

# The Performance Pay Premium and Wage Dispersion in Britain

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## Abstract

Estimates of the performance pay (PP) premium using household survey data are upwardly biased due to the use of PP contracts in higher paying workplaces. Using nationally representative linked employer-employee data we estimate the PP premium both at the mean and across the wage distribution, after accounting for workplace heterogeneity. We then go on to present the effects of PP on the wage distribution. Failure to account for the use of PP in high paying workplaces overstates the PP premium by around one-third. The premium rises as one moves up the wage distribution, but the effect is more modest after having accounted for workplace heterogeneity.

Key words: wages, wage inequality, performance pay, bonuses

JEL classification: J33

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## 1. Introduction

By rewarding output, performance pay offers employees the opportunity to earn more than they would under a fixed pay contract, creating incentives to exert effort, leading to higher pay. Longitudinal studies of employees broadly support Lazear's (1986, 2000) contention that part of the wage difference between performance pay (PP) and fixed pay (FP) employees reflects the sorting of more able employees into performance pay jobs (Lemieux et al., 2009; Böckerman et al., 2013; Bryan and Bryson, 2015). However, less attention has been given to the possibility that wage gains under PP may be upwardly biased due to *firm* heterogeneity. Performance paying firms may be higher wage firms than those offering fixed wage contracts since they need to be able to recoup the costs of monitoring inherent in performance pay systems (Booth and Frank, 1999; Lemieux et al., 2009). Therefore failure to account for heterogeneity between performance pay firms and those using fixed pay contracts may upwardly bias estimates of the size of any performance pay premium.

In the only paper of its kind Pekkarinen and Riddell (2008: 307) show that accounting for employee-firm matches accounts for about 40% of the performance pay premium in Finland's metal industry. Ours is the first paper to examine links between PP and wages in Britain using cross-sectional linked employer-employee data that are representative of employees in all but the smallest workplaces and contain individual-level measures of PP. We contribute to the literature by estimating the wage premium associated with PP across the wage distribution having accounted for fixed differences between workplaces that do and do not pay for performance.

The paper is organised in the following way. Section Two introduces the data. Section Three discusses estimation and the likely influences on the size of the PP premium. Section Four presents the results and Section Five concludes.

## **2. Data**

We analyse linked employer-employee data from the Workplace Employment Relations Survey 2011 (WERS) (Department for Business Innovation and Skills et al, 2014a). Appropriately weighted, it is a nationally representative survey 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 elements of the survey. The first is the management interview, conducted face-to-face with the most senior workplace manager responsible for employee relations. Interviews were conducted in 2,680 workplaces between March 2011 and June 2012 with a response rate of 46%. The second element is the survey of employees, distributed in workplaces where a management interview was obtained. Self-completion questionnaires were distributed to a simple random sample of 25 employees (or all employees in workplaces with 5-24 employees) in the 2,170 workplaces where management permitted it. Of the 40,513 questionnaires distributed, 21,981 (54%) usable ones were returned.<sup>1</sup> Weights are provided with the survey data to correct for the sample design and any observable non-response biases (see Forth and Freeth, 2014) and we use these weights throughout our analysis.

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<sup>1</sup> An additional 3,858 questionnaires were distributed at 247 workplaces where there were no employee questionnaires returned. We assume that these questionnaires were never distributed by the employer (van Wanrooy et al., 2013: 210) so they are not included in the figures in the text.

The PP measures are taken from the employee questionnaire. Employees are asked "Which of the following do you receive in your job here...Payments based on your individual performance or output; payments based on the overall performance of a group or a team; payments based on the overall performance of your workplace or organisation (eg. profit-sharing scheme)". Those in receipt of any of these are coded "1" on our performance pay dummy variable.

Our dependent variable is log hourly wages. WERS does not collect continuous data on employees' wages; instead it asks employees to categorize their gross weekly earnings into one of 14 bands ranging from 'less than £60 per week/£3120 per year' through to "£1051 or more per week/£54601 per year".<sup>2</sup> To obtain a continuous measure of gross hourly earnings the convention is to take the mid-point of the respondent's earnings band and divide this by the survey's continuous measure of hours worked (which includes overtime).<sup>3</sup> It is also conventional to top-code those in the top category, which has no ceiling, using an earnings figure that is 1.5 times the lower bound of this top category. We check whether these procedures introduce error into the dependent variable by imputing earnings within the bands using wage data from the Annual Survey of Hours and Earnings (ASHE). ASHE is a random sample of 1 per cent of all employees in Britain based on the last two digits of their National Insurance number. The employer is required by law to provide the information which is based on payroll records; it is

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<sup>2</sup> The wage is based on employee responses to the question: "How much do you get paid for your job here, before tax and other deductions are taken out? *If your pay before tax changes from week to week because of overtime, or because you work different hours each week, think about what you earn on average.*" There is no explicit instruction to respondents as to whether to include performance payments and, since respondents may not have annual bonuses in mind when making the calculation, this earnings measure may understate earnings variance associated with performance pay.

<sup>3</sup> The question asks: 'How many hours do you usually work each week, including any overtime or extra hours?'

therefore highly reliable and there is no top-coding.<sup>4</sup> For each employee in WERS, we impute a gross hourly wage by using ASHE to estimate the mean hourly wage of all employees within the hourly wage interval indicated by the WERS data. A comparison of imputed gross hourly earnings based on the conventional approach with those based on our new ASHE-based method indicates a correlation between the two measures is 0.99. Results are very similar whichever approach is taken.<sup>5</sup>

### **3. Estimation**

#### *3.1 Estimating the performance pay premium at the mean*

To estimate the performance pay premium at the mean in the wage distribution we estimate log hourly wages using Ordinary Least Squares. Because WERS contains a cross-section of employees we are unable to account for fixed unobservable employee attributes that might be correlated with both PP status and earnings. However, we are able to condition on a rich set of right-hand side variables including individuals' demographic, job and workplace characteristics.<sup>6</sup>

We hypothesise that there will be a sizeable wage gap between PP and FP employees due to the incentive effects associated with PP. However, this gap will partly reflect positive selection into PP jobs by more able employees. We are unable to account for unobservable differences between employees but we can account for part of their

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<sup>4</sup> We use the ASHE measure of annual earnings, divided by hours worked in the reference period. The advantage of the annual earnings measure is that it includes all payments made to an employee over the year, including cash and bonus payments made in months other than April. Judging by Forth et al.'s (forthcoming) analysis of bonus payments over the year, a focus solely on April wages would lead to a substantial underestimate of bonuses paid to employees. ASHE has no measure of annual hours worked.

<sup>5</sup> Results based solely on the ASHE-adjusted earnings data are available from the authors on request.

<sup>6</sup> These are described in the text and the footnote to Table 1.

human capital by controlling for their academic qualifications, tenure and age. In sensitivity analyses we also try to partial out the incentive effect of PP on effort by conditioning on how hard employees say they work.<sup>7</sup> In addition to these variables we observe employee demographic characteristics in some detail including gender, race, disability, marital and family status, and union membership. We control for a number of job characteristics to isolate the effect of PP. These include union coverage, occupation, hours worked, contract type, and job autonomy. Observable workplace controls include the size of establishment, whether it is part of a larger organisation and location.

One source of potential omitted variables bias is heterogeneity in workplace productivity. This does not affect within-workplace estimates of the performance pay premium but, if the incidence of performance pay is positively correlated with being in a highly productive workplace, it may be this - rather than performance pay itself - which accounts for any premium received by performance pay employees. To address this issue we link WERS to workplace total factor productivity (TFP) estimates based on analyses of the Annual Respondents Database (ARD).<sup>8</sup> In sensitivity analyses we incorporate TFP into OLS estimates of the performance pay wage premium.

These models are supplemented by workplace fixed effects models where workplace dummies replace the observable workplace characteristics to identify the wage gap between PP and FP employees within the same workplace. This is possible in WERS because, in most cases, the survey contains multiple observations within the workplace. If

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<sup>7</sup> This is captured by how strongly employees agree with the statement "My job requires that I work very hard".

<sup>8</sup> These estimates were kindly provided by Richard Harris. For details on how they were derived see Harris and Moffatt (2011). The matching procedure results in 573 WERS-ARD matches for private sector workplaces. We have TFP estimates for the period 2009-2012. We take the most recent estimate as our measure of TFP.

PP contracts are more likely to be offered by high wage workplaces because they are better able to recover the monitoring costs associated with PP than the wage gap will fall having accounted for workplace fixed effects.

### *3.2 Estimating the performance pay premium across the wage distribution*

There are four reasons why the PP premium may rise higher up the earnings distribution. First, those higher up the earnings distribution have greater opportunities to maximise their income on contracts that pay for performance. This is because they tend to have greater job autonomy than lower paid employees, such that they are better able to influence their output through ability or additional effort. We can account for this, at least partially, by introducing a control for job autonomy.<sup>9</sup> Second, a greater proportion of total earnings is linked to performance higher up the earnings distribution (Bell and Van Reenen, 2014), increasing the likelihood that employees will be able to recover their full marginal product for their exertions. Third, the size of the wage gap between PP and FP workers may reflect unobserved heterogeneity between workers: if the most able employees sort into higher paying jobs that allow them to maximise their earnings via PP contracts, the gap between the unobservable talent among PP and FP workers may rise as one moves up the earnings distribution.

Fourth, if it is the highest paying workplaces that offer the contracts with the largest performance-to-base-pay ratios, we would expect growth in the PP premium

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<sup>9</sup> This is an additive scale running from 0 to 15 based on responses to the following 5 questions: "In general how much influence do you have over the following...the tasks you do in your job; the pace at which you work; how you do your work; the order in which you carry out tasks; the time you start or finish your working day". Responses are coded on a four-point scale from "a lot" to "none". Higher scores denote higher job autonomy.

higher up the distribution to partly reflect workplace heterogeneity. The slope in the returns to PP may be attenuated having accounted for this heterogeneity.

Estimates of the relationship between PP and the wage distribution are based on a reweighting estimator originally deployed by DiNardo, Fortin and Lemieux (1996). The method constructs a counterfactual wage distribution from FP employees by reweighting them such that their observable characteristics closely resemble those of their PP counterparts. This in turn is achieved by running a probit estimate for the probability of being in receipt of PP and then using the predicted probabilities to reweight the FP employees in such a way as to give additional weight to those with high estimated probabilities of PP receipt. One can then recover the "effect" of PP at different parts of the wage distribution by comparing the actual distribution of wages among PP employees to the counterfactual distribution observed among the reweighted set of FP employees. This technique is identical to propensity score matching which is often used in the programme evaluation literature to recover the impact of treatment having balanced the treated and untreated samples on observable X's to recover differences in mean outcomes for the treated and counterfactual untreated.<sup>10</sup> The difference, of course, is that the reweighting estimator is recovering counterfactual wages across the wage distribution, rather than simply mean outcomes. Comparisons of the actual wage distribution and the counterfactual wage distribution allow us to identify that part of the wage gap between

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<sup>10</sup> The technique deals with selection into treatment on observables and recovers the treatment-on-the-treated parameter for performance pay across the wage distribution. It is unable to generate estimates which account for unobservable differences across treated and untreated observations. The identifying assumption is that error terms are uncorrelated with treatment status having conditioned on observables, such that outcomes are independent of treatment status conditional on observables (the conditional independence assumption or CIA). For further discussion see DiNardo et al. (1996) and DiNardo (2002). Appendix Table A1 presents Hotelling t-tests for the pre- and post-matched samples for the whole economy and private sector only which indicate that the reweighting significantly reduces, but does not eliminate, the differences in covariate means across the fixed pay and performance pay groups.



PP and FP employees that is attributable to PP, as opposed to differences in their observable characteristics. As DiNardo (2002) notes, at the mean, this estimate is identical to that obtained using the Oaxaca-Blinder wage decomposition method.

We run two variants of the probit model used to derive the propensity weights. The first is the model specification used in the OLS estimates which contain demographic, job and workplace traits.<sup>11</sup> The second replaces the workplace traits with a single variable, which we call WPCOEFFS, which is the coefficient for each workplace recovered from a workplace fixed effects estimate of the log hourly wage. The estimate is based on a model containing workplace fixed effects plus individual employee demographic characteristics: as such the coefficient captures differences across workplaces in their propensity to pay higher or lower wages. Matching on this coefficient, together with worker demographic and job characteristics, enables us to isolate the effect of PP on the wage distribution net of workplace-level traits which might otherwise bias our estimates.

### *3.3 Sensitivity tests and weighting*

We present whole-economy and private sector models: the numbers of public sector employees subject to performance pay in our sample are too low to run public sector only models.<sup>12</sup> A variety of robustness checks are undertaken including removal of

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<sup>11</sup> The pseudo-r-squared for this model is 0.21. Variables are correlated with the probability of performance pay in ways we would expect. For instance, the likelihood of performance pay is higher among men, the middle-aged, white, non-disabled, married, those with children, and those with higher qualifications. It falls among the unionised (with membership and bargaining coverage); it rises as one moves up the occupational hierarchy and is higher among those with greater job autonomy and those who reported doing jobs which required hard work; it rises with size of workplace and organizational size; and varies substantially across industry and region.

<sup>12</sup> Only 513 of the 6,629 public sector employees in our data - 7 per cent of the weighted public sector sample - said they received performance pay.

observations at the top and bottom 1 percent of the earnings distribution and the inclusion of workplace TFP for a subset of private sector workplaces.

OLS and workplace fixed effects estimates account for complex sample design. We apply survey weights to account for employees' probability of selection into the survey and to compensate for sample non-response bias, and when making statistical inferences we take account of the clustering of employees into workplaces (which are the primary sampling unit) and the probability of a workplace being sampled, which is based on stratifying variables relating to establishment size and industry.<sup>13</sup> Survey weights are also applied in the probit used to derive the propensity scores which underlie our estimates of PP effects on the wage distribution.

## **4. Results**

### *4.1 The performance pay premium at the mean*

Table 1 shows the association between being on a PP contract and log hourly wages.<sup>14</sup> The top panel presents results for the whole economy while the bottom panel is confined to employees in the private sector. The raw wage gap between PP and FP employees is 0.35 log points in the whole economy, rising to 0.43 in the private sector (column 1). The estimates in column 2 incorporate controls for employee's human capital. A comparison of the coefficients in columns 1 and 2 reveals that differences in the human capital attributes of PP and FP employees account for one-quarter of this raw difference (23 per cent in the whole economy and 28 per cent in the private sector). The

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<sup>13</sup> For more on the sampling and survey methodology for WERS see Van Wanrooy (2013).

<sup>14</sup> Other variables in the model perform as one might have expected. For example, log hourly wages rise with qualifications and tenure; they are higher among those on permanent contracts and those higher up the occupational hierarchy; they follow an inverted-u shape in age; they are lower for women, the disabled, and non-whites; they vary significantly across industry and increase with workplace size.

addition of all other (demographic, job and workplace) controls reduces the PP coefficient by nearly half in both the whole economy and private sector (column 3). These models account for well over half of all wage variance.

It is possible that the premium attached to a PP job simply reflects being in a job which requires the worker to work harder than FP jobs which pay wages for the time worked as opposed to output. To test this proposition we introduced an additional control variable identifying how strongly the employee agreed with the statement "My job requires that I work very hard". Although this is positively and significantly correlated with log hourly earnings its introduction has no effect on the PP coefficient.<sup>15</sup>

We add workplace TFP to the earnings model for the subset of private workplaces for which it is available. It is positively and significantly associated with earnings when entered alongside the PP indicator, but the association is no longer apparent when controls are added. The coefficient on PP and its significance are robust to the inclusion of TFP.<sup>16</sup>

It is clear, then, that those on PP earn more than those on FP. Part of the difference is accounted for by higher human capital among performance pay employees. For example, an Oaxaca-Blinder decomposition of the log hourly wage gap between PP and FP employees in the private sector reveals that 6 percentage points of the 43 percentage point difference in log hourly wages between employees on PP and FP can be accounted for by observable human capital, as captured in individuals' qualifications, age

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<sup>15</sup> For example, the (0,4) index identifying how hard employees feel their job requires them to work has a coefficient of 0.23 (t-stat=2.94) when added to the private sector model reported in column 3 of Table 1, but the PP coefficient remains identical.

<sup>16</sup> The model without controls is run on 3,476 private sector employees, falling to 3,400 when run with controls.

and workplace tenure - this amounts to 23 per cent of the explained gap and 14 per cent of the total wage gap. Still a sizeable PP premium is apparent.

With the introduction of workplace fixed effects in column 4 the models account for 72 percent of the variance in employees' log hourly wages. The decline in the PP coefficient with the introduction of workplace fixed effects (column 4 compared with column 3) confirms that PP is offered by workplaces that pay higher wages. Within workplaces those on PP contracts earn about 10 per cent more (0.1 log points) than their FP counterparts.

[INSERT TABLE 1]

This PP premium is sizeable. For instance, it is roughly twice the size of the union membership wage premium estimated in the fixed effects model for the whole economy.<sup>17</sup> The premium is considerably larger than earlier estimates by Manning and Saidi (2010) using the 2004 Workplace Employment Relations Survey. However, they rely on an occupation-level measure of the incidence of PP, which may have induced measurement error leading to a lower estimate.

#### *4.2 The performance pay premium across the wage distribution*

To establish how the PP premium varies across the wage distribution we turn to our estimates based on the reweighting estimator described in Section Three. Figure 1 compares the log hourly earnings of PP and FP employees across the wage distribution in the whole economy. The solid line is the raw difference between PP and FP employees at

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<sup>17</sup> The coefficient for union membership in the whole economy is 0.05, t-stat=4.30.

each point in the log hourly wage distribution. The raw gap is rising as one moves up the wage distribution, from around .19 log points at the 5th percentile of the wage distribution, to .36 at the median, to around .48 log points by the 90th percentile in the wage distribution. The gap then falls a little before it starts rising again at the very top of the distribution.

[INSERT FIGURE2 1-4]

The dotted line represents the counterfactual PP-FP wage gap based on a comparison of the wages of the PP employees with those of FP employees having reweighted the observable characteristics of the FP employees so that they are observationally equivalent to the attributes of the PP employees. The conditioning variables are those listed for the model in Table 1 column 3. The counterfactual gap also rises as one moves up the wage distribution in a manner similar to the raw gap. However, the counterfactual gap lies below the raw gap throughout the wage distribution, confirming that there is positive selection into PP on observable characteristics at all points in the distribution. At the 25th percentile of the wage distribution around half the raw gap is accounted for by differences between PP and FP employees in terms of their demographic, job and workplace attributes. But the percentage of the gap accounted for by observable differences diminishes further up the wage distribution. At the median point in the wage distribution .15 of the .36 log point raw differential (42 percent) is due to observational differences between PP and FP employees. At the 90th percentile only .15 log points of the .48 log point wage gap (31 per cent) is due to compositional

differences between PP and FP employees. As the size of the unexplained gap rises further up the wage distribution (from .08 log points at the 10<sup>th</sup> percentile to .36 log points at the 90<sup>th</sup> percentile), the implication is that PP does widen wage differentials in Britain, as it has been shown to do in countries such as the US and Germany, and it does so to quite a considerable extent. We return to our estimates on the impact on wage dispersion below.

Figure 2 reruns the analyses for the whole economy but replaces the workplace covariates with WPCOEFFS, the workplace coefficients from the log hourly wage regression, in the probit which produces the propensity scores used to match PP and FP employees. In doing so we account for workplace heterogeneity which might bias our estimates of the PP wage premium across the wage distribution. The results are striking. The counterfactual PP-FP wage gap indicated by the dotted line is lower than the one estimated in Figure 1 across the whole wage distribution. For example, at the 25th percentile it is .05 log points instead of .11 in Figure 1. At the median it is .14 log points compared to .21 in Figure 1, and at the 90th percentile it is .29 log points compared to .36 log points in Figure 1. It is clear that failure to account for workplace heterogeneity results in an overestimate of the PP wage premium throughout the wage distribution.

The growth in the PP premium as one moves up the wage distribution is also apparent when we confine our attention to the private sector (Figure 3). The raw gap between log hourly wages of PP and FP employees is larger in the private sector than it is for the whole economy. However, controlling for observable differences between the demographic, job and workplace characteristics of PP and FP employees, the PP

premium is similar to that estimated for the whole economy - apart from at the 99th percentile where it is much larger in the private sector.

As in the case of the whole economy, conditioning on WPCOEFFS leads to a substantial reduction in the counterfactual PP-FP wage gap in the private sector such that there is no discernible premium among employees in the bottom decile of the wage distribution (Figure 4). At the median the counterfactual wage gap is .15 log points, which is two-thirds the size of the gap estimated on observables only. Thus accounting for workplace heterogeneity results in a smaller counterfactual wage gap. However, workplace heterogeneity seems to matter a little less at the top of the wage distribution: at the 95th percentile of the earnings distribution the PP premium is .29 log points when conditioning on WPCOEFFS - that is, roughly four-fifths of the .36 log point PP premium obtained when conditioning on workplace observable traits.

#### *4.3 Quantifying the effects of performance pay on the wage distribution*

To quantify the effects of PP on the wage distribution we adopt the approach taken by Lemieux et al. (2009: 39) by comparing measures of the actual dispersion of log hourly wages alongside estimates of what the log hourly wage distribution would have looked like in the absence of PP. This counterfactual wage distribution is simply the wage distribution for FP employees weighted such that they are observationally equivalent to PP employees across the wage distribution.<sup>18</sup>

[INSERT TABLE 2]

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<sup>18</sup> The procedure we adopt is akin to that described by DiNardo (2000) in which the FP employees are reweighted back to the characteristics of PP employees, as opposed to the approach deployed by Lemieux et al. (2009) who reweight the FP employees back to the characteristics of the whole population.

Table 2 presents the reweighting estimates of the effect of PP on various measures of the distribution of log hourly wages in the whole economy. The top panel presents estimates which condition on demographic, job and workplace characteristics, while the bottom panel presents estimates conditioning on WPCOEFFS instead of the workplace characteristics. The first column shows the actual wage distribution in the whole economy. The second column shows the dispersion without PP jobs. The third column simply shows the difference between columns 1 and 2 and column 4 gives this difference as a percentage of the actual wage distribution.

The top row shows the coefficient of variance in wages is .423 in the whole economy, but this would have been .310 in the absence of PP, a fall of .113 or 26.7% of actual variance. The second row summarises wage variance in the top half of the wage distribution using the gap in log hourly earnings between the 90th and 50th percentiles in the wage distribution. This percentile gap is actually 0.815 in the whole economy, but would have been 0.692 in the absence of PP jobs, a reduction of .123 or 15.1% of the actual 90-50 log hourly wage gap. In contrast, it seems from row 3 that PP has little effect on wage dispersion in the bottom half of the wage distribution. If anything the 50-10 log hourly earnings gap is slightly compressed by PP.

The picture is broadly similar in the bottom panel of Table 2 which conditions on WPCOEFFS in that PP is associated with higher wage dispersion. It increases wage variance by 25%. Most of the effect is in the upper half of the wage distribution though here, unlike in the top panel, PP also increases the gap between the 50th and the 10th percentiles in the wage distribution, albeit very marginally.



[INSERT TABLE 3]

Table 3 presents similar analyses for the private sector only. Comparing column 1 in Table 3 with column 1 in Table 2 indicates that wage dispersion in the private sector is wider than it is in the whole economy, both at the top and the bottom of the wage distribution. The PP effect on the wage distribution is a little larger in the private sector than it is for the whole economy, as one might expect given the constraints public sector employers face in linking the pay of public servants to performance in sectors such as teaching and health. As in the whole economy, the PP effect is largely accounted for by what it does in widening the dispersion in the top half of the wage distribution. Conditioning on WPCOEFFS instead of workplace observable characteristics reduces the PP effect on wage dispersion in the top half of the wage dispersion quite markedly, but does little to the effect in the bottom half. The overall effect, however, is to markedly increase the PP effect on wage dispersion in the tails, as indicated by the 95-5 ratio.

## **5. Conclusions**

Using nationally representative linked employer-employee data we estimate the log hourly wage gap between PP and FP employees. The raw premium in the whole economy is .35 points. This falls to .14 log points controlling for demographic, job and workplace characteristics. It falls still further to .10 log points when comparing "like" employees in the same workplace, indicating that PP contracts are used in higher paying

workplaces. Thus failure to account for the use of PP in high paying workplaces overstates the PP premium by around one-third. A very similar pattern is observed for the private sector alone.

The PP premium rises markedly as one moves up the wage distribution, though the higher PP premium further up the distribution is again overestimated if one fails to account for workplace heterogeneity. Even so, under our preferred specification which conditions on the workplace fixed effects from a log hourly wage estimate, the PP premium in the whole economy is five times higher at the 90th percentile than it is at the 25th percentile in the wage distribution (.27 log points compared to .05 log points).

There are a number of limitations to our study, perhaps the chief one being our inability to account for unobservable differences across employees that may affect both their earnings and their propensity to enter PP jobs. It is therefore difficult to know what the size of any premium might look like if one were to account fully for selection into PP by more able employees. We also lack information on the size of performance payments made to employees.

We are also unable to say what the contribution of PP has been to change in wage dispersion over time. Fortunately Bryan and Bryson (2015) have undertaken this work, at least through to 2008. They show PP has contributed to the growth in wage inequality in Britain, albeit fairly modestly. This paper complements their analyses by identifying the contribution of PP to wage dispersion at a point in time having accounted for workplace heterogeneity, something that is not possible with household survey data. It is apparent that PP increases wage variance by around one-quarter in the whole economy and about 30% in the private sector, relative to a counterfactual wage distribution based on

reweighted estimates from FP employees. Most of this effect is concentrated in the top half of the earnings distribution, with PP increasing the 90-50 log hourly wage gap by between .171 and .085 log points depending on the precise estimates. Quantitatively these effects are fairly substantial and are larger than those Lemieux et al. (2009: 39) present for the United States. Their PP effect on the 90-50 gap is .039 in 1976-79 and .069 in 1990-93. They also find smaller effects in the bottom half of the wage distribution. It is difficult to make simple policy prescriptions based on the analyses of the PP premium presented here and its effects on the wage distribution. Although there have been calls for government to curb performance payments made to top executives, bankers and other highly paid professionals, recent studies for Britain suggest that PP tends to account for a relatively small percentage of most employees' earnings (Bryan and Bryson, 2015; Bryson et al., 2014) and most firms' wage bills (Forth et al., forthcoming). If, as much of the economic literature indicates, PP is a useful tool for firms to incentivise effort and attract more able individuals to work in environments where they are prepared to shoulder some of the risk inherent in linking pay to performance, it is hard to argue that firms should not be able to pay for performance. It is also important not to confuse reasonable concerns over real wage stagnation and growing earnings inequality at the top of the wage distribution with payment for performance across the whole wage distribution.

## References

- Bell, B. and Van Reenen, J. (2014) "Bankers and Their Bonuses", *The Economic Journal*, 124, F1-F21
- Böckerman, P., Bryson, A. and Ilmakunnas, P. (2013) 'Does High Involvement Management Lead to Higher Pay?', *Journal of the Royal Statistical Society Series A*, 176, 4: 861-885
- Booth, A. L. and Frank, J. (1999) "Earnings, Productivity and Performance-related Pay", *Journal of Labor Economics*, 17, 3: 447-463
- Bryan, M. and Bryson, A. (2015) "Has Performance Pay Increased Wage Inequality?", mimeo
- Bryson, A., Clark, A. E., Freeman, R.B., and Green, C. P. (2014) "Share Capitalism and Worker Wellbeing", *IZA Discussion Paper No. 8724*
- Department for Business, Innovation and Skills, Advisory, Conciliation and Arbitration Service and National Institute of Economic and Social Research (2014) *Workplace Employee Relations Survey, 2011* [computer file]. 4th Edition. Colchester, Essex: UK Data Archive [distributor], April 2014. SN: 7226, <http://dx.doi.org/10.5255/UKDA-SN-7226-4>
- DiNardo, J. (2002) "Propensity Score Reweighting and Changes in Wage Distributions", University of Michigan mimeo
- DiNardo, J., Fortin, N. and Lemieux, T. (1996) "Labor Market Institutions and The Distribution of Wages, 1973-1993: A Semi-Parametric Approach," *Econometrica*, 64 (5), 1001-1045

- Dohmen, T. and Falk, A. (2011) "Performance pay and multidimensional sorting: Productivity, Preferences and Gender", *American Economic Review*, 101(2): 556-90
- Forth, J., Bryson, A. and Stokes, L. (forthcoming) "Are Firms Paying More For Performance?", *International Journal of Manpower* (previously NIESR Discussion Paper No. 423 and CEP Discussion Paper No. 1272)
- Forth J and Freeth S (2014) *The Design and Administration of the 2011 Workplace Employment Relations Survey*, London: Department for Business Innovation and Skills. Available online at:  
[http://doc.ukdataservice.ac.uk/doc/7226/mrdoc/pdf/7226\\_the\\_design\\_and\\_administration\\_of\\_the\\_2011\\_wers\\_5\\_august\\_2013.pdf](http://doc.ukdataservice.ac.uk/doc/7226/mrdoc/pdf/7226_the_design_and_administration_of_the_2011_wers_5_august_2013.pdf)
- Green, C. P. and Heywood, J. S. (2012) "Don't Forget the Gravy! Are Bonuses and Time Rates Complements", mimeo
- Gregg, P. and Machin, S. J. (2012) *What a drag: the chilling impact of unemployment on real wages*, The Resolution Foundation
- Harris, R. and Moffatt, J. (2011) "Plant-level Determinants of Total Factor Productivity in Great Britain, 1997-2006", SERC Discussion Paper No. 64, Spatial Economics Research Centre, London
- Lazear, E. (1986) "Salaries and piece rates" *Journal of Business* 59, 405-31.
- Lazear, E. (2000) "Performance pay and productivity", *American Economic Review*, 90, 1346-1361.
- Lemieux, T., MacLeod, W. B., Parent, D. (2009) "Performance Pay and Wage Inequality" *Quarterly Journal of Economics*, 124 (1): 1-49

- Manning, A. and Saidi, F. (2010) "Understanding the Gender Pay Gap: What's Competition Got to Do with It?", *Industrial and Labor Relations Review*, 63, 4: 681-698
- McGovern, P., Hill, S., Mills, C. and White, M. (2007) *Market, Class and Employment*, Oxford University Press
- Pekkarinen, T. and Riddell, C. (2008) 'Performance Pay and Earnings: Evidence from Personnel Records' *Industrial and Labor Relations Review* 61, 297-319
- van Wanrooy, B., Bewley, H., Bryson, A., Forth, J., Freeth, S., Stokes, L. and Wood, S. (2013) *Employment Relations in the Shadow of Recession: Findings from the 2011 Workplace Employment Relations Study*, Palgrave Macmillan

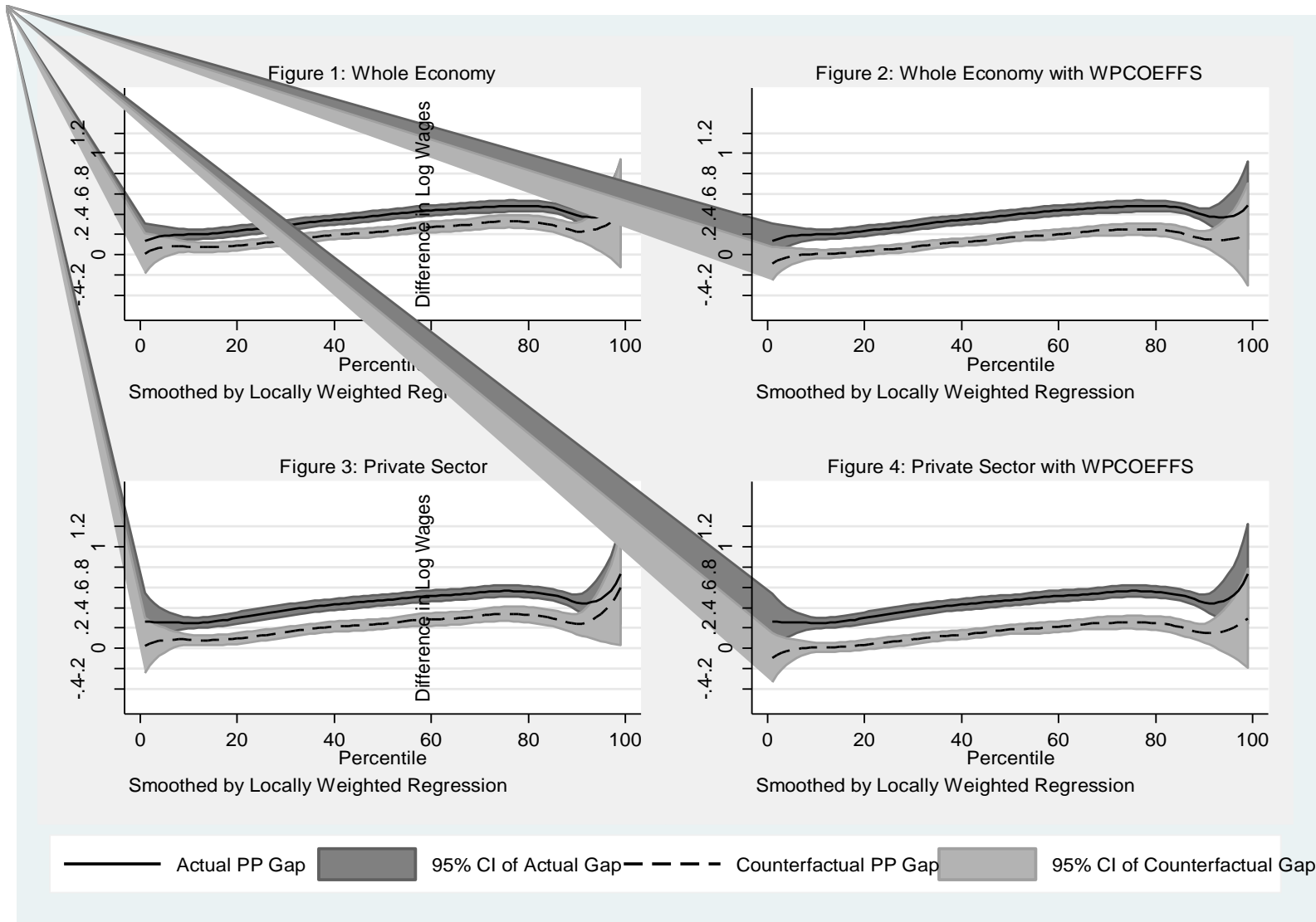


Table 1: Log Hourly Wage Premium for Performance Pay

	Model Specification:							
	(1) Raw		(2) Human Capital		(3) Full controls		(4) Workplace FE	
<i>Whole Economy</i>								
Any Performance Pay	.35	***	.27	***	.14	***	.09	***
	(11.14)		(11.32)		(8.55)		(5.85)	
r2	.05		.25		.57		.72	
N	17622		17622		17268		17268	
<i>Private Sector</i>								
Any Performance Pay	.43	***	.31	***	.17	***	.11	***
	(12.76)		(11.97)		(9.52)		(6.21)	
r2	.09		.27		.55		.72	
N	10871		10871		10639		10639	

Notes: (1) The dependent variable is log hourly wages as described in the text. (2) HC=human capital controls, namely highest academic qualification (8 dummies), workplace tenure (5 dummies) and the employee's age, which is a proxy for labour market experience (6 dummies). Column (3) incorporates all the human capital controls plus: female; white; disability; married/living as married; any dependent children; union member; covered by collective bargaining; occupation (9 dummies); usual hours worked (5 dummies); contract type (3 dummies); job autonomy scale; industry (13 dummies); N employees at workplace (6 dummies); single-establishment organisation; region (11 dummies). Workplace-level controls are replaced by workplace fixed effects in column (4). There are 1897 workplaces in the whole economy model and 1268 workplaces in the private sector model. (4) t-stats in parentheses \*=sig at 90% CI; \*\*=sig at 95% CI; \*\*\*=sig at 99% CI.





Note: Standard errors produced via bootstrapping (200 replications)

<i>Table 2: Reweighting Estimates of the Effect of PP Jobs on Measures of the Distribution of Log Hourly Wages, Whole Economy</i>				
	(1) Actual Dispersion	(2) Dispersion without PP jobs	(3) PP effect ((1)-(2))	(4) PP effect as % of (1)
<b>(a) Full controls model</b>				
Variance	.423	.310	.113	26.7
90-50	0.815	0.692	.123	15.1
50-10	0.604	0.637	-.033	-5.5
90-10	1.419	1.329	.090	6.3
95-5	1.809	1.758	.051	2.8
<b>(b) With WPCOEFFS</b>				
Variance	.423	.319	.104	24.6
90-50	0.815	0.768	.047	5.8
50-10	0.604	0.608	-.004	0.7
90-10	1.419	1.376	.043	3.0
95-5	1.809	1.701	.108	6.0
Notes: The counterfactual measures of wage dispersion reported in column (2) are computed by reweighting the sample of workers in FP jobs (see text for details). Columns (1) and (2) report differences between the two corresponding percentiles of the log wage distribution. The effect of PP in column (3) is the difference between columns (1) and (2). The full controls model for (a) is the model reported in Column 3 of Table 1. The WPCOEFFS model for (b) replaces the workplace controls with the workplace fixed effects coefficients from a log hourly wage model.				

<i>Table 3: Reweighting Estimates of the Effect of PP Jobs on Measures of the Distribution of Log Hourly Wages, Private Sector</i>				
	(1) Actual Dispersion	(2) Dispersion without PP jobs	(3) PP effect ((1)-(2))	(4) PP effect as % of (1)
<b>(a) Full controls model</b>				
Variance	.443	.303	.140	31.6
90-50	0.848	0.677	.171	20.2
50-10	0.637	0.656	-.019	-3.0
90-10	1.485	1.333	.152	10.2
95-5	1.836	1.758	.078	4.2
<b>(b) With WPCOEFFS</b>				
Variance	.443	.313	.130	29.3
90-50	0.848	0.763	.085	10.0
50-10	0.637	0.632	.005	0.8
90-10	1.485	1.395	.090	6.1
95-5	1.836	1.677	.159	8.7
Notes: The counterfactual measures of wage dispersion reported in column (2) are computed by reweighting the sample of workers in FP jobs (see text for details). Columns (1) and (2) report differences between the two corresponding percentiles of the log wage distribution. The effect of PP in column (3) is the difference between columns (1) and (2). The full controls model for (a) is the model reported in Column 3 of Table 1. The WPCOEFFS model for (b) replaces the workplace controls with the workplace fixed effects coefficients from a log hourly wage model.				

Appendix Table A1: Hotelling's t-squared generalised means tests for the unmatched and matched samples

	Unmatched	Matched
<i>Whole economy:</i>		
2-group hotelling t-squared	4734.248	186.42
F-stat	(67,17200)=70.39	(67,17200)=2.77
p>f	0.0000	0.0000
<i>Private sector:</i>		
2-group hotelling t-squared	2803.85	110.58
F-stat	(66,10572)=42.22	(66,10572)=1.665
p>f	0.0000	0.0006