ORIGINAL ARTICLE

Human resource management technology, workplace performance, and employee well-being in the British public sector

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Abstract

Using linked employer–employee data for workplaces in Britain, we find high-performance workplace practices (HPWPs) are positively associated with public sector workplace performance. Contrastingly, HPWPs are not associated with measures of public sector employees′ well-being or motivation. The implication is that the performance effects of HPWP in the public sector constitute part of efficient management technology, without the need to invoke special employee responses as mediators. Public sector findings differ from those in the private sector: in the latter, HPWPs are positively associated with some performance outcomes but employee outcomes are a complex mix of non-significant, positive, and negative associations.

1 | INTRODUCTION

Human resource management (HRM) emerged in the United States during the 1970s and 1980s and has subsequently become widespread in Britain and many other countries. HRM encompasses the work of what was formerly known as personnel management, together with a range of staff development, work organization (e.g. team-working), and internal communication practices that are as much, or more, the responsibility of line management. Interest in HRM on the part of economics and management has largely been motivated by a body of empirical work reporting

significant effects on various aspects of corporate performance (see, e.g. Combs et al., 2006; Bloom & Van Reenen, 2010; Jiang et al., 2012).

The focus of the present article is on two competing conceptualizations of the HRM-performance connection. We acknowledge that this is a drastic simplification of a complex field. The contrast that we address is between what we call the human relations or 'mutual gains' (Kochan & Osterman, 1994; Peccei & Van de Voorde, 2019) perspective that has dominated the management and work psychology literatures, and the more recent economic perspective that has emerged partly from the contributions of Bloom and Van Reenen (2010) and Bloom et al. (2017) (Bloom, Sadun, and Van Reenen, henceforth BSV). BSV seek to improve productivity analysis by inclusion of a 'management technology' concept in production functions.

What we have termed the human relations or mutual gains perspective drew initial momentum from empirical evidence that practices found to be effective in HRM from a performance viewpoint, for example open and participative discussion of work issues, could be beneficial to employees (Appelbaum et al., 2000). (Following a common terminology in the HRM literature, we will refer to these as high-performance work practices [HPWPs].).[1] Subsequently mutual gains theory has been developed to offer explanations of why HPWP contribute to employees' well-being and/or motivation, and recently to conceptualize the effects of HPWP on performance as depending on the intervening positive impacts on employees. Several alternative mutual gains models are outlined by Peccei & Van de Voorde, 2019 (henceforth PV); these vary in the form of the predicted dependence of performance on employee well-being. The most frequently adopted model in recent empirical studies, called by PV the fully mediated mutual gains model, envisages a single path from HPWP through well-being to performance. This model is often underpinned by a social exchange concept, whereby employees (feel obliged to) reciprocate the benefits they receive from HPWP by working beyond their contractual terms, for instance by making constructive suggestions or helping to solve operational problems, thus contributing to improved performance.

The management technology perspective on HRM offers a simpler explanation of performance effects, in the sense that no concepts and assumptions are required beyond those commonly used in economic treatments of the labour market and production. Management technology is the exercise of applied knowledge in pursuit of organizational goals. HPWPs form part of management technology because they constitute accumulated practical knowledge about how to activate and deploy human resources. In developing applications of the management technology concept, one may draw on other economic tools that are based on similar general assumptions.

Achievement of performance goals requires effective employee agency, but this is not guaranteed since employment contracts are incomplete and employees may be ill-equipped or unwilling to provide the needed inputs. In the management technology perspective, this problem is soluble if management possesses methods of developing capabilities in the workforce and incentivizing action. By recruiting appropriately, and by training and informing employees, managements equip them for effective agency. Employees comply with or support employer goals, and the means to those goals, to the extent that the goals and instruments have at least neutral consequences for the value they obtain from their own employment. Provided that is the case, employees have incentives to comply within common benefits of employment such as deferred compensation arrangements (Lazear, 1981) and promotion or mobility opportunities

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[1]It is also common in the HRM literature to speak of 'high-performance work systems', thus emphasizing the value of complementarity among the HPWP (Appelbaum et al., 2000; Huselid, 1995).

consequent on tenure (Sicherman & Galor, 1990). Managements may of course go further in developing other forms of incentive where that is advantageous (Prendergast, 1999).

To summarize, the management technology concept implies that 'bundles of management practices' will raise productivity 'across a wide range of environments' (BSV, p. 5). Positive psychic effects may also emerge in some circumstances, but are neither essential nor general. The mutual gains perspective on the other hand (at least in its fully mediated model) maintains that these psychic effects are both sufficient and necessary mediators of performance gains.

The present research investigates these issues through a study of medium-sized and large workplaces (50 or more employees) in the British public sector in 2011.[2] There have been rather clear goals and demands for the public sector set by its principals, government. It is the existence of these goals that makes a sectoral study feasible. They are encapsulated within what has been called the 'New Public Management' (NPM) in both Britain and internationally (Burke et al., 2013; LeGrand & Bartlett, 1993).

The Workplace Employment Relations Survey of 2011 (WERS 2011) provides several measures of performance outcomes. We estimate cross-sectional associations of HPWP with these performance outcomes, and by linking a subset of the sample to previous data, we also obtain a panel analysis. Moreover, WERS 2011 provides linked employee survey data and these permit assessment of relationships between HPWP and constructs of well-being and motivation based on employee responses.

Although the primary focus of the research is on the public sector, it is useful to perform parallel analyses in the private sector, also covered in WERS 2011. The results are found to contrast in part with those for the public sector and so tend to confirm sectoral distinctiveness and construct sensitivity. It is necessary to note, however, that we offer no substantive interpretation of the private sector results, a task that requires an extensive separate study.

The next section of this article describes the British public sector, the goals set by government for the sector and the role of HPWP with respect to performance, as viewed from a management technology standpoint. Section 3 describes the study's data and methods, Section 4 reports results, and Section 5 summarizes conclusions.

The main new findings of the research are, first, that on average across the public sector, increased development of HPWP results in higher workplace performance according to three criteria including a new objective labour cost measure. Second, in contrast, there is no indication there of HPWP having a positive effect on employees' well-being or motivation. Third, the private sector has a different and more complex pattern of results, with some positive effects of HPWP on performance, and a mixture of non-significant, positive, and negative effects on employee well-being.

2 | THE PUBLIC SECTOR CONTEXT

Spending on public services and public administration has fluctuated around an underlying upward course in the post-war period; variations can be broadly interpreted as the outcome of upward pressures met by policy responses (Clark & Dilnot, 2002). A particularly critical juncture for welfare policy across Europe was reached in the 1980s and 1990s (Esping-Andersen, 1996), due largely to demographic developments, notably increasing longevity with resultant pressure on healthcare and

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[2]We exclude smaller workplaces since we judge the issues vis-a-vis HPWP to be quite different there, as in the private sector. See our previous study of small firms (Bryson & White, 2018). The cut-point at 50 employees reflects official definition of small firms in the United Kingdom and European Union.

pensions, in Britain the largest elements in spending. One can also point to higher aspirations with respect to reducing child poverty and increasing educational opportunities. These pressures led to demands for improved services, coupled, however, with popular resistance to increased taxation (Ipsos MORI, 2020).

The main response by British governments has been to tighten expenditure and to require public services to embrace organizational and technical change in pursuit of increased cost-effectiveness. Budgetary tightening has been reflected in reduced headcounts: during the 1990s aggregate employment in the sector fell by about 800,000 (Hicks et al., 2005), and after a brief recovery in the early 2000s again shrank by about 600,000 after the financial recession (ONS, 2019). The pursuit of modernizing change is expressed in the Local Government Act 1999 that imposed a 'Duty of Best Value' on local government bodies whereby they were obliged to seek continuous improvement with regard to 'economy, efficiency and effectiveness'. Central government bodies have also subsequently committed to this regime. Effectiveness goals were also embodied in numerous centrally specified targets for particular public services (Hood, 2006). Centralized control came through cash-limited budgets and efficiency monitoring systems (Bach & Winchester, 2003). Another feature has been the advance of 'marketization' through outsourcing of services, competitive tendering and privatization (LeGrand & Bartlett, 1993), developments initiated during the 1980s.

The drive for cost-reduction and process innovation, together with the growth of marketization of public services, has been labelled NPM (Burke et al., 2013). To what extent were the personnel traditions of the British public sector equipped to respond to the demands of NPM? A review by Bach et al. (2009) pointed to paternalistic treatment of staff, notably through sickness pay and pension provisions; a near-universal union presence, and a 'model employer' orientation, in the sense of fairness of treatment. These do not appear orientated toward performance. None the less, the sector has been observed adapting to the considerable labour force reductions just noted. Some of the sector's traditional personnel practices may have had potential to act as incentives. High levels of ongoing training (Van Wanrooy et al., 2013, pp. 110–112), sustained in part by centrally supported regimes of continuous professional development, are conducive to staff retention, as is early financial reward for training completion (see Booth & Francesconi, 2003). In recruitment and selection, the British public sector established open, competitive entry long in advance of large firms (Thornthwaite, 2012).

Furthermore, there is evidence of the sector rapidly adopting typical private sector HRM practices, including HPWPs. Bach et al. (2009, pp. 324–329) discern a new performance orientation and emulation of private sector HRM across the late 1990s and early 2000s. By 2011, the prevalence of HPWP appears to have equalized across sectors, according to descriptive data included in Section 3 below. The present section concludes by envisaging how various aspects of HPWPs, referred to as domains, can be predicted to contribute to workplace performance related to the central goals of cost-efficiency and modernizing change.

We group HPWPs into five domains that we have derived from Bailey (1993) and Appelbaum et al. (2000), who established the abilities–motivation–opportunity schema that has shaped many subsequent empirical studies (see Jiang et al., 2012).

The participation domain refers to communication practices that open information flows between management and other employees. Common practices include consultative committees, management-staff meetings, and frequent briefings between supervisors and their work-teams. Evidently there are costs involved, but front-line employees' superior operational knowledge is likely to compensate, for example when changing and de-bugging new work processes, new technology or new forms of service. Furthermore, staff economies, often involving

restructuring, require processes to overcome resistance and obtain cooperation while reducing the costs of internal bargaining (Milgrom & Roberts, 1992, pp. 271–280). For empirical studies of public sector participative processes, see Neathey and Arrowsmith (2001), Blatchford et al. (2012), Bryson et al. (2020).

The development of team-working organization contributes toward participation: teams can be developed to widen the variety of tasks performed by each employee and to offer scope to contribute to joint decision making. There are also cost-efficiency aspects. Flexibility is increased to the extent that team members acquire capability to perform one another's tasks. On the criterion of maximizing monitoring information (Milgrom & Roberts, 1992), teams are valuable because members exercise joint supervision of one another. Gould-Williams and Gatenby (2010) in a study of local government found team-working positively associated with staff perceptions of workforce effectiveness.

Staff training and development practices support organizational change developments that call for new skills. Team-working benefits from the provision of multi-skill training that facilitates flexibility. Ongoing training of a general type increases the option value of employees in view of uncertainty about future demands on the organization.

Recruitment and selection practices form a further HPWP domain that supports change and efficiency, either as a complement or in some cases substitute for training (see Besley & Ghatak, 2005, discussing incentives for mission-oriented organizations). Skill in recruitment and selection processes can also serve to reduce labour costs, for instance through substitution of high-cost by less-costly staff. In schools, teaching assistants have been placed alongside teachers, at lower salaries: Blatchford et al. (2012) document the savings. In hospitals, some routine nursing work has been taken over by health care assistants on lower pay scales: see Cavendish and Baroness (2013).

Methods of payment linked in one way or another to performance have been slow to penetrate the public sector and have encountered difficulties in practice (Van Wanrooy et al., 2013, pp. 94–98; Hasnain et al., 2014 for international evidence). Burgess and Ratto (2003) have indicated some of the difficulties, including problems of measuring and attributing output, and the prevalence of multi-tasking. Nonetheless, a review by Prentice et al. (2007) reports some evidence of performance pay providing benefits in the public sector, though limited by design problems. As discussed earlier in this section, the public sector does possess practices, notably pensions and continuing training, that have been recognized as incentivizing economically valuable behaviour such as retention.

Division into the five domains used in this brief discussion is convenient but not fundamental. Others have introduced different divisions and these may be useful for some expositional purposes. For example, many researchers have deployed a concept of 'job design practices' with emphasis on those practices that contribute to autonomous and varied work patterns. Forth and Millward (2004), using data from WERS 1998, formed a construct of 'high involvement management' through selected practices of team-working, multi-skill training, and job-related participation and information-sharing (this construct was also taken over by Brown et al., 2008). Although we do not deploy this construct directly, a closely similar set has been incorporated within our team-working, training, and participation domains.

All divisions are in any case over-ridden by the complementarity between domains and between practices within domains, a point widely stressed in the literature. Bowen and Ostroff (2004) present a signalling theory of 'strong systems' prescribing that a large number of mutually consistent HRM practices must be developed together in order to transmit effective messages to employees. Becker and Huselid (2006) take a strategic view of HRM and deploy a

sustainable competitivity concept to argue for firms to make a unique selection of practices that matches their strategic needs and distinguishes them from other employers. BSV also stress complementarity of practices in their management technology concept. These ideas suggest that it will be more useful to examine the aggregate effects of HPWPs rather than to focus on particular domains or practices; this is supported by the meta-analysis of Combs et al. (2006). who found that summative measures were about twice as predictive of outcomes as the use of separate HPWP constructs.

3 | RESEARCH METHODS

3.1 | Data

We used the WERS 2011, a nationally representative survey of workplaces with at least five employees. Analysis was confined to medium-sized and large public sector workplaces (consistent with official definition), that is, those with at least 50 employees. Information had been collected through interviews with senior managers responsible for HRM and by a linked self-completion questionnaire completed voluntarily from a random sample of 25 employees per workplace. For further information on the survey, see Van Wanrooy et al. (2013). We replicated the analysis with data from the private sector sample with the same size definition.

The whole-economy survey response rate was 46 per cent of workplaces. For the medium and large workplace public sector, there was management information with linked employee information from 605 cases (79 per cent of workplaces with management interviews). By focusing on workplaces with linked data, we ensured that performance and employee outcomes were evaluated on the same basis. Managers were asked prior to interview to assemble information on workforce composition from personnel records. We eliminated 60 cases because of internally inconsistent data returns, so the sample for analysis was 545 workplaces with linked data from 7454 employees. The private sector sample numbered 519 workplaces on the same basis, linked with 6643 employees.

Finally, for 230 of the public sector workplaces, similar management data were available from the previous survey in the series (WERS 2004), thus permitting the construction of a two-period panel analysis. For the private sector sample, there were 235 cases for panel analysis.

3.2 | Dependent variables

3.2.1 | Workplace performance measures

Analyses covered three workplace performance measures, with descriptives shown in Table 1. The index of HPWP is also included in Table 1 but described later. Note the similarity of means between the two sectors. Similarity in levels of HPWP probably reflects pressure from the centre for public sector organizations to adopt what is regarded as good practice in the private sector; a gap apparent in 1998 has been progressively reduced subsequently.

We used ratings of workplace performance made by the respondent manager, relative to other similar workplaces. Ratings of each of three components of performance—financial, labour productivity, and service quality—were on a 5-point scale ranging from 'a lot below average' (coded 1) to 'a lot better than average' (coded 5). The three component ratings were summed to give a measure labelled overall performance. Ratings of this type, albeit subjective,

TABLE 1   Descriptives for HPWP and performance outcomes.

Variable	Public sector			Private sector		
	Mean	SD	N	Mean	SD	N
HPWP index	24.51	4.470	545	25.20	6.236	519
Overall performance index	10.90	1.772	477	11.31	1.792	475
Log median wage	2.56	0.284	545	2.41	0.436	519
Change activity index	2.96	1.408	545	2.78	1.459	519

Note: N refers to workplaces with 50 or more employees and linked employee survey data.

Abbreviation: HPWP, high-performance workplace practice.

have been used in previous studies of performance (e.g. Delany & Huselid, 1996; Ramsay et al., 2000; Wood & Ogbonnaya, 2016; Wu et al., 2015). The ratings are here assumed to be cardinal (equal interval) measures (Ferrer-i-Carbonell & Frijters, 2004); variant analyses with an ordered logit model were also conducted and gave qualitatively similar results.

We also constructed two objective measures of performance, the first relating to labour costs (the median wage) and the second to change initiatives across five types of change. Prior to interview, managers were asked to obtain information about the numbers of employees in six wage-bands. From this, we estimated the median wage at each workplace by linear interpolation, with logged values as the outcome measure. The mean of this derived variable was close to estimates for 2011 provided by Cribb et al. (2014, pp. 6, 42–43) from official data sources. Use of this outcome reduces risk of single-respondent bias since the information would presumably be prepared for the respondent senior manager from personnel records. We tested whether higher use of HPWP was associated with a lower median wage,[3] on the assumption that reduced labour costs has been a goal for the public sector.

For the second objective performance outcome, we constructed an index of the amount of change taking place at the workplace, by counting the number of types of change project, in the past 2 years, reported by the manager from a set of five: (a) development of new technology, including computers; (b) new services that involved new technology or enhancement of service; (c) altered working time arrangements; (d) change to work organization; (e) change to work procedures. The resulting index of workplace change takes values 0–5 and has been treated as a cardinal measure. This, however, requires a rather strong assumption of equality between changes, so we separately analysed the probability of change types (a), (b), and (c) which we take to be the most important. We test whether the prevalence of change, or the probability of each type of change, rises with increasing intensity of HPWP.

3.2.2 | Workplace employee outcome measures

To assess employee well-being and motivation, we used three scale measures from the employee questionnaires, in the form of workplace averages. For descriptive statistics, see Table 2. For labelling and explanation of measures, see PV. The rough similarity of means on

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[3]It has sometimes been claimed that HPWP entails increased labour costs but a review of US private sector evidence by Osterman (2006) revealed examples of both negative and positive relations with wages. Ramsay et al. (2000) found that managerial ratings of labour cost were negatively related to their HPWP variable in a whole-economy British sample.

T A B L E 2 Descriptives for well-being and motivational measures.

Variable	Public sector			Private sector		
	Mean	**SD**	**N**	**Mean**	**SD**	**N**
Satisfaction well-being (SWB)	24.61	2.37	524	24.83	2.19	498
Health well-being (HWB)	23.41	2.041	524	23.72	2.14	497
Organizational affective commitment (OAC)	11.35	1.16	524	11.25	1.14	497

Note: The sample is as for Table 1, subject to listwise deletion. Each variable is a workplace mean over summed employee responses. N refers to workplaces having an employee survey; on average, there were 14.1 employee respondents per public sector workplace and 13.3 per private sector workplace.

these measures across the public and private sectors appears reasonable, since any marked disparity in treatment could lead to costly cross-sectoral mobility.

The source data contained a block of eight facet satisfaction items, each scored 1–5. Our procedure was to sum the satisfaction scores across all eight items for each respondent, then take the workplace mean of these scores as the workplace satisfaction outcome. The measure is referred to as 'satisfaction well-being' (SWB).

For 'health well-being' (HWB, where health has a psychological sense) the survey offered a scale of six items, each scored 1–5, based on Warr (2007), with three items representing an 'anxious-contented' dimension and three a 'depressed-enthusiastic' dimension (see Van Wanrooy et al., 2013, pp. 127–129). Results of a principal components analysis in the public sector sample did not support splitting the items, as there was just one component with an eigenvalue greater than 1, and this accounted for 70 per cent of total variance (see Jolliffe, 2002). A single scale of HWB, with all items scored in a positive sense and the summed scores averaged for each workplace, was constructed.

By the same procedure, we constructed a measure of organizational affective commitment (OAC) averaged at the workplace level. There were three source questions corresponding to items in the Lincoln–Kalleberg measure of organizational commitment, each scored from 1 to 5. The inclusion of OAC makes it possible to consider employee motivation as an outcome alongside employee well-being. Locke and Latham (1990) formulated a theory of work motivation in which the two constituents were job satisfaction and organizational commitment. Harrison et al. (2006) assembled evidence indicating that this combination was predictive of several aspects of individual work behaviour. The indicators for motivation are SWB and OAC, whereas for well-being they are SWB and HWB: thus, satisfaction is common to both well-being and motivation concepts. We tested whether relationships between HPWP and these psychic outcomes were positive. According to the fully mediated mutual gains model (see PV and Section 1), in the absence of a positive relation between HPWP and well-being, there will be no effect of HPWP on performance outcomes.

Subjective well-being measures are known to be influenced by individual personality (Judge et al., 2002), and if unobserved personality is correlated with regressors, this will bias estimates of the well-being outcomes. Unobserved personality bias is likely to be reduced by averaging on the assumption that selection is not systematically related to long-term personality dimensions.

3.3 | Explanatory variables

The key explanatory variable in all analyses was a summative index of HPWP. Information about HRM practices came from the interview with the senior manager responsible for HRM at

TABLE 3   Estimated means (SE) for each HPWP domain, by sector.

	Public	Private
Participation	7.86 (0.112)	6.87 (0.195)
Teams	3.79 (0.092)	3.27 (0.094)
Development	5.31 (0.098)	5.00 (0.122)
Incentives	1.52 (0.109)	3.91 (0.276)
Selection	5.23 (0.108)	5.01 (0.110)
N	592	546

Note: Estimates are weighted means.

Abbreviation: HPWP, high-performance workplace practice.

the workplace. We included only items that were descriptive of current practice and devoid of evaluative language. In the HRM–performance literature, HPWP items have commonly been aggregated into a single overall index of practices, and we followed this method. Altogether 44 items were used, grouped into 'domains' (participation, team-working, training/development, recruitment/selection, and performance pay—see discussion in Section 2) that were tested by reliability analysis on the full sample prior to pooling (see Table A1); overall reliability of the HPWP index was 0.80. While many items were dummies of the simple 'present/absent' type, others were derived by reducing a quantified banded variable (such as estimated proportion of employees taking part in the practice, or time devoted to the practice) to dichotomous form by splitting at the median. Although sacrificing some information, this in our view is outweighed by the reduction of response error in the source items (Wald, 1940).

As well as estimating HPWP effects through the summative index measure, we ran variants in which the index was replaced by the five domain scores. Subpopulation estimates of the means and standard errors of domain scores, by sector, are shown in Table 3. The largest difference was with incentive pay, where on average public sector workplaces had less than half as many practices as the private sector. The public sector's difficulties with incentive pay have been discussed in Section 2. Within the other domains, however, the public sector had somewhat higher intensity of HPWP adoption (see also Van Wanrooy et al., 2013).

3.4 | Control variables

Omitted variable bias has been a recurrent issue in research on the effects of HRM/HPWP (Gerhart, 2013). As part of our effort to minimize this source of bias, we have included in all public sector analyses available variables known to have substantial influence on labour market outcomes. Workplace size for instance has been shown to have pervasive effects on workplace practices, unionization, and performance, while also affecting individual earnings, conditions and attitudes (see e.g. Kersley et al., 2006): it is here represented by the log of number of employees. Industrial relations structure is another variable having wide repercussions (e.g. Freeman & Medoff, 1984), represented here by single-union and multi-union dummies.[4] The age of the workplace is known to influence unionization (Machin, 2000) and may proxy

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[4]Multi-unionism provides a more sensitive measure than simple union recognition because unions are recognized throughout most of the public sector (Bryson & Wilkinson, 2001).

managerial and reputational resources that affect capacity for change. A further dimension of workplace heterogeneity is type of industry; we define five industry groups.

Possibly the most-studied influence on individual employment outcomes has been occupational group or class (e.g. McGovern et al., 2007); this also connects to the large literature on qualifications and skills, resources with obvious importance for HRM. Here, we included the workplace percentages in higher and lower occupational/skill groups, with intermediate occupations as the reference category. Other compositional variables we included were percentages of female employees, of part-time employees, and of those on fixed-term contracts, all of which have figured prominently in the debates around job quality and flexibility (e.g. Kalleberg, 2011). Finally, responding to studies by Zatzick and Iverson (2006) and Wood and Ogbonnaya (2016), a variable was included to represent the adoption of short-term cost-cutting workforce policies, such as wage freezes, wage cuts and short-time working, following the 2008 recession; these cuts might disturb HPWP effects. The variable was scored 1 if at least 3 policies from a list of 14 were reported.

Controls were similar for the private sector, except that 11 industry groups and an organizational size variable (four categories) were included. These differences rule out statistical contrasts but are sufficiently minor to permit qualitative comparisons.

3.5 | Analysis methods

WERS 2011 is a stratified sample, with oversampling of larger establishments. To maintain valid inference, inverse probability weighting and robust standard errors were applied for the cross-section analyses. The main analyses for workforce performance and employee mean outcomes were regression models incorporating a linear parameter in HPWP; variants added the square of HPWP to assess functional form. Results from the linear-quadratic specification are shown only when they appear superior to those from the linear model. Alongside the models using the HPWP index in linear form, we ran variants where the index was replaced by five variables representing the component domains. These additional analyses were estimated with the same set of control variables as for the main analyses.

For analyses of the probability of particular kinds of change taking place, the univariate probit model was used instead of linear regression, as these outcomes were binary. Weighting and robust standard errors were applied as before. Bivariate and trivariate probit models were also estimated to check robustness of the univariate estimates: these results are not reported here.

For two performance outcomes, we further constructed a fixed-effect (FE) panel analysis for a subset of workplaces that had similar data from the WERS 2004 survey—see Section 4.4 for details.

4 | RESULTS

4.1 | Workplace performance outcomes

Table 4 summarizes results from weighted robust regression analyses for the overall performance rating, log median wage, and workplace change outcomes described in Section 3.2.1. The estimates shown for the public sector (Panel a) are of the linear effects of HPWP intensity; models with an added term in HPWP-squared were not supported.

TABLE 4   HPWP effects on workplace performance outcomes.

	b	SE	|*t*|	*N*	R^2
(a) Public sector					
Overall performance index	0.067	0.031	2.20*	461	0.085
Log median wage	−0.006	0.0026	2.48*	523	0.606
Change activity index	0.075	0.019	4.03**	524	0.137
(b) Private sector					
{Overall performance index − HPWP − HPWP squared}	0.324	0.087	3.70**	455	0.161
	−0.006	0.002	3.03**		
Log median wage	0.0016	0.0032	0.50	498	0.757
Change activity index	0.039	0.013	2.95**	498	0.251

Note: Estimates shown are of models linear in HPWP except in the case of private sector overall performance index where the estimates are from a linear-quadratic model in HPWP. Method is survey-weighted regression with robust standard errors. All analyses have control variables as shown in Table A2.

Abbreviation: HPWP, high-performance workplace practice.

* and ** denote significance at 5 and 1 per cent levels, respectively.

The HPWP linear effect was significant and in accordance with predictions on all three performance outcomes: overall performance rating, positive and significant at the 5 per cent level; log median wage, negative and significant at the 5 per cent level; and index of change activity, positive and significant at the 1 per cent level.

To assess practical significance, we computed the predicted marginal effect of the median wage at the lower and upper quartile points of HPWP: the values being £12.17 for the former and £11.75 for the latter. For a 35-h week and full-time equivalent worker this was nearly a £15 ($23) difference at end-2011 values and prices. Another way of assessing practical significance is to compare with other independent variable effects, taking advantage of linearity of estimates. In the log median wage model, the effect of the part-time employee proportion was negative and significant ($b = −0.002$, SE = 0.0007); this implies that a difference in the part-time proportion of 15 percentage points approximately equates to the inter-quartile difference for the HPWP index. In the model of overall performance ratings, the proportion of employees on fixed-term contracts had a significant and positive effect ($b = 0.022$, SE = 0.010). Comparing to the HPWP effect, one sees that a 3 percentage point increase in the fixed-term employment rate roughly equated a one-item increase in the index. These results somewhat confirm the importance of labour flexibility in public sector policy while also underlining the performance impact of HPWP.

To develop the analysis of workplace change projects in more detail, univariate probit models assessed the HPWP effect separately on three types of change. The effect of HPWP on new technology introduction was estimated as 0.061 with $|t| = 2.88$; the effect on introduction of services involving new technology or extended provision was 0.065 with $|t| = 3.48$; while the effect on new working hours arrangements was 0.008 with $|t| = 0.42$. To assess practical significance, Table 5 shows the predicted marginal effects with each change outcome at the lower and upper quartile points of HPWP. The inter-quartile probability differences were 10 percentage points in the case of new technology and 11 percentage points in the case of new services. The lack of an HPWP effect on changes in hours arrangements can reasonably be explained by the primacy of union negotiation over this type of issue.

Panel (b) of Tables 4 and 5 show corresponding results in the private sector sample. There were two qualitative differences between the sectors. HPWP was positively but non-significantly

TABLE 5 HPWP and particular types of change: marginal effects from probit models.

Change type	Probability of each change at		Difference	|t|
	Lower quartile HPWP	**Upper quartile HPWP**		
(a) Public sector				
New technology	0.639 (0.0354)	0.739 (0.0366)	0.10	1.96*
New service	0.380 (0.0342)	0.492 (0.0397)	0.112	2.14*
Hours	0.321 (0.0331)	0.336 (0.0372)	0.015	0.294
(b) Private sector				
New technology	0.652 (0.039)	0.716 (0.041)	0.064	1.131
New service	0.384 (0.037)	0.567 (0.053)	0.183	2.831**
Hours	0.321 (0.037)	0.246 (0.038)	−0.075	1.41

Note: Marginal probabilities are computed from univariate probit models, with the HPWP index first at the lower quartile value and then at the upper quartile value. All other variables are kept at their observed values. Standard errors of these predictive margins are in brackets. The probit estimates (not shown) are obtained from survey-weighted analyses with robust standard errors, and control variables as shown in Table A2.

Abbreviation: HPWP, high-performance workplace practice.

* denotes significance at 5 per cent level.

related to the private sector median wage: this is not unexpected since private sector workplaces may pursue other goals, for example, upskilling, that would tend to counter downward pressure on wages. More surprising was the emergence of a non-linear relationship of HPWP to managers' ratings of overall workplace performance, with a turning point at about the mean HPWP value for the sample: positive over the lower range of HPWP, but turning negative above. On the final performance measure, the index of change activity, HPWP was estimated to have a positive effect significant at the 1 per cent level. In the probit models for the private sector, however, only that for change in service involving either new technology or substantial extension was statistically significant ($b = 0.062$, $t = 3.73$) with a predicted marginal inter-quartile difference of 18 percentage points. Improvement in services thus appears to have been the change priority for the private sector in the period following the 2008 recession. The relationship was also positive but much weaker in regard to technical change per se, not significant at the 10 per cent level, while for changes in working hours it was negatively signed.

4.2 | Employee outcomes

The effects of HPWP on public sector employees' well-being and motivation were examined through analyses summarized in Table 6, Panel (a). In these linear regression models, estimated effects of the HPWP index were indistinguishable from zero for all measures. Thus, we found no evidence that HPWP positively affected public sector employees either in respect of well-being (SWB and HWB) or in respect of motivation (SWB and OAC). Since the effects of HPWP on well-being and motivation outcomes did not differ significantly from zero, HPWP effects on performance outcomes were not here mediated by psychic gains for employees, on the usual assumption of a multiplicative mediation path.

Panel (b) of Table 5 shows results relating to the private sector. As with the public sector, the effect of HPWP on SWB was non-significant, but there were two notable qualitative

TABLE 6   Estimated effects of HPWP on workplace well-being and motivation.

	b	**SE**	|*t*|	*N*	R^2
(a) Public sector analyses					
SWB	−0.008	0.018	0.43	505	0.321
HWB	−0.005	0.029	0.16	505	0.182
OAC	−0.005	0.012	0.44	505	0.392
(b) Private sector analyses					
SWB	0.0046	0.0257	0.18	477	0.203
HWB	−0.067	0.0222	3.00**	476	0.159
OAC − effect of HPWP	0.140	0.072	1.95[+]	476	0.293
OAC − effect of HPWP-squared	−0.0031	0.0015	2.03*	476	0.293

Note: Estimates from survey-weighted regression analyses with robust standard errors. Estimates shown are for models linear in HPWP, except for private sector OAC where a model with linear and quadratic terms in HPWP is shown. Control variables were as shown in Table A2.

Abbreviation: HPWP, high-performance workplace practice; HWB, health well-being; OAC, organizational affective commitment; SWB, satisfaction well-being.

[+]denotes statistical signficance at a 10% level

*denotes statistical significance at a 5% level

**denotes statistical signficance at a 1% level

differences on the two other employee outcomes. Firstly, the linear effect of HPWP on HWB in the private sector was negatively signed and significant at the 1 per cent level. Secondly, there was a non-linear relationship between HPWP intensity and OAC, with the turning point a little below the mean value of HPWP in the private sector sample. Thus, employees' affective commitment declined at high levels of HPWP intensity. From a method viewpoint, the private sector results suggest that the measures and analysis specifications of this research are sufficiently sensitive to reveal significant effects, both linear and non-linear.

Variant models that added an interaction term between HPWP and short-term cost-cutting policies for the post-recessionary period were not supported in either sector.

4.3 | Cross-section analyses using HPWP domain measures

The analyses where the overall HPWP index was replaced by the five HPWP domain measures covered the three performance outcomes, and the three employee well-being and motivation outcomes, for the two sectoral samples. Most of the parameter estimates were non-significant, so we do not tabulate them, but two systematic features of the results are worth noting; both relate to the public sector only.

In regard to performance outcomes, the 'participation' domain played a consistently strong role giving some further insight into the overall HPWP effects. Participation was significantly associated (5 per cent level)[5] with a lower median wage and with higher ratings of overall workplace performance and with a higher level of the workplace change measure.

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[5]Estimates (SEs) were: for overall performance rating, $b = 0.183$ (0.093); for log median wage, $b = −0.016$ (0.007); for change index, $b = 0.125$ (0.055).

TABLE 7 HPWP and workplace performance outcomes: FE panel regression analyses.

	b	SE	$|t|$	Nobs	R^2 within	Rho
(a) Public sector						
Overall performance index	0.087	0.026	3.32**	374	0.085	0.564
Change activity index	0.087	0.022	3.89**	437	0.108	0.433
(b) Private sector						
Overall performance index − HPWP	0.066	0.023	2.72**	394	0.156	0.623
Change activity index	0.042	0.020	2.04*	437	0.078	0.450

Note: Two-period unweighted linear panel regression analysis with FEs. Significance: Rho is the proportion of residual error attributable to unobserved FEs.

Abbreviations: FEs, fixed effects; HPWP, high-performance workplace practice.

* and ** denote significance at 5 and 1 per cent levels, respectively.

In regard to well-being and motivational outcomes in the public sector, the moot question was whether any domain(s) had significant effects that were masked in the overall index. However, there was no instance of this being the case.

4.4 | Panel analysis of performance outcomes

For 230 of the workplaces in the public sector analysis sample, and for 235 of the private sector comparison workplaces, linkable data were available from the similar survey conducted in 2004. For these cases, a two-period balanced panel subsample was constructed. Pay distribution data in 2004 were inadequate for deriving a median wage, so this outcome could not be included in the panel analysis. However, FEs linear panel regression models were estimated for the overall performance rating index, and index of change-types. This analysis assesses robustness to removal of time-constant unobserved variable bias.

Several cautionary points should be noted about this part of the analysis. Questions about HPWP, though covering the same topics in 2004 as in 2011, were sometimes posed in a slightly different form, or with different wording, in the two surveys. In our judgement, this did not seriously affect the across-years meaning of the index. Size, unionization, and compositional variables were retained as controls, but age of workplace and industry group were omitted: for these, the few observed changes over time were suggestive of response or coding variation, so we treated them as constant. Analyses were run unweighted, as the available panel weights were unequal across years. Finally, panel sample selectivity is surely present. Despite these limitations, we regard these analyses as important since panel estimates are rare in the HPWP literature.

Table 7 summarizes the results from the FE analyses. For the public sector, the estimates of the HPWP effect were positive and significant at the 1 per cent level in both cases. For the private sector, the FE estimates were also positive and significant, but the coefficient was relatively small for the change activity analysis and this effect was significant at the 5 per cent level. Overall, results of the panel analysis appeared consistent with those from the 2011 cross-section.

5 | SUMMARY OF CONCLUSIONS

Our aim has been to assess the effects of HPWP across the public sector, excluding small establishments. We used a management technology framework for this purpose. Alongside performance outcomes, we also examined employee outcomes that relate to a mutual gains concept predicting that effects of HPWP on employee well-being are instrumental for performance. We also analysed a private sector sample for qualitative comparison.

The research provided evidence that HPWP intensity was positively associated with relevant measures of performance in the public sector. In parallel with managerial ratings, we assessed more objective measures in the form of the workplace median wage, a count of types of change project recently initiated at each workplace, and the occurrence of selected types of change. By comparing workplaces at lower and upper quartile levels of HPWP implementation, we estimated that the latter had a 3 per cent lower median wage and a 10–11 per cent higher probability of engaging in modernizing change projects. The study thus provides strong evidence that intensive use of HPWP is associated with improved performance with respect to major sectoral and NPM goals. There was also some evidence of positive effects of HPWP in the private sector, though somewhat less clear. Overall, HPWP appear to be an efficacious part of management technology.

Turning to employee well-being and motivation, viewed as sources of employees′ positive contributions, we estimated HPWP effects with measures that have been deployed in previous studies: satisfaction well-being, (psychological) HWB, and OAC. The estimated effects of HPWP on these outcomes in the public sector were so small as to be indistinguishable from zero. There was thus no evidence that HPWP constituted a 'mutual gains' system of practice for public sector employees. These employee outcomes cannot be supposed to mediate performance outcomes in the public sector, on the usual assumption of a multiplicative mediation pathway.

Significant associations of HPWP were found in the private sector with both the HWB and organizational commitment outcomes—albeit these relationships were negative in the former case and in the latter declining at above-average HPWP intensities (see also Godard, 2001; Ramsay et al., 2000). In our previous research, we have shown that the same measure of HPWP index was *positively* associated with satisfaction and commitment outcomes in a sample of small firms taken from the same data source as the present study (Bryson & White, 2018). It appears that there are large variations in the HPWP effects on employees both across sectors and within the private sector. One of the main tasks that is indicated for future research is to develop better understanding of these varying relations between HPWP and employee outcomes.

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APPENDIX

TABLE A1 Items used in construction of HPWP index.

Domains	Mean	SD	Range	KR20	Contents
Participation	7.90	1.86	1–10	0.69	Meetings are regular; *meeting frequency; staff time in meetings; briefing frequency; staff time in briefings*; subjects discussed in meetings (staffing, finance, investment); consultative committee; attitude surveys
Team working KR20 = 0.57	3.80	1.25	0–6	0.57	*Proportion in teams*; training for team-working; teams have inter-dependence, make joint decisions, have product/service responsibility; quality circles used
Development	5.42	1.41	1–8	0.60	'Investor in People' standard achieved; *proportion given workplace training; proportion given off-job training; proportion given cross-job training; variety of training courses used*; induction courses used; appraisal for managers; appraisal for all non-managers; employee development is part of workplace strategy; vacancies filled internally if possible.
Selection	5.54	1.56	0–8	0.62	Selection criteria: qualifications, skills, references, motivation, experience; use personality tests for manager jobs; use personality tests for non-manager jobs; use skill tests for manager jobs; use skill tests for non-manager jobs.
Incentives	1.85	2.05	0–8	0.81	Bonus for individual, group/team, workplace, organization performance; profit-sharing for non-managers; merit-based or performance pay; appraisals that affect pay differentials; incentives that affect pay differentials.
HPWP index	24.51	4.47	11–36	0.80	Sum of above items.

Note: KR20 is the Kuder–Richardson reliability measure for dichotomous item scales, computed over whole-economy sample ($N = 2680$). Italicized items are quantitative banded variables reduced to dichotomies by splitting at the median. 'Investor in People' is an externally awarded standard for people development.

Abbreviation: HPWP, high-performance workplace practice.

TABLE A2   Control variable descriptive statistics.

Sector	Public		Private	
Variable	**Mean**	**SD**	**Mean**	**SD**
3+ Recessionary actions	0.439	0.50	0.243	0.429
% Higher occ.	35.81	25.08	20.85	27.65
% Intermediate occ.	36.50	28.17	28.03	27.06
% Lower occ.	27.63	27.63	51.07	36.96
% Female	60.58	22.82	40.28	25.08
% Part-time	28.69	19.42	19.81	25.11
% Non-permanent	7.57	11.19	6.51	18.20
Size (log employees)	5.71	1.40	5.42	1.12
Age of site dummies				
• Less than 5 years	0.053	0.224	0.062	0.241
• 5–9 years	0.073	0.280	0.095	0.293
• 10–24 years	0.182	0.387	0.358	0.480
• 25 or more years	0.692	0.462	0.485	0.500
Unionization dummies				
• No union	0.116	0.320	0.556	0.497
• One	0.140	0.348	0.242	0.429
• Two or more	0.743	0.437	0.202	0.402
Industry group dummies				
• Commercial services	0.125	0.331	0.820	0.385
• Government services	0.261	0.440	0.005	0.074
• Education services	0.302	0.460	0.022	0.146
• Healthcare services	0.241	0.428	0.082	0.274
• Community services	0.069	0.254	0.071	0.257

Note: statistics are unweighted and refer to workplaces with at least 50 employees and linked employee data. For analyses reported in Tables 3–6, private sector commercial service industries are further split into seven subgroups (not shown).