-0.260
	(0.55)	(0.48)	(0.45)	(0.33)	(0.47)	(0.39)	(0.39)	(0.30)
self	-2.260***	0.992*	-0.325	0.370	-1.540***	0.782*	-0.739	0.400
	(0.59)	(0.51)	(0.54)	(0.48)	(0.52)	(0.42)	(0.48)	(0.44)
self_pay	0.016	-0.217	-0.329	-0.186	-0.011	-0.300*	-0.509*	-0.126
	(0.16)	(0.19)	(0.34)	(0.27)	(0.14)	(0.17)	(0.27)	(0.24)
_cons1	4.122	-1.540	-8.587	6.159	-1.696	-2.744**	-4.148	-0.858
	(3.37)	(2.33)	(7.37)	(4.74)	(1.66)	(1.07)	(3.44)	(2.02)
_cons2	5.956*	-0.733	-7.776	6.886	0.099	-1.928*	-3.348	-0.135
	(3.37)	(2.33)	(7.37)	(4.74)	(1.66)	(1.06)	(3.44)	(2.01)
_cons3	7.019**	0.326	-6.603	7.808*	1.073	-0.829	-2.108	0.706
	(3.37)	(2.32)	(7.37)	(4.74)	(1.66)	(1.06)	(3.44)	(2.01)
_cons4	8.195**	1.354	-5.557	8.845*	2.194	0.189	-1.080	1.701
	(3.38)	(2.32)	(7.37)	(4.74)	(1.66)	(1.06)	(3.44)	(2.01)
_cons5	9.165***	2.302	-4.269	10.072**	3.252**	1.093	0.115	2.927
	(3.38)	(2.33)	(7.36)	(4.75)	(1.66)	(1.06)	(3.44)	(2.02)
_cons6		3.310	-3.296	10.881**		2.175**	1.105	3.669*
		(2.33)	(7.37)	(4.75)		(1.06)	(3.44)	(2.02)
other conts	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
wrkpl-firm dum	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
7 sector dum	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
16org dum	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R sq.								
N	487	793	379	458	609	930	443	513

Notes: See Table 8

TABLE 10: Empirical classification workplace practices.

		COMMITMENT +	COMMITMENT -
WAGE	+	Individual appraisal schemes (w s *) Formal involvement (w s) Informal involvement (w,s) Autonomous teams(task and work) (w *)	Quality norms (w)
WAGE	-		Autonomous teams(responsibility and group) (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

TABLE 11: Empirical classification workplace practices by occupational groups.

Managers

		COMMITMENT +	COMMITMENT -
WAGE	+		Individual appraisal schemes (w *) Full autonomus teams (w, s)
WAGE	-	Informal involvement (w) Autonomous teams(responsibility and group) (s)	Teamworking (w)

Administrative

		COMMITMENT +	COMMITMENT -
WAGE	+	Individual appraisal schemes (w s *) Formal involvement (w s *) Autonomous teams(responsibility and group) (w)	Team performance related pay (w, s)
WAGE	-	Autonomous teams(task and work) (w) Autonomous teams(responsibility and group) (s)	Teamworking (w)

Skilled

		COMMITMENT +	COMMITMENT -
WAGE	+	Autonomous teams(task and work) (w s *)	
WAGE	-	Formal involvement (s *)	Team performance related pay (s)

Manuals

		COMMITMENT +	COMMITMENT -
WAGE	+	Individual appraisal schemes (w *) Informal involvement (w, s) Formal involvement (w, s)	
WAGE	-		

Notes: See notes Table 10

TABLE 12: List of controls included in regressions

\mathbf{z}	\mathbf{z}^w
female	
age	master/doctorate
age squared	first degree
experience	full time
tenure	
high school vocational	
high school technical	\mathbf{f} and \bar{q}
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	\mathbf{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 13: Correlation between workplace practices and job attributes

	fre_acc	fre_dis	fre_exh	effort	rep	var	sup	aut_time	aut_task	aut_proc	prob_un	easy
sugg2	-0.0321	0.0099	0.0738*	0.1344*	-0.1259*	0.2933*	-0.0786*	0.2498*	0.2987*	0.3189*	-0.1870*	0.07
meet	-0.0806*	-0.0622*	-0.0133	0.0899*	-0.0974*	0.2222*	0.0011	0.2048*	0.2308*	0.2299*	-0.1512*	0.03
sugg	-0.0838*	-0.0583*	-0.0048	0.0998*	-0.1046*	0.2305*	-0.0149	0.2210*	0.2476*	0.2478*	-0.1543*	0.05
app	-0.0087	-0.0209	0.0535*	0.1039*	-0.0560*	0.1476*	0.1224*	0.1207*	0.1129*	0.0967*	-0.1353*	-0.0
app_w	-0.0275	-0.0706*	0.0159	0.1079*	-0.0734*	0.1433*	0.0692*	0.0998*	0.1145*	0.0994*	-0.1139*	0.00
app_t	-0.0065	-0.0158	0.0338*	0.0574*	-0.0333*	0.1223*	0.0894*	0.0568*	0.0578*	0.0645*	-0.0640*	0.02
ISO9	0.0366*	0.0115	0.0032	0.0301	-0.0275	0.0795*	0.0021	0.0618*	0.0834*	0.0707*	-0.0611*	-0.0
team	0.0688*	0.0502*	0.0938*	0.1221*	0.0401*	0.0257	0.0552*	-0.0024	0.0123	-0.0055	-0.0348*	-0.0
self_task	0.0203	0.0097	0.0941*	0.1323*	-0.007	0.0662*	0.0153	0.0536*	0.0869*	0.0699*	-0.0207	0.04
self_group	0.0413*	0.0165	0.1051*	0.1196*	-0.0256	0.0287	0.0272	0.0267	0.0543*	0.0488*	0.0355*	0.04
self_work	0.0263	0.0109	0.0949*	0.1228*	-0.0135	0.0526*	0.0139	0.0380*	0.0708*	0.0598*	0.0081	0.03
self_resp	0.0595*	0.0204	0.0943*	0.1208*	0.0035	0.0282	0.0336*	0.023	0.0390*	0.0285	0.0167	0.01
self_pay	0.0196	-0.0175	0.0017	0.0539*	-0.0228	0.0873*	0.0340*	0.0515*	0.0628*	0.0506*	-0.1044*	0.00
QC	0.0083	0.024	0.0579*	0.0438*	-0.0467*	0.1070*	-0.0262	0.0791*	0.0898*	0.1023*	-0.0399*	0.02
sugg1	-0.0132	-0.0043	-0.0252	-0.0350*	0.0093	-0.0424*	0.0383*	-0.0599*	-0.0866*	-0.0963*	0.0396*	-0.0

Notes: *Significant at the 5% level