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ABSTRACT

Can HRM Improve Schools' Performance?*

Evidence on schools' performance is confined to comparisons across schools, usually based on value-added measures. We adopt an alternative approach comparing schools to observationally equivalent workplaces in the rest of the British economy using measures of workplace performance that are common across all workplaces. We focus on the role played by management practices in explaining differences in the performance of schools versus other workplaces, and performance across the schools' sector. We find intensive use of HRM practices is correlated with substantial improvement in workplace performance, both among schools and other workplaces. However, the types of practices that improve school performance are different from those that improve performance elsewhere in the economy. Furthermore, in contrast to the linear returns to HRM intensity in most workplaces, improvements in schools' performance are an increasing function of HRM intensity.

JEL Classification: I21

Keywords: school performance, human resource management, matching, first differences

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1. INTRODUCTION

In recent decades, a large literature has emerged devoted to identifying factors explaining variance in schools' performance, as indicated by their ability to improve pupil attainment, which is usually measured in terms of improvements in pupils' academic achievements since joining the school (value added). The literature has focused 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 them with the performance of other workplaces in Britain using an index combining their financial performance, labour productivity and quality of their services provided. The comparisons control for potential confounding factors using regression, matching and panel estimation techniques. First, we establish whether there are differences in the performance of schools relative to other observationally equivalent workplaces, and whether these persist over time, having conditioned on workplace traits which are plausibly exogenous, such as their size and workforce composition. Second, we focus on the choices schools and other workplaces make in terms of the managerial practices they adopt and their style of management. We investigate how schools differ from other workplaces in terms of the managerial practices they deploy and the intensity of their Human Resource Management (HRM) systems. Third, we establish

whether specific HRM practices and overall HRM intensity measures relate to school performance and the performance of other workplaces.

We find intensive use of HRM practices is correlated with substantial improvement in workplace performance, both among schools and other workplaces. However, the types of practices that improve school performance are different from those that improve performance elsewhere in the economy. Furthermore, in contrast to the linear returns to HRM intensity in most workplaces, improvements in schools' performance are an increasing function of HRM intensity.

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 maximise 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 harmonised 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 what they term "structured" management practices deployed and a range of economic outcomes such as higher profitability, improved labour productivity and lower closure rates (Bloom et al., 2017). Bloom et al. (2017) 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. (2017) 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).

In a related literature, White and Bryson (2016) and Bryson and White (2013) find the association between the use of management practices and employee job attitudes that are conducive to improved workplace performance is curvilinear, with low-intensity use of management practices lowering employee commitment and satisfaction, whereas intensive use is linked to improved job attitudes. They argue that their finding is consistent with Bowen and Ostroff's (2004: 206) contention that management practice systems perform a "symbolic or signalling function" requiring an intensive system to alter employee behaviours and performance". The u-shaped association between management practice intensity and job attitudes like organizational commitment and job satisfaction is consistent, they argue, with employers signalling insincerity in their use of high-performance practices until they reach a threshold of intensive usage.

This literature begs the question as to whether the management practices often viewed as optimal for profit-maximising 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. (2017) 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.

Evidence is sparse, but some studies do indicate that practices that have been deployed successfully in the for-profit sector have also proven valuable in a school setting. Sun and Van Ryzin (2014) in the United States, Tavares (2015) in Brazil, Argon and Limon (2016) in Turkey, and Di Liberto et al. (2014) in Italy all find indications of a positive relationship between various management practices and performance in a school setting. Perhaps the most pertinent one is the study by Bloom et al. (2015) 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. 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 incentivisation of talent). They find a linear association between management practice intensity and pupil attainment.[1]

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

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

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. (2017) 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 incentivise "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 three hypotheses. First, we hypothesise that school performance will improve with the intensity of HRM. Second, whereas some HRM practices found valuable in the for-profit sector may also be beneficial in schools, others may be less useful in schools. For instance, incentive pay may be difficult to implement and employees may be strongly motivated by non-pecuniary aspects of their jobs. Third, the 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 5 or more employees covering all sectors of the economy except agriculture and mining (van Wanrooy et al., 2013). The analysis exploits two aspects of the survey. The first is the cross-sectional data based on management interviews, conducted face-to-face with the most senior workplace manager responsible for employee relations. The 2011 survey interviews were conducted in 2,680 workplaces between March 2011 and June 2012 with a response rate of 46%. The 2004 survey interviews were conducted in 2,295 workplaces between February 2004 and April 2005 with a response rate of 64% (Kersley et al., 2006). 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%.

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: 212-3). All analyses are survey-weighted.

Schools: schools are identified using their five-digit Standard Industrial Classification. In addition to a dummy variable identifying schools (0, 1 where 1=school) we also distinguish

between primary schools, secondary schools and Technical/Vocational schools.[2] Managers are asked the formal status of the organization to which their workplace belongs, from which we distinguish public and private sector workplaces. We label private sector schools as private schools and public sector schools "state schools", to avoid confusion regarding the term "public school".[3]

There are 406 schools in the pooled cross-sectional data, over half of which are primary schools (Appendix Table A1). The panel contains 87 schools. Of these, 69 remain schools in both 2004 and 2011, 5 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.

Workplace performance: our main dependent variable is workplace performance which is measured using the manager's subjective assessment on three separate measures.[4] We follow Bryson et al. (2017) in the construction of the dependent variable. It is 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 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

[2] 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.
[3] In the UK "public schools" are private sector fee-paying schools.
[4] These measures are frequently used in the literature. For a recent example see Wu et al. (2015). For a discussion of these measures and their relationship with accounting measures of performance see Forth and McNabb (2008). Early studies using WERS panel data found managers' subjective assessment of poor workplace performance was predictive of subsequent workplace closure in the 1980s (Machin, 1995) and 1990s (Bryson, 2001).

lot better than average' on all 3 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 is presented in Appendix Figure A1. The panel analogue, which is simply the difference between the 2004 score and the 2011 score, is presented in Appendix Figure A2.

We supplement our main analyses which focus on this measure of workplace performance with analyses of worker absence rates, worker quit rates, rates of worker injury and illness, and the climate of employment relations. In doing so we focus on panel estimates which link changes in HRM to changes in outcomes of interest. These are intended to shed light on potential mechanisms by which HRM may affect workplace performance. Discussion of those measures is presented in the results section later.

Human resource management: Following White and Bryson (2013) and Bloom et al. (2017) we construct a single HRM index based on binary (0,1) indicators identifying the presence or absence of specific HRM practices.[5] The 48 items available are drawn from eight HRM domains, as indicated in Appendix Table A2. 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 – emphasised in the work of Bloom et al. (2014; 2017) – and total quality management (TQM)

[5] This is standard in the literature. As Becker and 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'.

which is often identified as key to lean production. The Kuder-Richardson coefficients of reliability are presented in the last column of Appendix Table A2. 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 investigate the association between HRM intensity using the overall score and, in alternative specifications, the role played by the eight HRM domains. Because we wish to compare the quantitative size of the associations across domains each is converted into a z-score with a mean of zero and standard deviation of 1. The composite index sums these z-scores and coverts the sum into a z-score. The weighted distributions for schools and non-schools are presented in Figure 1. The score ranges between -3.46 and +2.10.

[INSERT FIGURE 1]

Controls: most of the estimates presented rely on the assumption that any differences between schools and non-school workplaces that might be correlated with workplace performance and HRM are accounted for by conditioning on observed features of the workplace (the next section on estimation discusses this in greater detail). We condition on number of employees in the workplace; whether the workplace is a stand-alone workplace as opposed to belonging to a multi-establishment organisation; being an older establishment aged 25 years or more; 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[6]; 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. Where

[6] 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. Both the age share measures and age diversity measure are included in the models presented in this chapter, following the practice adopted in the rest of the literature reviewed above.

there was missing information on workplace demographic traits mean values were imputed and a marker incorporated identifying cases with imputed values.

Four additional control variables were incorporated in the models to capture managerial style which may affect both workplace performance and HRM practices. In their absence, our estimates might be vulnerable to omitted variables bias with HRM simply proxying underlying managerial style. These four dummy variables identify female Human Resource Managers[7]; managerial disagreement or strong disagreement with the statement "It is up to individual employees to balance their work and family responsibilities"; managerial strong agreement with the statement "We do not introduce any changes here without first discussing the implications with employees"; and strong agreement with the statement "We would rather consult directly with employees than with unions".

Finally, given the importance of competition in affecting performance and, potentially, in the propensity for employers to invest in HRM, we incorporated an additional variable in sensitivity analyses with the panel which captured those workplaces who, in response to the question "Looking at this card, can you tell me to what extent your workplace has been adversely affected by the recent recession?" answered "quite a lot" or "a great deal".

3.2 Estimation

We adopt four estimation strategies to establish whether there is a robust relationship between HRM and workplace performance in schools and other workplaces in Britain.

First we run pooled OLS estimates of the following form:

$$(1) \qquad p_i = \alpha + \beta hrm_i + \gamma school_i + \delta year_i + \lambda public_i + \varphi(hrm_i * school_i) + \pi X_i + \varepsilon_i$$

[7] There is a large literature indicating that women manage differently to men (Rosener, 1990) and that the presence of women in key managerial positions can affect firm performance (Christiansen, 2016).

where performance *p* of workplace i is a function of HRM, school status, belonging to the public sector, a vector of controls *X* discussed above, and a year dummy, with hrm*school capturing the differential returns to HRM in a school setting. 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 replace ZHRMSCORE – the z-score based on the z-scored eight domains of HRM – with the z-scored domains themselves. In variant models, we also distinguish between school type (primary, secondary, and Vocational/Technical), public sector workplaces that are not schools, and non-school private sector workplaces (the reference category). We also run separate estimates for schools and non-school workplaces, thus allowing all coefficients in the model to vary by school status.

Second, one might be concerned that some non-schools are unlike schools such that they are unlikely to constitute reasonable counterfactuals for the school workplace population. This concern can be addressed be reweighting the non-school population such that it resembles schools on variables likely to affect workplace performance. To address this concern, we rerun the OLS estimates with matching weights derived from a propensity score estimator which seeks to balance school and non-school workplaces on four covariates (number of employees, proportion female employees, proportion professional employees, and age of workplace) which differ markedly across schools and non-schools. The performance regressions are run on the sub-sample of schools for which there is common support among non-schools. We take the five nearest neighbours to schools based on their propensity to be schools, with a caliper of 0.005 ensuring neighbours are closely matched. In doing so 31 schools are off common support and they are bunched at the top end of the propensity distribution (Appendix Figure A3). The matched samples are well-balanced on covariates as indicated by standard statistics (Appendix Table A3).

Third, we use entropy balancing (Hainmueller and Zu, 2013) as an alternative method to propensity score matching to balance schools and other workplaces on some key covariates. The procedure reweights the non-schools so that the resulting distribution of covariates satisfies a set of specified moment conditions. Unlike matching, in entropy balancing all observations receive a weight so the full sample is available for estimation and there is no need for the enforcement of common support. We balance on means for the four covariates used for the propensity score matching.[8] Prior to balancing, schools were smaller, older, with more female employees and more professional employees than non-school workplaces. But the two samples are virtually perfectly balanced when weighted with the entropy balancing weights (Appendix Table A4).

Fourth, 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 with school status. These models, which are run on schools and non-schools separately[9], take the following form:

$$(2) \qquad \Delta p_i = \beta \Delta hrm_i + \pi \Delta X_i + + \Delta \varepsilon i$$

where Δ denotes change between 2004 and 2011. In variants of equation (2) we incorporate the measure described earlier identifying the extent to which workplace HR managers thought their workplace had been adversely affected by the recession. The variable was set to zero ("not at all") in 2004 prior to the recession. All panel estimates are survey-weighted so that one can

[8] Results using entropy balancing weights are very similar when we balance on means, variance and skewness.
[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.

extrapolate from the results to the population of workplaces that were operating in both 2004 and 2011.

We also run some OLS models to examine variance in HRM practices across different types of school, relative to non-school public sector workplaces and private sector non-schools. The dependent variables are ZHRMSCORE and the z-scored eight HRM domains.

4. RESULTS

4.1: Do Schools Perform Differently to Other Workplaces?

Schools' performance improved relative to other workplaces over the period 2004-2011 as indicated by the positive interaction between school and the 2011 year dummy in the pooled year regression (Table 1, column 2).[10] However, there appears to have been more variance in performance within the schools sector than across the schools/non-schools sectors. In the pooled data primary schools performed significantly better than private sector workplaces that were not schools, whereas Technical and Vocational schools performed significantly more poorly (column 3). The improvement in schools' relative performance over the period is wholly accounted for by the improvement in primary school performance: whereas their performance was indistinguishable from private sector non-schools in 2004, they were performing significantly better by 2011 (columns 4 and 5).[11] By contrast Technical/Vocational Schools were performing more poorly than private non-schools in both years.

[INSERT TABLE 1]

[10] The raw survey-weighted means for workplace performance in the non-schools sector were stable (5.15 in 2004 and 5.22 in 2011) but increased in the schools sector (from 4.76 in 2004 to 5.65 in 2011).

[11] Much has been made of the Academisation of schools in England which is credited with improvements in school value added (Eyles and Machin, 2015). However, this cannot account for relative improvements in primary schools over the period 2004-2011 because only secondary schools were able to switch to Academy status prior to the 2010 Academies Act, so the first primary school academies only came into being in 2010/11 (Eyles and Machin, 2015, footnote 3). In any case, as Eyles et al. (2016) show, the Academy system has not improved primary school performance.

4.2: Management Practices in Schools and Other Workplaces

Table 2 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.

[INSERT TABLE 2]

The underlined figures indicate scores that are statistically significantly different to the score for private workplaces that were not schools. The overall HRM index (row 9) is higher for all types of schools relative to private sector non-schools, and is a little higher than in the non-school public sector. However, private sector non-schools make significantly higher usage of records and targets than schools, while the incidence of incentives does not differ across organizational types.[12] Schools tend to use more HRM practices in the other domains (notably with respect to teams, training, participation, selection and TQM).

[INSERT TABLE 3]

The association between organization type and the incidence of various HRM types (expressed as z-scores) differs markedly once we condition on other factors such as workplace size, workplace age, location, workforce composition, unionisation and managerial style (Table 3). Private sector non-schools make significantly more use of incentives, records and targets relative to schools, and relative to public sector non-schools (rows 1-3).[13] These are the HRM domains which are the focus of studies by Bloom and co-authors (2014, 2015). Conversely, schools make significantly more use of participation (namely employee involvement initiatives and methods of communication with staff) than private sector non-schools. There is no significant difference between use of participation in the public non-schools sector and the private non-schools sector (row 7). There are few significant differences in other HRM

[12] Private sector non-schools make more use of performance pay, but this is counter-balanced by schools making greater use of appraisal.
[13] The exception is records kept by Vocational and Technical schools.

domains, although primary schools make significantly more use of TQM than private sector non-schools (row 6). The bottom row in Table 3 reports the regression for the overall HRM z-score. The model accounts for around one-third of the variance in the HRM score. Public sector non-schools have significantly lower scores compared with 'like' workplaces in the private sector, but there are no significant differences between schools and private sector non-schools, suggesting the differences in HRM domains mentioned above cancel one another out in the overall score.

4.3: Management Practices and Workplace Performance in Schools and Other Workplaces

Table 4 introduces z-scored HRM measures into estimates of workplace performance for the pooled cross-sectional data for 2004 and 2011. The HRM z-score is positively and significantly associated with workplace performance, a 1 standard deviation increase in HRM corresponding to a 0.2 point rise in the 10-point workplace performance scale. Although the coefficient on the interaction between the HRM z-score and school status is of a similar magnitude it is not statistically significant (Table 4, Model 1). The finding is consistent with the proposition in hypothesis 1, namely that schools benefit from HRM intensity. However, they do so no more or no less than other types of workplace.

Interacting the HRM z-score with school type both the school type variables and their interactions with the HRM z-score are jointly statistically significant (Table 4, Model 2). However, the only statistically significant interaction was the negative association between HRM in public sector non-schools: returns to HRM did not differ between different types of schools and private sector non-schools.

[INSERT TABLE 4]

Models 3 and 4 in Table 4 present effects of z-scored HRM domains for non-schools and schools respectively. The domains are jointly statistically significant in both models, but the effects of specific HRM domains differ markedly between schools and non-schools, as anticipated in hypothesis 2. Schools' performance improves significantly with the number of participation practices and selection practices used, the size of the effects being quite similar for both domains. None of the other domains are significant for school performance. Among non-schools, only training and incentives are associated with significant improvements in workplace performance, with incentives on the margins of statistical significance. In addition to incentives, Bloom and colleagues emphasise the role played by records and targets but these are not significantly linked to performance in these analyses. The implication is that what works for schools differs from what works for non-schools, in accordance with hypothesis 2, and that, at least in the case of incentives, the differences are to be expected and confirm previous literature (Bryson et al., 2017).

Models 5 and 6 in Table 4 present separate models for non-schools and schools again, but replace the HRM domains with the linear HRM z-score and a quadratic term. We had hypothesised that, in accordance with the existing literature, the association between HRM intensity and schools' workplace performance would be linear. This linear association is apparent in non-schools since the quadratic term is not significant (Model 5). However, the quadratic term is positive and statistically significant for schools, indicating that the performance returns to HRM are *increasing* with the intensive use of HRM.

Models 7 and 8 in Table 4 split the schools sector into private and state schools respectively to see whether the returns to HRM differ for schools under different governance regimes and with different resources and student intakes. The results for the state schools sector reflect those for

the all schools model with returns to HRM rising exponentially, as indicated by the statistical significance of both the linear and quadratic terms. In the case of private schools, on the other hand, only the quadratic term is statistically significant. Although the number of private schools in the data set is not large, the coefficients for the HRM terms suggest that returns to HRM intensity differ between the private and public sectors.

4.4: Matching-adjusted Estimates of Links between HRM and Workplace Performance

Table 5 reruns the pooled years models from Table 4 reweighted with the matching weights as described in Section 3.2. The propensity score matching estimation is run on a total of 784 workplaces consisting of 304 schools and 480 comparator workplaces identified as their five nearest neighbours, having dropped the 31 schools off common support. The HRM score is positive and statistically significant. In contrast to the OLS estimates in Table 4, the interaction between school and HRM score is positive and statistically significant (Model 2). However, although the interactions between school type and HRM score in Model 3 are jointly statistically significant none of them reach statistical significance. Weighting the regressions using entropy balancing weights confirms the positive and significant association between HRM score and workplace performance. In contrast to the PSM estimates performance of schools is significantly higher than that among non-schools (Models 4 and 5), with primary schools performing better than private sector non-schools (Model 6). However, there is no evidence of increased returns to HRM among schools: the interaction term in Model 5 is not significant and the interactions between school type and HRM are jointly and individually non-significant. It seems reasonable to conclude from these matching-weights estimates that HRM is positively associated with workplace performance, but there is no overwhelming evidence to indicate higher returns to HRM in a school setting.

[INSERT TABLE 5]

4.5: Panel Estimates of Links between HRM and Workplace Performance

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. We distinguish between workplaces that were never workplaces over the period, workplaces that were schools at some point, and those that we schools at both points in time. (The sometimes/always sample includes the small number of schools who switched status between 2004 and 2011, as described in Section 3.1). The models condition on a wide range of workplace demographics and managerial style variables, as noted in the footnote to Table 6, so that these estimates account for potential biases associated with both time-invariant workplace unobserved traits and time-varying workplace demography and managerial style.

[INSERT TABLE 6]

For all three samples increasing HRM is associated with improvements in workplace performance (Table 6, columns 1, 3 and 5), once again confirming hypothesis one. The coefficients are larger in the school samples. When we distinguish between HRM domains (Models 2, 4 and 6) we find schools benefit from different sets of HRM practices to those benefitting the non-schools sector, confirming hypothesis two. Increasing use of incentives is positively and significantly associated with improvements in non-schools' performance but not that of schools. The other HRM practice benefiting non-schools is increased use of training but this is also beneficial to schools, at least when one includes "sometimes schools" alongside "always schools". Conversely, schools' performance rises with increasing use of HRM to select employees (Model 4), whereas this is not the case for non-schools. Confining analyses to those workplaces that were schools in 2004 and 2011 reveals positive returns to increasing use of participative forms of HRM, record-keeping and TQM, none of which were significantly associated with performance in non-schools.

The negative shock that workplaces suffered due to the Great Recession and its aftermath affected schools and non-schools. Among the panel workplaces surveyed in 2011, 30 per cent of schools and 51 per cent of non-schools said they had been adversely affected "a great deal" or "quite a lot" by the recession. Those that said so were less likely to increase their HRM score over the period 2004 to 2011. However, conditioning on being adversely affected made no difference to the positive association between a growth in HRM and improved workplace performance found for schools and non-schools.[14]

4.6: Panel Estimates of Links between HRM and Other Workplace Outcomes

To gain some insight into how HRM may affect workplace performance we ran panel first difference models on non-schools and schools separately for eight outcomes. We ran these first for ZHRM, and then for the z-scored HRM domains. The coefficients for the z-scored HRM are presented in Table 7. The domain effects are not presented in the table but are available on request.

[INSERT TABLE 7]

The first three rows report results for the three components to the workplace performance measure used throughout the paper, namely financial performance, labour productivity and the quality of service or product. Increases in HRM are positively and significantly associated with improvements in financial performance in both schools and non-school workplaces (Table 7, row1). The separate HRM domain models indicate that, in the case of non-schools, incentives, targets and training were all positively and significantly associated with financial performance. None of these were significant in the school model. Instead participation, selection and record keeping were all positive and statistically significant.

[14] Full results are available from the authors on request.

Increased use of HRM practices is also positively associated with improvements in labour productivity in both schools and non-schools (Table 7, row 2). In the HRM domain models, the domains are neither jointly nor separately statistically significant for non-schools. However, they are jointly statistically significant in the case of schools: increased used of selection and training practices are positively and significantly associated with improvements in labour productivity.

Increased use of HRM practices was positively associated with improvements in the quality of output in non-schools, but not in schools (Table 7, row 3). In non-schools the HRM domains were jointly statistically significant, but the only HRM domain that was individually statistically significant was the positive effect of increased training. In schools, HRM domains were jointly on the margins of statistical significance ($p>f=0.108$): increased use of selection practices and TQM were positively associated with increased quality, whereas increased use of targets was negatively associated with quality of output.

Row 4 in Table 7 reports the percentage of work days lost through sickness or absence at the workplace in the last 12 months. There is no association between increased use of HRM and an increase in absence rates. However, in the school sector there are offsetting effects of incentives, which reduce absence rates, and targets, which raise them. In non-schools the only single HRM domain that is significant is the positive effect of record-keeping.

Increased HRM usage was not significantly associated with the percentage of employees who had left or resigned voluntarily in the last year. However, the coefficient for ZHRM in the school model is positive and on the margins of statistical significance. The HRM domains are not jointly or individually significant in the non-school model. The domains are jointly

significant in the school model, albeit marginally (p>f=0.092), with increased use of teams significantly associated with increased quit rates.

Change in the number of employees per 100 who had been absent in the last year due to illness caused or made worse by their work was not associated with change in HRM usage in non-schools. However, an increase in HRM was associated with an increase in illness rates in schools (Table 7, row 6). The only HRM domain positively associated with higher illness rates in schools was increased training. HRM domains were not significant in the case of non-schools, either jointly or individually.

Changes in injury rates were not linked to changes in HRM in school or non-school workplaces (Table 7, row 7). Nor were HRM domains, the exception of training which was associated with fewer injuries in schools.

Change in the climate of employment relations at a workplace is not significantly associated with changes in HRM in schools or non-schools, although the positive association is on the margins of statistical significance (Table 7 row 8). The HRM domains are also not jointly or separately significant in either sector.

Taken together, the results in Table 7 suggest HRM improved workplace performance through improvements in financial performance and labour productivity, but only improved the quality of service or output among non-schools. Increases in the HRM z-score were not generally associated with other workplace outcomes. However, greater HRM usage was associated with higher illness rates and, albeit marginally, with higher quit rates in schools. It is conceivable that greater HRM use in schools is linked to work intensification which, as in

other studies can result in worker absence (Böckerman et al., 2012). 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. Cullen et al. (2016) find the introduction of a rigorous job evaluation system in Houston increased the relative likelihood of exit for teachers in the bottom quintile of the teacher quality distribution. Adnot et al. (2016) find District of Columbia Public Schools successfully replaced poor performing with better performing teachers using a performance assessment and incentive system. It is conceivable that the quit effect is picking up similar behavioural responses with respect to HRM.

The way that HRM domains were associated with workplace outcomes also proved informative. Only rarely did the same domain have similar significant effects in the school and non-school sectors. As anticipated in the work of Bloom et al. (2014) incentives and targets improved financial performance in the non-school sector. Among schools, on the other hand, the domain that was most strongly linked to improved performance was selection: increased use of the HRM practices linked to selection of workers was positively and significantly associated with improvement in schools' financial performance, labour productivity and quality of output.[15]

5. CONCLUSIONS

We contribute to the literature on schools' performance by comparing them with the performance of other workplaces in Britain using an index combining their financial

[15] Jacob et al. (2016) show applicant performance during interview screening in Washington DC public schools strongly predicts teacher effectiveness. However, in their case, these traits were not strongly predictive of being hired, leading the authors to conclude that there is substantial scope for improving teacher quality through the hiring process.

performance, labour productivity and quality of their services provided. The comparisons control for potential confounding factors using regression, matching and panel estimation techniques. Using nationally-representative workplace data we explore the choices schools and other workplaces make in terms of the managerial practices they adopt and their style of management. We investigate how schools differ from other workplaces in terms of the managerial practices they deploy and the intensity of their Human Resource Management (HRM) systems. Then we establish whether specific HRM practices and overall HRM intensity measures relate to school performance and the performance of other workplaces. We find schools are similar to other workplaces in terms of their overall HRM score based on 48 measures of HR practices. However, they differ in the *types* of HRM they deploy. In keeping with much of the public sector, they are less likely to use incentives, records and targets than private sector non-schools. These are the practices that Bloom et al. (2014) have tended to focus on in most of their work. However, schools are more likely than observationally equivalent private sector non-schools to encourage employee participation through consultative mechanisms and employee involvement initiatives.

We find intensive use of HRM practices is correlated with substantial improvement in workplace performance, both among schools and other workplaces. However, the types of practices that improve school performance are different from those that improve performance elsewhere in the economy. Non-schools experience improvements in performance when they deploy more incentives, while schools tend to benefit from selection practices. Both see improvements in performance from increases in training. Furthermore, in contrast to the linear returns to HRM intensity in most workplaces, improvements in schools' performance are an increasing function of HRM intensity.

Exploration of HRM associations with various workplace outcomes indicates that the returns to increasing use of HRM are largely confined to improvements in workplace financial performance and labour productivity, rather than other mechanisms. This is the case for schools and other workplaces.

Although our results are fairly robust to a range of 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 and other 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 and non-schools in investing in HRM practices, and for exploring the possibility that the types of HRM schools may benefit from are different, at least in some respects, from those that might be valuable elsewhere.

Table 1: OLS Estimates of Workplace Performance

	Pooled	Pooled	Pooled	2004	2011
School	0.312				
	(1.64)				
Public	-0.105	-0.088	-0.134	-0.107	-0.173
	(0.64)	(0.54)	(0.82)	(0.49)	(0.73)
Year=2011	0.063		0.058		
	(0.73)		(0.68)		
School		-0.110			
		(0.46)			
2011		0.030			
		(0.34)			
School*2011		0.736			
		(2.89)**			
Organisation (ref.: Private, not school)					
Primary			0.434	-0.193	0.928
			(2.20)*	(0.64)	(3.79)**
Secondary			0.509	0.415	0.577
			(1.86)	(0.98)	(1.66)
Tech/Voc.			-0.951	-1.087	-0.887
			(4.27)**	(3.33)**	(2.08)*
Constant	4.908	4.928	4.931	4.750	5.361
	(18.16)**	(18.25)**	(18.26)**	(11.69)**	(16.13)**
Controls?	Yes	Yes	Yes	Yes	Yes
R^2	0.06	0.06	0.06	0.09	0.07
N	4,260	4,260	4,260	1,920	2,340

Notes: (1) Controls: single-establishment organization; region (11 dummies); establishment aged over 25 years; % age 16-21; % age 50+; age diversity; % female; gender diversity; % non-white; % part-time; % union density; % manager; % professionals; % associate professionals; management style (4 dummies for style female HR manager; prefer to discuss change; prefer direct communication to union; WLB not up to individual). (2) t-statistics in parentheses. Statistical significance: * $p<0.05$; ** $p<0.01$

Table 2: Mean Scores for Management Practices in Schools and Other Workplaces

	Not a School		*Schools*			
	Private	*Public*	*All*	*Primary*	*Secondary*	*Voc/Tech*
Incentives (0,4)	1.9	1.8	1.9	1.9	1.9	2.2
Records (0,9)	6.7	5.6	6.2	6.2	5.7	7.9
Targets (0,11)	4.0	3.5	2.6	2.5	2.7	3.5
Teams (0,4)	1.8	2.5	2.6	2.6	2.8	2.3
Training (0,5)	2.2	3.3	3.3	3.2	3.5	4.0
TQM (0,3)	1.1	1.5	1.8	1.8	1.9	1.3
Participation (0,5)	2.0	2.8	3.1	3.0	3.3	2.9
Selection (0,7)	4.2	5.0	5.2	5.3	5.4	4.6
HRM (0,48)	24.0	26.1	26.7	26.4	27.2	29.8
Management "style":						
Female HR Manager	43.5	53.8	68.2	69.6	56.6	76.6
WLB not up to worker	11.8	24.8	21.9	20.7	31.2	16.8
Prefer to discuss change	25.0	34.0	38.0	39.3	36.2	26.0
Prefers direct communication over union	43.3	13.7	33.9	36.2	33.6	4.2

Table 3: Regression-Adjusted Incidence of z-score HRM Measures Relative to Non-School Private Sector

	Model Fit	*Not a School*	*Schools*		
	R^2	*Public*	*Primary*	*Secondary*	*Voc/Tech*
Incentives	0.24	-.37 (4.05)**	-.40 (3.43)**	-.57 (3.24)**	-.46 (2.91)**
Records	0.09	-.60 (6.69)**	-.28 (2.52)*	-.60 (2.99)**	.46 (3.04)**
Targets	0.20	-.45 (6.8)**	-.60 (6.31)**	-.66 (5.77)**	-.40 (1.59)
Teams	0.10	.21 (1.76)	.25 (1.70)	.10 (0.54)	-.31 (1.49)
Training	0.31	.10 (1.22)	-.05 (0.50)	.17 (1.18)	.63 (4.36)**
TQM	0.23	-.03 (0.41)	.26 (2.53)*	.21 (1.36)	-.22 (0.96)
Participation	0.26	.09 (1.18)	.27 (2.86)**	.39 (3.26)**	.84 (6.67)**
Selection	0.15	.13 (1.73)	.17 (1.77)	.13 (0.94)	-.36 (1.64)
HRM score	0.32	-.19 (2.40)*	-.08 (0.79)	-.17 (1.05)	0.04 (0.19)

Notes: (1) Each row denotes a separate survey-weighted OLS regression. (2) Reference category: private, not a school. (3) Dependent variables are standardised scores for HRM domains using z-scores so that scores have a mean of zero and standard deviation of one; (4) Controls are as per Table 1. (5) t-statistics in parentheses. Statistical significance: * $p<0.05$; ** $p<0.01$ (6) Full models are available from the authors on request.

Table 4: OLS Workplace Performance Models

	Pooled	Pooled	Non-schools	Schools	Non-schools	Schools	Private schools	State schools
School	0.301							
	(1.60)							
ZHRM	0.214	0.231			0.228	0.369	0.038	0.470
	(4.44)**	(4.73)**			(3.70)**	(2.29)*	(0.20)	(2.67)**
ZHRM squared					0.009	0.490	0.341	0.649
					(0.27)	(3.06)**	(2.06)*	(3.17)**
School*ZHRM	0.242							
	(1.23)							
2011	0.014	0.011	-0.004	0.505	-0.013	0.492	0.625	0.581
	(0.17)	(0.13)	(0.05)	(2.18)*	(0.14)	(2.20)*	(1.50)	(2.53)*
Public	-0.056		-0.086	0.172	-0.091	0.194		
	(0.34)		(0.46)	(0.44)	(0.51)	(0.53)		
Public non-school		-0.190						
		(1.10)						
Primary		0.345						
		(1.78)						
Secondary		0.438		-0.162		-0.221	-0.549	-0.289
		(1.61)		(0.47)		(0.65)	(1.21)	(0.65)
Tech/Voc		-1.054		-1.245		-1.051	-0.296	-1.432
		(5.87)**		(2.49)*		(2.31)*	(0.81)	(2.09)*
Public non-school*ZHRM		-0.347						
		(2.24)*						
Primary*ZHRM		0.377						
		(1.60)						
Secondary*ZHRM		-0.068						
		(0.26)						
Tech/Voc*ZHRM		0.615						

		(1.68)						
Z-participation			0.018	0.310				
			(0.25)	(2.35)*				
Z-selection			-0.006	0.275				
			(0.12)	(2.00)*				
Z-incentives			0.108	0.025				
			(1.95)	(0.16)				
Z-records			0.067	-0.145				
			(1.34)	(0.93)				
Z-targets			-0.051	0.213				
			(0.86)	(1.40)				
Z-teams			-0.022	0.055				
			(0.55)	(0.42)				
Z-training			0.161	0.055				
			(2.70)**	(0.39)				
Z-TQM			0.046	-0.114				
			(0.72)	(0.87)				
Constant	5.056	5.072	5.087	7.741	5.077	6.051	8.000	5.619
	(18.79)**	(18.80)**	(18.30)**	(2.94)**	(18.18)**	(2.53)*	(2.20)*	(1.79)
R^2	0.08	0.08	0.08	0.32	0.08	0.32	0.86	0.37
N	4,260	4,260	3,925	335	3,925	335	66	269

Notes: (1) All models contain controls as per Table 1. (2) t-statistics in parentheses. Statistical significance: * $p<0.05$; ** $p<0.01$

Table 5: Workplace Performance Models Using Alternative Matching Weights

	OLS with PSM weights			OLS with ebalance weights		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
School	0.252	0.190		0.484	0.436	
	(1.67)	(1.25)		(3.33)**	(3.04)**	
ZHRM	0.287	0.153	0.216	0.281	0.182	0.250
	(3.28)**	(1.61)	(2.14)*	(3.20)**	(1.89)	(2.57)*
2011	0.100	0.092	0.097	0.246	0.232	0.242
	(0.68)	(0.62)	(0.67)	(1.74)	(1.64)	(1.74)
Public	-0.130	-0.137		-0.181	-0.181	
	(0.64)	(0.68)		(0.94)	(0.95)	
School*ZHRM		0.354			0.254	
		(2.08)*			(1.52)	
Public non-school			-0.002			-0.169
			(0.01)			(0.79)
Primary			0.275			0.464
			(1.27)			(2.37)*
Secondary			0.246			0.407
			(0.95)			(1.64)
Tech/Voc			-0.558			-0.618
			(1.01)			(1.20)
Public non-school*ZHRM			-0.221			-0.260
			(1.03)			(1.19)
Primary*ZHRM			0.423			0.306
			(1.68)			(1.29)
Secondary*ZHRM			0.276			0.235
			(1.15)			(0.98)
Tech/Voc*ZHRM			0.637			0.508
			(1.10)			(0.90)
Constant	4.546	4.487	4.589	5.715	5.642	5.959
	(5.78)**	(5.78)**	(5.88)**	(4.41)**	(4.36)**	(4.69)**
R^2	0.14	0.14	0.15	0.14	0.15	0.16
N	784	784	784	4,260	4,260	4,260

Notes: (1) All models contain controls as per Table 1. (2) Details of PSM and Ebalance estimators are provided in Section 3.2. (3) t-statistics in parentheses. PSM standard errors bootstrapped, 50 replications. * $p<0.05$; ** $p<0.01$

Table 6: First Difference Estimates of Change in Workplace Performance and Change in HRM

	Never School		Sometimes or Always School		Always School	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
ZHRM	0.605		1.639		1.318	
	(4.45)**		(2.72)**		(2.28)*	
Z-participation		0.028		0.377		0.955
		(0.22)		(1.01)		(2.39)*
Z-selection		0.121		1.969		0.874
		(1.17)		(2.68)**		(1.47)
Z-incentives		0.267		0.214		0.328
		(2.40)*		(0.62)		(1.24)
Z-records		0.110		0.574		1.219
		(1.12)		(1.24)		(3.23)**
Z-targets		0.151		-0.504		-0.583
		(1.27)		(1.11)		(1.87)
Z-teams		-0.045		0.279		-0.544
		(0.56)		(1.04)		(1.85)
Z-training		0.467		1.123		0.050
		(3.50)**		(2.46)*		(0.09)
Z-TQM		0.010		0.950		1.016
		(0.07)		(1.96)		(2.21)*
Constant	-0.270	-0.248	0.614	0.687	0.197	-0.254
	(1.92)	(1.86)	(1.60)	(1.62)	(0.62)	(0.70)
R^2	0.14	0.18	0.63	0.70	0.59	0.73
N	670	670	56	56	44	44

Notes: (1) First-difference models for panel workplaces. (2) 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; female HR manager; prefer to discuss change; prefer direct communication to union; WLB not up to individual. (3) t-statistics in parentheses. Statistical significance: * $p<0.05$; ** $p<0.01$

Table 7: First Difference Estimates of Change in Other Workplace Outcomes and Change in HRM

	ZHRM coefficient	R^2	*N*
Financial Performance:			
Non-schools	0.228 (3.40)**	0.12	738
Schools	0.489 (2.41)*	0.39	68
Labour Productivity:			
Non-schools	0.203 (2.85)**	0.08	710
Schools	0.590 (2.36)*	0.57	59
Quality of service/product:			
Non-schools	0.120 (2.00)*	0.06	798
Schools	0.074 (0.44)	0.39	76
Absence rate:			
Non-schools	0.007 (0.71)	0.07	639
Schools	0.019 (1.15)	0.50	54
Quit rate:			
Non-schools	-1.708 (1.42)	0.10	762
Schools	2.448 (1.94)	0.77	80
Illness rate:			
Non-schools	-0.187 (0.57)	0.02	902
Schools	5.018 (2.08)*	0.21	87
Injury rate:			
Non-schools	-0.393 (1.29)	0.03	902
Schools	-0.476 (1.33)	0.63	87
Employment relations climate:			
Non-schools	0.081 (1.86)	0.09	895
Schools	0.038 (0.32)	0.21	82

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; female HR manager; prefer to discuss change; prefer direct communication to union; WLB not up to individual. (5) t-statistics in parentheses. Statistical significance: * $p<0.05$; ** $p<0.01$

Figure 1: Distribution of ZHRMSCORE Across Schools and Other Workplaces

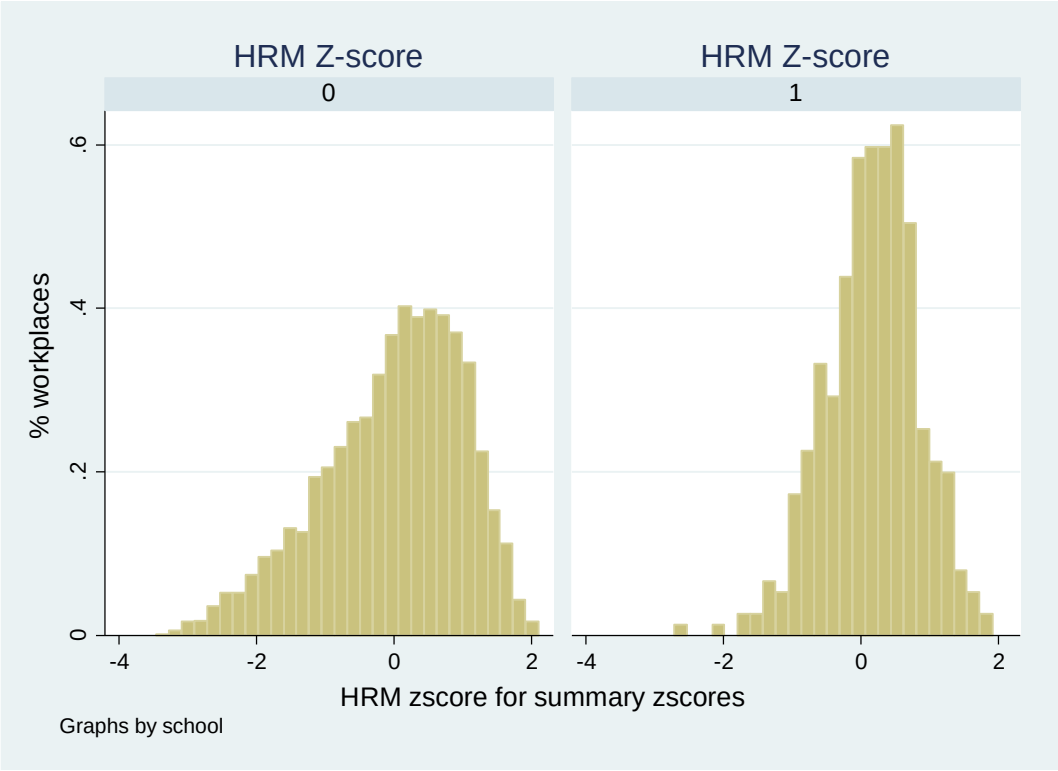

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Table A1: Schools and Other Workplaces in WERS 2004 and WERS 2011, Unweighted

	2004	2011	All
Private, not school	1691	1794	3485
Public, not school	464	620	1084
Primary school	85	141	226
Secondary school	45	84	129
Technical/vocational school	10	41	51
All	2295	2680	4975

Appendix Table A2: 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
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.		

Table A3: Quality of the Match, Propensity Score Matching

Sample	Ps R2	LR chi2	p>chi2	MeanBias	MedBias	B	R	%Var
Unmatched	0.473	1111.06	0.000	96.9	95.3	230.8*	0.38*	67
Matched	0.007	5.86	0.210	8.1	7.0	19.3	0.33*	100

* if B>25%, R outside [0.5; 2]

Appendix Table A4: Sample Balance Before and After Weighting with Entropy Weights

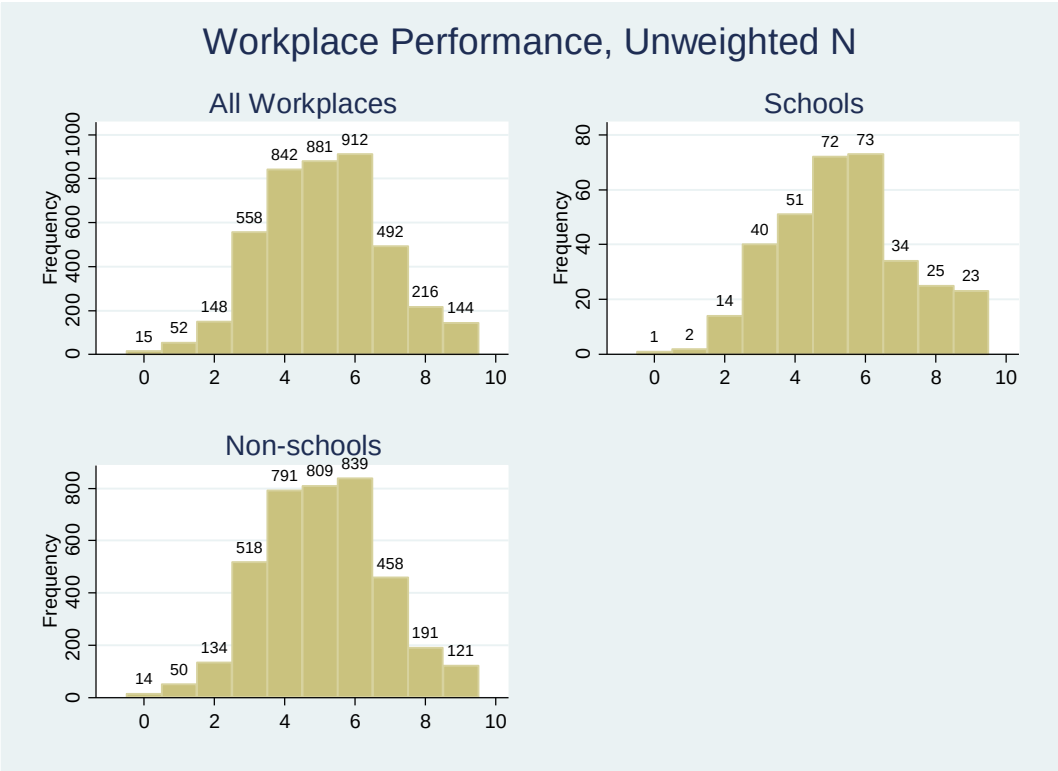
Before: without weighting

	School			Non-school		
	mean	variance	skewness	mean	variance	skewness
N employees	147.7	54804	3.854	458.4	1304529	5.455
Aged over 25	.5246	.25	-.09864	.2486	.1869	1.163
Prop. female	.7885	.02223	-.4446	.4909	.08017	.005645
% prof.	42.73	405.9	.1277	11.36	386	1.977

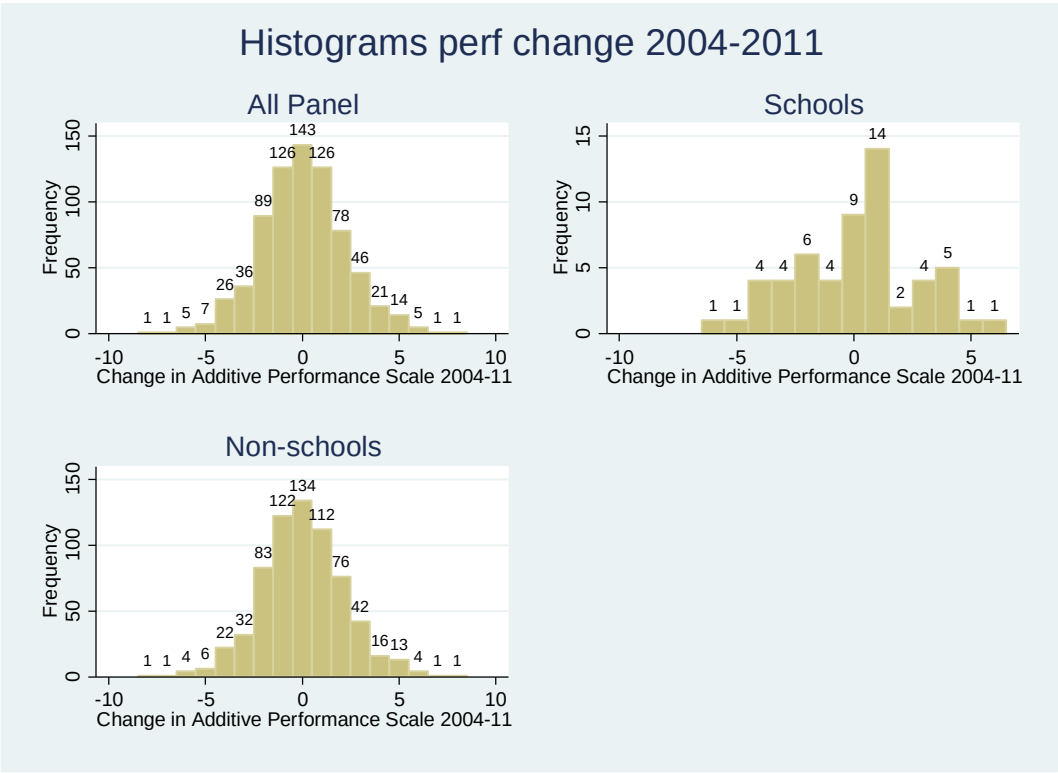
After: with entropy weights

	School			Non-school		
	mean	variance	skewness	mean	variance	skewness
N employees	147.7	54804	3.854	147.7	54801	3.863
Aged over 25	.5246	.25	-.09864	.5245	.2495	-.09805
Prop. female	.7885	.02223	-.4446	.7884	.02222	-.442
% prof.	42.73	405.9	.1277	42.72	405.8	.1288

Appendix Figure A1: Workplace Performance Distribution for Schools and Non-School Workplaces



Appendix Figure A2: Change in Workplace Performance, 2004-2011



Appendix Figure A3: Common Support for Schools in the Non-school Sample