Variety of Performance Pay and Firm Performance: Effect of Financial Incentives on Worker Absence and Productivity

[*]Konstantinos Pouliakas and [**]Nikos Theodoropoulos

[*]*University of Aberdeen Business School and IZA*

[**]*University of Cyprus*

Abstract:

Using two cross-sections of a representative dataset of British establishments, the effect of various forms of performance-related pay (objective/subjective, individual/group/collective) on the absence rates and productivity of firms is investigated. Incentives that are tied to the subjective evaluation of individual merit are found to be significantly related to lower absenteeism, but have no effect on labour productivity. In contrast, PRP that is objectively conditioned on outputs has a beneficial effect on workers' productivity, albeit with no effect on absence rates. The findings therefore suggest that firms are likely to use objective and subjective PRP schemes in tandem in order to counteract any possible dysfunctional responses on behalf of their workforce (e.g. intertemporal allocation of effort). It is also found that public sector firms and those which have interdependent production should be wary of using PRP as an absence control tool.

Keywords: performance-related pay, incentives, absenteeism, productivity.

JEL Classification: J22, J33, C21

[Date of draft: 17/11/09]

[Please do not quote without the permission of the authors]

Acknowledgments

We thank the sponsors of the Workplace Employment Relations Survey (WERS) - Department for Business Enterprise and Regulatory Reform, ACAS, ESRC and PSI - and the UK Data Archive for access to the WERS data. We are also grateful to Professor T. Barmby, Dr. J. Skatun, Dr. A. Zangelidis, Dr.N.Ziros, Mr. G. Panos and participants at a seminar of the University of Aberdeen Business School for useful comments.

1. Introduction

The examination of the effect of monetary incentives on firm performance and worker productivity lies at the heart of the principles of economics. According to the principal-agent paradigm (Mirlees, 1976; Holmstrom and Milgrom, 1987), in the face of asymmetric information firms should tie the remuneration of employees to any verifiable (individual or collective) signal of performance. Based on such a theoretical prediction, a number of studies in recent years have shown that, when implemented "wisely", financial incentives have the potential to exert strong effects on indicators of firm performance, such as productivity (Lazear, 2000; Gielen *et al*., 2009) and worker absenteeism (Wilson and Peel, 1991; Brown *et al*., 1999). Nevertheless, it has also been argued that improperly designed monetary rewards are likely to spur dysfunctional behavioural responses on behalf of workers, especially by those who multitask (Holmstrom and Milgrom, 1991; Baker, 1992), are members of teams (Drago and Garvey, 1997) or are subjected to subjective evaluations by superiors (Prendergast, 1999). Such inefficient reactions are believed to underpin the weak (or even negative) association of PRP schemes with organisational performance found by some researchers (Marsden and French, 1998; Benson and Brown, 2000). Furthermore, many have stressed the free riding problems of "collective" incentive plans, such as profit-related pay and share ownership (Prendergast, 1999; Oyer, 2004).

The widespread employment in the UK of various types of financial incentives that complement the base pay of employees has been extensively noted (Pendleton *et al*, 2009). Such forms of performance-related pay (PRP) have typically taken the form of either individual or (increasingly) group incentives tied to objective or subjective evaluations of workers' effort (e.g. payment by results, merit pay), or of collective schemes based on more aggregate measures of firm profitability (bonuses, profit-sharing, share-ownership, deferred profit-sharing). However, due to data constraints many studies in the past have examined the impact of a catch-all measure of PRP on a single indicator of firm performance (Brown, 1992; Booth and Frank, 1999), or in specific industries (Wilson and Peel, 1991; Brown *et al*., 1999). This has resulted in the confounding of the effect of individual measures of PRP on firm performance in most

cases, and has prohibited the detection of the exact incentive or disincentive power of distinct types of PRP schemes on various aspects of firm management.

This paper attempts instead to examine the effect of a wide and heterogeneous set of PRP on two indicators of firm performance, namely the absence rate and labour productivity. It uses two cross-sections (1998 and 2004) of the Workplace Employee Relations Survey (WERS), which enable the simultaneous examination of the potentially distinct impact of a variety of PRP instruments on multiple indicators of firm profitability. The WERS is a representative dataset of British establishments that permits the consideration of an extensive amount of firm heterogeneity and the matching of employee-workplace information when necessary.

The study shows that, *ceteris paribus*, firms that employ PRP wage schemes that are tied primarily to the subjective assessment of individual merit are characterized by significantly lower absence rates. Interesting disparities in the intensity of the negative impact of PRP on absenteeism are nonetheless detected, which depend on the extent of public-private status, teamwork and other features of firm production technology.

Importantly, it is found that even though subjective merit schemes have a beneficial impact on worker absenteeism, this does not necessarily translate into higher labour productivity. The reverse holds true for performance-contingent rewards that are explicitly linked to employee outputs, and rely less heavily on the input of time. The findings of the paper therefore support the "informativeness principle" (Holmstrom, 1979), which suggests that firms are likely to benefit from tying employee remuneration to alternative signals of performance. Nevertheless, to the extent that work attendance is weakly related to the effort process, an inefficient resource allocation may result as subjective incentive plans are likely to provoke opportunistic behavior on behalf of the workforce.

The structure of the paper is as follows. *Section 2* reviews the hypothesized relation between performance pay and signals of firm performance, such as absenteeism and labour productivity. *Section 3* provides a theoretical framework that underpins the empirical estimation. *Section 4* describes the data and presents descriptive statistics. *Section 5* presents the empirical estimates of the PRP-absenteeism

relationship, and engages in a number of important robustness and sensitivity tests. *Section 6* investigates the effect of the varying PRP schemes on productivity. Finally, *Section 7* concludes with a discussion of the implications of the analysis for the design of optimal managerial policies by firms.

2. PRP and Firm Performance

2.1 Performance-related pay and productivity

The bulk of the empirical evidence verifies that PRP is associated with substantially positive productivity effects (Prendergast, 1999). For instance, Lazear (2000) reported a large increase of 44% in productivity in his case study of a firm that switched from fixed salaries to piece rates, attributing almost a third of this to selection effects. Similarly, Paarsch and Shearer (2000) find a 22% increase in productivity in a Canadian firm, while Gielen *et al.* (2009) use a panel of Dutch firms to control for potential sorting effects following the introduction of PRP. They find that accounting for fixed effects reduces the positive impact of PRP schemes on productivity from 12.4% to 9%.

Despite the above convincing evidence, it is worth pointing out that a number of studies have failed to find a significant association between compensation and performance (Marsden and French, 1998; Benson and Brown, 2000; Kleiner *et al.*, 2001). Most of the existing research has also focused on individual-based PRP, such as piece rates, thereby omitting any important interactions between varying types of PRP on productivity. Furthermore, with the exception of Kahn and Sherer (1990), there is a dearth of evidence on the effect of subjective PRP schemes on firm performance. Numerous authors, though, have emphasized how a potentially dysfunctional behaviour by workers is likely to arise as a response to (non-linear) compensation contracts. Asch (1990) and Oyer (1998), for example, have illustrated how intertemporal effort reallocation can occur between evaluation periods, while it has also been argued that subjective assessments give rise to the possibility of inefficient influence activities on behalf of employees who seek to curry favour with their superiors (Prendergast, 1999).

2.2 Performance-related pay and absenteeism

There is an increasing amount of interest in recent years on the economics of absenteeism, spurred by a growing awareness that the economic and social costs of the phenomenon are large.[i] Economists originally viewed the absence phenomenon as a manifestation of the labour supply decisions of employees (Allen, 1981; Leigh, 1985), paying greater attention to how hours of work adjust to wages, sick pay and to whether there is a "disciplining" impact of unemployment (Leigh, 1985; Barmby *et al.*, 1994; Arai and Thoursie, 2005; Askildsen *et al.* 2005). Recently, economists have turned their focus to the demand side of the market, and most notably to aspects of the labour contract that affect the cost of absence [e.g. "assembly line" technology (Coles and Tremble, 1996; Coles *et al.*, 2007), teamwork (Heywood and Jirjahn, 2004; Heywood *et al.*, 2008), and firm size (Barmby and Stephan, 2000)].

Despite the fact that Allen (1981) identified merit wage increases and attendance bonuses as two of the main "weapons" that firms can use to raise the penalty of absence to their employees, an examination of the impact of PRP schemes on absence rates has been relatively sparse in the literature. The PRP-absenteeism nexus may nonetheless offer useful insights into the inter-relationship between firm technologies, personnel policies and the behavioural reactions of workers.

According to the standard principal-agent model, it is predicted that the total number of working hours will rise as workers respond optimally to the receipt of PRP, thus bridging the gap between contractual and actual hours. The absence rate of firms offering performance-contingent pay is therefore likely to be lower than of those who pay fixed salaries, all other things equal. This conclusion is reinforced when one considers the implications of Lazear's (1986) model, which predicts that hard-working/diligent/healthier employees will self-select into PRP firms. Indeed, due to the greater effort and/or ability of those on incentive pay, a positive relationship between PRP and earnings (Seiler, 1984; Booth and Frank, 1999) has been reported in the literature. To the extent that the surplus earnings obtained via PRP is typically not covered by the sick pay arrangements of firms (Barmby *et al.*, 1991), workers will thus be incentivized to reduce the number of hours that they do not show up at work.

PRP schemes constitute part of a bundle of human resource management innovations that are associated with the so-called new high performance workplace practices (HPWPs). Indeed, it has been argued that most of the positive effect of PRP on productivity can be indirectly attributed to the fact that its introduction is often a facilitator of other wider management and organizational changes (OECD, 2005). Since HPWPs are believed to breed greater feelings of employee empowerment and job satisfaction (Bauer, 2004), absenteeism may be negatively related to PRP via such an avenue.

Despite the above conjectures, the provision of PRP is likely to result in an increase in absence for a number of reasons. PRP schemes may undermine valuable teamwork by fostering an individualistic organizational culture that is permeated by envy and free-riding (Milgrom and Roberts, 1992; Drago and Garvey, 1998). Furthermore, high-powered PRP systems are believed to heighten the power asymmetry between supervisors and the workforce (Kohn, 1993). Psychological concerns over a potential "crowding-out" of intrinsic motivation have been raised, with assumed adverse effects on productivity and turnout at work (Frey and Jegen, 2001). In general, the use of PRP has been associated with dissatisfaction with the amount of stress experienced by workers (Pouliakas and Theodossiou, 2009), an increased incidence of workplace injuries (Freeman and Kleiner, 2005) and low morale (Bewley, 1999).

From the conflicting hypotheses outlined above, it becomes evident that there is no consensus regarding the overall effect of PRP on absenteeism. Interestingly, the lack of agreement on the direction of the effect is also mirrored in the empirical evidence, with some studies confirming the beneficial impact of financial rewards on absence rates (Wagner and Bankshares, 1990; Wilson and Peel, 1991; Brown *et al*., 1999; Arthur and Jelf, 1999; Jacobson, 1989; Hassink and Koning, 2005), while others emphasizing that there are non-measurable effects (Wolf, 1974; Schnebller and Kopelman, 1983; Engellandt and Riphahn, 2004). The latter have typically focused on the significant hidden absenteeism costs associated with the use of performance pay, such as free-riding within teams, the time inconsistency problems arising when offering longer-term bonuses to temporary contract employees, and the perverse reactions of workers to capped bonuses that are stretched over extended qualifying time periods. For

instance, workers are found to 'backload' their absence days towards periods in which they anticipate to have met their targets (Frick *et al.*, 2008).

3. Theoretical Framework

Following Heywood and Jirjahn (2004), assume that N identical workers, who face a probability m ($0 < m < 1$) of being monitored by their firm, maximize their von Neumann-Morgenstern utility function by choosing their optimal absence level, $a \quad [0,1]$:

$$(1 \quad a)U(W) \quad a(1 \quad m)U(w_s) \quad amU(R) \quad C(1 \quad a) \tag{1}$$

where those who exert the contracted amount of effort receive an overall wage rate W, as opposed to workers on "authorized" absence who receive sick pay, w_s. R is the reservation wage, obtained when an "unauthorized" absentee worker is caught shirking, and $C(.)$ is a convex function that captures the disutility of effort ($C \quad 0, C \quad 0$).

To combat moral hazard, firms are likely to condition their employees' remuneration to signals of their effort, such as the amount of actual man-hours that they are present in the workplace. Substituting a simple linear PRP scheme, given by $W \quad \overline{w} \quad b(1 \quad a)$, into (1), and maximization of the latter with respect to a implies:

$$U(W) \quad (1 \quad a^*)U(W)b \quad (1 \quad m)U(\overline{w} \quad) \quad mU(R) \quad C(1 \quad a^*) \tag{2}$$

It is therefore evident that in equilibrium workers equalize the marginal cost of exerting effort to the marginal gain from not being absent. This is given by the difference between the utility of the overall wage (base salary and bonus pay) and the sum of reservation utility and sick pay, where the latter is a fraction, , only of the base component of income (i.e. $w_s \quad \overline{w}$). In this way the model captures an important element of the incentive power of PRP, namely that since bonus pay is typically not covered (or partly covered) by the sickness insurance arrangements of firms (Barmby *et al.*, 1991), the shadow price

of absence is attenuated by the offer of incentive pay that supplements the usual fixed salary of employees $[\frac{a^*}{b} \quad \frac{C \quad b}{U\ (W)}]$.

Firms recognize that the absence rate of employees diminishes with the payment of a bonus, and sets *b* so that the increased wage bill is balanced by the marginal gain of reduced absence. If otherwise identical firms produce output *Q*, then expected profit is given by:

$$PQ(1 \quad a^*) \quad [\overline{w} \quad b(1 \quad a^*)](1 \quad a^*)N \quad \overline{w} \ a^*(1 \quad m)N \quad Z(m)N \qquad (3)$$

where *P* is the final product price, *N* is the total number of workers, while firms incur a cost of monitoring *Z(m)* ($Z \quad 0, Z \quad 0$). In the short-run, where firms can only alter the intensity of PRP rather than the number of employees, maximization of the expected profit yields:

$$\frac{}{b} \quad PQ\frac{a^*}{b} \quad [\overline{w} \quad \overline{w} \quad (1 \quad m)]\frac{a^*}{b}N] \quad (1 \quad a^*)^2 N \quad 2b(1 \quad a^*)\frac{a^*}{b}N \qquad (4)$$

So in equilibrium the firm selects *b* so that the increase in expected revenue plus the gain in reduced sick pay associated with reduced absence is equal to the marginal cost of providing PRP. Comparing (4) to the optimal profit condition of firms that pay a non-variable salary, it becomes evident that PRP firms will only be willing to sustain the higher marginal wage costs in equilibrium if $a^*_{PRP} \quad a^*_{NoPRP}$.

4. Data and Descriptive Statistics

Our data are derived from the 1998 and 2004 Cross-Section Workplace Employee Relations Survey (WERS). These are the fourth and fifth instalments of a Government funded series of surveys conducted at British workplaces. The previous surveys were conducted in 1980, 1984 and 1990.[ii]

The sample of workplaces was randomly drawn from the Interdepartmental Business Register (IDBR). This is maintained by the Office for National Statistics (ONS) and is considered to be the highest quality sampling frame of workplaces available in the United Kingdom. The sample is stratified

by workplace size and industry and larger workplaces and some industries are overrepresented (Chaplin *et al.*, 2005). A workplace is defined as the activities of a single employer at a single set of premises.

The survey comprises three main sections; the 'Management Questionnaire' (face-to-face interviews with senior managers with day-to-day responsibility for employee relations), the 'Worker Representative Questionnaire' and the 'Employee Questionnaire'. The survey population for the Management Questionnaire is all British workplaces barring those in agriculture, hunting and forestry, fishing, mining and quarrying, private households with employed persons, and extra-territorial organisations.

The response rate in the 1998 (2004) Management Questionnaire was 80% (64%).[iii] Changes in the nature of interest in employment relations led pe mp st livingi rpd ig for inte

A new element of information in the 2004 WERS was the incorporation of the Financial Performance Questionnaire which collected data on objective measures of establishments' overall costs, revenues and employment. Responses from a subset of 1070 UK firms were collected, based on those who gave their consent to matching their individual establishment information with the Annual Business Inquiry (ABI) survey (Forth and McNabb, 2008). We have therefore used this data in order to construct two alternative measures of labour productivity namely the *value-added per worker* and *profit per worker*.

Managers were also asked questions regarding the provision of different forms of variable pay schemes in their workplace. Amongst these options the offer of PRP is explicitly identified, though it is specified in a different manner between the 1998 (individual or group PRP) and 2004 waves (payment by results and merit pay). Table A1 in the Appendix provides a detailed set of definitions and descriptive statistics for the contingent pay variables of interest. It is clear that a sizeable part of the 1998 and 2004 samples contains firms that offer PRP of various types, such as individual or group PRP (28.1%) in the 1998 wave, and payment by results (32.8%) or merit pay (23.7%) in 2004.

To acquire an initial picture of the relationship between the absence rate, productivity and the various mechanisms of incentive pay, Table 1 provides some simple cross-tabulations of these variables. The table suggests that all PRP schemes are associated with lower absence rates, though only payment by results is associated with a substantially higher mean value of (log) labour productivity. Overall, these results tentatively appear to be consistent with the theoretical prediction that firms which offer financial incentives are expected to have lower absence rates and higher productivity, though they also highlight an important discrepancy with respect to the distinct impact of either objective or subjective types of PRP.

[INSERT TABLE 1 HERE]

In order to detect the *ceteris paribus* relation between financial incentives and the absence rate, a number of important determinants of the latter are taken into account. As identified in the relevant literature (e.g. Heywood *et al*., 2008), these include variables describing the demographic composition of

the workforce (e.g. proportions of employees by gender, age, ethnicity and disability status), working time schedules (e.g. whether employees engage in shift work, entitlement to the option of an annualized hours scheme, share of workers on part-time contracts), firm identity (establishment/organization size, years of operation), the nature of production (e.g. public-private status, industrial groupings, shares of occupational groups, "just-in-time" technology, degree of teamwork, degree of monitoring), contractual flexibility (proportion of employees on fixed term contracts and temporary agency employees), economic incentives (share of employees within various earnings bands, unemployment rate by travel to work area, provision of sick pay in excess of statutory requirements), the quality of industrial relations (trade union density, presence of joint consultative committees/health and safety committees/briefing groups, quality of relations between management and employees) and regional dummies.

Relative to the absence regressions, a parsimonious control set is used instead for the productivity estimation, including variables such as size of the firm, size of the organization, nature of the production (industry dummies), occupational and demographic composition of the workforce, if the establishment offers briefing groups, teamwork, age of the establishment, ownership of the establishment, training, and the log of capital/labour ratio.

Summary statistics of all variables of interest are presented in Table A2 in the Appendix.

5. Effect of PRP on Absence Rates

5.1 Main empirical findings

Our absence equation of interest is as follows:

$$Absence_j \quad _0 \quad _1 PRP_j \quad _2 VP_j \quad _3 W_j \quad _4 I_j \quad _5 R_j \quad _j \qquad (5)$$

The dependent variable $Absence_j$ indicates the absence rate of establishment j, where $j = 1,\ldots,N$, PRP_j captures the offer of PRP schemes within the establishments, VP_j is a vector of other types of variable pay schemes offered by firms (e.g. profit pay, share ownership, cash bonuses, deferred profit plans), W_j

summarizes various workplace characteristics, I_j captures industry fixed effects, R_j stands for region fixed effects and $_j$ is the establishment-specific error term. As is standard, unbiased ordinary least squares (OLS) coefficients of the effect of PRP on *Absence* will be obtained provided that $E(\ _j \mid PRP_j)\ \ 0$. OLS may nevertheless not be appropriate given that $Absence_j$ is a fractional response variable, in which case Papke and Wooldridge (1996) suggest that a logistic model may be more suitable. However, in the empirical estimates discussed below, no significant differences are detected between the estimates of the logistic and OLS models.[vi]

For this reason, Table 2 presents the estimated OLS effect of the main PRP and other variable pay variables on the absenteeism of British establishments for both years of data.[vii] It is evident that after holding constant various other types of financial incentives that firms employ, PRP emerges as a scheme that exerts an independent and significant negative effect on the mean absence records of British establishments.

Specifically, column 1 in the top panel of Table 2 suggests that, *ceteris paribus*, firms which offer "*individual or group performance-related schemes*" in the 1998 dataset have a 0.6 percentage point lower absence rate compared to firms without such schemes. For a mean absence rate of 3.8 percentage points (sample absence mean in 1998), the true effect is therefore equal to -15.8 [(-0.6/3.8)*100]} percentage points, which is a considerable amount. A significant negative effect on absenteeism of a slightly lower magnitude (-13.2%) is also found with respect to the provision of "*other cash bonuses*" by firms. In contrast, no evidence of a link between absence and various forms of collective PRP schemes (profit pay, share ownership) is discovered.

Column 2 in the upper panel of Table 2 presents similar results from the 2004 data, although the PRP variable is defined differently. The results offer further support to the argument that linking employees' pay to performance is likely to have an effect on their absence behavior, with the magnitude of the effect corresponding closely to that of the 1998 sample. Specifically, the overall PRP variable is broken down into its two constituent parts, namely *payment by results* and *merit pay*. Furthermore, since merit pay is

only relevant for non-managerial occupational groups, the sample is restricted accordingly by excluding the subset of firms that offer PRP only to managerial employees (i.e. 115 establishments). Interestingly, it is found that in the 2004 data PRP exerts a significant negative effect on absenteeism only when rewards are made contingent on the subjective evaluation of employees' merit.

In particular, the regression coefficient suggests that establishments which offer merit pay have a 0.7 percentage point lower number of lost workdays than establishments which do not offer such compensation. For a mean absence rate of 4.2 percentage points (sample absence mean in 2004), this translates to a decrease of 16.7 [(-0.7/4.2)*100)] percentage points in the absence rate.

[INSERT TABLE 2 HERE]

Delving more into the nature of the various methods of incentive pay that modern competitive organizations employ, we take into consideration that there are potentially significant interactions between them. In the spirit of Pendleton *et al*. (2009), we explore the possibility that establishments make use of more than one type of variable pay and also that they may utilize alternative configurations of the different reward mechanisms at their disposal. For instance, firms may use merit pay to target individual productivity, whilst offering profit-related pay to strengthen the commitment of the workforce towards the organization's goals.

The estimated effects where the number of different variable pay schemes a given establishment may have on offer is measured are presented at the bottom of Table 2. It is evident in both waves that the higher the number of such schemes used by an establishment, the greater is the effect on its absence rate. The 1998 results indicate that the effect of having five PRP schemes is more than double the effect of having only one such scheme in place. Having five PRP schemes reduces the establishment absence rate by as much as 39.5 percentage points. The equivalent finding from the 2004 wave (three schemes) indicates that firms which employ multiple forms of non-standard wage schemes are likely to benefit from a lower amount of lost workdays by around 28.6 percentage points.

The extensive information available in the WERS data permits the further investigation of the impact of the *coverage* of PRP schemes on absenteeism. Specifically, managers were asked to reply to the question: "*What proportion of non-managerial employees at this workplace have received performance related pay in the last 12 months?*"[viii] The available responses are then grouped into three broad categories: "1-39%", "40-79%" and "80-100%", the omitted category being "None". The results (see Table 3), especially those of the 2004 wave, are indicative of the fact that firms that have more extensive coverage of PRP are likely to enjoy lower absence rates.

Finally, it is possible to scrutinize further what is the *measure of performance* which is most likely to trigger the significant negative impact of PRP on absenteeism. In particular, managers were asked to unveil whether the amount of PRP that their employees receive is determined on the basis of (*i*) "Individual performance/output"; (*ii*) "Group or team performance/output"; (*iii*) "Workplace based measures"; (*iv*) "Organization based measures", or (*v*) "Other measures".[ix] The 1998 results suggest that individual performance output and workplace-43(R)67(P)-43( )-149(s)-1[(In)33( )-114056%8 0 1 328.9 533.R503ke

priori hypothesis is confirmed in Table 4, as it is shown that the positive worker attendance effect related to the use of individual or merit PRP is only relevant for *private sector* firms. In contrast, deferred profit sharing plans are found to be a significant absence control tool for companies in the *public sector*. This is reasonable, given that the service-incremental salary scales and long-term job attachments that typically characterize state employees are necessary conditions for tilted compensation profiles to provide effective incentives.

[INSERT TABLE 4 HERE]

5.3 Interaction with teamwork

While the effectiveness of compensation schemes that rely heavily on teamwork hinges critically on the 'silent' constraining effect of peer pressure (Kandel and Lazear, 1992), the evidence of Frick *et al*. (2008) and Dale-Olsen (2009) suggests that teamwork may be combined with PRP to significantly raise absence rates. This is attributed to the fact that since team production units can cover for absent colleagues without undue disruption in output, workers who anticipate meeting their production targets are likely to free-ride by taking unauthorized absence.

It is therefore of interest to examine closely the interrelationship between teamwork, the provision of performance pay and absenteeism. In fact, the positive interaction term shown in Table 5 suggests that the sensitivity of absence to PRP is muted in firms with interdependent production. This provides evidence in favour of the opportunistic conduct of workers hypothesis, and implies that firms that are dependent on the productive collaborations of workers should exercise caution when deciding whether to implement a PRP scheme.

[INSERT TABLE 5 HERE]

5.4 Other interaction effects and robustness checks

A number of further sensitivity tests have been carried out in order to verify that the negative effect of PRP is robust, as shown in Table 5.[xi]

First, given that reliable estimation of an absence equation hinges critically on correctly identified variation in earnings and working hours, the estimation has been replicated by matching to the establishments an average measure of hours and earnings from the Employee Questionnaire. The significant effect of the PRP variables in both waves remains unaffected. It is also found that the impact of PRP is more (less) pronounced in firms which have a greater share of lower (higher)-paid workers, presumably due to the greater incentive power that an additional unit of PRP is likely to have on workers on the lower rungs of the income distribution. Moreover, the positive interaction effect between PRP, the duration of hours and the share of employees working overtime signifies a diminishing impact of PRP on absenteeism once the gap between contractual and actual working hours is narrowed.

As the effect of PRP may be confounded by the fact it usually acts as a lever for organizational change, it has been interacted with a dummy variable identifying firms that did not introduce important organizational changes in recent years.[xii] It is found in the 2004 data that the negative effect of PRP on absence is diminished for such establishments, which implies that the effect is conditional on PRP acting as a stimulus for the introduction of broader managerial changes.

Despite the fact that in recent years PRP has generally been introduced alongside other innovative HR practices that have emphasized the promotion of employee empowerment, no significant interaction between PRP and the existence of briefing groups and joint consultative committees is detected. However, in the 2004 data the negative effect of merit pay on absenteeism is moderated within firms that operate so-called quality circles. This is likely to reflect that problem-solving groups may comprise a performance-enhancement practice used by firms that acts as a substitute to PRP.

The incidence of absence in larger-sized firms is typically higher due to the fact that it is more difficult to monitor the behavior of workers and because of the "buffer stock" of available employees that such firms can afford to employ (Barmby and Stephan, 2000). The interaction between PRP and the size of the firm, however, indicates that it is smaller-sized establishments that are more likely to benefit from using PRP as an absence control instrument, presumably because of their lower productivity (Gielen *et al.*, 2009).

5.5 Endogeneity of PRP and absence

Despite the robustness of the negative PRP coefficient in the absence regression, the possibility that endogeneity and reverse causation underlie the significant correlation should be recognized. An important criticism regarding the detection of the 'causal' effect of PRP on firm performance is that cross-section estimates are likely to mask unobserved firm heterogeneity (e.g. propensity of employees to be ill) and inherent differences in the *trend* of productivity, which are correlated with the introduction of PRP contracts (Prendergast, 1999, p. 43). For instance, it is probable that lower absence rates may be unrelated to the choice of PRP by firms *per se*, and reflect, instead, a historically rising trend of productivity that is correlated with the adoption and implementation of costly variable pay schemes. Another important avenue giving rise to a negative correlation between PRP and absenteeism is via the mediating effect of another potentially endogenous variable, namely firm monitoring. Specifically, firms which face a higher rate of absenteeism are more likely to utilize extensive monitoring rather than PRP, as a means of counteracting non-attendance.

In order to address the aforementioned concerns, the specification has been initially augmented with additional important control variables, as shown in Table 6. First, given that the dependent variable refers to workdays lost through both *employee sickness* or *absence*, two additional regressors have been added to the regression that capture the proportion of employees that have sustained certain types of injuries (e.g. bone fracture, amputation, loss of sight etc.) or illnesses/disabilities/other physical problems (e.g. skin or respiration problems, stress, musculoskeletal disorders) during working hours in the previous year of the survey. Since the impact of PRP remains unaffected, this constitutes evidence that the beneficial attendance effect of PRP is not likely to have arisen because of sorting of healthier workers into firms that offer PRP.

Extra controls capturing the managers' subjective (1998 and 2004) and objective (2004) evaluation of current labour productivity within the establishment have also been considered (see Table 6). In addition, the 1998 dataset contains the managers' subjective evaluation of whether labour productivity in their

establishment has gone up or down compared with five years ago. In all cases no evidence is found that would imply that the effect of PRP on absenteeism is somehow modified by the fact that firm productivity or its trend is likely to be correlated with both the adoption of PRP schemes and lower absence rates.

The significant negative effect of PRP on absenteeism persists even after the inclusion of an ordinal monitoring variable in the main regression as a further exogenous variable (see Table 6). In addition, using the methodology of Smith and Blundell (1986) and Rivers and Vuong (1988) it is tested whether there is any correlation between the errors of the structural equation of absence, $_j$, and those of two reduced-form regression equations, one for the provision of PRP (probit) and another for the existence of monitoring in the workplace (ordered probit). As is common, the above procedure requires the inclusion of the (generalized) residuals (Gourieroux *et al.*, 1987) of the reduced form equations as additional covariates in an auxiliary absence equation. The presence of endogeneity in the OLS coefficients of *PRP* and monitoring is then detected via a test of the joint significance of the coefficients of the two residual terms. Identification is achieved via inclusion in each reduced form equation of a set of exogenous variables that are strongly related to either of the two endogenous terms, but is uncorrelated with the absence rate.

Due to space limitations, a detailed account of this testing procedure is provided in the Appendix. It is emphasized in column (4) of Table 6, though, that the residuals obtained from the PRP and monitoring reduced form equations are insignificant variables when inserted into the main absence equation as extraneous controls. A test of their joint significance also fails to reject the null hypothesis of exogeneity of the two variables [F(2,2087) = 0.68 (1998); F(2,1432) = 0.25 (2004)] .

Despite evidence against the hypothesis of endogeneity, a "treatment effects" model has nonetheless been estimated that takes into account the binary nature of the endogenous PRP variable. The same set of instruments as described in the Appendix has been used. In both waves, the statistically significant negative effects of the PRP variables on absenteeism are found to persist, while the magnitude of the coefficients almost doubles (see column (5) of Table 6).

[INSERT TABLE 6 HERE]

6. Effect of PRP on Productivity

Given the findings that individual-based, subjective PRP schemes are likely to have a beneficial effect on lost man-hours, this section estimates the effect of the varying types of PRP measures on labour productivity. As noted before, although the absence behavior of workers may constitute an informative signal of employee effort to firms, tying the pay of employees to such a measure will only be optimal if physical presence in the job translates into higher productivity.[xiii] If this condition is not satisfied, this is indicative of opportunistic or multitasking behavior on behalf of employees. Of course, a firm that is concerned with various indicators of performance, such as absenteeism and productivity, may nonetheless decide to employ both objective and subjective schemes of performance-contingent pay in equilibrium, albeit with a different intensity of either of the two.

Two objective measures of worker productivity are employed, namely *value added per worker* and *profit per worker*, while the analysis is also replicated using a subjective measure of productivity as reported by the managers for robustness purposes (Forth and McNabb, 2008). The estimated relationship of interest is as follows:

$$\ln(\text{Productivity})_j \quad _0 \quad _1 PRP_j \quad _2 VP_j \quad _3 \quad _j \quad u \qquad (6)$$

where Ψ captures various determinants of firm productivity, as described in Section 4.

Table 7 indicates that there is a significant discrepancy with respect to the effectiveness of various types of PRP on absenteeism and labour productivity. Financial rewards that are tied to the production of output (rather than to the input of time), such as payment by results, are shown to have a significant positive effect on labour productivity, even though no corresponding impact is detected in terms of absenteeism (as identified in Table 2). In fact, the positive impact of payment by results on labour productivity is found to range from 6.2% (subjective measure) to as much as 10.7% (profit per worker). In contrast, merit pay, although shown to reduce rates of absence (Table 2), has no analogous impact on the productivity of workers (neither by itself nor when interacted with the payment by results variable).

[INSERT TABLE 7 HERE]

This finding has important policy implications for firms and indicates that organizations are likely to employ a multitude of objective and subjective incentive mechanisms in order to address a different set of problems associated with their performance. For instance, it is likely that the offer of payment by results may offer ample scope to workers to engage in the opportunistic intertemporal allocation of effort as identified in the multitasking literature, whereby workers 'backload' their absence days once a given set of targets are achieved. The use of subjective performance evaluations is then likely to be used to combat such phenomena, to the extent, of course, that a lower absence rate is beneficial to the overall performance of a company. This might be true as lower absenteeism might imply efficiency gains that are not necessarily related to a higher value-added per worker (e.g. a lower burden of sickness insurance costs, positive effect on work climate, avoidance of bottlenecks in team production).

7. Conclusion

Using two cross-sections (1998 and 2004) of a representative dataset of British establishments, the effect of various forms of incentive pay (e.g. PRP, profit-sharing, share ownership, cash bonuses) on the absence rates and productivity of firms is investigated. Incentives that are tightly linked to the subjective evaluation of individual merit are found to be significantly related to lower absenteeism, though not to higher labour productivity. The reverse effect is found for those PRP schemes that are conditioned on more quantifiable outputs, rather than to the input of time. The findings of the paper therefore explain why firms are likely to benefit from tying employee pay to both objective and subjective signals of performance. Indeed, given the well-known ingenuity of workers who are likely to game any compensation plan to their advantage, firms which will only rely on subjective evaluations of performance are likely to find that the physical attendance of the workforce does not necessarily translate into higher output per worker, whereas paying workers on the basis of their physical output is likely to give rise to an intertemporal allocation of effort.

The conclusion that some types of PRP are associated with lower absence rates or higher productivity, however, does not imply that all firms should employ PRP as an absence control or productivity-enhancement tool. Whether PRP is a suitable compensation strategy ultimately depends on the production technology of enterprises. For example, it was shown in the paper that the negative effect of PRP on absence is only found in private sector firms, and those that do not rely heavily on teamwork. Public sector firms and those which have interdependent production should therefore be wary of using PRP to combat absenteeism.

References

Airey, C., Hales, J., Hamilton, R., McKernan, A. and Purdon, S. (1999) '*The Workplace Employee Relations Survey, 1998 (WERS): 1998 Technical Report (Cross Section and Panel Samples)* London: Social and Community Planning Research.

Allen, S.G. (1981) 'An empirical model of work attendance' *Review of Economics and Statistics*, 63, 77-87.

Arai, M. and Thoursie, P.S. (2004) 'Incentives and selection in cyclical absenteeism' *Labour Economics*, 12, 269-80.

Arthur, J.B. and Jelf, G.S. (1999) 'The effects of gainsharing on grievance rates and absenteeism over time' *Journal of Labor Research*, 20, 133-45.

Askildsen, J.E., Bratberg, E., Nilsen, Ø.A., (2002) 'Unemployment, labour force composition and sickness absence: a panel data study', IZA Discussion Paper, No. 466, Bonn.

Asch, B. (1990) 'Do Inecntives Matter? The Case of Navy Recruiters' *Industrial and Labor Relations Review*, 43, 89-107.

Baker, G. (1992) 'Incentive Contracts and Performance Measurement' *Journal of Political Economy*, 100, 598-614.

Barmby, T., Orme, C., and Treble, J.G. (1991) 'Worker absenteeism: an analysis using microdata' *Economic Journal*, 101, 214–29.

Barmby, T. Sessions, J.G. and Tremble., J.G. (1994) 'Absenteeism, efficiency wages and shirking' *Scandinavian Journal of Economics*, 96, 561-66.

Barmby, T. and Stephan, G. (2000) 'Worker absenteeism: why firm size may matter' *Manchester School*, 68, 568-77.

Bauer T.K., (2004) 'High performance workplace practices and job satisfaction: evidence from Europe' IZA Discussion Paper, No. 1265, Bonn.

Benson, J. and Brown, M. (2000) 'Individual performance related pay and enterprise outcomes in Australia and Japan', *International Journal of Employment Studies*, 8, 1-26.

Bewley, T.F. (1999) 'Why Wages Don't Fall During a Recession', Harvard University Press: Cambridge, MA.

Booth, A. and Frank. J. (1999) 'Earnings, productivity, and performance-related pay' *Journal of Labor Economics*, 17, 447-63.

Brown, C. (1992) 'Wage levels and methods of pay' *Rand Journal of Economics*, 23, 366-75.

Brown, S. and Sessions, J. (1996) 'The economics of absence: theory and evidence' *Journal of Economic Surveys*, 10, 23–53.

Brown, S., Fakhfakh, F. and Sessions, J.G. (1999) 'Absenteeism and employee sharing: an empirical analysis based on French panel data, 1981- 1991' *Industrial and Labor Relations Review*, 52, 234-51.

Pendleton, A., Whitfield, K. and Bryson, A. (2009) 'The changing use of contingent pay in the modern British workplace' , Chapter 11 in W. Brown, A. Bryson, J. Forth and K. Whitfield (eds.) The Evolution of the Modern Workplace, pp. 256-284, Cambridge University Press

Burgess, S. and Rato, M. (2003) 'The role of incentives in the public sector: issues and evidence' *Oxford Review of Economic Policy*, 19, 285-300.

Chaplin, J., Mangla, J., Purdon, S. and Airey, C. (2005) 'The Workplace Employment Relations Survey 2004 (WERS 2004) Technical Report (Cross Section and Panel Surveys)', London: National Centre for Social Research.

Coles, M., Lanfranchi, J., Skalli, A., and Treble, J.G. (2007) 'Pay, technology and the cost of worker absence' *Economic Inquiry*, 45, 268–85.

Coles, M.G. and Tremble, J.G. (1996) 'Calculating the cost of absenteeism' *Labour Economics* 3, 169-88.

Dale-Olsen, H. (2009) 'Sickness absence, performance pay and teams' Working Paper, Institute for Social Research, Oslo.

Dew, K., Keefe, V. and Small, K. (2005), "Choosing to work when sick: workplace presenteeism", *Social Science and Medicine*, 60, 2273-2282.

Dixit, A. (2002), 'Incentives and organizations in the public sector: an interpretative review' *Journal of Human Resources*, 37, 696-727.

Drago, R. and Garvey, G. (1998) 'Incentives for helping on the job: theory and evidence' *Journal of Labor Economics*, 16, 1-25.

Engellandt, A. and Riphahn, R.T. (2009) 'Incentive effects of bonus payments: evidence from an international company' *Industrial and Labor Relations Review, forthcoming*.

Ercolani, M.G. (2009) 'Socio-economic patterns in UK employees' sickness absence: 1984-2008', working paper Birmingham University Department of Economics.

Forth, J., and McNabb, R. (2008) 'Workplace performance: a comparison of subjective and objective measures in the 2004 Workplace Employment Relations Survey' *Industrial Relations Journal*, 39, pp. 104-23.

Freeman, R.B. and Kleiner, M.M. (2005) 'The last American shoe manufactures: decreasing productivity and increasing profits in the shift to continuous flow production' *Industrial Relations*, 44, 307-30.

Frey, B. S. and Jegen, R. (2001) 'Motivation crowding theory: A survey of empirical evidence' *Journal of Economic Surveys*, 15, 589-611.

Frick, B., Gotzen, U. and Simmons, R. (2008) 'The hidden costs of high performance work practices: evidence from a large German steel company', mimeo.

Gielen, A.C., Kerkhofs, M.J.M, and van Ours, J.C. (2009) 'Performance related pay and labor productivity' *Journal of Population Economics, forthcoming*.

Gourieroux, C., A. Monfort, E. Renault and A. Trognon. (1987) 'Generalised residuals' *Journal of Econometrics*, 34, 5-32.

Hassink, W. and Koning, P. (2005) 'Do financial bonuses to employees reduce their absenteeism: outcome of a Lottery', IZA Discussion Paper No. 1644, Bonn.

Heywood, J.S. and Jirjahn, U. (2004) 'Teams, teamwork and absence' *Scandinavian Journal of Economics*, 106, 765-82.

Heywood, J.S., Jirjahn, U. and Wei, X. (2008) 'Teamwork, monitoring and absence' *Journal of Economic Behavior and Organization*, 68, 676-90.

Holmström, B. (1979), 'Moral hazard and observability' *Bell Journal of Economics*, 9, 74-91.

Holmström, B. and Milgrom, P. (1991) 'Multitask principal-agent analyses: incentive contracts, asset ownership, and job design' *Journal of Law, Economics, and Organization*, 7, 24-52.

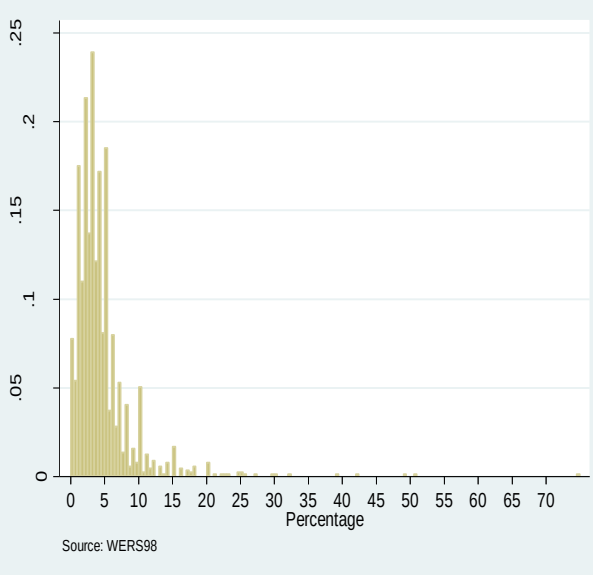
Holmström,B. and Milgrom, P. (1987) 'Aggregation and linearity in the provision of intertemporal incentives' *Econometrica*, 55, 303-28.

Jacobson, S.L. (1989) 'The effects of pay incentives on teacher absenteeism' *Journal of Human Resources*, 24, 280-86.

Kahn, L. and Sherer, P. (1990) 'Contingent Pay and Managerial Performance', *Industrial and Labor Relations Review,* 43, 107-121.

Kandel and Lazear (1992) 'Peer pressure and partnerships' *Journal of Political Economy*, 100, 801-17.
Kersley, B. Alpin, K. Forth, J. Bryson, A. Bewley, H. Dix, G. Oxenbridge, S. (2006) '*Inside the* . Routledge.
Kleiner, M., Helper, S. and Ren, Y. (2001), 'From piece rates to group incentives: Can the company and its employees gain?', *Industrial Relations Research Association Proceedings,* 183-191.
Kohn, A. (1993), *Punished By Rewards: The Trouble with Gold Stars, Incentive Plans, A's, Praise, and Other Bribes*, Mariner Books.
Lazear, E.P. (1986) 'Salaries and piece rates' *Journal of Business*, 59, 405-31.
Lazear, E.P. (2000) 'Performance pay and productivity' *American Economic Review*, 90, 1346-361.
Leigh, J.P. (1985) 'The effects of unemployment and the business cycle on absenteeism' *Journal of Economics and Business*, 37, 159–70.
Marsden, D. and French, S. (1998) 'What a performance: performance related pay in the public services' Centre for Economic Performance Special Report, July, London School of Economics: London.
Milgrom, P. and Roberts, J. (1992) *Economics, Organizations and Management*: Prentice-Hall: NY.
Mirlees, J. (1976) 'The optimal structure of incentives and authority within an organization' *Bell Journal of Economics*, 7, 105-31.
OECD (2005) 'Performance-related pay Policies for Government Employees', www.oecd.org
Oyer, P. (1998) 'Fiscal year ends and non-linear incentive contracts: the effect on business seasonality' *Quarterly Journal of Economics*, 113, 149-85.
Oyer, P. (2004) 'Why do firms use incentives that have no incentive effects?' *Journal of Finance*, 59, 1619-649.
Paarsch, H., and Shearer, B. (2000) 'Piece rates, fixed wages, and incentive effects: statistical evidence from payroll records' *International Economic Review*, 41, 59-92.
Papke, L.E., and Wooldridge, J.M., (1996) 'Econometric methods for fractional response variables with an application to 401(k) plan participation rates' *Journal of Applied Econometrics*, 11, 619-32.
Pendleton, A., Whitfield, K. and Bryson, A. (2009) 'The changing use of contingent pay in the modern British workplace' , Chapter 11 in W. Brown, A. Bryson, J. Forth and K. Whitfield (eds.) *The Evolution of the Modern Workplace*, pp. 256-284, Cambridge University Press.
Pouliakas, K. and Theodossiou, I. (2009) 'Confronting objections to performance pay: The impact of individual and gain-sharing incentives on job satisfaction' *Scottish Journal of Political Economy*, 56(5), 662-684.
Prendergast, C. (1999) 'The provision of incentives in firms' *Journal of Economic Literature*, 37, 7-63.
Prendergast, C. (2008) 'Intrinsic motivation and incentives' *American Economic Review*, 98, 201-05.
Rivers, D. and Vuong, Q. (1988) 'Limited information estimators and exogeneity tests for simultaneous probit models' *Journal of Econometrics*, 39, 347-66.
Schneblle, G.O., and Kopelman, R.E. (1983) 'Using incentives to increase absenteeism: a plan that backfired' *Compensation Benefits Review*, 15, 40-5.
Seiler, E. (1984), 'Piece rate vs. time-rate: the effect of incentives on earnings' *Review of Economics and Statistics*, 66, 363-76.
Smith, R. and Blundell, R. (1986) 'An exogeneity test for a simultaneous equation tobit model with an application to labour supply' *Econometrica*, 54, 679-85.
Wagner, T.J. and Bankshares, D. (1990) 'A meta-analytic review of absenteeism control methods' *Applied HRM Review*, 1, 19-22.
Wilson, N. and Peel, M.J. (1991) 'The impact on absenteeism and quits of profit-sharing and other forms of employee participation' *Industrial and Labor Relations Review*, 3, 454-68.
Wolf, C.H. (1974) 'The effect of monetary incentives on absenteeism: a case study' *USDA Forest Service Research Paper*, NE-291.
Wooldridge, J.M. (2002) '*Econometric Analysis of Cross Section and Panel Data* , MIT Press: Cambridge, Massachusetts.

Figure 1. Distribution of Workplace Absence Rate in the 1998 WERS



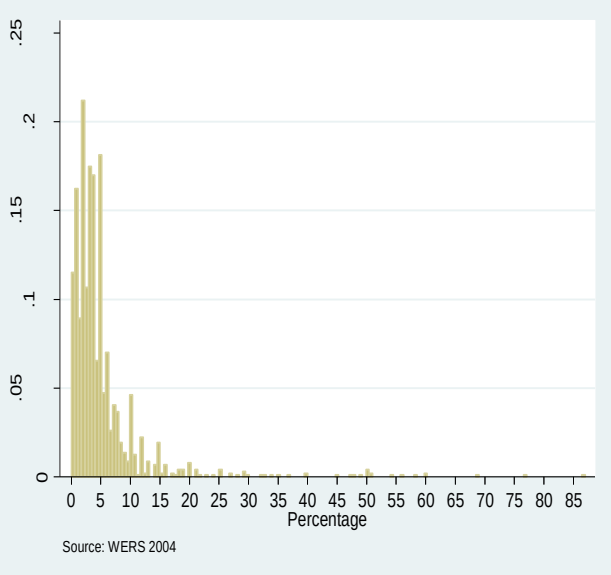


Table 1. Work Days Lost Through Employee Sickness or Absence by Type of Variable Pay Scheme

	1998		2004			
	Yes	No	Yes		No	
	Absence	*Absence*	*Absence*	*Productivity*	*Absence*	*Productivity*
PRP						
Individual or group PRP	0.034 (0.029)	0.040 (0.052)	---	---	---	---
Payment by result	---	---	0.038 (0.047)	5.98 (0.60)	0.044 (0.066)	5.87 (0.53)
Merit pay	---	---	0.036 (0.046)	5.92 (0.47)	0.044 (0.064)	5.90 (0.57)
Collective PRP						
Profit related pay	0.036 (0.034)	0.039 (0.053)	0.038 (0.051)	5.93 (0.45)	0.044 (0.065)	5.89 (0.59)
Employee share ownership schemes	0.038 (0.044)	0.038 (0.047)	---	---	---	---
Other Variable Pay						
Deferred profit sharing scheme	0.036 (0.033)	0.038 (0.047)	---	---	----	---
Other cash bonus	0.034 (0.032)	0.039 (0.050)	---	---	---	---

Notes. Means are weighted. Standard deviations in parentheses. "---" implies that the variable is not present in the respective wave. Means are lower than in raw data because of recoding of missing values to zero. The productivity figures are log values of value-added per worker, which are available only via the Financial Questionnaire in the WERS 2004 sample.

Table 2. Effect of Performance-Related Pay Schemes on Absence Rates

	1998	2004
Dependent Variable: Absence Rate		
PRP		
Individual or group PRP	-0.006**	---
	(0.002)	
Payment by result	---	-0.002
		(0.003)
Merit pay	---	-0.007*
		(0.003)
Collective PRP		
Profit related payments (or profit-related bonuses)	-0.003	-0.001
	(0.003)	(0.003)
Employee share ownership schemes	0.0002	---
	(0.004)	
Other Variable Pay		
Deferred profit sharing scheme	-0.002	---
	(0.003)	
Other cash bonus	-0.005*	---
	(0.002)	
Total Number of Incentive Pay Schemes in Firms		
1	-0.007*	-0.003
	(0.003)	(0.003)
2	-0.010**	-0.005
	(0.004)	(0.004)
3	-0.009+	-0.012*
	(0.005)	(0.005)
4	-0.014*	---
	(0.006)	
5	-0.015+	---
	(0.008)	
Number of observations	2,173	2,006

Notes: Full controls are included as in Table A3 in the Appendix. Robust standard errors are in parentheses. Levels of significance: ** 1%, * 5%, + 10 %. "---" implies that the variable is not present in the respective wave.

Table 3. Effect of Proportion of Non-Managerial Employees Who Received Performance-Related Pay in the Last 12 Months and Measure of Performance on Absence Rates

Dependent Variable: Absence rate	1998	2004
Proportion of PRP		
1% to 39%	-0.006*	-0.0003
	(0.003)	(0.005)
40% to 79%	-0.007*	0.0001
	(0.004)	(0.005)
80% to 100%	-0.006**	-0.009**
	(0.002)	(0.003)
Measure of Performance		
Individual performance/output	-0.009**	-0.001
	(0.003)	(0.005)
Group or team performance/output	-0.004	0.001
	(0.005)	(0.004)
Workplace-based measures	-0.012**	-0.007+
	(0.003)	(0.004)

Organization-based measures	-0.003 (0.003)	-0.007+ (0.003)
Number of observations	2,080	2,006

Notes: Full controls are included as in Table A3 in the Appendix. The "proportions" and "measures" dummy variables have been used in place of the "individual or group performance-related schemes" in the 1998 sample and the "merit pay" and "payment by results" variables in the 2004 sample. Robust standard errors are in parentheses. Omitted category: None of the workers at the workplace received PRP in the last 12 months. Levels of significance: ** 1%, * 5%, + 10 %. The number of observations (2,080) for the 1998 sample is less than the whole 1998 sample (2,173) as the "proportions" and "measures" variables refer to non-managerial employees only.

Table 4. Estimates of Performance-related Pay Schemes on Absence Rates by Public-Private Status

	1998		**2004**	
	Public	**Private**	**Public**	**Private**
PRP				
Individual or group PRP	-0.003 (0.003)	-0.008 (0.003)**	---	---
Payment by result	---	---	-0.007 (0.006)	-0.001 (0.003)
Merit Pay	---	---	-0.012 (0.008)	-0.006 (0.003)+
Collective PRP				
Profit Pay	-0.006 (0.006)	-0.003 (0.003)	-0.007 (0.013)	-0.002 (0.003)
Employee Ownership	---	-0.001 (0.004)	---	---
Other Variable Pay				
Deferred Profit	-0.026 (0.012)*	-0.002 (0.003)	---	---
Other cash bonus	-0.003 (0.003)	-0.005 (0.003)*	---	---

Notes: Full controls are included as in Table A3 in the Appendix. Robust standard errors are in parentheses. Levels of significance: ** 1%, * 5%, + 10 %. "---" implies that the variable is not present in the respective wave.

Table 5. Interaction Effects of Performance-related Pay Schemes on Absence Rates

WERS 1998							
PRP (individual or group)	-0.009 (0.003)**	-0.008 (0.003)**	-0.039 (0.012)**	-0.017 (0.007)**	-0.018 (0.008)*	-0.004 (0.002)+	-0.004 (0.002)*
PRP*proportion employees earning £22-29k pa	0.034 (0.019)+						
PRP*proportion of employees earnings more than £29k pa		0.028 (0.016)+					
PRP*average duration of workweek (inc.overtime)			0.001 (0.000)**				
PRP* more than half of workforce on overtime				0.017 (0.009)+			
PRP* more than half of workforce in teams					0.016 (0.008)+		
PRP*size of firm: 10-25						-0.016 (0.008)*	
PRP*size of firm: 26-50							-0.015 (0.008)+

WERS 2004							
Merit pay	-0.006 (0.003)*	-0.011 (0.003)**	-0.007 (0.003)*	-0.011 (0.003)**			
Merit pay*proportion employees paid less than $4.50 per hour	-0.028 (0.016)+						
Merit pay*team members jointly decide on work		0.010 (0.005)+					
Merit pay*no organizational changes in last two years			0.017 (0.009)+				
Merit pay*qualitycircles				0.012 (0.006)*			

Notes: Full controls are included as in Table A3 in the Appendix. Robust standard errors are in parentheses. Levels of significance: ** 1%, * 5%, + 10 %.

Table 6 Endogeneity of Performance-related Pay and Absence

	(1)	(2)	(3)	(4)	(5)
	Control for Illnesses/Injuries	*Control for productivity*	*Control for monitoring*	*Testing for endogeneity*	*Controlling for endogeneity*
WERS 1998					
Individual or group PRP	-0.005 (0.002)**	---	-0.006 (0.002)**	-0.007 (0.020)	-0.016 (0.006)**
Monitoring: Less than half		---	0.006 (0.003)*	0.060 (0.046)+	0.006 (0.003)+
Monitoring: More than half		---	0.004 (0.004)	0.004 (0.042)	0.003 (0.004)
Residual PRP		---		0.002 (0.005)	
Residual Monitoring		---		-0.021 (0.020)	
Percent injured	0.044 (0.027)				
Percent ill	0.152 (0.050)**				
					$\chi^2(1) = 3.81$+
N	2170	---	2170	2170	2170
WERS 2004					
Merit pay	-0.007 (0.003)*	-0.011 (0.004)*	-0.006 (0.003)+	-0.014 (0.017)	-0.010 (0.006)+
Monitoring: Less than half			-0.003 (0.005)	-0.003 (0.006)	-0.004 (0.005)
Monitoring: More than half			-0.006 (0.007)	-0.005 (0.007)	-0.006 (0.007)
Residual PRP				0.004 (0.001)	
Residual Monitoring				-0.012 (0.019)	

Percent injured	0.006 (0.034)				
Percent ill	0.072 (0.028)**				
Log(productivity)		-0.005 (0.003)			
					$\chi^2(1) = 0.91$
N(Private sector)		940	1503	1503	1503

Notes: Full controls are included as in Table A3 in the Appendix. Robust standard errors are in parentheses. Levels of significance: ** 1%, * 5%, + 10 %. is the correlation coefficient between the PRP and absence equations. The productivity variable captures the (log) value added per worker, and is available only for the 2004 wave. Column (5) indicates estimates of a treatment effects model.

Table 7 Effects of Performance-Related Pay Schemes on Labour Productivity – WERS 2004

	(1)	(2)	(3)
	OLS	OLS	Probit
Dependent variable	*Log(value added productivity)*	*Log(profit per worker)*	*Subjective productivity*
Merit pay	-0.028 (0.038)	-0.014 (0.052)	-0.013 (0.033)
Payment by result	0.097+ (0.058)	0.107+ (0.062)	0.062* (0.031)
Profit related pay	-0.041 (0.057)	-0.044 (0.054)	0.024 (0.032)
N	718	620	1976

Notes:

1. All specifications include the following controls: 11 industry dummies, 7 workplace size dummies, 4 organization size dummies, proportions of occupational groups in the establishment (9 variables), proportion of women, proportion of ethnic minorities, proportion of young and old employees, proportion of part time staff, proportion agency employees, proportion trade union members, briefing groups, teams jointly decide how the work is to be done, foreign owned establishment, UK and foreign owned establishment, old establishment, 6 dummies for employer training (omitted category, no training), 6 dummies for the proportion of workers who work overtime in excess of the normal working week, and log of capital/labour ratio (value of capital per worker).
2. In the third column the subjective productivity variable takes the value of 1 if manager reports that productivity is a lot better/better than average compared with other establishments in the same industry, 0 otherwise. Reported estimates are the marginal effects. The third column does not include the log of capital/labour ratio as the dependent variable is a subjective measure of productivity.
3. Estimates are weighted.
4. Full regression results are available upon request.

APPENDIX

Section A1. Definitions of the PRP variables of interest

Definition of PRP from the 1998 WERS

Do any employees at this workplace receive payment or dividends from any of the following variable pay schemes?

1. Profit-related payments or bonuses (37.4%)
2. Deferred profit sharing scheme (6.4%)
3. Employee share ownership schemes (21.9%)
4. Individual or group performance-related schemes (28.1%)
5. Other cash bonus (25.6%)
6. None of these (36.2%)

Definition of PRP from the 2004 WERS

Do any employees in this establishment get paid by results or receive merit pay?

(Interviewer: On this card is an explanation of what we mean by payment by results and merit pay. Probe: Which others? Until "None".

1. Payment by results (32.8%)
2. Merit pay (23.7%)
3. Neither (49.9%)

Card reads:

1. Payment by results

"Payment by results" includes any method of payment where he pay is determined by the amount done on its value, rather than just the number of hours worked. It includes commission, and bonuses that are determined by individual, establishment or organization productivity or performance. It includes profit-related pay schemes.

2. Merit pay

"Merit pay" is related to a subjective assessment of individual performance by a supervisor or manager.

Table A2. Descriptive Statistics of Control Variables of Interest

	1998	2004
Missing absence	0.157 (0.364)	0.154 (0.361)
Percent of employees earnings £22,000 to less than £29,000 per annum	0.086 (0.112)	0.071 (0.177)
Percent of managers	0.086 (0.097)	0.103 (0.105)
Percent of professional staff	0.129 (0.208)	0.109 (0.191)
Percent of technical staff	0.089 (0.156)	0.107 (0.195)
Percent of clerical and secretarial staff	0.157 (0.193)	0.151 (0.206)
Percent of craft and skilled service	0.104 (0.193)	0.072 (0.165)
Percent of personal and protective service	0.083 (0.206)	0.075 (0.204)
Percent of operative and assembly staff	0.128 (0.248)	0.096 (0.215)
Percent of sales staff	0.096 (0.225)	0.143 (0.274)
Percent of routine unskilled	0.124 (0.221)	0.136 (0.257)
Percent part time staff	0.263 (0.282)	0.268 (0.277)
Percent trade union staff	0.327 (0.339)	0.212 (0.307)
Percent of women	0.492 (0.288)	0.493 (0.294)
Percent of ethnic minorities	0.054 (0.109)	0.073 (0.148)
Percent of employees younger than 20 years old	0.061 (0.108)	0.090 (0.151)
Percent of employees older than 51 years old	0.157 (0.109)	0.200 (0.154)
Percent disable	0.009 (0.026)	0.010 (0.040)
Percent temporary agency employees	0.017 (0.052)	0.029 (0.098)
Between 5% and 25% of employee work on fixed-term contracts	0.515 (0.500)	0.407 (0.491)
More than 25% of employee work on fixed-term contracts	0.039 (0.194)	0.066 (0.248)
Manufacturing	0.226 (0.419)	0.156 (0.363)
Utilities (electricity, gas, water supply)	0.006 (0.079)	0.003 (0.059)
Construction	0.031 (0.174)	0.041 (0.199)
Wholesale	0.147 (0.355)	0.157 (0.364)
Hotels and restaurants	0.043 (0.202)	0.056 (0.231)

Transportation	0.056 (0.230)	0.067 (0.249)
Financial services	0.037 (0.188)	0.058 (0.234)
Other businesses	0.098 (0.298)	0.136 (0.343)
Other community services	0.033 (0.179)	0.051 (0.219)
Education	0.105 (0.306)	0.083 (0.276)
Health	0.139 (0.346)	0.138 (0.345)
Public sector establishment	0.304 (0.460)	0.239 (0.427)
East Anglia	0.082 (0.274)	0.088 (0.284)
Rest of the South East	0.145 (0.352)	0.137 (0.343)
South West	0.074 (0.262)	0.074 (0.262)
London	0.126 (0.332)	0.131 (0.337)
East Midlands	0.090 (0.286)	0.075 (0.263)
West Midlands	0.102 (0.302)	0.099 (0.299)
North East	0.047 (0.211)	0.039 (0.194)
North West	0.125 (0.331)	0.131 (0.337)
Scotland	0.094 (0.292)	0.095 (0.293)
Wales	0.042 (0.201)	0.044 (0.204)
Sick pay in excess of statutory requirements	0.771 (0.420)	0.692 (0.462)
System designed to minimize inventories, supplies or work in progress	0.328 (0.469)	0.273 (0.446)
Operating at this address or other for more than 5 years	0.899 (0.301)	0.915 (0.279)
Size of the establishment between 5 and 10 employees	---	0.101 (0.301)
Size of the establishment between 10 and 25 employees	0.138 (0.345)	0.170 (0.376)
Size of the establishment between 26 and 50 employees	0.143 (0.350)	0.142 (0.349)
Size of the establishment between 51 and 100 employees	0.137 (0.344)	0.135 (0.342)
Size of the establishment between 101 and 200 employees	0.137 (0.344)	0.122 (0.327)
Size of the establishment between 201 and 500 employees	0.186 (0.389)	0.142 (0.350)
Size of the establishment between 501 and 1,000 employees	0.092 (0.289)	0.079 (0.269)
Organization size 200 to less than 1,000 employees	0.085	0.119

	(0.278)	(0.324)
Organization size 1,000 to less than 5,000 employees	0.163 (0.370)	0.143 (0.350)
Organization size 5,000 to less than 50,000 employees	0.222 (0.416)	0.225 (0.418)
Organization size more than 50,000 employees	0.494 (0.500)	0.452 (0.498)
Working arrangements for non-managerial employees: annualised hours	0.097 (0.296)	0.143 (0.351)
Working arrangements for non-managerial employees: shift working	0.520 (0.500)	0.482 (0.500)
Specific health and safety committee	0.435 (0.496)	0.295 (0.456)
Teams jointly decide how the work is to be done	0.478 (0.500)	0.440 (0.497)
Joint consultative committee/work councils/representative forums	0.502 (0.500)	0.365 (0.481)
Briefing groups/team briefings	0.888 (0.316)	0.808 (0.394)
Relationship between management and employees is very good/good	0.862 (0.346)	0.897 (0.305)
Unemployment to vacancy rate by travel to work area	3.8 (1.59)	3.6 (2.5)
Foreign owned establishment	---	0.173 (0.345)
UK and foreign owned establishment	---	0.037 (0.188)
All (100%) employees have received training over the last 12 months	---	0.296 (0.456)
Almost all (80-99%) have received training over the last 12 months	---	0.125 (0.331)
Most (60-79%) have received training over the last 12 months	---	0.099 (0.299)
Half (40-59%) have received training over the last 12 months	---	0.097 (0.296)
Some (20-39%) have received training over the last 12 months	---	0.120 (0.325)
Few (1-19%) have received training over the last 12 months	---	0.139 (0.346)
All (100%) employees work overtime in excess of the normal working week	---	0.082 (0.274)
Almost all (80-99%) employees work overtime in excess of the normal working week	---	0.084 (0.278)
Most (60-79%) employees work overtime in excess of the normal working week	---	0.107 (0.309)
Half (40-59%) employees work overtime in excess of the normal working week	---	0.156 (0.363)
Some (20-39%) employees work overtime in excess of the normal working week	---	0.197 (0.398)
Few (1-19%) employees work overtime in excess of the normal working week	---	0.222 (0.416)
Log of capital/labour ratio (value of capital per worker)	---	3.103 (1.566)
Number of observations	2,173	2,006

Notes: Means are weighted. Standard deviations in parentheses. "---" implies that the variable does not exist, or is not used in the 1998 WERS. The mean of the Log of capital/labour ratio is estimated for 537 observations.

Table A3. Effect of Control Variables on Absence Rates

	1998	**2004**
Dependent Variable: Absence Rate		
Missing absence (dummy)	-0.045**	-0.050**
	(0.002)	(0.002)
Percent of employees earnings £22,000 to less than £29,000 per annum	-0.023*	-0.018*
	(0.010)	(0.008)
Percent of managers	-0.005	0.022+
	(0.010)	(0.013)
Percent of professional staff	0.003	-0.005
	(0.008)	(0.009)
Percent of technical staff	0.0003	-0.015+
	(0.008)	(0.008)
Percent of clerical and secretarial staff	-0.008	-0.001
	(0.008)	(0.009)
Percent of craft and skilled service	0.019*	0.008
	(0.009)	(0.009)
Percent of personal and protective service	0.010	0.006
	(0.008)	(0.011)
Percent of operative and assembly staff	0.019	0.009
	(0.010)	(0.009)
Percent of sales staff	0.014	0.013
	(0.011)	(0.010)
Percent of routine unskilled	0.022*	0.032**
	(0.010)	(0.011)
Percent part time staff	-0.009	-0.014*
	(0.007)	(0.007)
Percent trade union staff	0.005	0.021**
	(0.004)	(0.006)
Percent of women	0.018*	0.015+
	(0.009)	(0.008)
Percent of ethnic minorities	0.066	0.029+
	(0.041)	(0.016)
Percent of employees younger than 20 years old	0.031+	0.020
	(0.017)	(0.012)
Percent of employees older than 51 years old	-0.018	-0.004
	(0.011)	(0.009)
Percent disable	0.034	0.008
	(0.035)	(0.029)
Percent temporary agency employees	-0.047	-0.003
	(0.004)	(0.011)
Between 5% and 25% of employee work on fixed-term contracts	0.002	0.002
	(0.002)	(0.003)
More than 25% of employee work on fixed-term contracts	-0.003	0.007
	(0.006)	(0.009)
Manufacturing	0.001	-0.009
	(0.006)	(0.007)
Utilities (electricity, gas, water supply)	-0.002	0.018
	(0.005)	(0.035)
Construction	-0.006	-0.004

	(0.005)	(0.009)
Wholesale	0.0003 (0.006)	-0.008 (0.007)
Hotels and restaurants	-0.005 (0.008)	-0.014 (0.011)
Transportation	0.004 (0.006)	-0.007 (0.007)
Financial services	0.009+ (0.005)	0.008 (0.008)
Other businesses	0.001 (0.006)	-0.001 (0.007)
Other community services	-0.006 (0.005)	0.003 (0.008)
Education	0.005 (0.007)	0.006 (0.007)
Health	-0.00002 (0.006)	-0.002 (0.008)
Public sector establishment	0.007+ (0.004)	0.004 (0.006)
East Anglia	-0.019* (0.009)	-0.005 (0.006)
Rest of the South East	-0.020+ (0.011)	-0.0001 (0.007)
South West	-0.018+ (0.010)	-0.003 (0.007)
London	-0.025 (0.017)	-0.004 (0.008)
East Midlands	-0.013 (0.012)	-0.003 (0.006)
West Midlands	-0.015 (0.011)	-0.006 (0.006)
North East	-0.017+ (0.010)	-0.005 (0.008)
North West	-0.017+ (0.009)	-0.005 (0.006)
Scotland	-0.016+ (0.010)	-0.007 (0.006)
Wales	-0.006 (0.014)	0.001 (0.009)
Sick pay in excess of statutory requirements	0.009* (0.004)	-0.004 (0.003)
System designed to minimize inventories, supplies or work in progress	0.001 (0.002)	0.0002 (0.003)
Operating at this address or other for more than 5 years	-0.018 (0.011)	0.002 (0.005)
Size of the establishment between 5 and 10 employees	---	0.005 (0.007)
Size of the establishment between 10 and 25 employees	0.013+ (0.007)	0.014+ (0.008)
Size of the establishment between 26 and 50 employees	0.013* (0.006)	0.011 (0.007)
Size of the establishment between 51 and 100 employees	0.009* (0.004)	0.010 (0.006)
Size of the establishment between 101 and 200 employees	0.005 (0.003)	0.001 (0.005)

Size of the establishment between 201 and 500 employees	0.006* (0.003)	0.009+ (0.005)
Size of the establishment between 501 and 1,000 employees	0.009** (0.003)	0.008 (0.006)
Organization size 200 to less than 1,000 employees	0.001 (0.006)	-0.001 (0.009)
Organization size 1,000 to less than 5,000 employees	0.004 (0.006)	-0.001 (0.009)
Organization size 5,000 to less than 5,0000 employees	0.003 (0.006)	0.001 (0.008)
Organization size more than 50,000 employees	0.003 (0.006)	-0.008 (0.009)
Working arrangements for non-managerial employees: annualised hours	-0.010** (0.003)	0.004 (0.005)
Working arrangements for non-managerial employees: shift working	0.006+ (0.003)	0.009** (0.003)
Specific health and safety committee	-0.005** (0.002)	-0.007* (0.003)
Teams jointly decide how the work is to be done	-0.001 (0.002)	-0.001 (0.003)
Joint consultative committee/work councils/representative forums	0.007* (0.003)	0.005 (0.004)
Briefing groups/team briefings	-0.001 (0.005)	0.004 (0.004)
Relationship between management and employees is very good/good	-0.003 (0.003)	-0.003 (0.004)
Unemployment rate by travel to work area between 2% and 5%	-0.006 (0.005)	0.0004 (0.004)
Unemployment rate by travel to work area above 5%	-0.003 (0.005)	-0.001 (0.005)
Number of observations	2,173	2,006

Notes:
1. The omitted categories are: no variably pay schemes, zero proportion of employees work on fixed term contracts, public administration, Yorkshire and Humberside, no sick pay in excess of statutory requirements, no system to minimize inventories, operating at this address or other less than 5 years, more than 1,000 employees at the establishment, less than 200 employees in the organization, no annualized hours, no shift working, general joint committee, team members do not jointly decide how the work is to be done, no joint consultative committee, no briefing, relationship between management and employees is neither good nor bad/poor/poor/very poor, unemployment rate by travel to work area between 0 and 2 percent.
2. Estimates are weighted and robust standard deviations in parentheses.
3. "---" implies that the variable does not exist in the 1998 WERS.

Section A4: Description of the IV Estimation Methodology

In order to test whether PRP, monitoring (*M*) and absenteeism are endogenously related, the methodology proposed by Smith and Blundell (1986) and Rivers and Vuong (1988) is adopted. This methodology seeks to identify whether there is any correlation between the errors of the structural equation of absence, $_j$, and those of two reduced-form regression equations, one for the provision of PRP (probit) and another for the existence of monitoring (*M*) in the workplace (ordered probit). Wooldridge (2002) has shown that provided that consistent coefficients of the first-

stage equations are obtained, the estimated generalized residuals can be included as additional covariates in an augmented absence equation. The presence of endogeneity in the OLS coefficients of PRP_j and M_j is then detected via a test of the joint significance of the coefficients of the two residual terms.

As part of the first-stage of the IV estimation, a regression equation describing the incidence of PRP has been fitted to the data using a probit estimator (see Table A4). It is hence confirmed that extensive monitoring used by firms (proxied by a proportion of supervisors that exceeds half of the non-managerial workforce) is associated with a smaller probability of PRP being employed as a method of remuneration.

In order to implement the testing procedure, the set of explanatory variables has also been augmented with a number of identifying restrictions. These instrumental variables (IVs) are chosen to be strongly correlated with either of the two endogenous variables, but not related in any causal manner with the absence rate. Although it is acknowledged that the selection of reliable instruments is a difficult and sometimes *ad hoc* process, the specific instruments used to identify the PRP equation are as follows; *1998 wave*: whether firms use individual or team objectives and targets as the main method to make employees in the largest occupational group aware of their job responsibilities; whether management introduced any change in the organization of work in the past five years. *2004 wave*: whether the organization is UK and foreign owned/controlled; and if a single individual or family own at least 50 percent of the company. Similarly, the monitoring equation is identified with the addition of the following variables that we anticipate to influence monitoring: *1998 wave*: management did not introduce any change in the past five years; *2004 wave*: Manager is the proprietor/owner of the firm.

This choice of the aforementioned instruments can be justified as it is expected that firms which employ individual/team objectives, those which have undergone organizational changes in the recent past, and those whose ownership transcends domestic barriers, are more likely to use innovative compensation rewards, such as PRP. By contrast, the nature of incentive provision within establishments that are predominantly owned by a single individual or family is expected to be geared by factors other than financial rewards. Similarly, companies which did not undertake any significant changes in previous years, and those in which the manager is concurrently the owner of the firm, are less likely to require supervising employees. As shown in Table A4, these a priori expectations are confirmed.

In addition, there is no strong reason to believe that these variables are causally related to the (present) absence record of establishments. Indeed, the lack of correlation between the selected IVs and absenteeism is confirmed via

separate OLS absenteeism regressions that include the IVs as extra controls in the specification (available upon request). In all cases the selected IVs are found to be unrelated to absenteeism, at statistical significance levels that exceed by far what are regarded to be acceptable thresholds. It has also been corroborated that the chosen IVs for the PRP equation are insignificant determinants in the monitoring function, and vice versa.

Table A4. First Stage Estimates of Reduced Form Equations

	Probit PRP	*Ordered Probit Monitoring*
WERS 1998		
Individual or group PRP		-0.138 (0.073)+
Monitoring: Less than half	-0.142 (0.136)	
Monitoring: More than half	-0.445 (0.214)*	
IV: Employees made aware of responsibilities with one of individual or group targets	0.422 (0.113)**	
IV: Employees made aware of responsibilities via both individual or group targets	0.487 (0.113)**	
IV: Changes in work organization over last 5 years	0.256 (0.102)*	
IV: Organization owns or controls subsidiary companies outside the UK		0.184 (0.093)*
N	2170	2170
WERS 2004		
Merit pay		-0.035 (0.078)
Monitoring: Less than half	-0.165 (0.135)	
Monitoring: More than half	-0.034 (0.236)	
IV: Ownership of firm is UK and foreign	0.462 (0.193)*	
IV: Individual or family owns more than 50% of company	-0.258 (0.105)*	
IV: Manager is proprietor/owner		-0.401 (0.142)**
N (*Private sector firms)	1503	1503

Notes: Full controls are included as in Table A3 in the Appendix. Robust standard errors are in parentheses. Levels of significance: ** 1%, * 5%, + 10 %.

Endnotes

[i] For instance, estimates for the UK have placed the figure at about £6 billion per year in the 1980s (Brown and Sessions, 1996), rising to approximately £17 billion in 2009 (CIPD, 2009). These figures correspond to 2-3% of total Gross Domestic Product (GDP), or a typical year's growth. The latest calculations from the UK's Labour Force Survey also indicate that approximately 3% of contracted work hours are lost due to sickness absence, translating into an average annual absence of one and a half weeks for every UK employee (Ercolani, 2009).

[ii] There is a panel element of the management questionnaire in the WERS, but unfortunately it does not contain information on absence rates. Thus, we treat the 1998 and 2004 waves as two single cross sections.

[iii] See Airey *et al*., 1999 and Kersley *et al*., 2006 for reasons why the response rates differ.

[iv] The Employee Profile Questionnaire (EPQ) was posted to the management respondent before the interview took place. Mangers had to fill out the questionnaire and have it ready for the interviewer. This requirement made managers to look at their records and report the establishment absence rate according to their records rather than using their memory. Thus, we believe that measurement error due to recall bias was minimized.

[v] The percentage of missing responses was 15.7% in 1998 and 15.4% in 2004, respectively. After confirming that there is no systematic bias in the pattern of non-response using a Heckman-type selection model (*Identifying variable*: whether firms keep records on their costs), and in order to retain the full amount of available information in the dataset, the missing responses were not dropped from the empirical analysis. Instead, they were recoded as zero values of the dependent variable, while a dummy variable identifying those cases in which there is missing absence information was added to the specification.

[vi] In particular, a generalized linear model (GLM) has been estimated, which assumes that the logit transformation of *Absence* comes from the family of binomial distributions. This takes into account the excess concentration of observations at the boundaries of the permissible interval of responses. The results of the GLM estimation procedure are available from the authors upon request.

[vii] The regression coefficients of the remaining explanatory variables are found to correspond in most cases with the predictions of prior literature. Due to space limitations, they are not discussed in the main text, though the reader is referred to Table A3 in the Appendix for further details.

[viii] Managers had to choose between the following categories: 1. "All" (100%), 2. "Almost all" (80-99%), 3. "Most" (60-79%), 4. "Around half" (40-59%), 5. "Some" (20-39%), 6. "Just a few" (1-19%), 7. "None". Given that this question was asked to non-managerial employees, we estimate the regressions for the non-managerial staff only. For this reason, the number of observations for the 1998 sample is reduced to 2,080 firms, as opposed to the 2,173 which comprised the original sample.

[ix] Given that this question was asked to non-managerial employees, we estimate the regressions for non-managerial staff only.

[x] Such arguments have typically focused on the more complicated nature of performance measurement in state-level jobs (e.g. multiplicity of tasks and outputs; lack of clear goals; absence of market price signals), the prevalence of multiple principals with sometimes conflicting goals and the crucial role of teamwork in public good production. They have also highlighted the important sorting effects due to public service motivation (PSM).

[xi] Some of these are not discussed in the text due to space considerations. For instance, we have attempted to control for differences in job satisfaction among employees by exploiting the matched employer-employee element of the database. In addition, we used information on the number of years of experience (in personnel or employee relations management) of the managers of the firms, or the title of their jobs (e.g. human resource, employee relations, personnel manager) in order to correct for unobserved heterogeneity in managerial skills. No evidence of change in the PRP-absence coefficient was found.

[xii] Such changes in management refer to changes in: payment systems, working time arrangements, the organization of work, work techniques or to the introduction of: a new technology, a new product/service, initiatives of employee involvement.

[xiii] This is similar to concerns raised about the phenomenon of 'presenteeism' (Dew *et al*., 2005), whereby workers who are sick show up at work in order to exhibit good behaviour, though this is likely to have adverse consequences on productivity in the long-run.