Can Human Resource Management Improve Schools' Performance?

Alex Bryson[1] — Lucy Stokes[2] — David Wilkinson[1]

Abstract. Using data for British workplaces, we compare the associations between human resource management (HRM) practices and schools' performance, comparing those effects to the effects of HRM among private sector workplaces. We do so using measures of workplace performance that are common across all workplaces. We find intensive use of HRM practices is correlated with substantial improvement in workplace performance, both among schools and other workplaces. Results are robust to panel estimates of the correlation between changes in performance and changes in HRM.

1. Introduction

In recent decades, a large literature has emerged devoted to identifying factors explaining variance in schools' performance, usually measured in terms of improvements in pupils' academic achievements since joining the school (value added). The literature focuses on factors amenable to government action, such as class size, teacher quality, teachers' salaries, pedagogic techniques, the nutritional intake of students and school resources. The broader economic literature on factors affecting workplace and firm performance has investigated a wide range of capital and labour inputs standard in the production function literature but, in part motivated by remarkable within-industry variance in performance, the factors under consideration have been extended to include managerial practices, leadership skills and corporate governance. In these literatures, analysts tend to focus on profitability or performance metrics such as sales growth which are applicable across much of the for-profit sector.

We contribute to the literature on schools' performance by comparing their performance with that of private sector workplaces in Britain on dimensions including their financial performance, labour productivity and quality of their services provided. We establish how HRM intensity relates to school performance and the performance of other workplaces. In this sense, our paper is in the spirit of Lemos and Scur's (2012) analysis of management practices in the public and private sectors, although their setting (India) is very different.

We find intensive use of HRM practices is correlated with substantial improvement in workplace performance, both among schools and other workplaces. Results are robust to

[1]Department of Social Science, UCL, 20 Bedford Way, London, WC1H 0AL, UK.
E-mail: a.bryson@ucl.ac.uk
[2]NIESR, London, UK.

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panel estimates of the correlation between changes in performance and changes in HRM management.

The remainder of the paper is organized as follows. In Section Two, we review the literature on school performance briefly before focusing on the literature exploring links between managerial practices and performance and identify hypotheses to be tested in the data. In Section Three, we present the data and our estimation techniques before presenting our results in Section Four and concluding in Section Five.

2. Literature and hypotheses

A burgeoning literature examines attributes that may be linked to schools' performance, as indicated by their ability to improve pupil attainment. School performance is usually measured in terms of improvements in pupils' academic achievements since joining the school. Accurately identifying which schools are performing better than others matters, not only because government wishes to maximize the value of schooling to pupils but also because, in many countries, schools are ranked on performance metrics and parents and pupils seek to choose between schools based on their relative merits. Countries are also judged on the relative quality of their education systems using metrics that are harmonized across countries, such as PISA (Programme for International Student Assessment) scores (Jerrim, 2016).

The schools' literature focuses on factors amenable to government action, such as class size (Jepsen, 2015), school resources (Jackson *et al.*, 2016), teachers' salaries (Dolton and Marcenaro-Gutierrez, 2011), the nutritional intake of students (Anderson *et al.*, 2017), pedagogic techniques (Machin and McNally, 2008), teacher quality (Slater *et al.*, 2012) and school governance arrangements (Eyles and Machin, 2015). However, this literature has been divorced somewhat from the wider literature on firm and workplace performance which has investigated the role played by a broader range of capital and labour inputs which augment the standard production function. This wider economics literature is motivated by remarkable within-industry variance in performance, even in very narrowly defined markets and industrial sectors (Syverson, 2011). Recently, analysts have focused on choices made by firms in relation to factors such as managerial practices (Bloom *et al.*, 2014), leadership skills (Besley *et al.*, 2011) and corporate governance (Bhagat and Bolton, 2008). In these literatures, analysts tend to focus on profitability or performance metrics such as sales growth which are applicable across much of the for-profit sector.

The literature on management tends to find positive associations between the number of management practices deployed and a range of economic outcomes such as higher profitability, improved labour productivity and lower closure rates (Bloom *et al.*, 2017a). Bloom *et al.* (2017a) argue that this link is plausibly causal and, using a range of quasi-experimental methods, find support for this proposition among manufacturing establishments in the United States. They demonstrate that there is substantial variance in the number of practices deployed across manufacturing plants, even among those belonging to the same firm, and that around a third of the dispersion in these practices is linked to a combination of competition, business environment, the available supply of human capital and learning from the most productive workplaces in the locality. Bloom *et al.* (2017a) focus their attention on practices relating to worker monitoring, targets and incentives, but other studies using a broader array of management practices have also found positive independent

associations between the intensity with which management deploy practices and workplace or firm performance (Appelbaum *et al.*, 2000).

This literature begs the question as to whether the management practices often viewed as optimal for profit-maximizing firms might have similar beneficial effects in the not-for-profit sector. Underlying the practice intensity metric used to identify good quality management in Bloom *et al.* (2017a) is the assumption that the types of management practices they focus on would be beneficial to any organization choosing to adopt them and that the returns to their adoption will rise with the intensity with which the organization invests in them. However, related literatures suggest that the optimal configuration of management practices may differ across organizations, depending on the degree to which they 'fit' with other internal features of the organization, or 'external' factors such as the market it operates in (Delery and Doty, 1996). It may be that, in the case of schools, some practices are more valuable for performance than others but that the intensity with which they are deployed may nevertheless matter.

Although management scholars have recognized the potential importance of management in improving school performance since the early 2000s (Ouchi *et al.*, 2005), it is only recently that empirical research has emerged indicating that management practices often deployed successfully in the for-profit sector can also be beneficial in the not-for-profit sector. For example, Bloom *et al.* (2015b) find their management index is positively correlated with the performance of public hospitals in England, as indicated by survival rates from emergency heart surgery.[1] Rasul and Rogger (2018) show management practices can also affect the *quantity* of public services provided, as indicated by the Nigerian civil service signing off on engineering projects. Perhaps the most pertinent study is Bloom *et al.* (2015a) which focuses on high schools in eight countries. They find substantial variance in management practices across and within countries, with the latter determined in large part by differences in school governance (particularly accountability for performance) and school leadership.[2] They confirm that management practices typically found in more profitable firms also improve school value added. They focus on twenty practices falling into one of four domains: operations, monitoring, target setting and people management (which relates largely to the management and incentivization of talent). They find a linear association between management practice intensity and pupil attainment.[3]

In a series of field experiments, Fryer (2014, 2017) provides causal evidence identifying the impact of management practices on school value added in the United States. He finds value added in traditional public schools in Houston rose following the adoption of five managerial practices that were common in high-achieving Charter Schools (namely increased instructional time, a more rigorous approach to building human capital of teachers and administrators, high-dosage tutoring, frequent use of data to inform instruction, and a culture of high expectations) (Fryer, 2014). In a second field experiment involving 58 schools in Houston, Fryer (2017) finds intensive school principal training in relation to instructional planning, data-driven instruction, and observation and coaching raise school value added at a low marginal cost to schools.

However, other studies indicate that management systems linked to high performance in the private sector do not perform so well in the public sector, which harbours most schools. For example, Bryson *et al.* (2017a) find performance pay is negatively associated with workplace performance in the public sector. The finding is consistent with principal–agent theories regarding the difficulties of implementing performance pay in scenarios where monitoring output is costly (Lemieux *et al.*, 2009). More broadly, there may be

difficulties using financial instruments to incentivize 'mission-oriented' employees such as teachers whose motivation is often linked to intrinsic job rewards (Besley and Ghatak, 2005).

In the light of this literature, we test the hypotheses that school performance will improve with the intensity of HRM and that this association between HRM intensity and workplace performance is likely to be linear, as Bloom *et al.* (2017) found, suggesting 'more is better'.

3. Methods

In this section, we introduce our data, present the key measures used in our analyses and describe our estimation strategy.

3.1. Data

Our data are the Workplace Employment Relations Survey (WERS) 2004 and 2011. Appropriately weighted, they are nationally representative surveys of workplaces in Britain with five or more employees covering all sectors of the economy except agriculture and mining (van Wanrooy *et al.*, 2013). The data consist primarily of information gathered in face-to-face interviews with the most senior workplace manager responsible for employee relations at the workplace. They are targeted by the survey because they are best-placed to provide accurate information on the management practices deployed at the workplace.

The analysis exploits two aspects of the survey. The first is the cross-sectional data collected in interviews conducted in 2,295 workplaces between February 2004 and April 2005 and again at 2,680 workplaces between March 2011 and June 2012. The surveys had response rates of 64 per cent and 46 per cent, respectively. The second element of the survey we exploit is the panel component nested within the cross-sectional surveys. Among the 2,680 productive workplaces in 2011, 989 were panel workplaces that had previously been interviewed in 2004. The management response rate among this group of panel workplaces was 52 per cent.

Survey weights have been devised for each element of WERS to account for sample selection probabilities and observable non-response biases (van Wanrooy *et al.*, 2013). All analyses are survey-weighted.

3.1.1. Schools. Schools are identified using their five-digit Standard Industrial Classification.[4] Managers are asked the formal status of the organization to which their workplace belongs, from which we distinguish public and private sector workplaces. There are 406 schools in the pooled cross-sectional data. The panel contains 87 schools. Of these, 69 remain schools in both 2004 and 2011, five stop being schools and 13 become schools. (Most of the switchers are technical/vocational schools switching into or out of being adult education centres or providers of specialist education.) Our panel analysis is confined to schools who remain schools in both periods.

3.1.2. Workplace performance. We analyse both subjective and objective metrics of workplace performance. Managers are asked to provide subjective assessments on three separate measures.[5] We follow Bryson *et al.* (2017b) in the construction of an additive scale combining managers' responses to three questions: 'Compared to other workplaces

in the same industry how would you assess your workplace's. . .financial performance; labour productivity; quality of product or service'. Responses are recorded on a 5-point Likert scale from 'a lot better than average' to 'a lot below average'. The 'a lot below average' and 'below average' codes are collapsed (as few workplaces record performing 'a lot below average') and scales scored from 0 to 3 where 3 = 'a lot above average'. Summing them gives a scale of 0 ('below average' performance on all three items) to 9 (performance 'a lot better than average' on all three items). The pairwise correlations between the three measures vary between 0.57 (financial performance and product/service quality) and 0.63 (financial performance and labour productivity). Factor analysis identifies a single factor with an eigen value of 2.19, and an alpha reliability coefficient for the composite performance scale is 0.81. The mean for schools is slightly above that for non-schools (5.36 versus 5.08) and the distributions are similar (standard deviations of 1.86 and 1.71, respectively). The full unweighted workplace performance distributions for the whole sample and schools and non-schools separately are presented in Figure A1. The panel analogue, which is simply the difference between the 2004 score and the 2011 score, is presented in Figure A2.

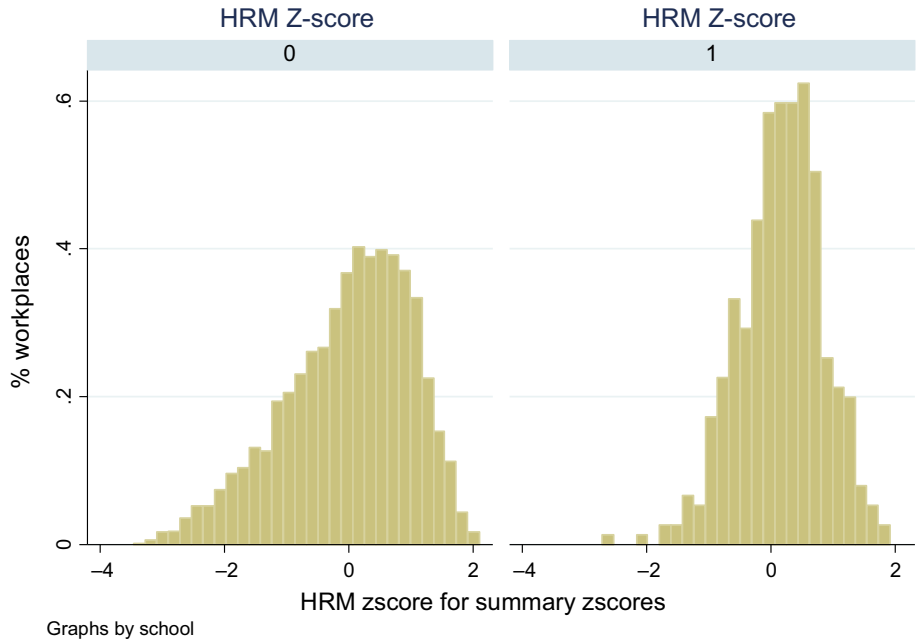
We also analyse links between management practices and worker absence rates, worker quit rates, rates of worker injury and illness, and the climate of employment relations. Discussion of those measures is presented in the results section later.

3.1.3. Human resource management. Following Bloom *et al.* (2017a), we construct a single HRM index based on binary (0,1) indicators identifying the presence or absence of specific HRM practices.[6] The 48 items available are drawn from eight HRM domains, as indicated in Table A1. These domains include five that are commonly the focus in the 'high performance work systems' literature, namely teams, training, participation, selection and incentives, together with target setting and record keeping — emphasized in the work of Bloom *et al.* (2014, 2017a) — and total quality management (TQM) which is often identified as key to lean production. The Kuder–Richardson coefficients of reliability are presented in the last column of Table A1. They range from 0.47 for the TQM indicators to 0.85 for the eleven targets. The KR20 for all 48 items together is 0.88.

In our empirical analysis, we first produce z-scores with a mean of zero and standard deviation of 1 for each of the HRM domains then add them together into a single additive score to capture HRM intensity. The weighted distributions for schools and non-schools are presented in Figure 1. The score ranges between −3.46 and +2.10.

3.1.4. Controls. In cross-sectional analyses, we isolate the partial correlation between HRM and workplace performance having conditioned on the number of employees in the workplace; whether the workplace is a stand-alone workplace as opposed to belonging to a multi-establishment organization; being an older establishment aged 25 years or more; industry classification and region. The composition of the workforce is captured with controls identifying the proportion of old (50+) and young (16–21 years) workers; age diversity[7]; the proportion female and gender diversity; the proportion from non-white ethnic minorities; the proportion part-time; the percentage union membership; the percentage in managerial posts; the percentage in professional posts; and the percentage in associate professional and technical posts. The panel estimates contain similar variables (detailed in the footnote to Table 3) but exclude workplace attributes that are fixed over time.

Figure 1. Distribution of ZHRMSCORE across schools and other workplaces



3.2. Estimation

We run OLS estimates of workplace performance for schools and non-schools separately pooling the data for 2004 and 2011:

$$p_i = \alpha + \beta hrm_i + \delta year_i + \pi X_i + \varepsilon_i, \quad [1]$$

where performance p of workplace i is a function of HRM, a year dummy and a vector of controls X discussed above. The Greek letters are parameters to be estimated. All models are survey-weighted so that results can be extrapolated to the population of workplaces with 5+ employees in Britain.

In variants of this model, we add ZHRMSCORSQ — the square of ZHRMSCORE — to see whether the quadratic HRM score indicates non-linear returns to HRM intensity.

Second, we use the two-wave panel data to estimate first-difference models to establish the association between variance in HRM and variance in workplace performance within workplaces over time. The advantage in doing so is that we net out time-invariant unobservable features of workplaces that may be correlated with performance and management practices. This is valuable if, for example, one thinks of management quality as a fixed unobserved factor that may bias the results.[8] These models, which are run on schools and non-schools separately[9], take the following form:

$$\Delta p_i = \beta \Delta hrm_i + \pi \Delta X_i + + \Delta \varepsilon i, \quad [2]$$

where Δ denotes change between 2004 and 2011. All panel estimates are survey-weighted so that one can extrapolate from the results to the population of workplaces that were operating in both 2004 and 2011.

4. Results

Table 1 presents the mean scores for the management practices in each of the eight domains described earlier, together with the overall management score. They are presented as raw survey-weighted counts.

The differences in HRM usage are not particularly large. Row 9 indicates that schools tend to use two or three more practices than private sector workplaces out of the forty-eight measured in WERS. However, in regression analyses controlling for potential confounders this differential is not statistically significant.

Table 2 shows the coefficients for the standardized HRM score and nine workplace performance metrics taken from cross-sectional regressions run on schools and non-schools separately in pooled year data. The HRM *z*-score is positively and significantly associated with the additive workplace performance scale, a 1 standard deviation increase in HRM corresponding to a 0.24 point rise in the 10-point workplace performance scale in non-schools and a 0.34 point rise in schools. In the case of non-schools, HRM intensity is positive and significant for all three components of the scale (financial performance, labour productivity and quality of output) whereas for schools significant correlations are found for financial performance and labour productivity but not for the quality of output.

Intensive HRM is also positively correlated with managers' perceptions that there is a good climate of employment relations at the workplace, but only in the case of private sector non-schools.

The independent association between HRM intensity and workplace performance is not confined to subjective measures of performance: greater HRM intensity is associated with lower quit rates in schools and with lower illness rates in non-schools.

These results broadly confirm earlier studies indicating that HRM intensity is positively correlated with workplace performance in non-school private sector workplaces, and our hypothesis that this would also be the case in schools. We also investigated whether there were non-linear returns to HRM. Here, the evidence was somewhat mixed. The quadratic HRM term was never statistically significant in the case of private sector non-schools. However, it was positive and statistically significant in schools for both the additive workplace performance measure (0.46, $t = 3.05$) and financial performance (0.13, $t = 3.02$), suggesting increasing returns to investment in HRM intensity. At the same time, the quadratic term was positively associated with greater quit rates (1.54, $t = 2.22$), perhaps indicating

Table 1. Mean scores for management practices in schools and private sector non-schools

	Not School	School
Incentives (0,4)	1.9	1.9
Records (0,9)	6.7	6.2
Targets (0,11)	4.0	2.6
Teams (0,4)	1.8	2.6
Training (0,5)	2.2	3.3
TQM (0,3)	1.1	1.8
Participation (0,5)	2.0	3.1
Selection (0,7)	4.2	5.2
HRM (0,48)	24.0	26.7

Note: Survey-weighted means for 406 schools and 3,485 private sector non-schools.

Table 2. Cross-sectional correlation between HRM score and workplace performance

	ZHRM coefficient	R^2	*N*
Additive performance scale			
Non-schools	0.243 (4.83)***	0.08	3,070
Schools	0.337 (2.10)**	0.21	335
Financial performance			
Non-schools	0.093 (3.80)***	0.05	3,214
Schools	0.149 (2.68)***	0.25	370
Labour productivity			
Non-schools	0.081 (3.59)***	0.08	3,151
Schools	0.211 (2.87)***	0.29	341
Quality of service/product			
Non-schools	0.068 (3.36)***	0.06	3,333
Schools	0.080 (1.12)	0.19	385
Employment relations climate			
Non-schools	0.044 (2.41)**	0.07	3,476
Schools	−0.009 (0.17)	0.18	400
Absence rate			
Non-schools	0.001 (0.33)	0.03	2,961
Schools	−0.054 (1.29)	0.11	319
Quit rate			
Non-schools	0.122 (0.27)	0.21	3,275
Schools	−1.886 (2.16)**	0.40	384
Illness rate			
Non-schools	−0.365 (1.87)*	0.04	3,485
Schools	0.999 (0.88)	0.40	406
Injury rate			
Non-schools	0.008 (0.11)	0.02	3,485
Schools	0.061 (0.88)	0.09	406

Notes: (1) OLS models for pooled 2004 and 2011 cross-sections. (2) Dependent variables are as follows. Financial performance, labour productivity and quality of service/output: ordinal scales where 1 = below/a lot below average to 4 = a lot better than average. The absence rate is the percentage of work days lost through sickness or absence at the workplace over the previous 12 months. The quit rate is the percentage of employees who left or resigned voluntarily in last year. The illness rate is the number of employees per 100 employees who have been absent in the last 12 months due to an illness caused or made worse by their work. The injury rate is the number of employees per 100 who have sustained an injury at work in the last 12 months. The climate measure is managerial responses to the question 'how would you rate the relationship between management and employees generally at this workplace?' with responses coded on an ordinal scale from 1 = poor/very poor to 4 = very good. (3) All models contain following controls: 2011 year dummy; region dummies (12); industry dummies (12 for private sector, 2 for schools); workplace aged 25+ years; *N* employees at the workplace; single-establishment organization; % age 16–21; % age 50+; age diversity; % female; gender diversity; % non-white; % part-time; % union density; % manager; % professionals; % associate professionals; % skilled crafts. (4) *t*-statistics in parentheses. Statistical significance: *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

that, at least in schools, very intensive HRM encouraged staff to leave. Lazear (2000) finds workers sort following the introduction of incentive pay, with more able employees entering the performance-paying firm, and less able employees leaving. It is conceivable that the quit effect is picking up similar behavioural responses with respect to HRM.

To establish the association between changes in HRM and change in workplace performance, we turn to the panel of workplaces surveyed in both 2004 and 2011. The models condition on a wide range of workplace demographics, as noted in the footnote to Table 3, so that these estimates account for potential biases associated with both time-invariant

Table 3. First-difference estimates of correlation between change in HRM score and workplace performance

	ZHRM coefficient	R^2	N
Additive performance			
Non-schools	0.648 (5.06)***	499	0.16
Schools	1.497 (2.45)**	44	0.44
Financial performance			
Non-schools	0.256 (3.68)***	0.11	549
Schools	0.481 (2.30)**	0.24	54
Labour productivity			
Non-schools	0.231 (3.27)***	0.13	523
Schools	0.811 (2.87)**	0.57	47
Quality of service/product			
Non-schools	0.126 (1.90)*	0.05	590
Schools	0.249 (1.49)	0.15	61
Employment relations climate			
Non-schools	0.095 (1.88)*	0.09	644
Schools	0.173 (1.04)	0.20	64
Absence rate			
Non-schools	0.007 (0.54)	0.20	469
Schools	−0.300 (1.74)*	0.51	45
Quit rate			
Non-schools	−1.861 (1.39)	0.10	573
Schools	1.129 (0.88)	0.22	64
Illness rate			
Non-schools	−0.032 (0.10)	0.03	649
Schools	5.410 (1.40)	0.30	69
Injury rate			
Non-schools	−0.509 (1.38)	0.02	649
Schools	0.501 (2.32)**	0.31	69

Notes: (1) First-difference OLS models for panel workplaces. (2) Non-schools models are run on panel workplaces that were never schools in 2004 and 2011. Schools models include workplaces that were schools in either 2004, 2011 or both. (3) Dependent variables are as follows. Financial performance, labour productivity and quality of service/output: ordinal scales where 1 = below/a lot below average to 4 = a lot better than average. The absence rate is the percentage of work days lost through sickness or absence at the workplace over the previous 12 months. The quit rate is the percentage of employees who left or resigned voluntarily in last year. The illness rate is the number of employees per 100 employees who have been absent in the last 12 months due to an illness caused or made worse by their work. The injury rate is the number of employees per 100 who have sustained an injury at work in the last 12 months. The climate measure is managerial responses to the question 'how would you rate the relationship between management and employees generally at this workplace?' with responses coded on an ordinal scale from 1 = poor/very poor to 4 = very good. (4) All models contain following controls all expressed as change between 2004 and 2011: % age 16–21; % age 50+; age diversity; % female; gender diversity; % non-white; % part-time; % union density; % manager; % professionals; % associate professionals. (5) t-statistics in parentheses. Statistical significance: *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

workplace unobserved traits and time-varying workplace demography. Again, estimates are run separately for schools and private sector non-schools.

The results presented for the first five dependent variables are strikingly similar to the cross-sectional estimates presented in Table 2: increased HRM intensity is positively associated with improved performance for schools and non-schools as measured by the additive performance scale, financial performance and labour productivity whereas, for non-schools, it is also positively associated with the quality of output and employment relations climate.

For schools, increased HRM intensity is also associated with lower absence rates, albeit at a 90 per cent confidence level. However, there are signs that HRM intensity may come at some cost to employees, at least in schools, because greater HRM intensity is positively associated with increased injury rates in schools, and there is a suggestion that it might also be linked to higher illness rates (although this coefficient does not approach statistical significance). These findings are suggestive that some of the performance benefits from HRM intensity in schools may be linked to more intensive working practices in schools.

5. Conclusions

We contribute to the literature on schools' performance by assessing the association between HRM intensity in schools and private sector non-schools in Britain. We do so using both cross-sectional and panel data which, when weighted, are nationally representative of workplaces with five or more employees. We use an array of performance metrics to test the proposition that HRM intensity is positively linked to performance in schools and elsewhere, including both subjective and objective metrics.

We find schools are similar to other workplaces in terms of their overall HRM score based on 48 measures of HR practices. Exploration of HRM associations with various workplace outcomes indicates that the returns to increasing use of HRM are apparent in schools and private sector non-schools. In schools, these effects are largely confined to improvements in workplace financial performance and labour productivity, rather than other outcomes, whereas in non-schools they extend to quality of output and the climate of employment relations. The results are robust to cross-sectional and panel estimation.

Although our results are robust to cross-sectional and panel estimation techniques, they may nevertheless be subject to estimation biases which prevent us from making causal inferences about the relationship between HRM and workplace performance. In our first-difference estimates, we account for both fixed unobserved differences across workplaces and time-varying workplace demographic changes that might otherwise bias the estimated relationship between HRM and performance. But HRM practices are not randomly assigned and we have no source of exogenous variance in HRM deployment which might assist with causal inference. Nevertheless, there appear to be some grounds for concluding that there are potential benefits for schools investing in HRM practices, just as there are for private sector workplaces.

Appendix

Table A1. Management practices

HRM Domain	HRM measures for each domain	KR20
Incentives (0,4)	Any performance pay; managers appraised; 100% non-managers appraised; non-manager appraisal linked to pay	0.50
Records (0,9)	Sales, costs, profits, labour costs, productivity, quality, turnover, absence, training	0.77
Targets (0,11)	Volume, costs, profits, ULCs, productivity, quality, turnover absence, training, job sat, client sat	0.85

Table A1. Continued

HRM Domain	HRM measures for each domain	KR20
Teams (0,4)	100% largest non-managerial occupation in teams; teams depend on each other to perform work; team responsible for products and services; team jointly decides how to do the work	0.63
Training (0, 5)	80% largest non-managerial occupation had on-job training lasts 12 months; workplace has strategic plan with employee focus; Investors in People Award; standard induction programme for new staff in largest non-managerial occupation; number of different types of training provided is above population median.	0.57
TQM (0, 3)	Quality circles; benchmarking; formal strategic plan for improving quality.	0.47
Participation (0,5)	Formal survey of employee views in last 2 years; management–employee consultation committee; workforce meetings with time for questions; team briefings with time for questions; employee involvement initiative introduced in last 2 years.	0.55
Selection (0,7)	References used in recruitment; recruitment criteria include skills; recruitment criteria include motivation; recruitment criteria include qualifications; recruitment criteria include experience; recruitment includes personality or aptitude test; recruitment includes competence or performance test.	0.51

Note: KR20 is the Kuder–Richardson coefficient of reliability used for dichotomous items.

Figure A1. Workplace performance distribution for schools and non-school workplaces

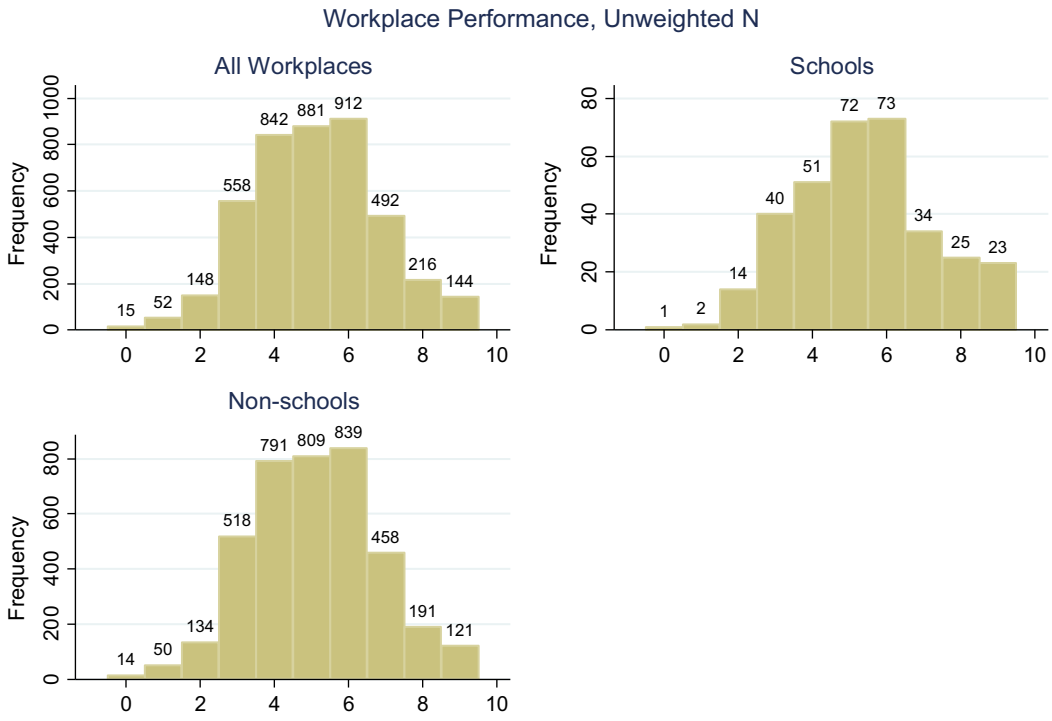
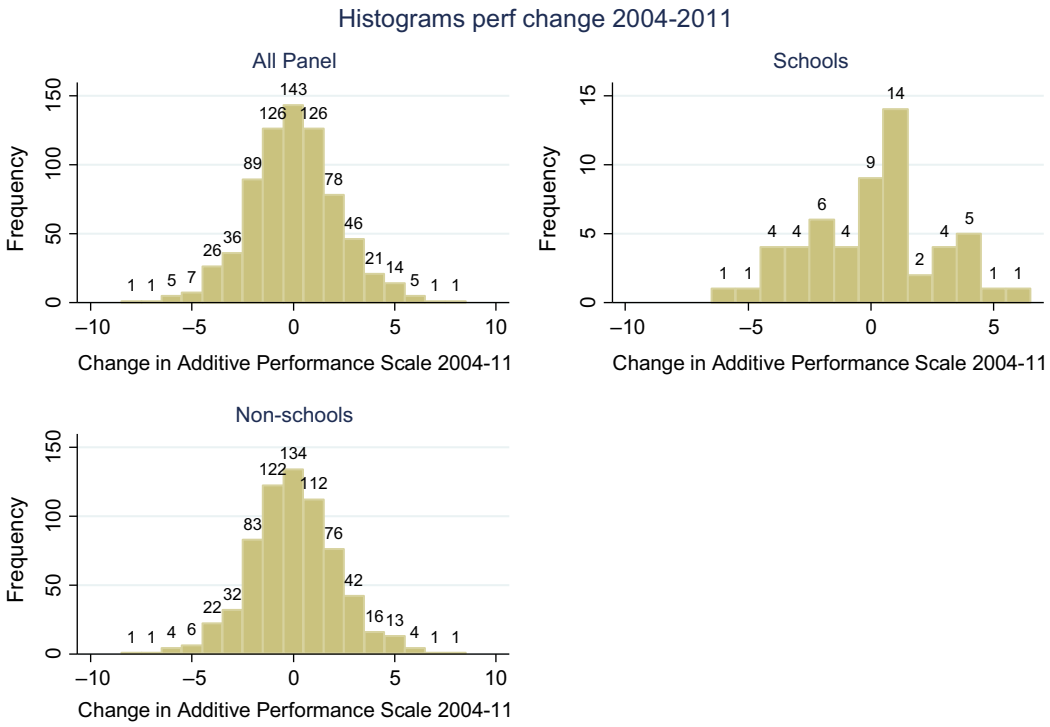


Figure A2. Change in workplace performance, 2004–11



Notes

[1]In subsequent work, they find similar results across country using myocardial infarction mortality rates as a performance metric (Bloom *et al.*, 2017b).

[2]Earlier work for the United States established the value of devolving management responsibilities to school principals in achieving student attainment metrics (Ouchi, 2006).

[3]Reflecting the broader economics literature recent contributions have also emphasized the importance of the quality of management in the form of school leadership (e.g. Ahn and Vigdor, 2014; Stokes et al., 2017) and governance arrangements (e.g. Eyles and Machin, 2015).

[4]Under the SIC 2003 classification, the codes identifying schools are 80100, 80210, 80220. Under the SIC 2007 classification, the relevant codes are 85100, 85200, 85310 and 85320. Primary schools are coded 80100 under SIC 2003 and 85100 or 85200 in SIC 2007. Secondary schools are coded 80210 in SIC 2003 and 85310 in SIC 2007. Technical and vocational schools are coded 80220 in SIC 2003 and 85320 in SIC 2007.

[5]Research for Denmark and Texas has questioned the value of subjective performance metrics collected from school middle managers (Meier *et al.*, 2015). However, the WERS measures have been frequently used in the literature (for a recent example, see Wu et al., 2015), in part because they have been validated in earlier research. For example, studies using WERS panel data show managers' subjective assessment of poor workplace performance are predictive of subsequent workplace closure (Machin, 1995). More broadly Forth and McNab (2008) point to the value of the subjective metrics in their own right, and in relation to accounting type metrics.

[6]This is standard in the literature. As Becker & Huselid 1998: 63) say: 'The overwhelming preference in the literature has been for a unitary index that contains a set (though not always the same set) of theoretically appropriate HRM policies derived from prior work'.

[7] Age diversity is calculated as one minus the sum of the squared age share terms where the age shares relate to those aged 16-21, 22-49 and 50+. The index has a minimum value of zero if there is only one category represented within the workplace and, as in our data, where we have three age categories, a maximum value of 0.67 if all categories are equally represented.

[8] Meier & O'Toole (2002) demonstrate the importance of managerial quality for the performance of schools in Texas.

[9] As noted earlier, our data contain workplaces that switch school status between 2004 and 2011 but the numbers are small and the behaviours of these schools with respect to changes in HRM practices and performance are unlikely to be particularly informative. We test the sensitivity of our baseline results to the inclusion of workplaces that switch school status: results are robust.

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